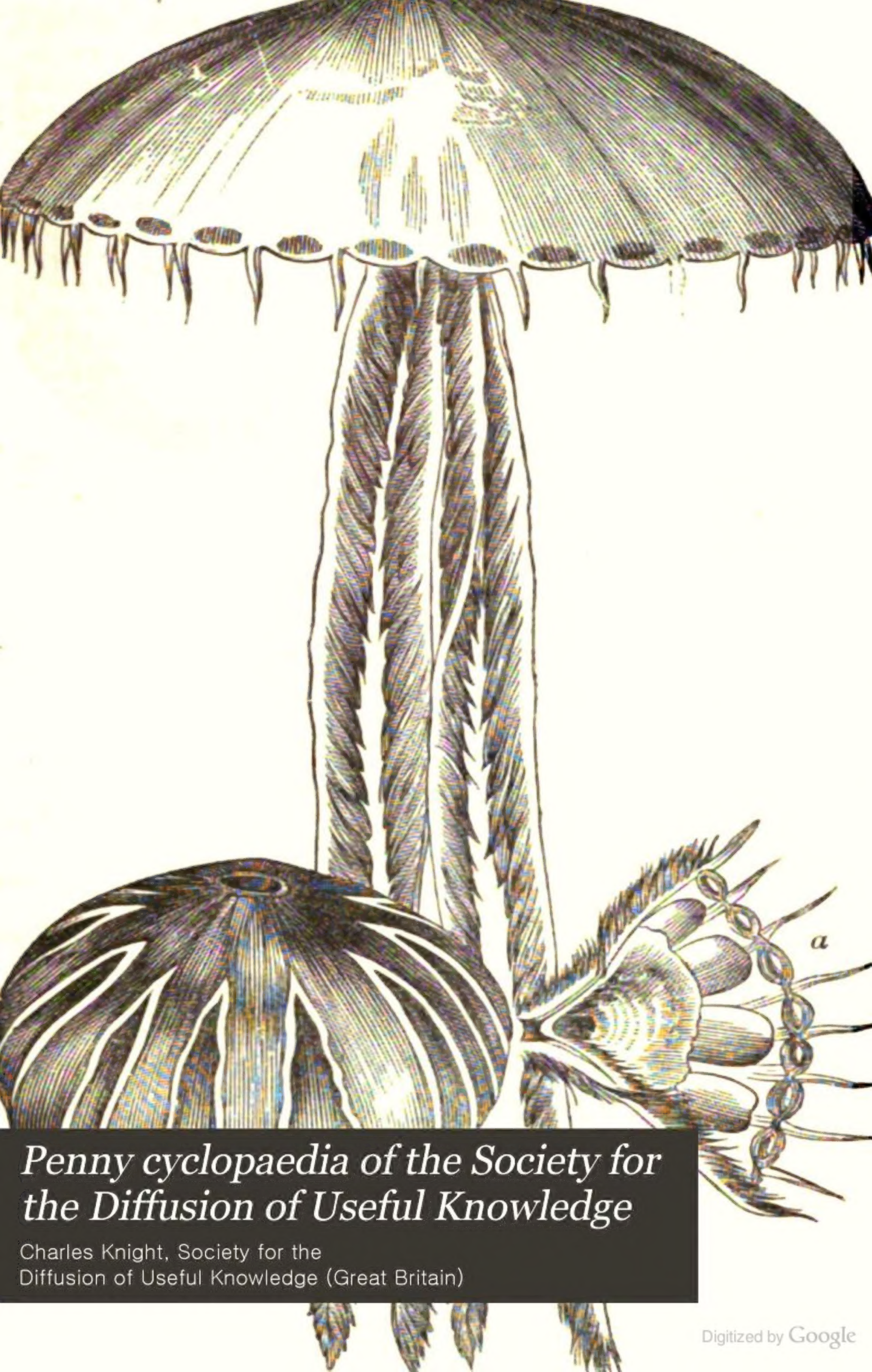

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OF

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VOLUME XIX.

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THE PENNY CYCLOPÆDIA

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PRIMATI'CCIO, FRANCESCO, was born at Bologna, in 1490. He was of a noble family, and his parents intended to have him brought up to the mercantile profession; but his natural genius leading him to the arts, he learned design and colouring from Innocenzio da Imola and Bagnacavallo, and having manifested extraordinary talent, he went to Mantua to study under Julio Romano, who was engaged on some great works in the palace Del Tè at Mantua, many of which Primaticcio and others of his disciples executed after his designs. Frederic, duke of Mantua, recommended him in 1531 to Francis, king of France, who entrusted him with many works. A great jealousy arising between him and Rosso, who was likewise in high favour with Francis, the king sent Primaticcio to Rome to purchase antiques, a commission in which he was extremely successful. He was recalled from Rome to complete a large gallery left unfinished by the death of Rosso. The number of works which he executed in France is truly astonishing, especially in the palace of Fontainebleau, where, assisted by his pupil Nicolo Abate, he painted, besides other works, in the great gallery, which was 456 feet long and 18 wide, fifty-eight pictures, each 6½ feet high and 8 feet wide, representing the principal scenes of the Odyssey; the roof, which was richly adorned with gilding and stucco, was decorated with fifteen large and sixty small pictures, chiefly subjects of heathen mythology. This great work was totally destroyed in 1738, when the great gallery was pulled down to erect apartments for some persons attached to the court. Francis II. gave him the abbey of St. Martin de Troyes, with a revenue of 8000 crowns, which he enjoyed till his death in 1570. Primaticcio's talents however were chiefly called into exercise under Henry II., most of the frescoes with which Francis intended to adorn Fontainebleau not being executed till after his death. The oil-paintings of Primaticcio are excessively rare in Italy. Fuseli mentions a Concert of three female figures in the Zambeccari gallery as an enchanting performance; and Dr. Waagen says that a picture at Castle Howard representing Penelope relating to Ulysses what has passed in his absence, is the finest work of this master that he had yet seen.

PRIME. A number is said to be prime when it is not divisible without remainder by any less number than itself, except unity. Thus 1, 2, 3, are of necessity prime; 4 is not, being divisible by 2; 5 is prime, and so are 7, 11, 13, 17, 19, 23, 29, 31, &c.

Large lists of prime numbers have been published [Tables], but they are seldom possessed by the elementary student. As it is however frequently desirable to know whether a number not exceeding 10,000 is prime or not, we shall give a table to that extent, the manner of using which is as follows:—If we wish to know whether 2897 be a prime number, under the heading 2 and in the column 8 we look for 97, which we find there: whence the table shows that 2897 is a prime number. Again, by the same means we find that 1457 is not a prime number, the adjacent prime numbers being 1453 and 1459.

0

0	1	2	3	4	5	6	7	8	9
1	01	11	07	01	03	01	01	09	7
2	03	23	11	09	09	07	09	11	11
3	07	27	13	19	21	13	19	21	19
5	09	29	17	21	23	17	27	23	29
7	13	33	31	31	41	19	33	27	37
11	27	39	37	33	47	31	39	29	41
13	31	41	47	39	57	41	43	39	47
17	37	51	49	43	63	43	51	53	53
19	39	57	53	49	69	47	57	57	67
23	49	63	59	57	71	53	61	59	71
29	51	69	67	61	77	59	69	63	77
31	57	71	73	63	87	61	73	77	83
37	63	77	79	67	93	73	87	81	91
41	67	81	83	79	99	77	97	83	97
43	73	83	89	87		83		87	
47	79	93	97	91		91			
53	81			99					
59	91								
61	93								
67	97								
71	99								
73									
79									
83									
89									
97									

1

0	1	2	3	4	5	6	7	8	9
09	03	01	01	09	11	01	09	01	01
13	09	13	03	23	23	07	21	11	07
19	17	17	07	27	31	09	23	23	13
21	23	23	19	29	43	13	33	31	31
31	29	29	21	33	49	19	41	47	33
33	51	31	27	39	53	21	47	61	49
39	53	37	61	47	59	27	53	67	51
49	63	49	67	51	67	37	59	71	73
51	71	59	73	53	71	57	77	73	79
61	81	77	81	59	79	63	83	77	87
63	87	79	99	71	83	67	87	79	93
69	93	83		81	97	69	89	89	97
87		89		83		93			99
91		91		87		97			
93		97		89		99			
97				93					
				99					

2

0	1	2	3	4	5	6	7	8	9
03	11	03	09	11	03	09	07	01	03
11	13	07	11	17	21	17	11	03	09
17	29	13	33	23	31	21	13	19	17
27	31	21	39	37	39	33	19	33	27
29	37	37	41	41	43	47	29	37	39
39	41	39	47	47	49	57	31	43	53
53	43	43	51	59	51	59	41	51	57
63	53	51	57	67	57	63	49	57	63
69	61	67	71	73	79	71	53	61	69
81	79	69	77	77	91	77	67	79	71
83		73	81		93	83	77	87	99
87		81	83			87	89	97	
89		87	89			89	91		
99		93	93			93	97		
		97	99			99			

3

0	1	2	3	4	5	6	7	8	9
01	09	03	01	07	11	07	01	03	07
11	19	09	07	13	17	13	09	21	11
19	21	17	13	33	27	17	19	23	17
23	37	21	19	49	29	23	27	33	19
37	63	29	23	57	33	31	33	47	23
41	67	51	29	61	39	37	39	51	29
49	69	53	31	63	41	43	61	53	31
61	81	57	43	67	47	59	67	63	43
67	87	59	47	69	57	71	69	77	47
79	91	71	59	91	59	73	79	81	67
83		99	61	99	71	77	93	89	89
89			71		81	91	97		
			73		83	97			
			89		93				
			91						

4

0	1	2	3	4	5	6	7	8	9
01	11	01	27	09	07	03	03	01	03
03	27	11	37	21	13	21	21	13	09
07	29	17	39	23	17	37	23	17	19
13	33	19	49	41	19	39	29	31	31
19	39	29	57	47	23	43	33	61	33
21	53	31	63	51	47	49	51	71	37
27	57	41	73	57	49	51	59	77	43
49	59	43	91	63	61	57	83	89	51
51	77	53	97	81	67	63	87		57
57		59		83	83	73	89		67
73		61		93	91	79	93		69
79		71			97	91	99		73
91		73							87
93		83							93
99		89							99
		97							

5

0	1	2	3	4	5	6	7	8	9
03	01	09	03	07	01	23	01	01	03
09	07	27	09	13	03	39	11	07	23
11	13	31	23	17	07	41	17	13	27
21	19	33	33	19	19	47	37	21	39
23	47	37	47	31	21	51	41	27	53
39	53	61	51	37	27	53	43	39	81
51	67	73	81	41	31	57	49	43	87
59	71	79	87	43	57	59	79	49	
77	79	81	93	49	63	69	83	51	
81	89	97	99	71	69	83	91	57	
87	97			77	73	89		61	
99				79	81	93		67	
				83	91			69	
								79	
								81	
								97	

6

0	1	2	3	4	5	6	7	8	9
07	01	03	01	21	21	07	01	03	07
11	13	11	11	27	29	19	03	23	11
29	21	17	17	49	47	37	09	27	17
37	31	21	23	51	51	53	19	29	47
43	33	29	29	69	53	59	33	33	49
47	43	47	37	73	63	61	37	41	59
53	51	57	43	81	69	73	61	57	61
67	63	63	53	91	71	79	63	63	67
73	73	69	59		77	89	79	69	71
79	97	71	61		81	91	81	71	77
89	99	77	67		99		91	83	83
91		87	73				93	99	91
		99	79						97
			89						
			97						

7

0	1	2	3	4	5	6	7	8	9
01	03	07	07	11	07	03	03	17	01
13	09	11	09	17	17	07	17	23	07
19	21	13	21	33	23	21	23	29	19
27	27	19	31	51	29	39	27	41	27
39	29	29	33	57	37	43	41	53	33
43	51	37	49	59	41	49	53	67	37
57	59	43	51	77	47	69	57	73	49
69	77	47	69	81	49	73	59	77	51
79	87	53	93	87	59	81	89	79	63
	93	83		89	61	87	93	93	93
		97		99	73	91			
					77	99			
					83				
					89				
					91				

8

0	1	2	3	4	5	6	7	8	9
09	01	09	11	19	01	09	07	03	23
11	11	19	17	23	13	23	13	07	29
17	17	21	29	29	21	27	19	19	33
39	23	31	53	31	27	29	31	21	41
53	47	33	63	43	37	41	37	31	51
59	61	37	69	47	39	47	41	37	63
69	67	43	77	61	43	63	47	39	69
81	71	63	87	67	63	69	53	49	71
87	79	69	89		73	77	61	61	99
89	91	73			81	81	79	63	
93		87			97	89	83	67	
		91			99	93		87	
		93				99		93	
		97							

9

0	1	2	3	4	5	6	7	8	9
01	03	03	11	03	11	01	19	03	01
07	09	09	19	13	21	13	21	11	07
11	27	21	23	19	33	19	33	17	23
13	33	27	37	21	39	23	39	29	29
29	37	39	41	31	47	29	43	33	31
41	51	41	43	33	51	31	49	39	41
43	57	57	49	37	87	43	67	51	49
49	61	77	71	39		49	69	57	67
59	73	81	77	61		61	81	59	73
67	81	83	91	63		77	87	71	
91	87	93	97	67		79	91	83	
	99			73		89		87	
				79		97			
				91					
				97					

The distribution of the prime numbers does not follow any discoverable law, but it begins to be evident from the preceding table, that in a given interval the number of primes is generally less, the higher the beginning of the interval is taken. The following table will set this in a clearer light: the numbers in the first column mean thousands, and in the second column are found the numbers of primes which lie in the interval specified in the first column. Thus between 10 thousand and 20 thousand lie 1033 primes.

Between	No. of Primes.	Between	No. of Primes.
0 and 10	1230	150 and 200	4135
10 and 20	1033	200 and 250	4061
20 and 30	983	250 and 300	3943
30 and 40	958	300 and 350	3989
40 and 50	930	350 and 400	3884
50 and 60	924	400 and 500	7677
60 and 70	878	500 and 600	7555
70 and 80	901	600 and 700	7442
80 and 90	876	700 and 800	7402
90 and 100	879	800 and 900	7331
100 and 150	4257	900 and 1000	7225

In the first 10,000 numbers, upwards of 12 per cent. are primes; but between 900 thousand and a million, only 7½ per cent. are primes. The preceding enumerations are taken from Legendre's Theory of Numbers, and were made from the large tables of primes given by Vega, Chernac, and Burkhardt. The only thing known relative to the proportions of prime numbers to others is that if x be a very large number, the number of primes contained between 0 and x is nearly $x \div (\log x - 1{\cdot}08366)$, $\log x$ being the Naperean logarithm. This very curious theorem was discovered empirically, that is, by looking for a formula which should nearly represent the results of tables. Legendre, in the work cited, gave proof that such a formula must have the form $x \div (A \log x - B)$, but no reason has yet been given why A is 1, and B is 1·08366. Using the common logarithm, we find that the number of primes less than x is such a proportion of x as ·4342945 is of $\log x -$ ·470628, nearly. Thus, of all numbers less than a million of million of millions, only one out of 40 is prime, while the number of primes under the square of that number is one out of 82.

It thus appears that we might name a succession of numbers beginning with one so high, that a million, or any other number however great, of numbers should pass without containing one prime number. Nevertheless there cannot be an end to the prime numbers; for if so, let p be the last prime number, and let N be the product of all the prime numbers 2, 3, 5, ..., p. Now every number is either prime or divisible by a prime; but $N+1$ is not divisible by 2, 3, 5, ... or p, since it leaves a remainder 1 in every such division. It is therefore prime, or there is a prime number $N+1$, greater than the greatest prime number p, which is absurd. The following are among the properties of prime numbers. (1.) Every prime number (except 2) is odd, or of the form $2x+1$. (2.) Every prime is of the form $4x+1$ or $4x+3$, and a prime of the form $4x+1$ is always the sum of two squares. (3.) Every prime is of the form $6x+1$ or $6x+5$. (4.) No algebraical formula can always represent a prime number; but some formulæ show a long succession of primes: thus x^2+x+41 is prime from $x=0$ to $x=39$, both inclusive. (5.) If $2x+1$ be a prime number, and N any number which it does not divide, either N^x-1 or N^x+1 must be divisible by $2x+1$. (6.) If M and N be two prime numbers, and if $M=2x+1$, $N=2y+1$, then if x and y be both odd numbers, either $(M^y-1) : N$ and $(N^x-1) : M$ are both whole numbers, or $(M^y+1) : N$ and $(N^x+1) : M$ are both whole numbers. But if x and y be not both odd, then either $(M^y-1) : N$ and $(N^x+1) : M$ are both whole numbers, or else $(M^y+1) : N$ and $(N^x-1) : M$ are both whole numbers. This theorem is of considerable importance in the theory of numbers, and has been termed the law of reciprocity of prime numbers.

Two numbers are said to be prime to one another, when they have not any common measure except unity: as 36 and 55.

The prime factors of a number are those prime numbers which divide it. Thus 360 being $2^3 \times 3^2 \times 5$, its prime factors are 2, 3, 5, of which the first enters three times, the second twice, and the third once. If A, B, C, ... be the prime factors of a number, and $a, b, c, \ldots$ the number of times which they severally enter, the number is $A^a \times B^b \times C^c \times \ldots..$, and the number of divisors which it admits of (unity and itself included) is $(a+1) \times (b+1) \times (c+1) \times \ldots.$ Call this number N: then the number of numbers less than N, and prime to N, is

$$N \times \frac{a-1}{a} \times \frac{b-1}{b} \times \frac{c-1}{c} \times \ldots..$$

PRIME AND ULTIMATE RATIOS. [RATIOS, PRIME AND ULTIMATE; DIFFERENTIAL CALCULUS.]

PRIME'RO, a game at cards, so called from a situation in the game. He who holds the *prime* (primero), that is, a sequence of the best cards and a good trump, is sure to be successful over his adversaries; hence its denomination *Primero, Prime*, and *Primavista* were one and the same game.

Primero appears to have been one of the earliest games at cards played in England, and continued to be the most fashionable game throughout the reigns of Henry VIII., Edward VI., Mary, Elizabeth, and James. In the earl of Northumberland's letters relating to the powder-plot, we find that Josceline Percy was playing at primero on Sunday, when his uncle, the conspirator, called on him at Essex-house. In the Sydney Papers there is an account of a quarrel between Lord Southampton, the patron of Shakspere, and one Ambrose Willoughby, on account of the former persisting to play at primero with Sir Walter Raleigh and another, in the Presence Chamber, after the queen had retired to rest.

Shakspere speaks of Henry VIII. playing at primero with the duke of Suffolk.

One of the dialogues at the end of Minshew's Spanish Dictionary illustrates the method of playing this game; many of the terms of which are also detailed in one of Sir John Harington's epigrams, in which he describes 'the Story of Marcus's Life at Primero.'

It is uncertain whether this game is of Spanish or Italian origin. Daines Barrington and Mr. Bowle (*Archæologia*, vol. viii., 133-151) were of opinion that it is of Spanish origin; but Berni's *Capitolo del Gioco della Primiera* affords proof that it was at least commonly played in Italy at the commencement of the sixteenth century.

(Nares's *Glossary*; Singer's *Researches into the History of Playing Cards*, 4to., Lond., 1816, p. 244-256.)

PRI'MNOA, a subdivision of the Linnæan genus Gorgonia.

PRIMOGENITURE may be defined to be that rule of law by which a title of dignity or an estate in land comes to a person in respect of his being an eldest male. If a man dies seised of real estate, of which he had the absolute ownership, without having made any disposition of it by his last will, the whole descends to the heir at law or customary heir; and the heir at law is such by virtue of being the eldest male person of those who are in the same degree of kindred to the person dying, or the representative of such eldest male. [DESCENT.] This is a case in which primogeniture operates. A common example of primogeniture is where a father dies absolutely entitled to real estate, and without disposing of it by will, in which case his eldest son takes it all. If land is settled or entailed on a man and his male issue, the eldest son takes the land by two titles, first as being a male, and next as being the eldest son. The law of primogeniture then only applies in the case of land when the owner dies without having made any disposition of it by will, or where the land is settled on a man and his male issue. It does not apply when the interest in land is a chattel interest, or a term of years, whatever may be its duration.

At present, those who are the absolute owners of large landed estates seldom die without making a disposition of them by will. In the case of lands which are settled, the person in possession is generally tenant for life, and the inheritance is entailed on the eldest son. When the eldest son is about to marry, it is usual for the father and son to take the usual legal steps (which they can do as soon as the son is of age) to unsettle the estate and obtain the absolute ownership. They then resettle the estate, making the father tenant for life as before; the son, who was before tenant in tail, is also made only a tenant for life; and the inheritance is settled, as before, on the eldest son of the intended marriage. Such eldest son takes the estate, not as heir, and therefore not by the law of primogeniture, but he takes it as the person designated by the deed of settlement.

When a man happens to be tenant in tail, he usually takes the legal steps necessary (which he can do as soon as he is of age) to acquire the absolute ownership of the property, which he then generally settles again by deed or will, or disposes of absolutely.

It is usual in England to settle all large estates, and the object of the settlement is to keep the estates together, and to perpetuate them in one family; but there is a limit to this power of settlement. A man cannot, either by deed or will, settle his land, so as to prevent the absolute ownership of it from being obtained, for a longer period than a life or lives of persons in existence at the time when the settlement takes effect, and twenty-one years more.

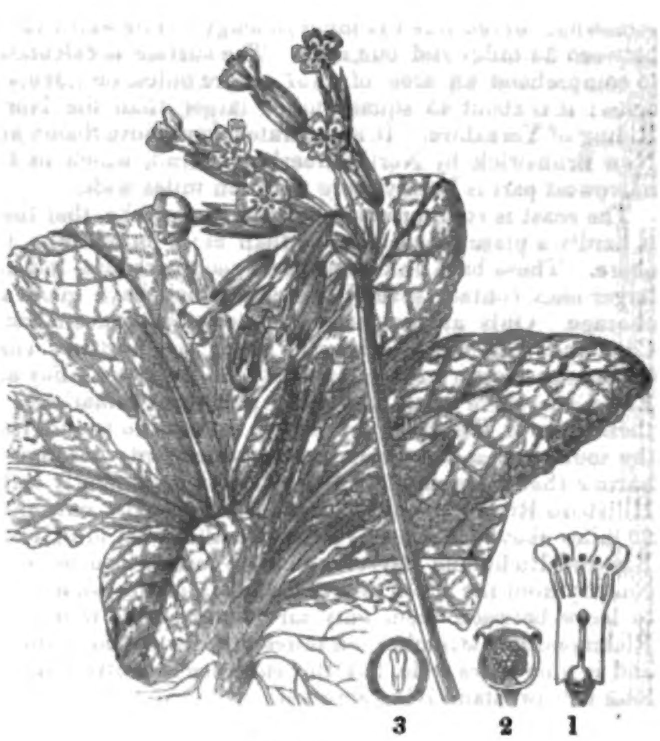
Lands in GAVELKIND and BOROUGH ENGLISH are an exception to the general rule of law as to the descent of land.

The law of primogeniture then only operates in the cases already explained; and the system of settlements by which property is kept together in large masses is quite distinct in principle from the law of primogeniture. It is not the result of a law which favours primogeniture, but it is the result of the legal power which an owner of land has over it, and of the habits of the people. The various reasons which have laid the foundation of this habit, and which perpetuate it, are foreign to the consideration of primogeniture as a rule of law.

In Virginia, after the Revolution, an act was passed for converting estates tail into fee simple, and at the same time the law of primogeniture was abolished. These laws have so far been in accordance with or have acted on public opinion, that a parent by his will now generally makes the same disposition of his property as the law makes in case he dies intestate. (Tucker's *Life of Jefferson*, i. 96, &c.)

(*Remarks on Primogeniture and Entails*, Hayes, *Introduction to Conveyancing*.)

PRIMULA'CEÆ are monopetalous Exogenous plants, peculiarly distinguished by the stamens being opposite to the lobes of the corolla, and a superior capsule with a free central placenta. In most respects they correspond indeed with the Myrsinaceous order, but the latter are known by their being trees or shrubs with an indehiscent fleshy fruit. The Primulaceous order consists of herbaceous plants inhabiting the temperate parts of the world, in moist situations, such as meadows, morasses, and alpine stations, or in the damp parts of woods, which they adorn with their lively flowers. The Primula, Anagallis, Soldanella, Cyclamen, and Lysimachia, of various species and under many forms, are the gayest of the genera, some of whose species are found in almost all gardens. The cowslip is slightly narcotic, but the order is of no known utility.



Primula veris.

1, a corolla laid open; 2, a section of a capsule; 3, a section of a seed.

PRIMUM MO'BILE, the name given in the old astronomy to the imaginary sphere by the motion of which diurnal motion was given to the heavens. [PTOLEMAIC SYSTEM.]

PRINCE is the Latin word *princeps*, which was originally used to denote the person who was entitled princeps senatus in the Roman State. He seems to have been originally the custos of the city, and his office was one of importance. Subsequently it became a title of dignity, and the princeps was named by the censors. (Liv., xxvii. 2.) In the senate he gave his opinion first after the magistratus. Augustus and his successors adopted the title of princeps, as a name that carried no odium with it; and this became henceforward the characteristic title of the master of the Roman world. Accordingly the constitutions of the emperors are called principum (Gaius, i. 2), or principales. The word princeps is formed similarly to anceps, municeps, &c., and contains the same element as 'primus.' In the course of time the word prince, which is derived from princeps, has come to be applied to persons having personal preeminence, and especially to certain sovereigns of smaller states possessing either perfect independence of all others or enjoying under some superior high political rights. Of the first kind were the old sovereigns of Wales, who, under the name of princes, enjoyed the same right and power which belong to kings; and of the second, the heads of certain states of Germany comprehended in the great Germanic confederation. But the word seems not to have acquired so definite a sense as that which belongs to king, duke, marquis, earl, and some others of the class; but rather to denote persons of eminent rank in certain states, as in Prussia, Russia, Italy, and other continental states, when no sovereignty, properly so called, comes along with it, or persons who are junior members of sovereign houses, as Prince Leopold, Prince Albert, both younger members of one branch of the sovereign house of Saxe.

In England it has sometimes been the practice of the heralds to speak of a duke as the high and mighty prince; but the word seems rather to be restricted among us in its application to persons who are of the blood-royal, that is, a son, grandson, or nephew of a king; and it would probably be extended to the remote male posterity, though no such case has arisen in the course of the last three centuries; and in its application it is merely a term of common parlance, not being conferred, like the title of duke, in any formal manner; and even the precedence which is given to blood-royal has respect to birth, and not to the enjoyment of this word as a title of honour. The king's eldest son is however made Prince of Wales by a special act of creation.

PRINCE EDWARD'S ISLAND, a British island on the coast of North America, in the Gulf of St. Lawrence, is situated between 45° 58′ and 47° 7′ N. lat. and between 62° and 64° 27′ W. long. It extends from east to west in a somewhat curved line 135 miles in length. The width varies between 34 miles and one mile. The surface is calculated to comprehend an area of 2157 square miles, or 1,380,480 acres: it is about 45 square miles larger than the North Riding of Yorkshire. It is separated from Nova Scotia and New Brunswick by Northumberland Strait, which in the narrowest part is hardly more than ten miles wide.

The coast is so intersected by bays and creeks, that there is hardly a place which is more than eight miles from the shore. These bays and inlets form good harbours, and the larger ones contain several branches which have good anchorage. Only at the western extremity, between North Cape and West Cape, and again along the northern coast towards the eastern extremity, between St. Peter's Bay and East Cape, there is no harbour. The most remarkable of these bays is Hillsboro Bay, which enters the island from the south with a broad opening, but afterwards becomes so narrow that it appears like a river, and is accordingly called Hillsboro River: the tide ascends nearly to its extremity, 20 miles above Charlotte Town. Farther west are Halifax Bay and Richmond Bay, of which the former intersects the country from the south and the latter from the north, so as to leave between them only an isthmus one mile wide. Richmond Bay stretches ten miles from its entrance inland, and is nine miles wide, but the entrance is contracted by a long narrow island lying across it.

The surface of the island consists of gentle ascents and descents. There is no plain of any extent, and the eminences do not deserve the name of hills, with the exception perhaps of a series of heights which intersect the island nearly in the middle, running from Disable Bay on the southern shores, to Grenville Bay on the north. The soil, though nowhere very fertile, is in general productive. There are a few swamps, some of which are dry and covered with shrubs and moss; others are wet, and produce dwarf alder, long grass, and a variety of shrubs. There are also barren tracts which produce nothing except dry moss or shrubs. But the swamps and barrens bear only a small proportion to the whole surface of the island.

The climate of Prince Edward's Island is favourably distinguished from that of all the surrounding countries by being exempted from fogs and being much less subject to cold. A misty fog appears sometimes on a summer or autumnal morning, but it is soon dispersed. The winter is two months shorter than in Nova Scotia and New Brunswick, and the frost much less intense; snow however falls in considerable quantity. For three or four months the country is covered with it. In April spring begins, but the heat increases rapidly, and summer may be considered as beginning in May. In June, July, and August the heat is excessive, the thermometer commonly rising to 80° or 90°, and during this period thunder-storms are frequent. From September to November the season is pleasant, and in December the frost sets in.

With the exception of the swamps and barrens, the island was formerly entirely overgrown with high forest-trees, especially pine, the timber of which has been so largely exported to England, that at present there is no more than is required by the inhabitants for house and ship building and other purposes. The other trees are spruce-fir, hemlock, beech, birch, maple, poplar, and white cedar in abundance; oak, elm, ash, and larch are not plentiful, and the quality of the first is very inferior. At present about one half of the cultivable surface of the island is still wooded.

Soil and climate unite to make this island an agricultural country. All kinds of grain and vegetables raised in England grow very well. Wheat, barley, and oats are extensively grown; and some winter-rye and buckwheat. Beans and peas are also raised. All the culinary vegetables common in England attain perfection. Indian-corn does not succeed well. Flax is raised only for home consumption, and is of excellent quality; hemp does not thrive well. The fruits are cherries, plums, damsons, and black, red, and white currants. Apples and pears require great attention, and are of inferior quality.

The horses are small but hardy. The black cattle are of a smaller size than in England. Sheep and swine are plentiful, and the breed of the former has lately been much improved. The wild animals are bears, loup-cerviers, foxes, hares, otters, martens, musquashes, minks, squirrels, musk-rats, and weasels. The bears, which formerly destroyed a great number of cattle, sheep, and hogs, have been nearly exterminated. Otters, martens, and musk-rats, which supply valuable furs, have become scarce. Seals are found in the bays and along the shores in summer and autumn; and in summer immense numbers sometimes come down on the ice from the northward. Among the birds, the partridges are distinguished by their size, and wild pigeons are numerous, but only appear in summer. Wild geese make a stay of about six weeks in spring, and about as long in autumn. Fish as well as shell-fish are plentiful, and the oysters are considered the finest in America. Many cargoes are annually sent to Quebec and Halifax.

No minerals have been found on the island except red and white clay, fit for bricks and pottery.

The island is divided into three counties, King's County, Queen's County, and Prince's County. Queen's County occupies the central districts, King's County the east, and Prince's County comprehends the west. Queen's County contains 771 square miles, and is nearly equal to Nottinghamshire; King's County contains 650 square miles, and is not so large as Worcestershire; Prince's County has 736 square miles, or almost as many as Oxfordshire. The population chiefly consists of Scotch emigrants and their descendants, some families of English extraction, and a few Acadians, or Americans of French origin. Formerly there were several families of Micmac Indians, but it appears that they have all emigrated to Chaleurs Bay. In 1768 the number of families did not exceed 150. According to the census taken in 1827, the population consisted of about 36,000, and as the number of settlements was then rapidly increasing, Bouchette estimated the population, in 1832, at 50,000.

The settlements are dispersed all over the island. The coasts are more densely settled than the interior, with the exception of the western coast between North Cape and East Cape, which is almost entirely in its natural state, and is overgrown with forests. The northern coast has a greater number of settlements than the southern. Charlotte Town, the capital and seat of government, is situated in Queen's County, on the north side of Hillsboro River, near its confluence with the rivers Elliot and York. The harbour is considered one of the best in the Gulf of St. Lawrence. At the entrance it is little more than half a mile wide, but within it enlarges and forms a safe and spacious basin, which branches off into three beautiful and navigable rivers. The town stands on a gently rising ground, and is regularly built with broad streets intersecting each other at right angles. There is a court-house, an Episcopal church, a Scotch church, and a Roman Catholic and a Methodist chapel. In 1830 it contained about 350 dwelling-houses and 3400 inhabitants. In three or four places on the eastern and northern coast timber is shipped for England.

Ship-building is carried on in this island, and a considerable number of vessels, from one hundred to six hundred tons, are built for the British market: but the principal trade of the island consists in supplying Newfoundland with schooners for the seal and cod fisheries, with black cattle, sheep, hogs, poultry, oats, potatoes, turnips, &c.; the returns are chiefly made in money or West India produce. Wheat and other grain are sent to Miramichi and other settlements on the eastern coast of New Brunswick, where the population are chiefly engaged in preparing timber for the market. The same articles are sent to Halifax. Beef, pork, sheep, hams, cheese, oats, potatoes, flour, and fish are occasionally exported to Bermuda. Though the best fishing-banks within the Gulf of St. Lawrence lie in the immediate vicinity of the northern shores of this island, fishing is not carried on to any great extent.

Prince Edward's Island was discovered by Cabot in 1497, on St. John's day, and hence it obtained the name of St. John's Island, which it preserved up to 1799, when it was changed into its present name in honour of the late duke of Kent. It was taken possession of by the French after the settlement of Canada, but no permanent establishment seems to have been formed in it before the peace of Utrecht (1713), when some families from Cape Breton settled there. In 1758 it was taken by the English, who retained possession of it at the peace of Paris (1763). In 1770 a separate constitution was granted to it, and the first House of Assembly met in 1773.

Prince Edward's Island is in the diocese of Nova Scotia. There are two schools supported by the government in Charlotte Town; and there are also schools for elementary instruction in most of the settlements. The government is conducted by a lieutenant-governor and a council, which also acts in a legislative capacity; and there is a House of Assembly, which consists of eighteen members. The English law is administered by a chief-justice, and there are district courts for the recovery of small debts.

(MacGregor's *British America*; Bouchette's *British Dominions in North America*.)

PRINCE WILLIAM'S SOUND is a wide bay on the north-west coast of North America, extending, with several branches, between 60° and 61° N. lat. and between 146° and 148° 30′ W. long. It is called by the Russians Tshongathkaia. It opens to the south, and the entrance contains two large islands, of which the eastern is called Rose Island, and the western Montague Island. In both islands there are good harbours, and the largest vessels may enter the bay on both sides of Montague Island. Rose Island contains Port Etches, where the Russians have a factory, and a wooden fort, called Fort Constantine. The islands are rocky and mountainous, but the mountains do not rise so high as on the continent. The country abounds in pine-trees, some of which are very large; there is also a great quantity of alder and hazel trees. Wild berries, as strawberries, raspberries, and alderberries, are plentiful. Sea-otters and foxes are still frequently met with, and other fur-bearing animals are abundant in the forests. The natives, who are few in number, and called Oogaliakhmutes, live mostly on the produce of their fishing. They are short in stature, and seem to be a cross between the Esquimaux and the other Indians. (Portlock's *Voyage Round the World*.)

PRINCE OF WALES'S ISLAND. [Penang.]

PRINCE'S METAL, or *Prince Rupert's Metal*, an alloy of copper and zinc, which contains more copper than brass does, and is prepared by adding this metal to the alloy.

PRINCIPAL, the name of a stop or row of metal pipes in an organ, tuned an octave higher than the diapason, an octave lower than the fifteenth, and serving to blend the two, as well as to augment the volume of sound.

PRINCIPAL. [Agent.]

PRINCIPA'TO CITRA. [Salerno, Province.]

PRINCIPA'TO ULTRA, called also 'Provincia di Avellino,' is a province of the kingdom of Naples, bounded on the north by the provinces of Sannio and Capitanata, from which it is divided by the central ridge of the Apennines, on the east by Capitanata, on the south by Basilicata and the province of Salerno, and on the west by Terra di Lavoro. The province of Principato Ultra lies almost entirely in the Apennines, and between the western lower ridge of those mountains, including Monte Taburno, Tifata, and Monteforte, which divides the basin of the river Calore, an affluent of the Volturno, from the plains of Campania, and the central ridge, which forms the watershed between the streams that flow into the Mediterranean and into the Adriatic. The Calore and its affluents the Tamaro and Sabbato are the principal rivers of the province. A small part of Principato Ultra however extends along the eastern slope of the central ridge, where the river Ofanto (Aufidus) has its source in the neighbourhood of Conza and Nusca.

Owing to the local situation of the province and its elevation above the sea, the temperature is considerably lower upon the whole than that of the plains of Campania, although in some of the valleys the summer heats are occasionally very great. Some places in the valley of the Calore are subject to the malaria in consequence of stagnant waters. The country produces corn, fruits in abundance, silk, some wine, and has excellent pasture for cattle. By the last census the population of the whole province was 390,000, exclusive of Benevento and its territory, which belongs to the pope, although geographically included within the boundaries of Principato Ultra. [Benevento.] The area is reckoned at 1960 square miles. (Neigebaur; Serristori.) The principal towns of the province are, Avellino, Ariano, Montesarchio with 6000 inhabitants, Montefusco, with 3000, and Sant' Angelo dei Lombardi. The province is divided, for administrative purposes, into three districts:—Avellino, Ariano, and Montefusco.

The province of Principato Ultra occupies the country of the antient Hirpini, one of the nations of the Samnite confederation.

PRINCI'PIA, the contracted title of the 'Philosophiæ Naturalis Principia Mathematica,' the great work of Newton, the publication of which is the most remarkable epoch in the history of science. The title-page of the first edition is: '*Philosophiæ Naturalis Principia Mathematica. Autore Is. Newton, Trin. Coll. Cantab., Soc. Matheseos Professore Lucasiano, et Societatis Regalis Sodali. Imprimatur. S. Pepys, Reg. Soc. Præses, Julii 5, 1686. Londini Jussu Societatis Regiæ ac Typis Josephi Streater. Prostat apud plures Bibliopolas. Anno MDCLXXXVII.*'

The object of this article is to describe the publication and the contents of the Principia, with a brief notice of the principal commentaries. The first head, the publication, we should have left untouched, referring to the article Newton, if it had not been for the work which the late Professor Rigaud published a short time before his death, entitled 'Historical Essay on the First Publication of Sir Isaac Newton's Principia,' Oxford, 1838. A slight account of this publication, embodying Mr. Rigaud's conclusions, may be usefully appended to the article cited.

Mr. Rigaud appears to receive the common story of the fall of an apple. [Newton, p. 201.] It was communicated by Newton's niece to Voltaire, and by her husband, Mr. Conduit, to Fontenelle. It is clear however that Newton first thought on the subject in 1666. With reference to the story of his laying by the theory until Picard's measure of the earth was brought to his notice in 1682 [p. 199], Mr. R. states the fact that Picard's 'Mésure de la Terre' was published in 1671, and much discussed at the Royal Society in the years following.* Moreover Dr. Pemberton, who derived his information from Newton himself, states most explicitly (in his preface) that a letter from Hooke gave occasion to his resuming his old thoughts, and that he then used Picard's measure. This letter from Hooke, the subject of which was the curve in which a falling body descends to the earth, taking into account the earth's motion, is clearly made out to have been written in 1679, which is therefore the date of Newton's resumption of his attempt, not 1682, as generally stated. The new attempt, as every one knows, was more successful, but Newton did not write any treatise nor contemplate any publication; he traced out the foundation of his system, and threw aside his papers. In January,† 1684, Halley had concluded, from Kepler's third law, that the centripetal force on the planets (supposed to move in *circles*) was as the inverse square of the distance. Not being able to proceed further, he applied to Hooke and Wren, the former of whom professed to have solved the whole problem, but would communicate nothing; the latter declared that he had long given over the question from inability to succeed. In August following, Halley paid a visit to Newton at Cambridge, who informed him that he had solved the problem, but *was not able to lay his hand on the papers which contained his solution*, so completely had he thrown the subject aside. After Halley's departure, he worked the theorems out again, and transmitted them to Halley through Mr. Paget, the mathematical master at Christ's Hospital. On receipt of this communication, in November, Halley immediately paid another visit to Cambridge, to gain more information, and to induce Newton to pursue the inquiry. December 10, 1684, Halley stated at the Royal Society that 'he had lately seen Mr. Newton at Cambridge, and that he had shown him a curious treatise *De Motu*, which, upon his desire, he said was promised to be sent to the Society to be entered upon their register.' Halley and Paget were accordingly deputed to keep Newton in mind of his promise (a singular proceeding, showing how well the Society knew Newton's indifference about communicating), and the consequence was, that about the middle of February, 1685, a communication (that previously made to Halley, enlarged), entitled 'Isaaci Newtoni Propositiones de Motu,' was sent and registered: it contains what were afterwards the main theorems of the early sections of the Principia, direct and inverse, relating to centripetal forces. No Principia as yet existed, and even this basis had only recently been written down satisfactorily. Newton writes to Mr. Aston, Sec. R. S., in acknowledging the news of the above entry, 'I designed them for you before now, but the examining several things has taken a greater part of my time than I expected, and a great deal of it to no purpose. And now I am to go into Lincolnshire for a month or six weeks. *Afterwards I intend to finish it* as soon as I can conveniently.' (February 23, 1685.) On this Mr. Rigaud well remarks, 'The Principia was not a protracted compilation from memoranda which might have been written down under the impression of different trains of thought: it had the incalculable advantage of being composed by one continued effort, during which the mutual bearing of the several parts was vividly present to the author's mind.' On the 21st of April, 1686, Halley announced to the Royal Society that Mr. Newton 'had an incomparable Treatise on Motion almost ready for the press;' and on the 28th of the same month Dr. Vincent* presented the manuscript of the first book to the Society, who referred the question of printing to the Council, and the production of a report upon the contents to Halley. May 19, the Society decided that the work should be printed forthwith in quarto, &c.; and hence it has always been supposed that the Society paid the expenses of printing, though the title-page only bears 'jussu Societatis,' &c., and not 'jussu et sumptibus,' as usual where it bore the expenses. But Mr. Rigaud quotes the minute of the *Council* of the Society of the 2nd of June, confirming the vote of the *Society* to the extent of resolving 'that Mr. Newton's book be printed,' but adding that 'E. Halley shall undertake the business of looking after it, *and printing it at his own charge, which he engaged to do.*' The fact was, that when the Council came to consider the Society's vote of the 19th of May, they found there was no money; a work of Francis Willughby, 'De Historia Piscium,' published 'jussu et sumptibus,' in 1686, had so reduced their funds, that they were obliged to pay their officers in copies of this very book about fishes.

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* Mr. R. mentions that Newton must have been acquainted with the measures of Snell and Norwood, the result of the former of which appears in his own edition of Varenius. The latter, there can be no doubt, he did not trust; and as to the former, we have shown [Mile] that in this very edition of Varenius, he had allowed gross errors to pass as to the measures of his own country. It may be inferred that he had not much to do with the details of it.

† That is, what we call 1684; Halley writes 1683-4. [Periods of Revolution.] And the following dates are for a year beginning in January.

In the meanwhile arose a controversy with Hooke, the universal claimant, who, when the first part of the manuscript was presented by Vincent, asserted that he had discovered the law of the inverse squares, and had communicated that and other discoveries to Newton. The heads of the paper on which he founds his claim are given at length in HOOKE, ROBERT, and they show that though he had (in common with several others) some very correct notions on the subject, he had not even arrived at the knowledge of the law of the inverse squares, though that had been propounded by BOUILLAUD. Mr. Rigaud enters at great length into this question; if we were to do the same, we should take an advanced position, and before we attempted to show that Hooke did not write any part of the substance of the Principia, we should require reasonable proof that he would have been able to read and understand the mathematical part of it when written: and not until this had been given, which we are convinced could not be given from Hooke's writings, should we consider it necessary to enter on the first point. Had it not been for Halley, this trumpery claim of Hooke's would have produced serious consequences. Newton, easily disgusted by controversy, and having observed that physical questions generally gave rise to it, proposed (in a letter to Halley, June 20, 1686) to omit the third book altogether, which contains the actual application of the first two books to the existing universe. He says, 'The third I now design to suppress. Philosophy is such an impertinently litigious lady, that a man had as good be engaged in lawsuits as have to do with her. I found it so formerly, and now I have no sooner come near her again, but she gives me warning. The two first books, without the third, will not so well bear the title of "Philosophiæ Naturalis Principia Mathematica," and therefore I had altered it to this,—"De Motu Corporum Libri Duo," but upon second thoughts, I retain the former title. 'Twill help the sale of the work, which I ought not to diminish now 'tis yours.' Halley had to soothe this irritation, and prevent the consequences; and as the letter in which he did this is very curious, and has never been printed altogether, except by Mr. Rigaud, the surpassing interest which everything connected with the Principia excites will justify our giving it entire, particularly as it is the original voucher for several of the most important circumstances connected with the publication:—

'London, 29 June, 1686.

'SIR,—I am heartily sorry that in this matter, wherein all mankind ought to acknowledge their obligations to you, you should meet with anything that should give you disquiet; or that any disgust should make you think of desisting in your pretensions to a lady whose favours you have so much reason to boast of. 'Tis not she, but your rivals, envying your happiness, that endeavour to disturb your quiet enjoyment; which, when you consider, I hope you will see cause to alter your resolution of suppressing your third book, there being nothing which you can have compiled therein, which the learned world will not be concerned to have concealed. Those gentlemen of the Society to whom I have communicated it, are very much troubled at it, and that this unlucky business should have happened to give trouble, having a just sentiment of the author thereof. According to your desire in your former, I waited upon Sir Christopher Wren, to inquire of him, if he had the first notion of the reciprocal duplicate proportion from Mr. Hooke. His answer was, that he himself very many years since had had his thoughts upon the making out the planets' motions by a composition of a descent towards the sun, and an impressed motion; but that at length he gave it over, not finding the means of doing it. Since which time Mr. Hooke had frequently told him, that he had done it, and attempted to make it out to him; but that he never was satisfied that his demonstrations were cogent. And this I know to be true, that in January, 1683-4, I, having, from the considerations of the sesquialter proportion of Kepler, concluded that the centripetal force decreased in the proportion of the squares of the distances reciprocally, came on Wednesday to town, where I met with Sir Christopher Wren and Mr. Hooke, and falling in discourse about it, Mr. Hooke affirmed, that upon that principle all the laws of the celestial motions were to be demonstrated, and that he himself had done it. I declared the ill-success of my own attempts; and Sir Christopher, to encourage the inquiry, said that he would give Mr. Hooke, or me, two months' time to bring him a convincing demonstration thereof; and, besides the honour, he of us, that did it, should have from him a present of a book of forty shillings. Mr. Hooke then said, that he had it, but he would conceal it for some time, that others trying and failing might know how to value it, when he should make it public. However, I remember that Sir Christopher was little satisfied that he could do it; and though Mr. Hooke then promised to show it him, I do not find that in that particular he has been so good as his word. The August following, when I did myself the honour to visit you, I then learnt the good news that you had brought this demonstration to perfection: and you were pleased to promise me a copy thereof, which the November following I received with a great deal of satisfaction from Mr. Paget; and thereupon took another journey to Cambridge, on purpose to confer with you about it, since which time it has been entered upon the Register Books of the Society. As all this passed, Mr. Hooke was acquainted with it, and according to the philosophically ambitious temper he is of, he would, had he been master of a like demonstration, no longer have concealed it, the reason he told Sir Christopher and me now ceasing. But now, he says, this is but one small part of an excellent system of nature, which he has conceived, but has not yet completely made out, so that he thinks not fit to publish one part without the other. But I have plainly told him, that unless he produce another differing demonstration, and let the world judge of it, neither I nor any one else can believe it. As to the manner of Mr. Hooke's claiming the discovery, I fear it has been represented in worse colours than it ought; for he neither made public application to the Society for justice, nor pretended you had all from him. The truth is this: Sir John Hoskyns, his particular friend, being in the chair when Dr. Vincent presented your book, the Doctor gave it its just encomium both as to the novelty and dignity of the subject. It was replied by another gentleman, that you had carried the thing so far, that there was no more to be added. To which the Vice-president replied, that it was so much the more to be prized, for that it was both invented and perfected at the same time. This gave Mr. Hooke offence, that Sir John did not, at that time, make mention of what he had, as he said, discovered to him; upon which they two, who till then were the most inseparable cronies, have since scarce seen one another, and are utterly fallen out. After the breaking up of that meeting, being adjourned to the coffee-house, Mr. Hooke did there endeavour to gain belief, that he had some such thing by him, and that he gave you the first hint of this invention. But I found, that they were all of opinion, that, nothing thereof appearing in print, nor on the books of the Society, you ought to be considered as the inventor. And if in truth he knew it before you, he ought not to blame any but himself, for having taken no more care to secure a discovery which he puts so much value on. What application he has made in private, I know not; but I am sure that the Society have a very great satisfaction, in the honour you do them, by the dedication of so worthy a treatise. Sir, I must now again beg you, not to let your resentments run so high, as to deprive us of your third book, wherein the application of your mathematical doctrine to the theory of comets and several curious experiments, which, as I guess by what you write, ought to compose it, will undoubtedly render it acceptable to those who will call themselves Philosophers without Mathematics, which are much the greater number. Now you approve of the character and paper, I will push on the edition vigorously. I have sometimes had thoughts of having the cuts neatly done in wood, so as to stand in the page with the demonstrations. It will be more convenient, and not much more charge. If it please you to have it so, I will try how well it can be done; otherwise I will have them in somewhat a larger size than those you have sent up. I am, Sir, your most affectionate humble servant, 'E. Halley.'

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* This gentleman is supposed to have been the husband of a lady to whom Newton was attached in early life.

Newton had completed the first draught of the work by the end of 1685, though none of it was sent till April, 1686. The third book was presented to the Society, April 6, 1687, in proof, probably, since the whole was published (at ten or twelve shillings a copy) about Midsummer, 1687. The order of the Council of the Society to license the book was made on June 20, 1686, and the imprimatur of Pepys was dated July 5.

The part which Halley had in the matter would alone immortalise his name. He found out the ability of Newton to write such a work, prevailed upon him to write it, took charge of the publication, prevented the author from materially mutilating it in disgust, paid the expenses of printing, at a time when, owing to his father's death and consequent litigation, he had nothing to spare (which never happened to him before or after), gave a copious explanation of it in the Philosophical Transactions, and is generally admitted to have been for a long time the only person in Europe who showed that he thoroughly appreciated the value of the work, and knew the place it must occupy in the history of discovery.

The interest attached to the second and third editions of the Principia (superintended by Cotes in 1713, and by Pemberton in 1726) is considerable, with reference to the alterations made in them by Newton. It would not however be worth while to specify these alterations, which are numerous, some in correction of errors, others in extension of views. With reference to the suppression of the celebrated Scholium, see Commercium Epistolicum and Fluxions.

The Principia of Newton contains the dedication to the Royal Society, a short preface, verses by Halley in honour of Newton, definitions, axioms, a first book on unresisted motion, a second on resisted motion, and a third on the system of the universe. Halley's verses were somewhat altered by Bentley in the second edition, but the original readings were very nearly restored in the third. Newton wrote a short preface for each of the editions, and Cotes one of considerable length for the second. The dates of the Newtonian prefaces are, May 8, 1686; March 28, 1713; January 12, 1725-6. The following is the description of the contents of the third edition:

The definitions comprise, 1. Quantity of matter measured by density and volume jointly. 2. Quantity of motion [Momentum] by velocity and quantity of matter jointly. 3. Vis insita, or vis inertiæ. [Inertia.] 4. Vis impressa, or external force. 5. Centripetal force. 6. Absolute magnitude of centripetal force. 7. Accelerating force. 8. Moving force. A scholium is added on time, space, and motion, the latter considered absolutely and relatively.

The axioms are the three laws of motion [Motion, Laws of] and certain corollaries, namely: 1. The composition of velocities and forces. 2. Their resolution, and deduction of the property of the lever. 3. Momentum of a system in a given direction not changed by the mutual action of the parts. 4. Nor the motion of the centre of gravity. 5. Relative motion of bodies not altered by absolute motion of the space they move in. 6. Nor by equal and parallel accelerating forces applied to all. A scholium is added, containing the experimental verifications of the third law in the cases of impact, attraction, and operation of machines.

The First Book*, on unresisted motion, consists of fourteen sections, and ninety-eight propositions. The numbers in parentheses refer to the propositions.

Section 1 contains eleven lemmas and a scholium. This section is explanatory of Newton's peculiar mode of reasoning, which subject, with the contents of this section, will be treated under Ratios, Prime and Ultimate.

Section 2. On Centripetal Forces. (1) Equal areas are described in equal times. Six corollaries on the comparison of velocities and forces; the former inversely as the perpendiculars on the tangents, the latter as the sagittæ of arcs described in equal times. (2) If equal areas be described in equal times about a centre, fixed or moving straightly and uniformly, the force is centripetal. Two corollaries and scholium. (3) In equiareal motion of a point about a moving centre, that point is acted on by a centripetal force, and by all by the accelerating forces which act on the centre. Four corollaries and scholium. (4) In different circles uniformly described, force varies as $(\text{vel})^2 \div \text{rad}$. Nine corollaries and scholium indicating the deduction in the case of the planets. (5) Given the velocities in different parts of an orbit, to find the centre of force. (6) Centripetal force in the middle of a small arc is as $\text{sagitta} \div (\text{time})^2$. Five corollaries; various ways of comparing forces. (7) The orbit circular, centre anywhere within, to find the law of force. 3 Cor. (8) Ditto, ditto, where the forces act in parallel lines. Scholium; same considerations apply to other conic sections. (9) Law of force in equiangular spiral. Lemma 12 (the numbering of the lemmas runs on from the first section), Equality of parallelogram about conjugates in conic sections. (10) Law of force in ellipse about the centre. 2 Cor and Schol.; extension to the parabola.

Section 3. Motion in conic sections about the focus. (11) Law of force in ellipse about focus. (12) Same for hyperbola. Lemma 13, Latus rectum in parabola always four times focal distance. Lemma 14, Perpendicular on tangent of parabola, mean between focal distances of point of contact and vertex. 3 Cor. (13) Law of force in parabola about focus. 2 Cor. (14) In conic sections about same focal centre, latera recta are in duplicate ratio of areas described. 1 Cor. (15) In ellipses, periodic times are in sesquiplicate ratio of major axes. 1 Cor. (16) And velocities are as perpendiculars on tangents inversely, and subduplicate ratio of latera recta directly. 9 Cor.; comparison of velocity in conic section and circle. (17) Given initial position and velocity, required conic section described. 4 Cor. and Schol.

Section 4. On finding conic sections from a given focus and *Section* 5. On finding conic sections of which no focus is given. These sections, which carry on the lemmas from 15 to 27, both inclusive, and the propositions from (18) to (29), both inclusive, are entirely geometrical exercises in drawing conic sections through given points, or touching given straight lines, &c.: the results are hardly of use, even in the rest of the work, and a particular reference would now be of no use whatever.

Section 6. On finding the motion in a given orbit. (30) To find the place of a body in a parabola at the end of a given time. 3 Cor. Lemma 28, There is no oval figure whose area contained being any two radii, can be obtained by an equation in finite terms. [Quadrature of the Circle.] 1 Cor.; relates to the ellipse. (31) To find the place of a body in an ellipse at the end of a given time. Scholium; approximate method.

Section 7. On rectilinear ascent and descent. (32) Required the space described in a given time by a body descending towards a centre*. Three cases, derived from the three conic sections. (33) Law of the velocity in the preceding, in the cases derived from the ellipse and hyperbola. 2 Cor. (34) The same in the case derived from the parabola. (35) An equable description of certain areas in the conic sections just alluded to takes place during the motion. (36) The time of the whole descent of a body from rest. (37) The time of the whole descent of a projected body. (38) Velocity and time determined in descent to a centre, the force being as the distance. 2 Cor. (39) Granting the quadrature of curves [Quadrature], and the law of force being any whatever, to determine the time and velocity at any point of a descent. 3 Cor.

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* This description is for reference, not for explanation, and is therefore very briefly given. To give an account of every corollary and scholium would have extended the article to a great length: hence only some of the more important of them are described. But the references to other articles in this work are for the elementary student.

* The law of force, where not otherwise specified, is always as the inverse square of the distance.

Section 8. Determination of the orbit under any law of centripetal force. (40) The velocity at a given distance is always the same both in an orbit and a descent, if it be the same at any one distance in both. 2 Cor. (41) Granting the quadrature of curves, to find the orbit and the time of describing an arc, under any law of force. 3 Cor. (42) The same, the initial velocity and direction being given.

Section 9. On the motion of bodies in moveable orbits, and on the motion of the apsides. (43) How to make a body revolve equiareally in both a moving orbit and in the same fixed. (44) The difference of forces in the two cases is as the inverse cube of the distance. 6 Cor.; mostly exhibiting the conclusion in algebraical form. (45) To find the motion of the apsides in orbits nearly circular. 3 Examples; 2 Cor.

Section 10. On the motion of bodies in given surfaces, and on pendulous motions. (46) Given a plane, and a centre of force external to it. to find the motion of a point parallel to that plane, the law of force being any whatever. (47) The force in the last being as the distance, the orbit parallel to any plane must be an ellipse, and in all such ellipses the time of revolution is the same, and the same as that of a double ascent and descent. Schol. (48) and (49) Rectification of the epicycloid and hypocycloid. 3 Cor. (50) Way to make a body oscillate in a given hypocycloid. Cor. (51) If the force tending to the centre of the fixed circle in such an oscillation be as the distance, the times of all such oscillations are equal. Cor. (52) Determination of the velocity and time at any point of such an oscillation. 2 Cor.; the second being an application to the common cycloid. (53) On a given curve, to find the law of force which gives isochronous oscillations. 2 Cor. (54) A body moving on a rigid curve, under a given law of centripetal force, to find the time of its oscillations. (55) If a body move on a surface of revolution, the centre of force being in the axis, equal areas are described in equal times on a plane perpendicular to the axis. Cor. (56) To find the curve described in the last case.

Section 11. On the motion of bodies centripetally attracted to each other. (57) Two bodies, mutually attracting, describe similar figures about each other and about their common centre of gravity. (58) And with the same forces, the same curve may be described by either about the other at rest. 3 Cor. (59) Relation of the periodic times about the centre of gravity, and of one body about the other at rest. (60) In the same two cases, relation of the axes of the ellipses described. (61) And for any law of force, the bodies move round their centre of gravity as if a third body were placed in that centre, attracting with the same law of force. (62) Determination of the descent towards each other of two mutually attracting bodies. (63) Determination of the orbits of two such bodies, with given initial velocity and direction. (64) The force being as the distance, determination of the relative motions of several bodies. (65) The force being inversely as the square of the distance, and there being several bodies, one may move round another in an ellipse *nearly*, and describe areas nearly proportional to the times. 3 Cor. (66) The celebrated proposition of the three bodies, showing the diminution of the disturbance by the third body attracting both the others. (In the corollaries following, let the earth and moon, for distinctness sake, be the two bodies, and the sun the disturbing body: but let it be remembered that Newton does not mention the name of any planet nor hint at any application.) Cor. 1, If the earth had more satellites, the same proposition would apply to one as disturbed by the rest. Cor. 2 and 3, The moon moves quickest, ceteris paribus, in conjunction and opposition, and slowest in quadratures. Cor. 4, The moon's orbit is more curved in quadratures than in syzygies. Cor. 5, Hence, excentricity being excluded, the moon is farther from the earth in quadratures than in syzygies. Cor. 6, Explanation of the effect of the variation of the sun's distance on the moon's period. Cor 7, The moon's apsides progress and regress, but the former more than the latter. Cor. 8, Effect of the position of the apsides with respect to the sun. Cor. 9, Effect on the excentricity of the moon's orbit. Cor. 10 and 11, Effect on the inclination and place of the nodes. Cor. 12, Disturbance rather greater in conjunction than in opposition. Cor. 13, The same species of effect produced whether the disturbing body is the greater or the less of the three. Cor. 14, 15, 16, 17, On the dependence of the disturbing forces on the distance of the disturbing body. Cor 18, 19, 20, 21, 22, Explanation of precession of equinoxes and tides. (67) The disturbing body describes areas more nearly proportional to the times about the centre of gravity of the other two bodies than about either of them, and an orbit more nearly elliptic. (68) And the more so on account of its attracting the other bodies. Cor. (69) The attracting forces of bodies are, ceteris paribus, as their masses. 3 Cor. and Scholium.

Section 12. On the attractions of spherical bodies. (70) A particle placed inside a spherical shell is in equilibrium. (71) Spherical shells attract as if their whole masses were collected at their centres. (72) The attractions of spheres on points similarly placed with respect to them are as their diameters. 3 Cor. (73) At different internal points of a solid sphere the attractions are as the distances from the centre. Schol. (74) Solid spheres attract as if the whole masses were collected at their centres. 3 Cor. (75) The same of spheres attracting spheres. 4 Cor. (76) The same of spheres consisting of concentric layers of unequal density. 9 Cor. (77) The same is true when the forces of particles to each other are as their distances. (78) With the same law, the same is true of spheres consisting of concentric layers. Cor. and Schol.: Lemma 29. (79); (80), 4 Cor.: (81), 3 Exam.; (82); these show the method of finding the attraction of any sphere on a point without it, for any law of force. (83) The force being as the inverse *n*th power of the distance, to find the attraction of a segment of a sphere on a particle at its centre. (84) The same when the particle is not in the centre. Schol.

Section 13. On the attractions of non-spherical bodies. (85) If the attraction of the body on a contiguous particle be much greater than on one at a little distance, the attraction of the molecules of the attracting body diminishes in a higher ratio than the inverse square of the distance. (86) And the hypothesis of the last is a consequence, if the attraction of the molecules diminishes as the inverse cube of the distance, or faster. (87) If two similar bodies of the same material attract two molecules proportional to themselves and similarly placed, the attractions of the molecules on the two bodies will be proportional to their attractions on their similar particles similarly placed. 2 Cor. (88) If the particles of a body attract a molecule with forces as their distances, the whole attraction of the body will be towards its centre of gravity, and equal to that of a sphere equal to the body, and having its centre in that centre of gravity. Cor. (89) And the same if there be several bodies. Cor. (90) To determine the attraction of a circle on a point in its axis. 3 Cor. (91) To determine the attraction of a solid of revolution on a point in its axis. 3 Cor. relating to cylinders and spheroids. (92) Given an attracting body, to find (experimentally) the law of attraction of its particles. (93) If particles attract as the inverse *n*th power, a solid bounded by a plane, but indefinitely extended in all directions on one side of that plane, will attract an external particle with a force proportional to the inverse $(n-3)$rd power of the distance from that plane. 3 Cor., Schol.

Section 14. On the motion of particles from one medium into another. (94) If a particle pass through a medium contained between parallel planes, and be in its passage attracted to or repelled from the boundary of the medium it has left with a force depending on the distance from the boundary; the sine of the angle of emergence is always in a constant ratio to that of incidence. (95) And the velocity before incidence is to that after emergence as the sine of the angle of emergence to that of incidence. (96) And if the velocity must be greater before than after incidence, the angle of incidence may be made so great that the particle shall be reflected, and the angles of incidence and reflexion are equal. Scholium. (97) To give the boundary separating two media such a form that all particles issuing from one point may be refracted to another. 2 Cor. (98) To form a lens which shall have the property mentioned in the last. Scholium.

The Second Book, mostly on resisted motion, contains 9 sections and 53 propositions.

Section 1. When the resistance is as the velocity. (1) The motion lost is as the space described. Cor. Lemma 1. (2) When no forces act but the resistance, the velocities at the beginnings of successive equal times are in geometrical progression, and the spaces described as the velocities. Cor. (3) To determine the resisted motion of ascent or descent when the force of gravity acts. 4 Cor. (4) The same when the particle is projected obliquely. 7 Cor., and Scholium, to the effect that the hypothesis is 'magis mathematica quam naturalis.'

Section 2. When the resistance is in the duplicate ratio of the velocity. (5) When no force acts, equal spaces are described in times which are in increasing geometrical progression; the velocities at the beginning of the times being in the inverse geometrical progression. 5 Cor. (6) Equal and homogeneous spheres, acted on by no forces, describe equal spaces in times which are reciprocally as their initial velocities, in which also they lose the same parts of their velocities. (7) Also, in times which are as the first velocities directly and the first resistances inversely, they lose the same fractions of their velocities, and describe spaces jointly proportional to the times and the first velocities. 5 Cor. Lemma 2; which answers to finding the fluxions (called here momenta) of simple algebraical quantities. 3 Cor. and *Scholium*. [FLUXIONS.] (8) When a particle descends or ascends by gravity, the whole forces (gravity and resistance compounded) at the beginning of equal successive spaces, are in geometrical progression. 3 Cor. (9) Determination of the proportions of the times of ascent and descent in the last. 7 Cor. (10) The law of resistance being jointly as the density and the square of the velocity, required the law of density so that (gravity acting) a given curve may be described; as also the law of velocity. 2 Cor., followed by 4 Examp. and Schol., and also by 8 rules.

Section 3. When the resistance is partly as the velocity, partly as its square. (11) No force acting, and times being taken in arithmetical progression, the reciprocals of the velocities, increased by a certain constant quantity, will be in geometrical progression. 2 Cor. (12) But if spaces be taken in arithmetical progression, the velocities increased by a constant quantity will be in geometrical progression. 3 Cor. (13) Gravity acting, the relation between the time and velocity in the ascent or descent is shown. Cor. and Schol. (14) Relation connecting the space described with the preceding. Cor. and Schol.

Section 4. On spiral motion in a resisting medium. Lemma 3. A property of the equiangular spiral. (15) The density being inversely as the distance from the centre, and the centripetal force inversely as its square, the particle can revolve in an equiangular spiral. 9 Cor. (16) And, other things remaining, the same can be when the force is inversely as any power of the distance. 3 Cor. and Schol. (17) To find the force and law of resistance, by which a body may move in a given spiral, with a given law of velocity. (18) Given the law of force in the last, to find the density of the medium.

Section 5. On the density and compression of fluids, and on hydrostatics. Definition of a fluid. (19) A homogeneous fluid compressed in a close vessel (gravity, &c. apart) is everywhere equally pressed, and at rest. 7 Cases and Cor. (20) If a solid sphere form the nucleus of a fluid mass bounded by a concentric sphere, and the parts of the fluid gravitate equally to the centre at equal distances, the pressure sustained by the sphere is the weight of a cylinder which has the superficies for its base and the height of the incumbent fluid for its altitude. 9 Cor. (21) The density being proportional to the compression, and the centripetal force of particles inversely as their distance from the centre, then at distances in geometrical progression, the densities will be also in geometrical progression. Cor. (22) But if the force be inversely as $(\text{dist})^2$, then at distances in harmonical progression the densities will be in geometrical progression. Cor. and Schol. (23) If the particles of the fluid repel each other, the density is as the compression (and then only) when the repellent force of two particles is inversely as the distance of their centres. Scholium. (In consequence of the particles being supposed to repel only their nearest, Newton treats this only as a purely mathematical result.)

Section 6. On the resisted motion of pendulums.* (24) The quantity of matter in pendulums of the same length, is in a ratio compounded of their weights and of the duplicate ratio of their times of oscillation in vacuo. 7 Cor. (25) A pendulum which moves in a medium in which the resistances are as the *moments* of the times, and another moving unresisted in a medium of the same specific gravity, make their cycloidal oscillations in the same times, and describe proportional parts of their arcs together. Cor. (26) Resistance being as the velocity, cycloidal oscillations are isochronous. (27) Resistance being as the $(\text{velocity})^2$, the difference between the time of cycloidal oscillation in a resisting medium and a non-resisting one of the same specific gravity, will be very nearly as the arcs of oscillation. 2 Cor. (28) The resistances being as the moments of the time, the resistance is to the force of gravity as the excess of an arc of descent (cycloidal) over the subsequent arc of ascent to the square of the length of the pendulum. (29) Resistance being as $(\text{velocity})^2$, to find the resistance at any point of a cycloidal oscillation. 3 Cor. (30) Easier method of exhibiting the difference of an arc of descent and ascent. Cor. (31) If the resistance be altered in a given ratio, the difference of the arcs of ascent and descent is altered in the same ratio. Scholium Generale, containing many experimental results.

Section 7. On the motion of fluids and resistance of projectiles.* (32) Two systems of similar particles similarly placed, with given ratios between their densities, and beginning to move similarly in proportional times, will continue to do so, if there be no contact of particles except at instants of reflexion, and if there be no attracting forces of particles on one another but such as are as the diameters of corresponding particles inversely and the square of the velocities directly. 2 Cor. (33) And finite parts of these systems are resisted in a ratio compounded of the duplicate ratio of the velocities and diameters, and the ratio of the densities. 6 Cor. (34) The circular end of a cylinder encounters twice as much resistance as a sphere moving with the same velocity. Scholium, containing among other things the construction (without demonstration) of the solid of least resistance, which shows that Newton must have carried his fluxions (before 1687) far enough to solve some problems at least in what is now called the calculus of variations. (35) A medium consisting of equal particles at equal distances, to find the resistance it offers to a sphere. 7 Cor. and Schol. (36) To find the motion of water issuing through an orifice at the bottom of a cylinder. 10 Cor. Lemma 4. (37) Resistance to a cylinder moving in a non-elastic fluid. 3 Cor. and Schol. Lemma 5, 6, 7. A cylinder, sphere, or spheroid, of the same circular section, placed in a cylindrical canal of running water, or moving equally in it, are equally urged or resisted. Schol. (38) Resistance to a globe in a non-elastic fluid. 4 Cor (39) The same when the globe is in a cylindrical canal. Schol. (40) The same, showing how to find the resistance experimentally. Scholium, containing accounts of fourteen experiments.

Section 8. On motion propagated through a fluid. (41) Pressure is not propagated through a fluid in right lines, unless when the particles lie in right lines. Cor. (42) Every motion propagated through a fluid diverges from the direct path. (43) Every tremulous body excites in an elastic medium pulses in every direction; but in a non-elastic medium, a circular motion. Cor. (44) 3 Cor. (45) Oscillation of water in a bent tube. (46) The velocity of waves. 2 Cor. (47) In pulses, the motion of the particles follow the law of an oscillating pendulum.† Cor. (48) The velocities of pulses in different media are as the square roots of the elastic force directly and the density inversely. 3 Cor. (49) Given the density and elasticity, to find the velocity 2 Cor. (50) To find the length of the pulses. Scholium.

Section 9. On the circular motion of fluids. (Refutation of Des Cartes's vortices on the hypothesis that the resistance which arises from the want of *lubricity* of the parts of a fluid, is proportional to the velocity with which the parts of the fluid are separated.) (51) If a cylinder of infinite length revolve about its axis in a uniform and infinite fluid, and create a vortical motion, the periodic times of the particles of fluid are as their distances from the axis. 6 Cor. (52) But if the revolving body be a sphere, these periodic times are as the squares of the distances from the centre. 11 Cor. and Schol. (53) A body revolving in a vortex so as to return to its place, must be of the same density as the parts of the vortex, and move in the same manner. 2 Cor. and Scholium, completing the refutation above mentioned.

The THIRD BOOK, or application, styled 'De Systemate Mundi,' contains forty-two propositions, and preliminaries. It is to be noted that it was the original intention of Newton that this book should be a popular one; and the original draft (so it is considered by Mr. Rigaud) was preserved, and was published in English, in 1728, under the title of 'The System of the World demonstrated in an Easy and Popular Manner by the illustrious Sir Isaac Newton;' and again in the original Latin. It is Opusculum XVII. in the collection of Castillioneus, who takes it from an edition published in 1731. It is not altogether popular, but, containing the mathematical propositions concerning comets to which Halley alludes in his letter, is doubtless the third book as it stood at the time when the idea of suppressing it was in Newton's mind.

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* Some of these propositions would require explanation to make their meanings clear, which we have not here room to give.

* See note in preceding column.

† Lagrange has shown (*Misc. Taur.*) that the method of Newton here only leads to a concealed identity, which proves nothing.

Regulæ philosophandi. 1. No more causes of natural things are to be admitted than are both true and sufficient to explain their phenomena. 2. The same causes are to be assigned to effects of the same kind, as far as that can be done. 3. Those qualities of bodies which can neither be strengthened nor weakened, and which belong to all bodies which are capable of being tried, are to be considered as universal qualities. 4. In experimental philosophy, all propositions collected by induction from phenomena are to be held either exactly or approximately true until other phenomena are found by which those propositions can be made either more accurate or subject to exception.

Phenomena. 1. The satellites of Jupiter describe areas proportional to the times about the planet, and their periodic times are in the sesquiplicate ratio of their distances from the planet. 2. The same is true of the satellites of Saturn (five then known). 3. The five primary planets, Mercury, Venus, Mars, Jupiter, and Saturn, revolve about the sun. 4. And their periodic times, and that of the earth about the sun, or the sun about the earth, the fixed stars being at rest, are in the sesquiplicate ratio of their mean distances from the sun. 5. And the primary planets are very far from describing equal areas in equal times about the earth; but do so about the sun. 6. The moon describes equal areas in equal times about the earth.

(1) The satellites of Jupiter are attracted to the planet by forces inversely as the squares of their distances. (2) The same of the primary planets about the sun. (3) The same of the moon about the earth. (4) The force which retains the moon in her orbit is the same force as that which, at the earth's surface, we call gravity. Schol. This is the celebrated test-proposition, the failure of which, in the first instance, made Newton lay his theory aside. (5) A similar result inferred as to satellites about their primaries, and primaries about the sun. 3 Cor. and Schol. (6) All bodies gravitate towards every planet; and gravitation towards every planet, at a given distance from it, is as the mass of that planet. 5 Cor. (7) Attraction belongs to all bodies, and is proportional to the quantity of matter in them. 2 Cor. (8) If each of two globes be everywhere of one density at one distance from the centre, the attraction of each on the other is inversely as the square of the distance of their centres. Cor. 4. (9) In descending to the centre of a planet, gravity diminishes as the distance from that centre. (10) The motion of the planets can continue for an immensely long time.

Hypothesis 1. The centre of the solar system is at rest. (Newton takes the universally admitted hypothesis, and shows what the long disputed centre of the system is.) (11) The centre of gravity of the whole system is at rest. (12) The sun is perpetually in motion, but never far from the centre of gravity of the whole. Cor. (13) The planets move in ellipses, having their focus in the sun's centre, and they describe equal areas in equal times about that focus. (14) The nodes and aphelia of the planets are at rest. 2 Cor. and Schol. modifying the proposition by considerations of perturbation. (15) To find the axes of the orbits. (16) To find the eccentricities and aphelia. (17) The diurnal motion of the planets is uniform, and the libration of the moon arises from the diurnal motion. (18) The figures of the planets are oblate. (19) To find the proportions of the axis of a planet. (20) To compare the weights of bodies at different parts of the earth. (21) The equinoctial points must regress, and the axis of the earth must have a nutation twice in each year. (22) All the lunar motions and inequalities follow from the preceding principles. (23) The inequalities of other satellites may be derived from those of the moon. (24) The tides of the sea arise from the actions of the sun and moon. (The Jesuits' edition inserts in this place the treatises of Daniel Bernoulli, Maclaurin, and Euler, on the tides.) (25) To find the disturbing force of the sun upon the moon. (26) To find the horary increment of the moon's area about the earth. (27) From the moon's horary motion to find its distance from the earth. 2 Cor. (28) To find the diameters of the orbit in which the moon would move, but for excentricity. (29) To find the variation of the moon. (30) To find the horary motion of the moon's nodes in a circular orbit. 2 Cor. To find the horary motion of the moon's nodes in an elliptic orbit. Cor. (32) To find the mean motion of the moon's nodes. (33) To find the true motion of the moon's nodes. Cor. (Newton, in the third edition, here adds Machin's method of finding the motion of the moon's nodes.) (34) To find the horary variation of the moon's inclination. 4 Cor. (35) To find the moon's inclination at a given time. Schol. giving an account of several other peculiarities of the lunar motions, and completing the lunar theory. (36) To find the force of the sun upon the sea. Cor. (37) The same for the moon. 10 Cor. (38) To find the figure of the moon. Cor. Lemma, 1, 2, 3. On the effect of a ring of matter at the equator, disturbed by the sun, upon the earth's rotation. *Hypothesis* 2.[*] The effect of such a ring in causing precession is the same whether the ring be fluid or solid. (39) To find the precession of the equinoxes. Lemma 4. Comets are above the moon, and in the planetary regions. 3 Cor. (40) Comets revolve in conic sections, having the sun in a focus, and describe equal areas in equal times. 4 Cor. Lemma 5. To find a curve of the parabolic kind, which shall pass through any number of given points. Cor. Lemma 6. From any given places of a comet to find its place at any intermediate time. Lemmas 7, 8, 9, 10, 11. On the parabola, preparatory to the next propositions. (41) To find the parabolic orbit of a comet, from three observations. Example, the comet of 1680, from various observations, and a long discussion of the physical characters of comets. (42) To correct the orbit of a comet; with other examples and discussions. It is to be understood that throughout this third book continual comparison with observation occurs, which it is unnecessary to repeat as to each particular case, since the purpose of the book itself is the comparison of the results of theory with observation.

The *Scholium generale*, at the end of the Principia, has been so often quoted, alluded to, attacked, or brought forward as Newton's final explanation of the metaphysics (if that be a proper word) of his system, that even as a matter of reference we may be justified in translating it entire. It is not found in the first edition. Two notes, as marked, are Newton's.

'The hypothesis of vortices is encumbered with many difficulties. Since a planet's radius describes areas proportional to the times, the periods of the parts of the vortex should be in the duplicate ratio of their distances from the sun. And since the planets' periods are in the sesquiplicate ratio of their distances, the periods of the parts of the vortex should also be in that ratio. Since the minor vortices about Jupiter, Saturn, &c. preserve their rotation, and swim quietly in the vortex of the sun, the periodic times of the parts of the solar vortex should be equal. The revolutions of the sun and planets about their axes, which should agree with the motions of the vortices, differ from all these proportions. The motion of comets is highly regular, follows the same laws as that of the planets, and cannot be explained by vortices. They are carried most excentrically to all parts of the heavens, which could not be unless the vortices were removed.

'Projectiles, in our atmosphere, feel only the resistance of the air; take that away, as in Boyle's vacuum, and the resistance ceases, since the light feather and the solid gold fall with the same velocity in this vacuum. And such is the case in the celestial spaces which are above the atmosphere of the earth. All bodies in those spaces must move perfectly freely; and hence the planets move perpetually, according to the laws explained, in orbits of given form and position. They will persevere in their orbits by the laws of gravity; but they could by no means originally have taken that regular orbital path by the same laws.

'The six principal planets revolve about the sun in circles concentric with the sun, in the same direction, and very nearly in the same plane. The ten moons revolve about the earth, Jupiter, and Saturn, in concentric circles, in the same direction, and very nearly in the plane of their planets' orbits. And all these regular motions have no origin in mechanical causes*; for the comets are freely carried in very excentric orbits, and through all parts of the heavens. By such motion comets pass freely and easily through the planetary orbits, and in their aphelia, where they move more slowly and remain longer, they are very distant from each other, and attract each other very little. This most elegant group of sun, planets, and comets can only arise from the design and government of a powerful and intelligent being. And if the fixed stars be centres of like systems, all these constructions of a similar design must be under the dominion of one being: the more since the light of the fixed stars is of the same nature as that of the sun, and all the systems give light to each other. And that the systems of the fixed stars may not fall into each other, he has placed them at immense distances from each other.

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[*] In the first edition this is a lemma, which probably appeared to Newton to need no proof, as none is given. In the third it is, as we see, made an assumption. Laplace has confirmed it, by showing that the precession and nutation would remain unaltered, if the whole sea were at any one moment to be solidified without alteration of its specific gravity.

'He rules all things, not as the soul of the world, but as the lord of all things. And from his dominion, God the Ruler is often called Παντοκράτωρ. For God is a relative term, which refers to his servants; and deity is the rule of God, not over his own body, as those think who call him the soul of the world, but over his servants. The most high God is a being eternal, infinite, absolutely perfect; but a being however perfect, without dominion, is not God the Ruler. For we say, my God, your God, the God of Israel, the God of gods, the Ruler of rulers; but we do not say, my eternal one, your eternal one, the eternal one of Israel, the eternal one of gods; we do not say, my infinite one, or my perfect one. These appellations have no relation to servants. The word God always† signifies ruler; but every ruler is not God. The rule of a spiritual being makes him God, true rule a true god, the highest rule the highest god, a feigned rule a feigned god. And from the reality of his dominion it follows that the true God has life, intellect, and power; and from his other perfections, that he is the highest or most perfect being. The Eternal is infinite, omnipotent, and omniscient; that is, endures from eternity to eternity, and is present from infinity to infinity; he rules all and knows all that is or can be. He is not eternity nor infinity, but eternal and infinite; he is not time nor space, but endures and is present. He endures for ever, and is everywhere present; and by his universal existence, both in time and space, he is the creator‡ of time and space. Since any particle of space always is, and also some one indivisible moment of duration, certainly the framer and ruler of all things can never be nonexistent at any time or in any place. Every thinking soul is, at different times, and in its different organs of sense or motion, the same indivisible person. There are parts of time successive, and parts of space co-existing; but neither in the person of man, that is, in his thinking principle, and much less in the thinking substance of God. Every man, considered as a sentient existence, is one and the same man throughout his whole life, and in every one of his organs of perception. God is one and the same God always and everywhere. He is omnipresent, not only virtually but substantially; for the first without the second cannot be. In him§ all things are contained and moved, but without mutual effect from each other. God no way feels the motion of bodies; they feel no resistance from the omnipresence of God. All men confess that the most high God exists necessarily, and by the same necessity always and everywhere. Whence also he is throughout alike, all eye, all ear, all brain, all arm, all thought, understanding and action, not in the human or corporeal manner, but in one altogether unknown. As a blind man has no idea of colour, so we have no idea of the modes in which the all-wise God perceives and understands all things. He is altogether without body or figure, and thence can neither be seen, heard, touched, nor worshipped under the likeness of any corporeal thing. We have ideas of his attributes, but we know nothing of the substance of any thing. We see only the figures and colours of bodies, we hear only sounds, we touch only external surface, we smell only odours, and taste tastes: we can perceive the inmost substance by no sense, by no reflected action; much less can we have an idea of the substance of God. Him we know only by his properties and attributes, and by the most wise and excellent structure and final causes of things; and we wonder at him for his perfections, but we venerate and worship him for his dominion. We worship him as servants, and a God without dominion, providence, and final causes is nothing else but fate and nature. From a blind metaphysical necessity, which is certainly the same always and everywhere, no variation of things can arise. Every diversity of created things in space and in time can only arise from the ideas and the will of a necessarily existing being. But God is said allegorically to see, hear, speak, laugh, love, hate, desire, give, receive, rejoice, be made angry, fight, work, build, and construct. For every expression concerning God is drawn from human affairs by a certain figure of similitude, not perfect indeed, but something like. And this much of God, of whom it certainly belongs to natural philosophy to treat from phenomena.

'So far I have explained the phenomena of our heavens and the sea by the force of gravity: but I have not yet assigned the cause of gravity. Certainly this force arises from some cause, which penetrates even to the centre of the sun and planets, without diminution of its virtue; and which acts not according to the superficial magnitude of particles (as do many mechanical causes), but according to the quantity of solid matter; and of which the action is extended in every direction to immense distances, diminishing always in the duplicate ratio of the distances. Gravity towards the sun is compounded of the gravity towards all the several particles of the sun, and in receding from the sun diminishes accurately in the duplicate ratio of the distances, as far as the orbit of Saturn, as is made manifest by the quiescence of the aphelia of the planets, and even as far as the aphelia of the comets, if they also do not move. But I have not yet been able to deduce the reason of these properties of gravity from phenomena, and I do not frame hypotheses. For whatever is not deduced from phenomena, is to be called *hypothesis:* and hypotheses, whether metaphysical or physical, or of occult qualities, or mechanical, have no place in *experimental philosophy*. In this philosophy propositions are deduced from phenomena, and are rendered general by induction. So impenetrability, mobility, the impetus of bodies, and the laws of motion and gravity have become known. And it is enough that gravity really exists and acts according to laws explained by me, and suffices for all the motions of the heavenly bodies and of our sea.

'I might add something on that most subtile spirit which pervades solid bodies and lies hidden in them, by the force and action of which the particles of bodies attract each other at the smallest distances, and adhere when contiguous: and by which electric bodies act at greater distances, both by attracting and repelling neighbouring particles; and by which light is emitted, reflected, refracted, inflected, and gives heat to bodies; and by which all sensation is excited, and the limbs of animals are moved at pleasure, namely, by its vibrations through the solid capillaments of the nerves, propagated from the external organs of sense to the brain, and from the brain to the muscles. But this could not be explained in few words; nor is there a sufficient quantity of experiments to show and determine the laws according to which this *spiritus* acts.'

There is not a sentence of the preceding scholium which has not a direct reference to some common opinion, at home or abroad, of the physics, metaphysics, or theology of Newton's system. He had probably seen and heard enough, in the interval between the editions, to teach him on what points explanation was desirable; certain it is, that there is hardly an objector since his time who might not have found himself already answered, if he had read this scholium with candour and attention.

The commentators of Newton have one and all, as might be supposed, treated their author as a source of elementary instruction, to be explained and cleared from the effects of that brevity and obscurity (the latter more than due to the former) which the Principia almost everywhere presents. But the time has arrived when this work is hardly in the beginner's course, though it may be recommended to him, when he has studied the modern analysis, to make himself acquainted with its methods, until he has caught their spirit. What we now want is rather an historical commentary, which shall put the student in possession of the modes of reasoning peculiar to Newton's predecessors, shall point out how the Principia came to have its form, and shall place him, as far as is possible, in the midst of that atmosphere of remnants of the old philosophy and aspirations after the new, in which the mind of Newton gained its growth.

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* By *causas mechanicas* Newton means a material machinery, such as the solid orbs of some of the Ptolemaists.

† 'Our countryman Pocock derives the word Deus from the Arabic *du* (sometimes *di*), which means ruler. And in this sense the princes are called gods, *Psalms*, lxxxiv. 6, and *John*, x. 45. And Moses is called God of his brother Aaron, and of king Pharaoh, *Exodus*, iv. 16, and vii. 1. And in the same sense the souls of departed princes were called gods by Gentile nations, but falsely from want of dominion.' (Author's note.)

‡ 'Et existendo semper et ubique durationem et spatium *constituit*.'

§ 'So thought the antients, as Pythagoras (Cic., *De Nat. Deor.*, lib. i.); Thales; Anaxagoras; Virgil (*Georgics*, iv. 220, *Æn.*, vi. 721); Philo (*Allegor.*, lib. i. sub init.); Aratus (*Phæn.*, sub init.) So also the sacred writers, as Paul, *Acts*, xvii. 27, 28; John, *Gospel*, xiv. 2; Moses, *Deut.*, iv. 39, and x. 4; David, *Psalms*, cxxxix. 7, 8, 9; Solomon, 1 *Kings*, viii. 27; *Job* xxii. 12, 13, 14, *Jeremiah*, xxiii. 23, 24. The idolators falsely imagined the sun, moon, and stars, the souls of men, and other parts of the universe to be parts of the most high God, and therefore to be worshipped.' (Author's note.)

In 1730, Dr. John Clarke published 'A Demonstration of some of the principal sections of Sir I. Newton's Principles,' &c. This work contains the greater part of the first book somewhat expanded, and with the applications of the third book intermixed. But it omits the most important part of the eleventh section: nevertheless, a student who should join with Dr. Clarke's work the article GRAVITATION in the present one, would have the most important parts of the Principia, as far as is necessary to gain an insight into Newton's methods.

In the same year, 1730, George Peter Domck published his 'Philos. Math. Newt. Illustratæ Tomi Duo, Londini.' (This work is inadvertently called an edition of the Principia in NEWTON, and its author's name is spelled Donick.) The first volume of it is only a preparatory course of mathematics; the second gives a large part of the first book in Newton's manner, and gives more of the results of the eleventh section. It also enters upon some of the numerical applications of the third book.

The Commentary of the Minims (Jesuits they are usually but wrongly called) Le Sueur and Jacquier (1739) is an excellent performance for its time, considered as attempting to smooth the details of the mathematical difficulties. It uses algebra freely, but is totally insufficient to show the use of the differential calculus as now known; but it very frequently develops satisfactorily a point at which Newton only hinted.

Emerson's 'Short Comment on Newton's Principia,' 1770, is a brief explanation of some of the mathematical difficulties and obscurities, followed by defences of the Principia, the Optics, and the Chronology. Emerson defended everything of Newton's.

The popular explanations of Maclaurin, Pemberton, and Voltaire are too widely known to need description; they do not much help the mathematical student. Many so-called explanations of Newtonian philosophy (such as Benjamin Martin's, 1751) are literally nothing but treatises on general physics.

The additions to Madame du CHASTELLET's translation consist of a popular *resumé* and the mathematical treatment of various questions of the Principia. The latter must be considered as emanating from Clairaut, since they were his lessons to his pupil. Some have supposed that Voltaire's work belongs in the same sense to Madame du Chastellet.

In the 'Mécanique Céleste,' book 16, cap. 2, Laplace has exhibited the results of Newton's lunar theory, and connected them with the modern analysis of the subject to a certain extent. The preciseness of the manner of compressing Newton's results renders this chapter valuable, and likely to assist the student of the Principia.

Mr. Airy's development and extension of the results of the eleventh section (which forms the article GRAVITATION in this work) places one of the methods of the Principia, and one which ought to last, within the reach of every student. It is unique, the difficulties of the eleventh section having left it almost without a commentator, and altogether without an explainer; and it takes in several of the discoveries of the present time.

Many commentaries on the Principia have been written at Cambridge by private tutors for the use of their pupils, of which some have been printed. Of the following we have never seen more than the title: 'Excerpta quaedam e Princ. Phil. Nat., cum notis variorum,' Cambridge, 1765. There is Carr's three sections of Newton, a modern work, and an exposition of various parts of the Principia, contained in the second edition of Professor Whewell's 'Dynamics.'

To give a view of the foreign objections to Newton's system, at the time of its first introduction, the following works may serve: 1, 'Collection of Papers which passed between Mr. Leibnitz and Dr. Clarke, in 1715 and 1716,' by Dr. Samuel Clarke; London, 1717. 2, 'Traité de Paix entre Des Cartes et Newton,' by the Jesuit Aimé-Henri-Paulian; Avignon, 1763. 3, 'Le vrai Systême de Physique générale de M. Isaac Newton, exposé et analysé en parallele avec celui de Des Cartes,' by the Jesuit Louis Castel; Paris, 1743 (a defence of Descartes). 4, 'Anti-Newtonianismus,' by Celestini Cominale, M.D.; Naples, 1754. 5, 'Discours sur les différentes Figures des Astres,' by Maupertuis, the first assertor of Newton's doctrines in France; Paris, 1732, and in the collection of his works. 6, 'Letters to a German Princess,' by Euler (first published in 1770, translated into English by Dr. H. Hunter, 1795).

The most celebrated comments in the way of objection are those of Leibnitz, John Bernoulli, and Huyghens [HUYGHENS]; the first and second real admirers of the genius of Newton, the third also an admirer after his fashion. Many of their remarks may be found in the published correspondence of the first two, but the history of the effect produced by the Principia in the years following its publication is scattered in too many places for us to attempt to give the particular publications which should be consulted.

PRINCIPLE, D'ALEMBERT'S. [FORCES, IMPRESSED AND EFFECTIVE; VIRTUAL VELOCITIES.]

PRINGLE, JOHN, the youngest son of Sir John Pringle, Bart., and Magdalen Eliott, the sister of Sir Gilbert Eliott, Bart., was born at Stichell-House in Roxburghshire, April 10, 1707. Having received at home, under a private tutor, the elements of a classical education, he entered the university of St. Andrews, where a relative of his father, Mr. Francis Pringle, was at that time professor of Greek. After keeping the ordinary number of terms, he removed to Edinburgh, in October, 1727, in order to qualify himself for the medical profession; but in the year following he proceeded to the university of Leyden. It is stated by Dr. Kippis, on the authority of Mr. James Boswell, that Pringle was at one time intended to follow a mercantile life, and that on leaving Edinburgh he went to Amsterdam for that purpose, but that his attention was accidentally drawn to the study of medicine by attending a lecture of Boerhaave in the university of Leyden. He entered this university in 1728, and took the degree of doctor of physic, 20th July, 1730, his diploma bearing the signatures of Boerhaave, Albinus, Gravesande, and other eminent individuals. His inaugural dissertation was entitled 'De Marcore Senili.' On quitting Leyden, he proceeded to Paris, where he completed his medical studies, after which he settled as a physician at Edinburgh. He had not however given his attention exclusively to medicine. In 1734 he was appointed by the magistrates and council of Edinburgh to the professorship of moral philosophy in the university of Edinburgh, jointly with Mr. Scott, during the life of the latter, and solely after his decease. Dr. Kippis says he was appointed to the chair of pneumatics and moral philosophy, but no mention of the former of these sciences is to be found in any other notice of Pringle's life to which we have referred. He continued to practise at Edinburgh as a physician till 1742, when he was nominated physician to the Earl of Stair, who then commanded the allied armies of England and Austria, and through whose recommendation he received the same year the further appointment of physician to the military hospital in Flanders, at a salary of 20*s.* a day, and half-pay for life. He was present at the battle of Dettingen (26th June, 1743), shortly after which he was promoted by the Duke of Cumberland, second son of George II., to be physician-general to his majesty's forces in the Low Countries, whereupon he resigned his professorship. The benevolence of his disposition and the exemplary zeal and ability with which he discharged his official duties while connected with the army, are attested by all who knew him. Impressed with the suffering frequently attendant on the sudden movement of an army, which necessitated as sudden a removal of the hospitals or the abandonment of the men to the doubtful generosity of an enemy, he applied himself earnestly to the consideration of the means whereby it might be mitigated or removed. Prior to this it had been the custom to place the sick and wounded at a distance from the army, but even then it often happened that a position of salubrity was incompatible with one of safety. Through his exertions a convention was entered into, in the early part of the campaign of 1743, between Lord Stair and Marshal Noailles, for the mutual protection of the hospitals of both armies. This convention was faithfully adhered to by both the French and English generals. Pringle's situation afforded ample opportunity of observing the influence of climate, diet, confined and humid quarters, habits of intemperance and uncleanness, &c. These, with the characteristics of the epidemics peculiar to armies, he carefully recorded and digested, applying himself indefatigably to the investigation of the proper modes of treatment under different circumstances. His treatise 'On the Diseases of the Army,' which appeared in 1752, and which passed through seven editions, besides being translated into the French, German, and Italian languages, was not a work from which the medical practitioner alone was capable of deriving instruction. Among other instances corroborative of its general utility, General Melville, who, while governor of the Friendly Islands, was instrumental in saving the lives of near seven hundred of his soldiers, attributed his success to the plainness of the language employed in this work and the soundness of the information which it conveyed.

Dr. Pringle was recalled from Flanders in 1745 in order to attend the army employed under the Duke of Cumberland in suppressing the Scotch rebellion. He remained with the forces till after the battle of Culloden (16th April, 1746). The year following he again accompanied the army abroad, but on the conclusion of the peace of Aix-la-Chapelle (30th April, 1748), he returned to England, after which he resided principally at London, as physician in ordinary to the Duke of Cumberland. He had been elected in 1745 a member of the Royal Society, and his communication to their published Transactions of a paper entitled 'Experiments on Septic and Anti-septic Substances, with remarks relating to their use in the theory of medicine' (1750), to which the Copley medal was awarded, added to his reputation. Empiricism indeed appears in some measure to have been looked upon by him as not only the beginning, but the end of all useful inquiry, and he not merely entertained a strong aversion to all hypothesis, but attached comparatively little value to theory even when based on experiment. Upon one of the members of the Royal Society remarking to him that it was at least necessary to reason on the results of observation and experiment, he is said to have replied, 'The less the better; it is by reasoning that you spoil everything.'

In 1753 he was elected one of the council of the Royal Society. In 1758, on relinquishing his appointment in the army, he was admitted a licentiate of the College of Physicians. In 1761, soon after the accession of George III., he was appointed physician to the queen's household, and in 1763 physician extraordinary to her majesty. The same year he was chosen a member of the Academy of Sciences at Haarlem, and fellow of the College of Physicians, London. In 1766 he was elected a member of the Royal Society of Sciences at Göttingen, and the same year the dignity of baronet was conferred upon him by George III. In 1772 he was elected president of the Royal Society. In 1774 he was appointed physician extraordinary to his majesty. In 1776 he became a member of the Academy of Sciences at Madrid, the Society for the Promotion of Agriculture at Amsterdam, the Academy of Medical Correspondence at Paris, and the Imperial Academy of Sciences at St. Petersburg. In 1778 he succeeded Linnæus as foreign member of the Academy of Sciences at Paris, an honour which that body has hitherto restricted to eight individuals. The same year he became foreign member of the Academy of Sciences and Belles-Lettres at Naples, and in 1781, a fellow of the then recently instituted Society of Antiquaries at Edinburgh.

As president of the Royal Society the annual presentation of the Copley medal devolved upon him, and on each of these occasions he read before the members a discourse on the history and present state of the particular science the extension of which it was the object of the medal of that year to reward. These discourses, six in number, were published the year after his death, by his friend Dr. Kippis, in one volume, 8vo.

About the year 1778 a dispute arose among the members of the Royal Society relative to the form which should be given to electrical conductors so as to render them most efficacious in protecting buildings from the destructive effects of lightning. Franklin had previously recommended the use of points, and the propriety of this recommendation had been acknowledged and sanctioned by the Society at large. But after the breaking out of the American revolution, Franklin was no longer regarded by many of the members in any other light than an enemy of England, and as such it appears to have been repugnant to their feelings to act otherwise than in disparagement of his scientific discoveries. Among this number was their patron George III., who, on its being proposed to substitute knobs instead of points, requested that Sir John Pringle would likewise advocate their introduction. The latter hinted that the laws of nature were unalterable at royal pleasure; whereupon it was intimated to him that a president of the Royal Society entertaining such an opinion ought to resign, and he resigned accordingly. This story, though it does not appear to be in print, having been suppressed in deference to royalty, was current at the time among the members of the Society, and there is no doubt of its truth. Dr. Hutton alludes to it in the following extract from his 'Mathematical Dictionary:'—'Considering the great attention that was paid by Sir John Pringle to the various and important duties of his office, and the great pains he took in the preparation of his discourses, it was natural to expect that the burthen of his honourable station should grow heavy upon him in a course of time. This burthen, though not increased by any great addition to his life, for he was only six years president, was somewhat augmented by a fall from which he received some hurt. From these circumstances some persons have affected to account for his resigning the chair. But Sir John Pringle was naturally of a strong and robust frame and constitution, and had a fair prospect of being well able to discharge the duties of his situation for many years to come, had not his spirits been broken by the most cruel harassings and baitings in his office. His resolution to quit the chair originated from the disputes introduced into the Society concerning the question whether pointed or blunt electrical conductors were the more efficacious, and from the cruel circumstances attending those disputes. These drove him from the chair. Such of those circumstances as were open and manifest to every one were even of themselves perhaps quite sufficient to drive him to that resolution. But there were yet others of a more private nature which operated still more powerfully and directly to produce that event, which may probably be hereafter laid before the public.'

In 1781 he disposed of his house in Pall Mall, and the greater part of his library, and removed to Edinburgh, where he purposed residing permanently, but the rigour of the climate, the state of his health, and a restlessness of spirits induced him to return to the metropolis the same year. On quitting Edinburgh he presented the College of Medicine in that city with three manuscript volumes in folio, on the condition that they should neither be suffered to leave the college nor to be printed. He died January 18, 1782. His remains were interred in St. James's church, with great funeral solemnity, and a monument, by Nollekins, at his nephew's expense, was some time after erected to his memory in Westminster Abbey. A list of his published works is given in Watt's 'Bibliotheca Britannica,' and under the article 'Sir John Pringle,' in Brewster's 'Cyclopædia.' They are not numerous, and, with the exception of those already mentioned, they no longer possess much interest. The circle of his correspondents included the most eminent men of science in Europe, more particularly those of France, Germany, and Holland, with whom he kept up an active intercourse both by letter and by the attention and hospitality he showed them during their visits to the metropolis, but the extent and interest of his epistolary correspondence can be but imperfectly judged of, owing to the circumstance of his having ordered the whole of his letters to be destroyed a short time before his decease.

(*Life of Sir John Pringle*, by Andrew Kippis, D.D., prefixed to Sir John Pringle's Six Discourses above referred to; *Eloge de M. Pringle*, by Condorcet, *Œuvres Complètes*, tom. ii., pp. 226-247.)

PRI'NIA, Dr. Horsfield's name for a genus of birds first defined in *Linn. Trans.*, vol. xiii., and figured and described in the Doctor's *Zoological Researches in Java*.

Generic Character.—Bill rather lengthened, much compressed, entire; rictus smooth, wings rounded, tail broad and cuneate; feet large, strong. (Sw.)

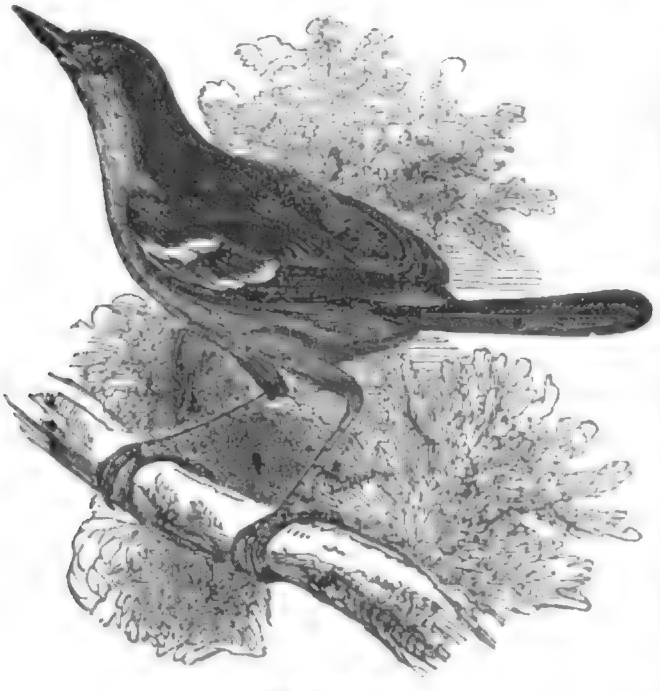
Example, *Prinia familiaris*.

Description.—Dark brown above with a faint tint of orange. The throat and neck anteriorly are white, and the breast and abdomen pale sulphureous yellow. The wings crossed transversely in an oblique direction, with two white bands. Tail-feathers, except the two intermediate ones, marked near the end with a broad band of blackish brown, tips dirty white. Intermediate tail-feathers brownish throughout underneath, and, near the extremity an almost imperceptible transverse band of a deeper hue. Tarsi yellowish. Bill corneous brown above and at the point; its base pale yellow.

This is the *Prinya* of the Javanese, *Familiar Creeper* of Latham.

Locality, Habits, &c.—Abundant in many parts of Java, near villages and gardens, in the confines of which, among trees and shrubs, it builds its nest. It is a sprightly bird, sporting among the branches in short and rapid flights, and has received its native name from its lively and pleasant notes. (Horsf.)

Mr. Swainson (*Classification of Birds*) thinks that *Prinia* may be a subordinate type or subgenus of *Drymoica*. [SYLVIADÆ.] He observes that the *Priniæ* have all the activity and familiarity of the true Wrens (*Troglodytes*), and so much resemble them in general appearance, in their short sweet song, and the throwing up of the tail, that it is not very surprising that they should have been classed with the scansorial creepers.



Prinia familiaris.

⁂ In the article PLOVERS, *Himantopus Melanogaster* is erroneously printed under the cut instead of *Himantopus Melanopterus*, as well as in four places in the adjoining columns. The reader is requested to substitute '*melanopterus*' for '*melanogaster*,' in each of these cases.

PRINSEP, JAMES, was descended from a family of Swiss extraction which had been some time settled in England. He was born in the year 1800, and went out to the East Indies at an early age in the service of the East India Company in the Mint department. On his arrival in India he was appointed assaymaster at Benares, where he remained about ten years. Here he collected the materials of his 'Sketches of Benares,' which perhaps give some of the best representations of Indian life yet published. He planned and constructed many works of public utility, and engaged in a valuable series of statistical inquiries connected with Benares. At this time he wrote an elaborate memoir on the mode of determining accurately the point at which the precious metals fuse, which was published in the 'Philosophical Transactions.' Subsequently he was elected a Fellow of the Royal Society.

When the Benares mint was abolished, Prinsep was transferred to that at Calcutta. He had previously contributed to the 'Gleanings of Science,' conducted by Capt. Herbert, and on the departure of that gentleman from Calcutta he became the secretary to the physical class of the Asiatic Society, and editor of the 'Gleanings,' which he remodelled in 1832, under the title of the 'Journal of the Asiatic Society,' a work which has contributed in an eminent degree to the extension of every species of information in India. His attention having been directed to the subject of Bactrian coins, he made numerous discoveries which enabled him to fill up the blank left in the history of the successors of Alexander the Great in Bactria, and constructed a nearly unbroken series of numismatic records, which extended from the Macedonian king to modern times.

On the departure of H. H. Wilson for England in 1832, he became secretary to the Asiatic Society, and he now began to follow up the steps of Jones, Colebrooke, and Wilson, in the field of Indian antiquities. Meantime his labours as editor of the 'Journal' were unabated; he was in a great measure the engraver and lithographer for it; and he carried on an extensive correspondence in India and with Europe, besides contributing a number of valuable articles on a great variety of subjects, especially chemistry, mineralogy, Indian numismatics, and Indian antiquities. The most interesting of his discoveries is the deciphering of inscriptions which had remained a sealed book to all previous Orientalists, and which are important as connecting the history of India with that of Europe: the name of Antiochus the Great and the mention of his generals as commanding in the north of India, occur in two edicts of Asoka, or Piyadasi, king of India.

Under the weight of these and other labours his health began to break down. It was hoped that a voyage to England would restore him; but after an illness of eighteen months, he died, on the 22nd of April, 1840, in the 40th year of his age. His case is said to have borne a considerable resemblance to that of Sir Walter Scott. His death has left a blank in the progress of knowledge and civilization in India which will not perhaps be readily filled up.

(*Delhi Gazette*, July 8, 1840; *Proc. Roy. As. Soc.*, 1840.)

PRINSE'PIA, a genus of plants of the natural family of Chrysobalaneæ, so named by Dr. Royle in honour of James Prinsep, the late distinguished secretary of the Asiatic Society of Calcutta, in consequence of his contributing, by his researches into the meteorology of India, to the progress and right understanding of the geography of plants, an important branch of botany. The genus consists of only a single species, remarkable for its thorny appearance, but it may be considered typical of the labours of the individual whom it is designed to commemorate, as, early in the season, it is conspicuous for the abundance of its inflorescence, and, later, for that of the purple-coloured berries with which it is loaded. The seeds are large, and yield by expression an oil which is highly esteemed by the mountaineers of the Himalayas, where it is indigenous, and which by Europeans is thought a good substitute for salad oil.

PRINTING, in the widest sense of the word, may be defined to be the art of producing copies of any writing or other marks by pressure, either upon a substance so soft as (like wax or clay) to take the shape, whether in relief or by indentation, of the stamp applied to it, and yet not so perfectly fluid (like water) as to refuse to retain the form so given to it, or upon a substance sufficiently bibulous or otherwise attractive as to receive colour from some pigment with which the stamp is daubed. The essence of printing is the production of a copy by pressure. Correctly speaking however it is not an exact copy or fac-simile which printing produces in any case; so far from that, wherever the surface is raised in the stamp, it is sunk in the impression, and *vice versâ*, and even a merely coloured mark is always reversed in form; but, what is alone of importance, all the impressions are exact copies of one another, and also bear a certain and perfectly assignable relation to the stamp or type.

Even on a theoretical view of the subject, printing by means of merely a variegated surface of stamp, or, in other words, the reproduction, in soft substances, of cameos and intaglios, would seem to be the simpler and more obvious of the two kinds of printing we have mentioned. This may be said to be printing by pressure alone. In the other kind of printing, by the transference of colour, there is required the introduction, in addition to the type and its recipient, of a third element or agent, namely, the colour to be transferred. And this was an addition very little likely ever to be made until the idea of multiplying copies of coloured marks had itself occurred, that is, until the very object had been thought of which this was the only means of accomplishing, and which was the only object this process was suited to accomplish. Having a seal or cut stamp in his hand, the making an impression with that upon wax or any other soft substance was extremely natural for a person wishing on any occasion to leave his mark or sign; it was the same thing, in fact, with notching a piece of wood or stone with a knife or other sharp instrument, with this difference only—that the knife makes its marks by excision, or altogether removing and abstracting part of the substance operated upon; the stamp, by extrusion, or merely pushing it aside. Or still more nearly it resembles the rudest and readiest of all ways of making a mark, namely, by dealing a blow. But it is a mode of making a mark only; that is its sole purpose and object. There is no thought, so long as this kind of printing exclusively is used, of multiplying copies of the same mark; that is an idea far removed from the first and most natural employment of a dry stamp or seal, and not perhaps more likely to be suggested by such stamping or sealing (although capable of being so realised) than by some other things—by the mere common process, for instance, of copying by imitation. If a transcriber had ever had before him a written page, with the ink not yet dry, which he was laboriously reproducing with his pen, the slowness of his procedure, especially if he were pursued by an active and growing demand on the part of the public for books, might have led him to the thought of the possibility of performing the whole task in a manner at once, by merely impressing the wet writing upon the blank paper, and then re-transferring it from the reversed copy thus made to another sheet, in order to recover the original position of the characters. And if by any means the reversed copy could be kept moist, or its moisture repeatedly renewed, here was a method of procuring in the same easy manner an indefinite number of copies. The mechanical facilities were still to be invented, but this was the elementary idea of what we have been regarding as the second kind of printing; which, it thus appears to us, would probably not be suggested by the first kind at all, but rather by the desire of effecting an object (namely, the multiplying of copies) altogether different from that (namely, the mere making of a mark) which was the primary purpose of a dry stamp or seal, and only presenting itself at a much later and more advanced stage in the progress of civilization.

These considerations may help to account for the historic fact that the use of engraved seals for impressing soft substances preceded by so many centuries the invention of the art of printing by the transference of a pigment, or, in other words, by means of coloured stamps or types. Of the great antiquity of seals for making marks with, we have abundant evidence. Seals and signets are repeatedly mentioned in the Jewish scriptures, and, we know, were in common use among all the civilised nations of antiquity. If the idea of multiplying copies of books or writings had chanced to occur in combination with that of this employment of dry seals, it might no doubt have produced an invention serving the same purpose with our modern printing, but in that case the first printing would probably have been that indented or embossed kind which has been lately introduced for the use of the blind. After that had been practised for some time, ingenuity or accident would have suggested the introduction of a pigment for the purpose of making the indentations more distinctly visible; and from that to the omission of the indentations altogether would have been apparently an easy and obvious step, though it might have happened here too, as in many other cases, that all the advantages of the new process would not be at once perceived, and a part of the old method, the utility of which it had really superseded, would nevertheless for a considerable time continue to be practised as before. But the fact, as we have said, appears to be that the art of printing did not take its rise in this way at all, but from the combination of the idea of multiplying copies of books with the other idea of the possibility of taking off an impression from a page of writing while yet wet by the simple act of applying to it another flat surface to receive a portion of the ink or other pigment. We say, applying the receiving substance to the writing; for even in this point of detail the process would probably differ altogether from the common mode of using a seal, which is impressed upon the receiving substance, not that upon it.

Nevertheless the principle of an engraved or uneven surface might still for a particular purpose be called in to the aid of the process of pigment-printing, although it had nothing to do with the suggesting of that process. Suppose the writing which is to be transferred by such mode of printing to be traced in visible black characters upon a smooth surface of wood or metal, how is the pigment to be most conveniently renewed every time it gets dry or faint? With an even surface it is evident that this could only be done by the tedious method of retracing every line of the writing with a pen or brush, a method which—besides its consumption of time, making printing, in fact, as slow as writing—would probably be found to be inefficient, as leaving the page dry or half dry in one part before it could be inked over in another. But by either cutting hollows for the ink, or causing the characters to stand out in relief, the great advantage is gained of being able to spread the pigment by a few sweeps of the brush along every line which it ought to colour, without leaving any of it upon the intervening parts of the wood or metal: in the case of hollow lines being cut (as in copperplate-printing), the ink that is spread in the first instance over the whole surface is easily wiped away from the rest without being taken out of the hollows.

At this point then we may be said to have at last obtained the art of printing in a practical shape. The art was now invented. This is precisely the art of printing as it has been known in China since the middle of the tenth century, when it is said to have been discovered by a minister of state named Foong-taon, and as it is still practised there. The page of writing to be multiplied is pasted down upon the smooth surface of a prepared block, commonly of pear-tree, on which it leaves an impression of the characters in an inverted form, and then the block thus marked is made ready for being printed from by all the blank parts of the face of the wood being cut away, and the lines forming the characters being thus left in relief, so as alone to receive the ink every time the brush is applied.

In such a language as the Chinese, which is without an alphabet, or, at least, in which the elementary characters have not been reduced to the same limited and commodious number as in most other languages by making them represent sounds instead of ideas or things, this is the only kind of printing that is generally applicable. The subsequent improvements or extensions of the principle of the invention are all dependent upon the common alphabetic mode of writing.

Even in Europe however, although the mode of writing was alphabetic, it was the Chinese mode of printing that was first practised. Some have even supposed that the knowledge of the art was originally obtained from the Chinese; and indeed, besides what other less direct communication there may have been, Marco Polo, who returned from China about the end of the thirteenth century, had seen and described at least one application of the invention in that country, the fabrication of a species of paper-money by stamping it with a seal coloured with cinnabar (vermillion). But, as far as we can trace, it was not till fully a century after this that even this simplest kind of printing began to be practised in Europe. It appears to have been first applied to the fabrication of playing-cards and manuals of popular devotion, the latter for the most part consisting, like the cards, of merely a single page, though in some instances assuming the form of little books of several pages. It is believed that about the year 1400, or soon after, both these articles, which had previously been manufactured by hand, and each copy of course by a separate operation, began to be multiplied, like the Chinese paper-money, from engraved blocks or stamps. There is no record of this innovation, but the fact is inferred from the perfect similarity of several copies of the same page, which could only have been produced by their having all been impressions from a common original. The playing-cards thus fabricated are merely pictures; but many of the devotional manuals, besides pictures, which in these also fill the greater part of each page, present short texts from scripture, and other examples of engraved letters and words. It is evident however that the essence of the new art is as much in the pictures as in the legends, which are only pictures of another kind.

The æra of these block prints and books, as they are called, may be stated to be the first half of the fifteenth century: one in Lord Spencer's collection bears the date of 1423, and there is reason to believe that other specimens were executed almost as late as 1450. Of the block-books of any considerable magnitude the two most remarkable are the 'Biblia Pauperum,' a small folio of forty leaves, each containing a picture, with a text of scripture, or some other illustrative sentence under it, which is supposed to have been produced some time between 1430 and 1450; and the 'Speculum Humanæ Salvationis,' consisting of sixty-three leaves of the same small folio size, containing in all fifty-eight pictures, with two lines of Latin rhyme under each. With regard to this last in particular however there has been a great deal of disputation, some denying altogether its claim to be reckoned a specimen of block-printing, in so far as the legends are concerned; but it is now generally admitted that at least some of the legends have every appearance of having been printed from the same block with the picture, although in other cases they seem to have been subsequently inserted from moveable types. The probability is that at first the 'Speculum' was entirely a block book, but that in subsequent editions the block-printing was mixed with printing from moveable types: the few copies that have come down to modern times are perhaps made up of leaves collected from several impressions, some in which moveable types were and others in which they were not used. Like the 'Biblia Pauperum,' it has no date; but it is generally admitted to have in all probability been first printed before 1440. Another block-book that was frequently printed, and which is noticeable as consisting wholly of text, without pictures, was the small Latin Grammar of Donatus, the common school-book of those days. These block-books are, like the Chinese books at this day, printed only on one side of the leaf; and they appear to have all been produced in the Low Countries.

At this point, as we have already observed, printing would have stopped, if the art of alphabetic writing had remained undiscovered. At most, the art could not have been carried beyond what has been called logography, or the printing with types each containing a whole word, a method which is in partial use in China, and has even in recent times been attempted among ourselves, but which is manifestly of very limited application. Logography, indeed, is merely a modification of block-printing; the principle is the same whether the block or type contain a whole word, a whole line, a whole sentence, or a whole page.

It is not unlikely however that the partial employment of logography in the infancy of European printing may have been what suggested alphabetic printing. There is good evidence that some words of common occurrence were early cut out on separate stamps or types; and although this may have been done only after the invention of alphabetic printing, to save the trouble of composition (or setting up the words from the letters), it is possible that the same thing may also have been done while only block-printing was known, with the view of saving the repeated cutting out of the same words. If so, the perception, thus awakened and turned to account, of the fact that two different pages often contained some words in common, would be apt, it may be thought, to conduct to the reflection that all words and all pages that could be printed were composed out of the same twenty-four letters, and that therefore if a sufficient number of types consisting each of a single letter could be provided, the same types that had been made use of in printing any one page might, with the mere trouble of re-arrangement, be made to serve for printing any other. Here was what we may call quite a new principle. Logography was indeed the employment to a certain extent of moveable types; but the principle of moveable type printing was no more there than we can say the principle of alphabetic writing is to be found in the 214 radical characters of the Chinese. The universality which is the essence of a principle is equally wanting in both cases.

Yet, whether it may have been arrived at through the medium of logography or not, it may be safely affirmed that, where alphabetic writing was known, alphabetic printing could not be long in being found out. It was in fact in a manner already invented, in the co-existence of pigment printing on the one hand, and of alphabetic writing on the other; for it was the mere resultant, without the assistance of any third element, of the combination of these two ideas. Not that even this simple combination would of necessity be immediately made; the history of discovery sufficiently attests that it will often be a considerable time before a third thing is thought of which would be at once accomplished by the mere bringing together, and into simultaneous and accordant action, of two things already familiarly known and practised; but still, fortuitously or through reflection and experiment, the new idea is much more likely to be struck out in these circumstances than if a more complex combination were required to produce it, and, especially where the state of society supplies any considerable stimulus to the attainment of it, cannot be very long in being arrived at.

The common art of printing, in essentially the same degree of completeness in which we now possess it, had certainly been discovered before the middle of the fifteenth century; but when, where, and by whom each successive improvement of the original pigment-printing by means of engraved blocks was discovered and first put in practice is not so easily settled. The employment of moveable types, the production of such types by the process of casting them in metal, and the formation of the matrix, or mould, by means of the punch, or stamp of hardened steel by which the matrix is impressed or hollowed out; these, disregarding mere mechanical facilitations, may be considered as the three great organic revolutions by which block-printing was transformed into the art as it now exists. They are far, indeed, from being upon a level in point of importance; they descend in value in the order in which we have enumerated them, which must also have been the order in which they followed each other; and the third contributes so little to the completion of the invention, as compared with either the first or second, that we might perhaps without much injustice omit it altogether. Yet, strictly considered, it too has the same characteristic with the others of converting a process of mere imitative copying into one of what we may call identical reproduction, or, in other words, substituting the unity of a single mechanical operation for a succession of separate manipulations. The invention of printing may be said to be, in all its parts, distinguished from mere writing by this very characteristic; this is throughout its principle, and that in which it consists; in block-printing, the page, having been once cut out upon the wood, is afterwards reproduced by a single touch of the inking-brush as perfectly as it could be by retracing every line of every letter with the pen; by the employment of moveable types, the same letters which have already served to print one book are made to print any other, without a new cutting, however new the matter, or any further trouble except a re-arrangement of them; by the art of founding or casting the types in metal, the separate fabrication of every single type is done away with, and any number of types of the same character are obtained by merely dropping the metal into the matrix; and, finally, by the contrivance of the punch, matrices themselves are thus mechanically multiplied as well as types. Pigment stamping, the breaking up of the block-page into single letters, the substitution of letters of cast metal for those of cut wood, and the production of many matrices from one punch, the four successive steps constituting the invention of printing, have thus all one end and aim. This very circumstance might enable one of them in a great measure to suggest another.

Simple as the first of the four successive discoveries—stamping or printing with a pigment—may be thought, it was perhaps both the most important and the most difficult to achieve of the whole. Even if the art of printing had never been carried farther than the Chinese have carried it, how precious a gift of heaven would it not still have been! how incalculably would it not have elevated the function of written language! Indeed that primitive sort of printing would have been all-sufficient, and in every respect the best, in all those numerous instances in which stereotyping (essentially the same thing) is now resorted to, even in countries possessing an alphabet; and a time perhaps is coming when in all countries the increase in the number of readers may make that kind of printing the kind most employed, as it probably would be in China from that cause alone, even did the nature of the written language admit of the employment of moveable types. The idea of producing an impression by a coloured stamp would seem also to have lain very remote from ordinary operations and habits of thought; men had been using dry seals from the earliest times of Eastern civilization, but we find no trace of this other kind of stamping, at least for the purpose of multiplying writing, even in the East, till about nine centuries ago, and none in Europe till five hundred years later. Neither Egypt, nor Greece, nor Rome, had thought of this, with all their ingenuity, and among all their arts. He therefore, we may say, was truly a great genius who first meditatively conceived the notion of making an engraved seal or block thus produce a permanent impression of itself upon a hard surface by merely besmearing it with a little colouring matter—simplest of all simple operations as that seems, now that we are familiar with it, and must have seemed indeed as soon as it had been even once performed.

As for the three subsequent improvements, which constitute the whole portion of the art of printing indisputably invented in Europe in the fifteenth century, and to which alone the claims of the several individuals to whom the invention has been attributed have any reference, even the chief of them, the substitution of types containing each a single letter for blocks containing an entire page, must, we apprehend, be considered as inferior to the primary

Chinese discovery in novelty, or real originality of conception, as it undoubtedly is in importance. That wonderful instrument, the alphabet, being already invented, this improvement consisted merely in chopping down the engraved wooden block into as many separate pieces as there were letters cut upon it. The first time that a school-alphabet was printed by block, the thing was in a manner done; here stood the twenty-four letters already separated to the eye, and in all respects, except in so far as regarded the material cohesion of the wood; and actually to part them was no more than what is done by every child who finds himself in possession of a similar alphabet embossed upon a cake of gingerbread. Probably this was done in the first instance without any forethought of their recomposition in a new order; so that there may have been moveable types before moveable-type printing was dreamed of, and the latter may have been suggested by the former. But at any rate, an innovation the idea of which consisted simply in supposing the arrangement in a different order of a number of objects already visibly unconnected, or separable, must in one way or another have been speedily brought about. The casting of metal types again was only an application of the art of founding, which is one of the most antient of the arts practised by men; and the fabrication of the matrix by a punch was merely an example of the familiar practice of receiving the impression of a stamp or seal upon a substance softer than itself, and precisely the same thing with the very common mode of stamping coins by hammering.

Four names have principally figured in the controversy that has been raised about the invention of printing:—John Gutenberg (paternally Gensfleish), of Strasburg; John Fust (or Faust), of Mayence; Peter Schoeffer (in Latin, Opilio), of Gernsheim; and Lawrence Coster (or Janszoon), of Haarlem. The pretensions of John Mentelius, of Strasburg, need scarcely be noticed. In addition to the accounts which will be found under these names, we shall here subjoin a summary of what appears to be the most probable state of the facts, and the version of the matter that is now generally received.

With regard to the tradition recorded by Hadrian Junius, which ascribes the invention of printing to Coster [COSTER], it may be remarked that, whatever may be thought of the external evidence for the story, the account of the invention with which it supplies us is in the highest degree improbable. The date assigned to Coster's experiments cannot, by any straining of Junius's meaning, be carried farther back than the year 1440. We know that long before that time block-printing, both of pictures and of words, was in common use; yet the Haarlem churchwarden is represented as no more indebted for his new idea to that process than if he had never heard of its existence; that is to say, nine-tenths of the whole art of printing being already discovered and in use, this singular genius discovers the remaining tenth, not by availing himself of what had been already done, but by beginning from the beginning in a way of his own, and most unnecessarily discovering the whole over again. Coster must have seen block-pictures and block-books, but these do not afford him a hint; he takes his whole notion of printing from having been accidentally led to cut out some letters in the bark of trees; the letters already properly reversed on the blocks, and actually employed for making impressions, teach him nothing, suggest nothing to him; but he is filled with the idea of the whole process of printing, in its most improved form, including moveable types, by his own carvings in the bark, which really could have no more tendency to suggest any part of the idea than any other characters graven on wood, or stone, or metal, he had ever looked upon, or even than the common writing in a book. Of course, when Coster, in his afternoon walks, made, like Orlando in the play, the trees his books, and charactered his thoughts in their barks, he cut his letters so as that they should present the usual appearance to the eye; if he reversed them, then it was not his operations on the bark that gave him the idea of printing, but the idea of printing previously acquired, and elsewhere derived, that set him to operate on the bark. But the truth is that the maker of this story misapprehended altogether in what it is that the invention of the art of printing consisted; it did not consist in conceiving the employment of inverted characters—that was quite a familiar expedient, as old as the coining of money or the use of seals, things which had been known for thousands of years; what it consisted in was the application of a pigment to the stamp or seal in a manner which this stupid story about Coster takes no notice of whatever. The probability is, that Coster was one of the early block-printers, whose art, there is every reason to believe, was first practised in Holland. If this art could be proved to have been really invented there, whether by Coster (whose date however is scarcely antient enough) or by some other of his countrymen, and not borrowed from the Chinese, the Dutch would be then entitled to take to themselves the glory of being the true discoverers of printing, and would have little reason to grudge their German neighbours all that they claim as its improvers and perfecters by having been the first to employ moveable types, and matrices, and punches.

These mere improvements are all that can be attributed to Gutenberg, Fust, and Schoeffer. Gutenberg, it is now generally supposed, first began to print at Strasburg some time between the years 1436 and 1442. If what he first practised was block-printing, as has been asserted, he was not the inventor of that method, which we know was in use some years before the earliest of these dates. But there is good reason for believing that before he left Strasburg he had begun to print with moveable types of wood. Having then established himself in Mayence, which was his native town, he there, in the year 1445, entered into partnership with Fust, who seems not only to have supplied the capital for carrying on the business, but also to have assisted Gutenberg in devising or carrying into effect his subsequent great improvement of the art, by casting the types of metal. But to Schoeffer, who was in the service of Gutenberg and Fust, and had married Fust's daughter, is assigned the credit of having facilitated and (as far as the principle was concerned) brought to perfection the process of founding by the contrivance of the punch. This is the account of the matter at once most accordant with the words of the only contemporary or nearly contemporary authority, the abbot John Trithemius, in his 'Annales Monasterii Hirsaugiensis,' and best supported by all the facts that have since come to light. Trithemius, who died in 1516 (though his work was not printed till 1690, 2 vols. folio, Monast. S. Galli), professes to have derived his information from a grandson of Schoeffer. It is observable that he expressly attributes the invention of the art to Fust as well as to Gutenberg.

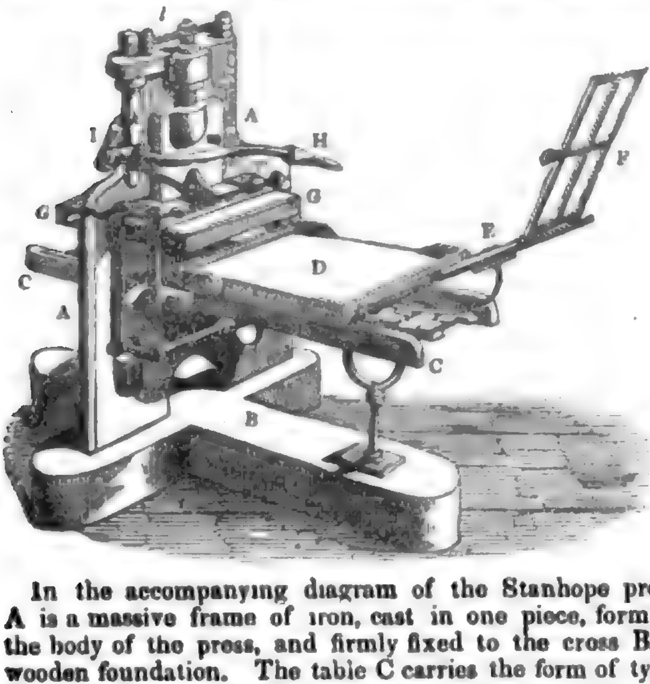
An antient chronicle, first printed at Cologne in 1474 ('Chronica, sive Fasciculus Temporum,' &c., commonly called the 'Cologne Chronicle'), notes that, after ten years had been spent in preparation, the art of printing began to be practised (cœptum est imprimi) in the year 1450. The first book, this chronicle proceeds to state, that was printed was the Bible. Trithemius informs us that before the first twelve sheets of this Bible were printed, Gutenberg and Fust had incurred an expenditure of four thousand florins. The Bible in question is the edition of the Latin Vulgate commonly known by the name of the 'Mazarin Bible,' from a copy of it having been discovered about the middle of the last century in the 'Bibliothèque Mazarine' (ou du Collège des Quatre Nations) by the bookseller De Bure, who has given a minute description of it in his 'Bibliographie Instructive' (vol. i., pp. 32-40). Many other copies of the book however have since turned up. It is without either date or printer's name, but it appears to have been completed before 1455. For some time the new art is said to have been kept secret, and a story is commonly told of the copies of this very edition of the Bible having been sold for several years at Paris as manuscripts, but this anecdote is neither very probable nor very well authenticated. Gutenberg, Fust, and Schoeffer appear to have printed in partnership till the year 1458, when Gutenberg quarrelled with the other two, who then carried on the business by themselves, while he set up a new press, also in Mayence. The knowledge of the art was first made public and carried into other countries by the dispersion of many of the workmen on the storming of Mayence by Adolphus of Nassau, in 1462. Printing was first practised in Italy, in the town of Subiaco, in the Roman territory, in 1465; in France, at Paris, in 1469; in England, at Westminster, in 1474; and in Spain, at Barcelona, in 1475. It is said that by the year 1530 ther were already about 200 printing-presses in Europe.

Among the principal works upon the invention and history of printing, are—Bern. à Malinkrot, 'De Ortu et Progressu Artis Typographicæ,' 4to., Colon. Agrip., 1639; Jac. Mentelii 'De Typographiæ Origine Parænesis,' 4to., Paris, 1650 (this is an assertion of the claim of the author's ancestor of the same name); J. de la Caille, 'Histoire de l'Imprimerie,' 4to., Paris, 1689; And. Chevillier, 'L'Origine de l'Imprimerie de Paris,' 4to., Paris, 1694; Fra. Pellegrino Antonio Orlandi, 'Origine e Progressi della Stampa,' 4to., Bologna, 1722; Jo. Ch. Wolfii 'Monumenta Typographica,' 2 tom., 8vo., Hamb., 1740; Pros. Marchand, 'Histoire de l'Origine et des Progrès de l'Imprimerie, 4to., La Haye, 1740; Mich. Maittaire, 'Annales Typographicæ,' 5 tom., 4to., Hag. Com., Amstel., et Lon., 1719-1741; P. S. Fournier, 'Dissertation sur l'Origine de l'Imprimerie,' 8vo., Paris, 1759; Jo. Dan. Schœpflini 'Vindiciæ Typographicæ,' 4to., Argentor., 1760; Gerardi Meerman, 'Origines Typographicæ,' 2 tom., 4to., Hag. Com., 1765; Ch. Hen. Baron Heinecken, 'Idée Générale d'une Collection complete d'Estampes,' 8vo., Leips., 1771; Pi. Lambinet, 'Recherches sur l'Origine de l'Imprimerie,' 8vo., 1798, and 2 tomes, 8vo., 1810; Singer's 'Researches into the History of Playing-Cards;' Ottley's 'History of Engraving;' Fried. Metz, 'Geschichte des Buchhandels und der Buchdruckerkunst,' Darmstadt, 1834; Falckenstein, 'Entstehung und Ausbildung der Buchdruckerkunst,' Leips. (announced as about to appear in a valuable paper on the 'History of the Book-trade of Germany,' by M. Henry Meidinger, published in the 'Quarterly Journal of the Statistical Society of London' for July, 1840 (vol. iii., part 2, pp. 161-190).

PRINTING-PRESS. The term printing-press is applied to the machine used for letter-press printing or copper-plate printing, but more usually the former. The date of the invention of the printing-press is unknown, but some contrivance for this purpose must have been used as soon as printing by blocks or types was introduced. The increased force requisite to make an impression, the size of the surface to be printed from being increased, would soon suggest recourse to some of the simple machines or mechanical powers for the modification of the power requisite to obtain the necessary pressure. The screw, as applied in the common screw-press [SCREW-PRESS], would obviously suggest itself; and accordingly, in all the earlier printing-presses, the screw alone is used.

The operations to be performed in the process of printing will point out the essential parts of a printing-press. The types, being set up and arranged in a form of suitable dimensions, have to be inked; this is effected by passing across them a cylinder, or roller, covered with an elastic composition of molasses, glue, and tar. The paper to be printed has to be laid on the types when inked, and then the requisite pressure for making the impression has to be applied.

The earliest form of printing-press very closely resembled the common screw-press, as the cheese or napkin press, with some contrivance for running the form of types, when inked, under the pressure, and back again when the impression was made. This rude and inconvenient form of press was superseded by the invention of Blew, a printer of Amsterdam. Other improvements were from time to time introduced; but they were all superseded, about the commencement of the present century, by an invention of Lord Stanhope.



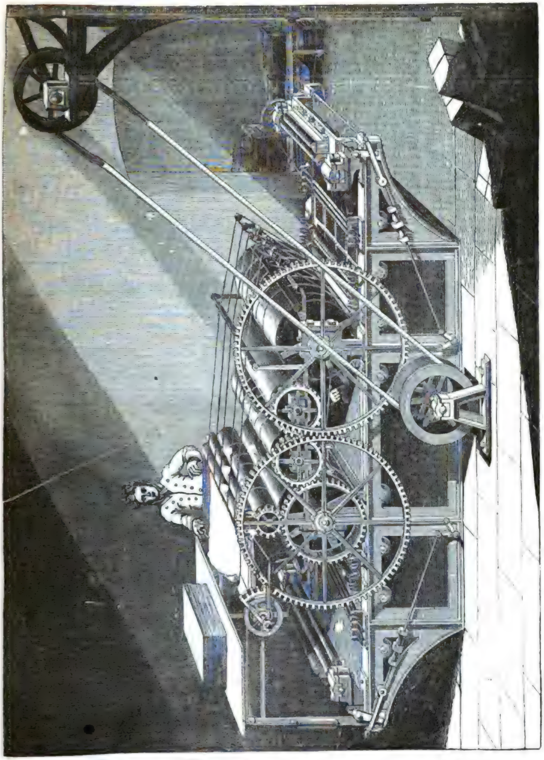
In the accompanying diagram of the Stanhope press, A is a massive frame of iron, cast in one piece, forming the body of the press, and firmly fixed to the cross B, or wooden foundation. The table C carries the form of types D, which, being placed on a carriage, traverses the table backwards and forwards, motion being given to it by means of the crank-handle acting underneath the table. To the carriage are attached the tympans E, which are light frames covered with parchment, and so constructed that the inner tympan just lies within the outer tympan. Some blanketing is placed between the tympans, so as to equalise the pressure upon the surface of the types. To the outer tympan is attached the frisket F. The sheet of paper to be printed being placed on the tympans, the frisket is turned down upon it; and then the frisket and tympans are turned down upon the form of types. The frisket is covered with paper or parchment, cut out so that the sheet to be printed, when placed between the tympans and frisket, and folded down together on the form of the types, may be in contact with the surface of the types; while the remainder of the frisket-sheet preserves the margin from being soiled.

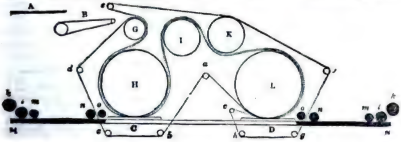
The form of types being inked, and the tympans and frisket, with the sheet of paper between them, folded down on the form, the whole is run, by turning the crank-handle, under the plattin G, which is a massive plate of cast-iron, moveable up and down perpendicularly, its weight being rather more than counterbalanced by the weight I at the back. The pressman pulls the handle of the bar H towards him, or across the press, and thus communicates motion to *k* and *l*, and causes the spindle *m*, which sustains the plattin, to descend and produce the requisite pressure. The principal improvement of the Stanhope press consists in the manner in which the descending motion is given to the screw. This depends on the properties of the bent lever, and may be explained in the following manner:—It is a necessary consequence of the peculiar combination and arrangement of the bent lever here employed, that on the handle H being moved, the plattin descends rapidly at first; but as the plattin comes very near to the extreme point of its descent, the motion is extremely slow. But at this instant the plattin is pressing the paper upon the types, and the pressure exerted being inversely as the rate of the descent of the plattin, whose motion at this instant is exceedingly slow, the pressure produced is enormously large. It will be found also that at the instant the plattin is at its lowest point, the connecting bar *l*, by which the power applied is transmitted to the plattin, passes across the centres of motion of the system of forces; and at this instant, as theory points out, the ratio of the pressure produced to the power applied is indefinitely large. The pull having been made, or the pressure produced, the handle H returns to its original position, being taken back by the weight I at the back, which rather more than counterbalances the plattin. The carriage is then run back, the frisket and tympans unfolded, and the printed sheet being taken out, the same operation is repeated. The usual rate of printing by the Stanhope press is two hundred and fifty per hour, two men being employed, one to ink the types, and the other as pressman.

The principle of the Stanhope press has been followed out by several subsequent inventors, and improvements of mechanical detail introduced, tending to the economy of time and labour, and to precision of workmanship. In the Ruthven press, the form of types remains stationary, and the plattin is removed to permit the types to be inked; and in this, as well as the Columbian, the pressure is produced by a combination of levers alone, without the use of any portion of a screw or inclined plane.

The press for copper-plate printing consists of two cylinders, or rollers, of wood, supported in a strong wooden frame, and moveable about their axes, one placed just above and another just below the level of the table upon which the plate to be printed is laid. The upper roller is turned round by the arms of a cross fixed to its axis. The copper-plate being inked, the paper on which the impression is to be taken, and two or three folds of soft material, as blanketing, are placed upon it. The plate so prepared is moved along the table to the juncture of the two rollers, and the upper roller being turned by the arms of the cross, the plate, with its furniture, is passed through the press. The rollers may be placed nearer to or farther from each other, according to the amount of pressure requisite for making a good impression, that is, according to the depth of the engraving and the degree of blackness which the impression is required to have.

PRINTING-MACHINE. The printing-press, though much improved during the last half-century by the ingenuity of Lord Stanhope and others [PRINTING-PRESS], is quite in-

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adequate to a rate of production equal to the present demand. The attention of practical men was consequently directed to some more rapid means of production, and as early as 1790, even before the Stanhope-press was generally known, Mr. W Nicholson had letters-patent for a machine similar in many respects to those which have now come into use. Subsequently Mr. König, a German, conceived nearly the same idea, and meeting with the encouragement in this country which he failed to obtain on the Continent, constructed a printing-machine, and on the 28th of November, 1814, the readers of the 'Times' were informed that they were then for the first time reading a newspaper printed by machinery driven by steam-power. This printing-machine, though highly ingenious, was very complicated, and the machine of König was soon superseded by that of Messrs. Applegath and Cowper, the novel features of which were accuracy in the register, the method of inking the types, and great simplicity in hitherto very complicated parts. Printing-machines may be distinguished into single and double; the single being that in which only one side of the sheet of paper is printed, the double that in which both sides are printed before the sheet leaves the machine. The former is used for newspapers and that kind of printing in which it is not necessary for the two sides of the sheet to 'register,' that is, for the printing on one side to be exactly at the back of the other; the latter for books, in which it is essential that the printing on one page should correspond with the printing on the other when the sheets are folded. This important object of the register is effected by causing the parts to move at precisely the same speed. This being the principle of the register, its success will depend on great accuracy of workmanship in the mechanical parts. The accompanying representation of the printing-machine will furnish a correct notion of the several parts, and of the way in which motion is communicated to them. A sheet of paper is taken from the pile to be printed (as represented at the left-hand side of the drawing), and put into the machine by one attendant, and taken out printed on both sides by the other attendant, whose hand is shown under the cylinders. The accompanying sketch will show the principle of the printing-machine.

The sheet of paper taken from the table A is laid on the feeder B, which consists of girths of linen, tightly stretched by being passed round two cylinders. By the motion of this feeder the sheet is placed between the two systems of tapes which lie on the cylinder G: these tapes, of which one set is represented by the dotted line, and the other by the thin line, lie two and two over each other on the cylinders and small rollers *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, *i*. The sheet of paper grasped between them is kept clean at the places in which it is in contact with them, and by the motion of the various parts is conducted under the first printing-cylinder H, and receives an impression from the types at C; thence by means of the cylinders I, K, to the second printing-cylinder L, where it receives an impression on the other side from the types at D. Thus printed on both sides, it is taken out at *e* by the attendant. The cylinders I and K are simply for the purpose of conveying the sheet steadily and smoothly from one printing-cylinder to the other. The sheet will be seen to be reversed in its progress from one set of types to the other, descending the left side of the first and the right side of the second printing-cylinder.

An inking-apparatus is placed at each end of the table M, N, which carries the types C, D, and which traverses backwards and forwards under the printing-cylinders L, H, and inking-rollers. The ink, received from a reservoir *k* by the two rollers *l* and *m*, is transferred from them to the surface of the table; the surface of the table inks the rollers *n*, *o*, and these, in their turn, ink the types as they pass backwards and forwards for each impression. The excellence of the printing depends in a great measure on the types being properly inked. In a machine arranged according to the accompanying diagram, the types are touched four times by the inking-rollers for each impression, and by increasing the number of rollers, any perfection of inking may be obtained. The machines commonly used for printing books will print from seven hundred to one thousand per hour, in perfect register; and for newspapers, printed on one side only, from four thousand to six thousand per hour.

PRINTING, CALICO. [CALICO PRINTING.]

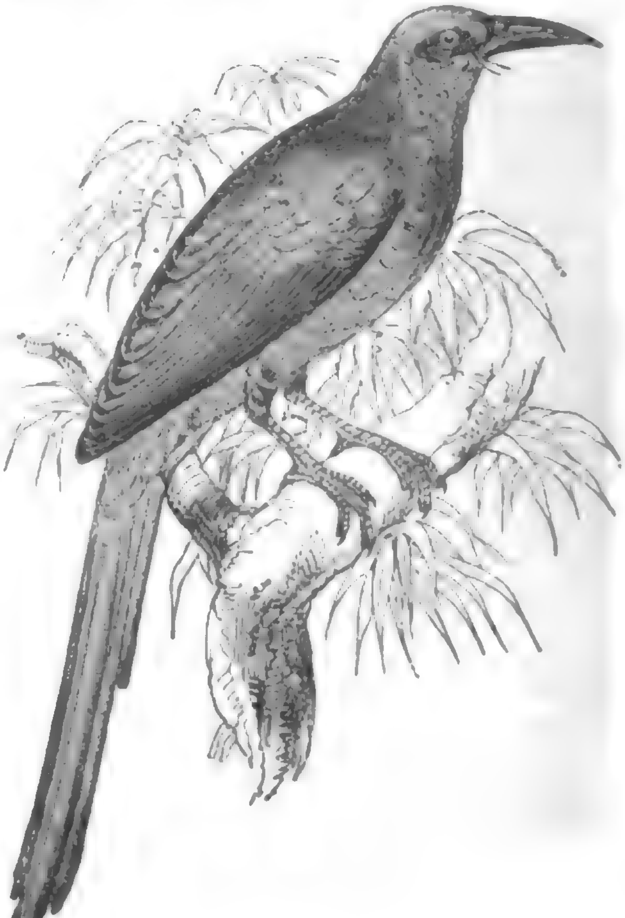
PRI'ODON. [ARMADILLO, vol. ii., p. 354.]

PRION. [PETRELS, vol. xviii., p. 47.]

PRIONI'TES, Illiger's name for a genus of birds.

Generic Character.—Both *mandibles* slightly curved and compressed; the margins with strong denticulations. *Tongue* long, slender; the sides ciliated. *Wings* short, rounded. *Tail* lengthened, cuneated. *Feet* gressorial, as in *Merops*. (Sw.)

Mr. Swainson (*Classification of Birds*) remarks that every writer since the days of Linnæus (who at first actually classed them in the same genus) has placed the Motmots (*Prionites*) and the Toucans (*Ramphastos*) close together, not only from the similarity of their habits, but from the structure of the tongue, which in both is long, and so much ciliated at its sides as to resemble a feather; so far, therefore, he observes, the resemblance is unquestionable. 'But,' continues Mr. Swainson, 'the feet of the motmot are totally different from the toucan; they are not scansorial, but of that particular structure so common among the *Fissirostres*. The toucans, we know, from personal observation, to be gregarious, living in flocks, and seeking their food from the tops of lofty trees; the motmot is solitary, hiding in the deep shades of the forests, and, like other air-feeding birds, is always found sitting nearly motionless. Here, then, is a very obvious departure from the structure and habits of the toucan. The question then is, to what does it lead? If to the hornbills (which has been inferred from the structure of the feet), we should have no diminution in the size of the bill, which in both the hornbills and toucans is equally large, but in the motmot of an ordinary and proportionate size: we should further expect a bird which was gregarious, since both these groups are so. Yet there is nothing in the motmot, beyond its feet, which will at all assimilate it to the perchers; while its fissirostral habit of catching its food upon the wing, and the discovery of the broad-billed species, *Prionites platyrhynchus*, seems to us a conclusive argument for placing this genus in the fissirostral order, as more intimately connected to the Jacamars (*Galbula*) [KINGFISHERS, vol. xiii., p. 233], than to any other known genus.



Prionites Mexicanus.

Example, *Prionites Mexicanus*.

Description.—Green above, paler beneath; head and neck above crimson; ears black, varied, and tipped with bright blue stripes; belly white. (Sw.)

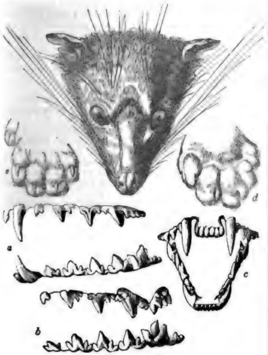
Food, Habits, Geographical Distribution.—Mr. Swainson (*Zool. Ill.*) states that the motmots or momots, 'so named from their monotonous note, live only in the tropical forests of the New World, preferring those deep recesses of perpetual shade where a high canopy of matted foliage nearly excludes the rays of a vertical sun. They appear even more solitary in their disposition than the *Trogons;* their note may be heard, morning and evening, from the depths of the forests, but the bird is never seen, unless the hunter comes unexpectedly upon its retreat. This we have generally found to be a low withered branch completely shaded and just at the edge of such paths as are made by the Cavies or the Indians. The *Jacamars* and the *Trogons* both love these shady nooks, where they sit nearly motionless, watching for passing insects, on which they dart. Such is, no doubt, the manner in which the motmot feeds; but his strong conformation enables him to capture larger game. Travellers assert that he also devours the eggs and young of other birds, like the Toucans; this we believe, as both have the same long and feather-like tongue.'

Mr. G. R. Gray makes the *Momotinæ*, a subfamily of the *Todidæ*, consist of the genus *Crypticus*, Sw. (*Momotus*, Leadb.; *Prionites*, Sw.), and the genus *Momotus*, Briss. (*Baryphonus*, Vieill.; *Prionites*, Ill.; *Momota*, Shaw; *Ramphastos*, Linn.).

PRIO'NODON, Dr. Horsfield's name for a feline form (*Felis gracilis*, *Delundung* of the Javanese), and placed by him in a separate section under the name of *Prionodontidæ*, between *Felis* and *Viverra*. (*Zoological Researches in Java.*)

Mr. Swainson remarks (*Classification of Quadrupeds*) that of the genus *Prionodon*, at present, but one species has been found, in Java. As a familiar appellation, expressive, in all probability, of its analogy to the *Sorecidæ*, he terms it the *Shrew Cat.*

Dental Formula:—Incisors $\frac{6}{6}$; canines $\frac{1-1}{1-1}$; molars $\frac{5-5}{6-6}$



Head, teeth, and feet of Prionodon.
Head two-thirds of nat. size.

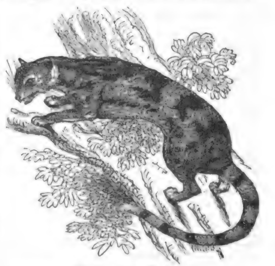
a, lateral view (external) of the teeth; *b*, lateral view (internal); *c*, front view: *d*, fore-foot, covered with fur: *e*, hind-foot, fur removed: these last figures about one-fourth larger than natural size. (Horsfield.)

Mr. Swainson thus enumerates the distinguishing peculiarities of this interesting form as given by Dr. Horsfield:—

'In the number of toes on the hind feet, and of the teeth, as well as in the form of the head and body, this animal resembles the Gennets (*Viverra*); but the character of the claws and peculiar structure of the teeth indicate a decided affinity to the *Felinæ*. Both these families indeed have the incisive or cutting teeth alike, and those of the shrew cat are similar: nor does there appear any essential difference in respect to the canine teeth of the three. The cats have three or four cheek-teeth above, and three below; the *Viverræ*, on the contrary, have six; while our present animal differs from both, in having five above and six below. The pupil of the eye is circular; that of the genus *Felis* in some instances is the same, but in others oblong; while in the *Civets* it is transversely elongate. In the ears and form of the body, our animal much more resembles the *Viverræ* than the *Felinæ;* but in regard to colour it preserves a much closer relation to the genuine cats. The ears are short and round, the body long, and the legs short. From these facts it appears more natural to associate this singular animal with the present group (*Felinæ*) than with the Gennet family; inasmuch as although it wears the aspect and possesses some of the characters of the latter, it has others, more important to its economy and habits, which belong only to the *Felinæ*. So far we coincide with the views of those who associate *Prionodon* with the true *Felinæ*. But before this question can be ultimately decided, it is absolutely necessary that the circle of the *Mustelidæ* should be analysed. *Prionodon* may possibly be the type of *Felis*, in the circle of *Viverra;* or it may be, as we esteem it at present, an aberrant form of the group before us (Felinæ).'

Description.—Tail elongated, annulated, cylindrical; body pale flavescent, with four very wide dorsal bands and two narrow anal bands; two broad lateral striæ, the narrow cervical striæ, the numerous humeral and femoral spots, and the seven caudal rings very deep brown. (Horsf.)

Habits, Locality, &c.—Dr. Horsfield discovered this animal in 1806, during the early period of his researches in the district of Blambangan, situated at the extremity of Java; the natives distinguish it by the name above given. Dr. Horsfield was not able to ascertain that it is found in any other part of the island, or that it has another name; but he states that even in Blambangan it is rarely met with. He notices it as inhabiting the extensive forests which, with the exception of the capital of Banyuwangi and a few small villages, cover that district. He obtained but little information as to its habits and manners, and records nothing on the subject beyond what we have mentioned.



Prionodon gracilis. (Horsf., Java.)

PRI'ONOPS. [SHRIKES.]

PRIOR, PRIORY, ecclesiastical terms denoting certain monastic foundations and the heads of such foundations. They differ in nothing essentially from the terms abbot and abbey. There were in England religious houses the chiefs of which were called priors, quite as rich and as powerful as many that had a chief who was called the abbot. Thus in Yorkshire there were two houses at no great distance from each other, called Roche and Nostel, the head of the former being an abbot, and of the latter a prior, though Nostel was the more antient and more considerable foundation. Neither has the distinction respect to the order to which the house belonged; for Kirkstall had an abbot, while Fountains had only a prior, and yet both were Cistercian houses. The prior of Saint John of Jerusalem was equal to any abbot; yet in the main we find the greater monastic foundations presided over by monks who were called abbots, as Glastonbury, Malmesbury, Tewkesbury, and others of ante-Norman foundation. In some cases there was both an abbot and a prior, when the abbot was regarded as the superior officer; and in the priories there was often a second officer called the sub-prior.

PRIOR, MATTHEW, was born on the 21st of July, 1664, it is uncertain whether at Wimborne in Dorsetshire, or in London, in which city his father is said to have been a joiner. His uncle, Samuel Prior, kept the Rummer Tavern near Charing-Cross. Matthew, on the death of his father, was taken charge of by his uncle, who sent him to Westminster school, then under Dr. Busby. When he was well advanced in the school, his uncle took him home with the intention of employing him in his business; but he had the good fortune to attract the notice of the earl of Dorset, who formed so favourable an opinion of his talents, that he sent him, in 1682, to St. John's College, Cambridge, where he was admitted to his bachelor's degree in 1686, and obtained a fellowship. Dryden's 'Hind and Panther' was published in 1786, and Prior, in conjunction with the Hon. Charles Montague, afterwards earl of Halifax, wrote, in ridicule of Dryden's poem, 'The City Mouse and Country Mouse,' which was published in 1687. After the Revolution of 1688, Prior came to London; and was introduced at court by the earl of Dorset, by whose influence he was appointed secretary to the embassy which was sent to the congress at the Hague in 1690, and his conduct gave so much satisfaction to King William, that he made him one of the gentlemen of his bedchamber. On the death of Queen Mary in 1695, Prior wrote an ode, which was presented to the king on his arrival in Holland after her death. In 1697 he was appointed secretary to the embassy which concluded the peace of Ryswick, and the next year filled the same office at the court of France, where he was treated with marked distinction. In 1799 he was at Loo in Holland with King William, by whom he was charged with dispatches to England, and on his arrival was made under-secretary of state, but losing his place soon after, on the removal of the earl of Jersey from the office of secretary of state, he was made, in 1700, one of the commissioners of trade. This year he published a long and elaborate poem, the 'Carmen Seculare,' in which he celebrates the virtues and heroic actions of King William.

In the parliament that met in 1701, Prior sat as member for East Grinstead. Soon after this he joined the Tory party. In 1706 he celebrated the battle of Ramillies, in a long ode, which he inscribed to Queen Anne. In July, 1711, the Tories being now in power, Prior was sent privately to Paris with proposals of peace. In about a month he returned, bringing with him the Abbé Gualtier, and M. Mesnager, one of the French ministers, who was invested with full powers. The queen's ministers met Mesnager privately at Prior's house on the 20th September, 1711. This private meeting was made the ground of the charge of treason which the Whigs afterwards brought against Prior. The conferences began at Utrecht, on the 1st of January, 1712, but the business advanced so slowly that Bolingbroke was sent as ambassador to Louis XIV. at Paris, to forward it, and Prior either accompanied or followed him. After Bolingbroke's return, Prior acted as ambassador, though he was not officially appointed till August, 1713; his public dignity however was of short duration, for on the 1st of August, 1714, the Tories lost office, and Prior was recalled by the Whigs, by whom he was committed on a charge of high treason, and remained in custody two years. During his confinement he wrote his poem of 'Alma.' He was now without the means of subsistence, except from his fellowship, which he still retained; but the publication of his poems by subscription, which amounted to 4000 guineas, and an equal sum added by Lord Harley, son of the earl of Oxford, for the purchase of Down-hall in Essex, which was settled upon Prior for his life, restored him to easy circumstances. He died at Wimpole, a seat of the earl of Oxford, in Cambridgeshire, September 18, 1721, at the age of 57. A monument was erected to him in Westminster Abbey; and for this and the Latin inscription upon it, which he directed in his will to be written by Dr. Robert Friend, he left 500*l*.

Prior seems to have been well fitted for the public situations which he filled. It is evident that he was skilled in the art of pleasing, an important requisite in a diplomatist. He secured the approbation of the English sovereigns and ministers who employed him, and his influence at the French court was undoubted. When he joined the Tories he became, as is usual in such cases, a violent partisan; and the charge of high treason and two years' imprisonment were the result of a malignant persecution to which he had exposed himself by his desertion of the Whigs.

In his private habits he appears to have been negligent and sensual. It is stated, on the authority of Spence, that the woman with whom he lived was 'a despicable drab of the lowest species.' It is evident however that he secured the esteem and affection of a large circle of associates; he became indeed almost a member of the family of the earl of Oxford.

Prior, as a poet, was once popular, but is little read now. His lighter pieces are the most attractive. His Tales, though borrowed and mostly indecent, are told with ease and sprightliness, and his Epigrams are often neatly pointed. His 'Alma, or the Progress of the Soul,' the style of which is professedly an imitation of that of 'Hudibras,' has not much either of philosophy or wit in it, but is written in a very lively manner. 'Solomon' is one of the best of his poems. It is a sort of epic, formed out of the 'Proverbs' and 'Ecclesiastes.' The reflections are elaborately expressed, and often with great felicity of diction, but being without character or incident, it is rather heavy reading. 'Henry and Emma' is displeasing from the improbability both of the circumstances and sentiments; yet it was once a favourite with the public. Johnson very truly calls it a 'dull and tedious dialogue.' His smaller occasional poems are deformed by the continual introduction of the deities of the Grecian and Roman mythology. Venus and Cupid and Mars and Mercury and Jupiter meet us at every turn. Prior is fortunately one of the last of that race of poets who sought for ornament in these school-boy allusions. On the whole, it may be said of Prior that he had none of the higher qualities of a poet—no invention, little power of imagination, and consequently no vividness of description. He has diligence and judgment, and he may be regarded as one of the most correct of English poets. A 'History of the Transactions of his own Times,' for which he had been collecting materials, was published after his death, in 2 vols. 8vo., but it has little in it of Prior's, and is of small value.

(Johnson's *Lives of the Poets; Life of Prior*, by Humphreys; *Biographie Universelle;* Campbell's *Specimens of the British Poets.*)

PRIORITY. [NOTICE.]

PRISCIA'NUS was a celebrated Roman grammarian, who is said to have been born at Cæsarea; but we have hardly any particulars respecting his life. It appears that he was appointed professor of grammar at Constantinople in the reign of Justinian, about A.D. 525 (Fabricii *Bibliotheca Latina*, vol. iii., p. 398, ed. Ernesti); and we may infer from this circumstance, as well as from several passages in his works, that he was a Christian. He received instruction himself from Theoctistus, whom he frequently mentions with great praise.

Priscian's work 'De Arte Grammaticâ' is comprised in eighteen books, and is dedicated to Julian, whom some modern writers have erroneously supposed to be the emperor of that name. This work, which is the most complete treatise on the Latin language that has come down to us from antiquity, supplied the materials for most of the Latin grammars published at the revival of learning; and the estimation in which it was held at that time is shown by the fact that five editions of it were published between the years 1470 and 1495. Modern scholars may still consult it with profit; it is particularly valuable for the number of quotations which it contains from writers whose works have not come down to us. Besides this work, the following treatises of Priscian's are extant:—'De XII. Versibus Æneidos principalibus ad Pueros,' 'De Accentibus,' 'De Declinatione Nominum,' 'De Versibus Comicis,' 'De Præexercitamentis Rhetoricæ,' 'De Figuris et Nominibus Numerorum et de Numis ac Ponderibus.' The best editions of Priscian are by Putschius, in his 'Grammaticæ Latinæ Auctores antiqui,' 4to., Hanov., 1605, and by Krehl, 8vo., Lips., 1819-20. The 'Opera Minora' were also edited by Lindemann, 8vo., Lugd. Bat., 1818. His treatise on Comic Metres is included in Gaisford's 'Scriptores Latini Rei Metricæ,' 8vo., Oxon., 1834.

Priscian also wrote a short poem entitled 'De Laude Im peratoris Anastasii,' which was published for the first time by Endlicher, 8vo., Vindob., 1828.

PRISCILLIA'NUS. [Office, Holy.]

PRISM (πρίσμα), in Mathematics, is a solid formed by a straight line which moves parallel to a given straight line, and one end of which traces out the contour of a given rectilinear polygon. The other extremity of the moving straight line traces out an equal and similar polygon, placed parallel to the former one: and the prism is thus bounded by two equal and parallel polygons, joined by as many parallelograms as each polygon has sides. When these parallelograms are at right angles to the planes of the polygons, the solid is called a right prism; in all other cases, an oblique prism. The prism is among plane solids what the cylinder is among curvilinear ones: it is also called triangular, quadrangular, pentagonal, &c. according as the polygons have three, four, five, &c. sides. Thus the prism used in optics is a triangular prism, while the parallelopiped is a quadrangular prism.

The number of cubic units in the content of a prism is found by multiplying the number of square units in either of the polygons by the number of linear units in the perpendicular distance between the planes of the two polygons; and all prisms, however much they may differ in obliquity, which have equal bases, and equal heights or perpendicular distances between opposite polygons, are equal in magnitude.

No other rule can be given for computing the surface of a prism except the simple direction to add the areas of the two polygons to those of the joining parallelograms. But in the case of a right prism, the finding of the parallelograms may be shortened by multiplying the number of linear units in the contour of one polygon by the altitude of the prism.

PRISM. (Optics.) [Refraction.]

PRI'SODON, Schumacher's name for a form among the *Naiades*, *Hyria*, &c. of authors. [Naiades.]

PRISON. [Transportation.]

PRISTIDACTYLS, the name assigned by MM. Duméril and Bibron to a group of *Cœlodonts*, being the second of their *Lézards Lacertiens ou Autosaures*. The Lacertians of this group are those which have the toes either dentilated laterally or carinated on their inferior surface, or provided both with carinations below and dentilations along their edges. None of them have the temples covered with plates or large scales. In the greater part of the species the plates which surround the nostrils are more or less convex, the palpebral disk is nearly completely surrounded with a *cordon* of granules, and the ventral lamellæ, as well as the preanal scales, are smaller and more numerous than in the *Leiodactylous Cœlodonts*.

The following genera are arranged by MM. Duméril and Bibron under this group:—

Psammodromus, Fitz. (*Notophilis*, *Aspistis*, Wagl., Bonap., Wiegm.; *Psammodromus*, Wiegm.).

Ophiops, Ménestriés (*Amystes*, Wiegm.). [Ophiops.]

Calosaura, Dum. and Bibr.

Acanthodactylus, Fitz. (*Podarcis*, part, Wagl.).

Scapteira, Fitz. [Scapteira.]

Eremias, Fitz. (*Podarcis*, part, Wagl.).

PRITTLEWELL. [Essex.]

PRIVAS, a town in France, capital of the department of Ardèche, situated on the little river Ouvèze, 382 miles from Paris by Lyon and Valence, in 44° 44′ N. lat. and 4° 35′ E. long.

This small provincial capital is on a hill rising out of a pleasant valley. It has few public structures of any importance. There are an old castle, and a convent of Recollet monks, now converted partly into a court of justice and partly into barracks. The population of the commune in 1831 was 4342. The townsmen are engaged in throwing and manufacturing silk, and carry on trade in leather. There are coal-mines in the neighbourhood. Privas has a subordinate court of justice, several fiscal government offices, a house of correction, a library, and an agricultural society. The town was taken from the Huguenots, A.D. 1629, by Louis XIII.

The arrondissement of Privas had, in 1831, a population of 107,696. It comprehends 107 communes, and is divided into ten cantons or districts, each under a justice of the peace.

PRIVATEER, a private ship of war, fitted out at the cost of an individual for the purpose of carrying on hostilities on his own account, but under the sanction of a belligerent state, against the public enemy. It is the practice of most nations to commission vessels of this kind as auxiliaries to the public force. The owners of them are licensed to attack and plunder the enemy, and their enterprise is encouraged by allowing them a large portion of any property they may capture. By the law of nations they are not considered pirates. It is usual for the country on whose behalf they carry on war to take security for their duly respecting the rights of neutrals and allies, and observing generally the law of nations. [Prize.] (45 Geo. III., c. 72; 1 Kent's *Commentaries*, 96.)

PRIVILEGE (*Privilegium*, from the sense of which however it has been perverted), a particular beneficial exemption from the general rules of law. Privilege is of two kinds; *real*, attaching to place, and *personal*, attaching to persons, as ambassadors, peers, members of parliament, attorneys, &c., whose peculiar privileges are stated under these heads respectively.

Formerly many places conferred the privilege of freedom from arrest, even in criminal matters, upon those entering them [Sanctuary]; and even in later times many places existed which privileged those within them from arrest in civil suits. Of these the most notorious were White Fryars, the Savoy, the Mint, and other places in their neighbourhood. But by 8 & 9 Will. III., c. 27, the privileges of all these places were abolished. However, at the present time, no arrest can be made in the king's presence, nor within the verge of the palace of Westminster, nor in any palace where he resides, nor in any place where the king's justices are sitting. (3 *Inst.*, 141.) Personal privilege, conferring freedom from arrest, is enjoyed by all suitors, counsel, witnesses, or other persons attending any courts of record upon business, or an arbitrator under a rule of Nisi prius. This exemption is to be interpreted liberally, and will not therefore be forfeited by taking refreshment after a suit, or by going other than the direct road to or from a court. (Com., *Dig.*, tit. 'Privileges.')

PRIVILE'GIUM. [Law.]

PRIVY COUNCIL (Consilium regis privatum, concilium secretum et continuum concilium regis). The privy council, or council table, consists of the assembly of the king's privy councillors for matters of state. During the existence of the Star-chamber, the members of the privy council were also members of that court. Their number was antiently about twelve, but is now indefinitely increased. The present usage is, that no members attend the deliberations of the council who are not especially summoned for that purpose. They must be natural-born subjects of England, and are nominated by the king without any patent or grant. After nomination and taking the oath of office, they immediately become privy councillors. Formerly they remained in office only during the life of the king, who chose them subject to removal at his discretion; but by 6 Anne, c. 7, the privy council continues in existence six months after the demise of the crown, unless sooner determined by the successor, and they are to cause the successor to be proclaimed. The privy council of Scotland is now merged in that of England, by 6 Anne, c. 6. The duties of a privy councillor, as stated in the oath of office, are, to the best of his discretion truly and impartially to advise the king; to keep secret his counsel, to avoid corruption, to strengthen the king's council in all that by them is thought good for the king and his land, to withstand those who attempt the contrary, and to do all that a good councillor ought to do unto his sovereign lord. By the Act of Settlement (12 & 13 Will. III., c. 2) all matters relating to the government properly cognizable in the privy council are to be transacted there; and all the resolutions taken thereon are to be signed by such of the privy council as advise and consent to them.

The court of privy council is of great antiquity; and during earlier periods of our history appears not always to have confined itself to the entertainment of mere matters of state. It had always and still has power to inquire into all offences against the government, and to commit the offenders for the purpose of their trial in some of the courts of law; but it often assumed the cognizance of questions merely affecting the property and liberties of individuals. This is evident from the complaints and remonstrances that so frequently occur in our history, and ultimately from the declaratory law of the 16 Ch. I. referring to such practices. Probably the very statement of Sir Edward Coke, that the subjects of their deliberation are the 'publique good, and the honour, defence, safety, and profit of the realm....private causes, lest they should hinder the publique, they leave to the justices of the king's courts of justice, and meddle not with them,' proceeded from his knowledge that such limits had not always been observed, and his jealousy of their invasion. Several other passages in his works seem to show that this was so. These encroachments, in one arbitrary reign, received the sanction of the legislature. By 31 Hen. VIII., c. 8, the king, with the advice of his privy council, was empowered to set forth proclamations under such pains and penalties as seemed to them necessary, which were to be observed as though they were made by Act of Parliament. It is true there was an attempt to limit the effects of this, by a proviso that it was not to be prejudicial to any person's inheritance, offices, liberty, goods, or life. The statute itself however was repealed in the first year of the ensuing reign. The king, with the advice of his council, may still publish proclamations, which are said to be binding on the subject; but the proclamations must be consonant to and in execution of the laws of the land. The attempts to enlarge the jurisdiction of the council appear always to have been resisted as illegal; and they were finally checked by the 16 Chas. I., c. 10. That statute recites that of late years 'the council-table hath assumed unto itself a power to intermeddle in civil causes, and matters only of private interest between party and party, and have adventured to determine of the estates and liberties of the subject, contrary to the laws of the land, and the rights and privileges of the subject.' By the same statute it is declared and enacted that neither his majesty nor his privy council have or ought to have any jurisdiction in such matters, but that they ought to be tried and determined in the ordinary courts of justice, and by the ordinary courts of law.

Subsequently however to this statute, in matters arising out of the jurisdiction of the courts of the kingdom, as in colonial and admiralty causes, and also in other matters, where the appeal was to the king himself in council, the privy council continued to have cognizance, even though the questions related merely to the property of individuals. By 2 and 3 Wm. IV., c. 92, the powers of the high courts of delegates, both in ecclesiastical and maritime causes, were transferred to the king in council. The decision of these matters being purely legal, it was found expedient to make some alterations in the court, for the purpose of better adapting it to the discharge of this branch of its duties. Instances had before occurred where the judges had been called in and had given extra-judicial opinions to the privy council; but the practice was inconvenient and unsatisfactory, and all necessity for it is now wholly removed. By the 3 and 4 Wm. IV., c. 41, the jurisdiction of the privy council is further enlarged, and there is added to it a body entitled 'the judicial committee of the privy council.' This body consists of the keeper of the great seal, the chief justice of the King's Bench and of the Common Pleas, the master of the rolls, the vice chancellor, the chief baron of the Exchequer, the judges of the prerogative court of Canterbury and of the high court of admiralty, the chief judge of the bankruptcy court, and all members of the privy council who have been presidents of it or have held the office of chancellor or any of the before-named offices. Power is also given to the king by his sign manual to appoint any two other persons who are privy councillors to be members of the committee. In the third section of the act are enumerated the appeals which are to be referred to this committee. They are authorised to examine witnesses on oath, and to direct an issue to be tried by a jury. The same powers for enforcing their decrees, &c. are given to the judicial committee as are possessed by the Court of Chancery, King's Bench, &c. A registrar is also attached to the committee, to whom matters may be referred, as in chancery to a master.

The privileges of a privy councillor, beyond those of mere honorary precedence, formerly related to the security of his person. If any one struck another a blow in the house or presence of a privy councillor, he was fineable. Conspiracy by the king's menial servants against the life of a privy councillor was felony, though nothing were done upon it. And by 9 Anne, c. 16, any unlawful assault by any person on a privy councillor in the execution of his office was felony.

These statutes have however been now repealed, by 9 Geo. IV., c. 31, and any offence against a privy councillor stands on the same footing as offences against any other individual. (1 Co. Lit., 110, a, n. 5; 3 *Inst.*, 182; 4 *Inst.*, 52; 1 Bl., *Com.*, 222; Hallam's *Constitutional History*.)

PRIZE, property taken from an enemy. The term is generally applied to property taken at sea exclusively. The law of prize is regulated by the general law of nations. As between the belligerent powers themselves, the property in a ship or other thing captured passes at once, by the mere taking itself, to the captor. But the thing captured may be purchased from the captor by a person belonging to a neutral state, or it may be recaptured. It becomes therefore necessary, as between the original owner and such purchaser, or between the original owner and the recaptor, to lay down some rule for determining at what time and under what circumstances the thing captured becomes prize, so that the property in it passes to the captor for all purposes. The law of nations upon this point was very vague and unsettled. It used to be said that property was not devested by capture until after possession had been retained twenty-four hours, or until the prize had been taken infra præsidia; or again, until the spes recuperandi was gone. The present rule is thus expressed by Lord Stowell:—'By the general practice of the law of nations a sentence of condemnation is at present deemed generally necessary, and a neutral purchaser in Europe during war looks to the legal sentence of condemnation as one of the title-deeds of a ship, if he buys a prize vessel.' Sentence of condemnation, that is, sentence that the thing captured is prize, and that consequently the property of the original owner in it is entirely devested, must be pronounced by a court of the capturing power duly constituted according to the law of nations. The prize court of the captor may sit in the territory of an ally, but not in that of a neutral. Questions of prize are by the English law disposed of in the courts of Admiralty. [ADMIRALTY.]

(45 Geo. III., c. 72; 1 Kent's *Commentaries*, 100; Douglas's *Reports*, p. 612.)

PRIZE-MONEY. All the acts relating to army prize-money have been repealed by the 2 and 3 Wm. IV., c. 53, which also enacts that all captures made by the army shall be divided according to such general rule of distribution as the king shall direct.

PROBABILITY, PROBABILITIES, THEORY OF. A conclusion may be said to be known in two distinct ways: first, when it is derived from those principles (as we call them) which may be considered as common to all mankind, or which at least no one is found to deny; secondly, when it results, by a sure process of inference, from premises which are believed to be known. Whether these premises are properly known, that is to say, whether another person assuming to decide on the propriety or impropriety is satisfied or not, is not a part of the present inquiry. That knowledge of the first kind exists is unquestioned, and most of the results of such knowledge are agreed upon. That knowledge of the second kind exists is also unquestioned, though two men may differ as to whether a given conclusion is part of it or not. The distinction, as elsewhere noticed [MATHEMATICS], is positive, easily apprehended, and useful; it exists moreover, and must exist, whatever may be the system of metaphysics on which one man or another may explain it.

In the exact sciences, demonstration is always effected in such a way as to show that nothing contradictory of the proposition demonstrated either is true or can have been true at any time. Two sides of a triangle are, were, and always will be, greater than the third; by which we mean that persons with minds constituted as ours are, must have admitted this, must now admit it, and must admit it in all time to come. Those who should deny the proposition must really hold that a whole may be less than its contained part: such is the alternative which geometrical demonstration offers for acceptance, and we should cease to consider a mind as the proper object of instruction which should prefer the alternative to the proposition. Such truths as these are not the subject of the present article.

The other class of conclusions consists of those which may be false, or which may have been false at one time, or may become so, without the necessity of our supposing an absolute and inconceivable difference of mental constitution between ourselves and the person who may have seen this falsehood, may now see it, or is to see it. Many such conclusions appear to be as certain as if they were absolutely demonstrated, until a close and (to those who have not considered the subject) a captious test is applied, which shows that this certainty is not what is called mathematical certainty. One of the most certain perhaps of all is this: a ball of iron suspended by a thread will fall to the ground when the thread is cut; every one is as well persuaded of this truth as of the two sides of a triangle being together greater than the third; those who have not studied geometry know the former much better than the latter. But let any one assert that he has seen, in a part of Africa unexplored except by himself, a ball of iron suspended in the air, which, though iron to the touch and iron to every *chemical* experiment, not only remains in the air without support, but, when forced to the ground, rises again of itself to the same height. We should laugh and disbelieve it, but we could not disprove it; in spite of our laughter and unbelief, no man can know such a thing to be false. Let a number of credible persons solemnly declare that they have seen the same phenomenon, and our unbelief would be shaken: finally, let it be matter, as it is called, of common notoriety, and let a continual succession of good witnesses passing and repassing constantly confirm each other in the recital above mentioned, and our positive disbelief would be changed into as positive a belief. But let a new witness declare that the natives use bows and arrows of the common form, in which the straight string of the bow, meaning that part of it which joins the extremities of the bow, is four or five times as long as the curved bow itself; though our disbelief of this first witness would not be sensibly stronger than our disbelief of the first witness in the preceding case, yet it must be of this kind, that any succession of respectable witnesses, however numerous, could never add any force to the fact in a mind which can properly appreciate the grounds of the assertion that a straight line is the shortest distance between the two points. A million of witnesses could do no more than one to establish the fact stated, in the mind of a person who knows what geometrical demonstration is; though it is just possible that another, who only learns the connection of the sides of a triangle from experiment, may be capable of being convinced of the second assertion by evidence, as well as of the first.

The *probability* of an asserted fact or conclusion means, in common language, the degree of belief which we think we ought to accord to it, and it depends in each mind upon the amount of evidence offered, the degree in which that evidence is understood, the fitness of that mind to receive and be acted on by evidence, and in particular by the evidence which is offered. Evidence insufficient, or ill understood, or offered to a mind which is unduly credulous or sceptical, whether to the particular sort of evidence in question or to evidence in general, may give a low degree of probability, or none at all, to what another mind considers as indisputable; or the contrary. In the common use of the word, a result is said to be probable only when the mind inclines more or less to believe it, and improbable in the contrary case. The mathematical use of the term is rather different; but, till further notice, we retain the common signification.

We mean by evidence, in the present inquiry, not merely oral or written testimony, but everything which disposes the mind, however little, to adopt or reject, including even the effect of previous knowledge. The value of evidence, that is, the extent it should go towards inducing belief, is really the subject of inquiry in a branch of exact science known by the name of the *theory of probabilities.* But how can the value of evidence be made a subject of measurement? why can this be done in the case of an amount of credibility more than in that of an amount[*] of benevolence, courage, or talent? We should assuredly think any one must be in a curious delusion who should suppose himself to have ascertained, from the data given by Homer, that the warlike skill of Achilles was exactly 552 times that of Thersites, and that Shakspere had done the former a foul wrong, for that he had made it only 237 times and a fraction. But what is the difference, in the nature of the inquiry sought to be instituted, between attempts to measure prowess and probability? On the mode of answering this question it depends whether we are to make our subject merely, as heretofore, a kind of artificial method of judging the chances of a game of hazard; or, a rational and exact mode of doing when data are sufficient, that which we daily attempt to do as well as we can, with our inaccurate appreciations of the circumstances of common life, and a science to be used, as are others of a mathematical nature, for accustoming ourselves to estimate or guess with something like accuracy, by habitual acquaintance with cases in which absolute accuracy is attainable.

When we consider all the circumstances which affect belief or opinion, both those which are external and those which depend on the mind which is exposed to them, it may well bewilder the imagination of a person not accustomed to the idea, when he hears of an attempt to reckon credibility in numbers, and to deduce what are called exact conclusions from hypotheses as to the force of assertions. To remove from the threshold of the subject the incredulity which must exist and ought to exist, in the first instance, let us suppose the other branches of science presented to a student not in their simple beginnings, but by a description of their ultimate physical objects. To put this beginner in a state parallel to that of readers in general with respect to the subject of probabilities, he must be of mature age, with very little knowledge of number, none of any other branch of mathematics, and no conception of the construction or use of any philosophical instrument, nor of the object and procedure of any one experiment. He might then be addressed as follows:—'You are, without moving from this earth, to track the motions of all the heavenly bodies, to be able to ascertain where they were or will be at any moment of time past or future, to measure their sizes, to weigh their contents, and to find the species and amount of insensible forces which, by some unknown means, they exercise on one another. You are to detect the existence of a subtle fluid which can neither be seen, heard, nor felt, to measure vibrations of which there are millions in a minute, and to trace the course of effects which travel hundreds of thousands of miles in a second. You are to weigh against each other atoms of matter of which it cannot be shown that millions put together would be visible to the eye.' The person so addressed would not be less bewildered nor more disposed to treat the proposed results as fictions, than he who hears for the first time of a numerical theory of probabilities. But let us now reverse the method, and suppose the learner allowed to begin at the beginning. He first finds that, step by step, his rude notions of number are organised into a method of computation which enables him easily to perform more than he could have imagined the most subtle brain to have devised. From notions of the simplest kind connected with space, properties of figure become almost intuitive, of which he could at one time not have comprehended the description, far less the demonstration. By reasoning on the simplest properties of matter, such as can be proved to his senses, he finds no difficulty in tracing remote and complicated combinations of effects from the plainest causes, by which he learns to invert this process, and to reduce observed combinations to their simplest elements. But if, during this long and very gradual process, he were to keep continually before his mind those great results the knowledge of which he had been promised, looking to arrive at the fulfilment of the promise by some sudden acquisition of power, his whole course would be one of disappointment. He would be peeping forward a few pages in his Euclid, in hopes of seeing himself almost arrived at the means of calculating an eclipse or explaining the theory of colours, and would find that he was to learn how to make a square equal to a given figure instead.

Now the application of the preceding description to our present subject is as follows:—The beginner in exact science has usually no definite notions as to the end which he is to arrive at; nor do the terms algebra, geometry, mechanics, &c. suggest any associations beyond a vague notion that they are parts of a learned system. But it is impossible that the beginner in the subject of this article should be without an explicit and probably an exaggerated notion of what he is to attain. There is no unknown Greek or Arabic term the meaning of which must be slowly learned by the study of the science of which it is the name; the word *probability*, so well known in the common affairs of life, stares him in the face at the head of every page, and reminds him to be dissatisfied with the extent of power gained, up to the point at which he has arrived. Unless then he can make up his mind to descend, as a student would do who, having in his head the theory of gravitatio and the laws of light, should lay by these grand ideas, and set himself to trace the consequences of the simple notion that two straight lines cannot enclose a space—he must be warned that he will be likely to quit the subject in disgust. We now proceed to the fundamental points of the theory.

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[*] It is rather for the argument that we endeavour, however imperfectly, to make numerical standards of use in estimating every one of these qualities, which we put down at hazard before the matter of this note suggested itself. We are apt to compare the benevolence of two persons by the pecuniary results of their liberality; confounding the two qualities, but perhaps the very confusion arises partly from the numerical measure which is thereby supposed attainable. We form a vague notion of the comparative courage of two soldiers, by comparing the different amounts of danger which we think they have faced: a most unfair and fallacious test, but still indicative of the tendency to measure. Finally, we measure talent in a more rational, though still imperfect manner, by trials of what competitors can do under the same circumstances and in the same time.

That opinion may be formed with more or less strength, particularly when the subject-matters are of different species, is well known to every one from his own experience. The most decided republican in England, for instance, is not so sure of the wisdom of the Long Parliament as he is that all its members are now dead; and no royalist, however well persuaded of his tenets, thinks the Restoration was of as much consequence to this country as sun, wind, and rain. It matters nothing that the different degrees of assurance refer to very different matters, and are obtained in very different ways; that they are separate amounts of the same kind of feeling is universally felt and admitted. To make something like a gauge for these degrees of belief is not difficult; to apply it is a harder task, seeing that the cases which present circumstances of sufficiently definite character are seldom met with.

Suppose a box to contain 3 white and 4 black balls; it is easily admitted that it is more likely that a black ball should be drawn than a white one, on the supposition that the drawer does not see the balls. Or rather we should say it is easily admitted that every well regulated mind *ought* to think a black ball more likely than a white one: and that if any one should imagine the contrary, he has formed an opinion from prejudice, fancy, or want of proper consideration. Just as we should say that if all the balls were black, a black ball would certainly be drawn, so when a majority of the balls is black, and each one ball is as likely to be drawn as any other, there are more ways of drawing black than white, and we look upon the former as more obtainable, and more likely to be obtained, than the latter. Common experience makes us consider the black as more likely than white, when the number of black balls is much greater than that of white balls; as, if there only 3 white balls, and a million of black ones. Here, as in other questions of magnitude, we can see a difference when the difference is great, which we must perhaps learn to see when it is small: it is plain enough that the black is more likely than the white when there are a million of black balls to one white; but not so easily grasped that the black is more likely than the white when there are five hundred thousand and one black balls to five hundred thousand white.

The next step to be made is the assertion that when there are 3 white and 4 black balls, the probability of drawing white is to that of drawing black in the proportion of 3 to 4; that is, if we could by a voluntary act make our impressions of the probability of future events of that strength which our reason tells us they ought to have, we should choose to expect a black ball more strongly than a white one in the proportion of 4 to 3. The principle on which we do this is the main point of the theory, the only objectionable part, if there be one: for all the rest is mathematical deduction.

The principle is as follows:—When any number of events, A, B, C, &c., are such that one and only one can happen at a time, and when a, b, c, &c. are the numbers of ways in which they can severally happen, the probabilities of the several events are in the proportions of the numbers a, b, c, &c. Returning to the preceding simple instance, we have an obvious negative reason for supposing that the probabilities should be as 4 to 3, since there is no imaginable ground for assuming, while the excess of black balls is the sole cause of the superior probability of drawing one of them, that this excess of probability should be in any other proportion than that of the excess of black balls. If we grant the following, namely, that the probability of having one or other out of two of the different results which a trial may give, is, or ought to be, the sum of the probabilities of the two separately, we shall be obliged to admit positive reason for the preceding principle, as follows:—Suppose a box to contain 10 balls, marked 1, 2, &c. up to 10, and no others. A ball is to be drawn, and the drawer has in his mind an amount of hope, fear, or simple admission of possibility, as the case may be as to the happening of each number. If the drawing of No. 1 be to gain him a prize, there is a certain amount of hope; if it be to procure him a loss, of fear; if neither one nor the other, of feeling that No. 1 may be that which is drawn. Now let either 1 or 2 bring the gain or loss; is the feeling of hope or fear doubled in strength? or rather, ***ought*** it to be doubled? He who admits this, admits the whole theory of probabilities, for all the rest is mathematical deduction. Let x be the proper numerical measure of the probability of drawing 1, or of drawing 2, &c.; these probabilities being equal, since there is, by the hypothesis, nothing to render one more likely than the other. Then, if the preceding be admitted, $2x$ is the probability that either 1 or 2 is drawn; $3x$, that either 1, 2, or 3 is drawn; and so on up to $10x$, which is the probability that one or other of the set 1, 2, 3, ... 10, shall be drawn. But since that a drawing shall take place is an absolute condition, one of the ten numbers must be drawn; hence x must be so taken that $10x$ shall be the numerical measure of certainty. It is indifferent what number is taken to stand for the exponent of certainty, as far as principles are concerned; but in a mathematical point of view, unity is more convenient than any thing else. Let unity be adopted, then $10x=1$, or $x=\frac{1}{10}$. Hence the chance of drawing, say one of the three, 1, 2, 3, is $\frac{3}{10}$; and that of drawing one of the remaining 7 is $\frac{7}{10}$. If then the first three should be white balls, and the last seven black, the chance of a white ball is $\frac{3}{10}$, that of a black one is $\frac{7}{10}$; and a black ball is more likely than a white one in the proportion of 7 to 3, which being an inequality in the proportion of 2⅓ to 1, the *odds* are said to be 2⅓ to 1 in favour of a black ball, or against a white one. By this we do not mean that every man *does*, in such a case, look for a black ball with an expectation 2⅓ times as great as his expectation of a white ball, but that, if he *could* measure the strength of his own feelings and adjust them with mathematical precision, he *would* proportion the strength of the two expectations in the preceding manner. And if money were to be spent upon the expectations, he may as reasonably give £2⅓ for a black ball, before it appears, as £1 for a white one.

It thus appears that the theory of probabilities is simply the reduction to numerical estimation, in cases which are perfectly known as to the number of events which may happen, of our comparative right to expect one or another event in preference to the rest. In the events of common life, we make estimations of this comparative right, but not *numerically*, because we are not in sufficient possession of the events which might have happened instead of the one which does happen. In such terms as barely possible, very unlikely, improbable, not improbable, as likely as not, rather likely, highly probable, almost certain, &c. we see a gradation which amounts to a rough attempt to make those comparisons which might be made numerically if the proper data could be obtained. The truth is, that almost every one naturally admits and practises the fundamental principles of this theory, though often, it may be, unskilfully. But it is not to be imagined that persons in general make an investigation like the preceding, nor indeed any investigation at all: how is it then that not only are these principles acquired, however imperfectly, by the majority of mankind, but the mathematical results which are obtained by those who professedly study the subject, are received almost universally; inasmuch that not only are they felt to be agreeable to common sense in a great majority of cases, but they are soon admitted to be sufficient indications that common sense is wrong, in the few cases in which they at first appear repugnant to it? The answer to this question leads to another view of the subject.

We all find, by every-day observation, that whenever an event of one kind happens permanently more often than one of another kind, there exists some reason for such frequency of occurrence, which, had it been inquired into before any event happened, would have enabled us to predict the frequency in question. So much is this the case, that if we were to take an observer to an urn in which were black and white balls, but how many of each he is not told, and were to make 1000 drawings, replacing the ball drawn after each drawing, and shaking the urn before every trial; if of the thousand drawings 822 were white and 178 black, he would be irresistibly led to conclude that there must be more white balls than black ones in the urn. Not that this is absolutely necessary; for it is barely possible that there may be only one white ball and 999 black ones, and that by a remarkable coincidence that one white ball may have come up 822 times out of the 1000 trials. More than this, a person used to observation would conclude, not only that there are more white balls in the urn, but that the proportion of white and black balls does not differ very greatly from that of 822 to 178. There is a disposition, derived from experience, to think that events happen in the long run in some sort of manner connected with the facilities afforded for their happening beforehand: and hence follows a disposition to judge what those facilities were from observed events, as well as to predict events from observation of those facilities; and it may happen that one person would draw his notion of likelihood from the first, and another from the second. Thus, if we were to put the question, 'What do you mean by saying that it is 5 to 3 for A against B?' one person might reply, 'I mean that in the long run A will happen 5 times for every 3 times which B happens;' while another might say, 'I mean that precedent circumstances are so arranged that for every 3 contingencies under which B may happen, there are 5 under which A may happen.' If these two persons were to dispute which was the *true* mode of viewing the subject, they would be fighting about nothing; for both are true, and each of them follows from the other: but if they were to differ as to which is the *common* mode, we should feel rather disposed to side with the one who was for the first answer.

The following problems, illustrative of the connection between the two modes, are the results of mathematical investigation. The table used is that given in **Mean**, which we have re-examined and find correctly printed: but two decimal places must be made in column A, and four in column B; thus 451 opposite to 4 must be read as ·0451 opposite to ·04, similarly ·8931 comes opposite to 1·14, and ·9825 opposite to 1·68.

Problem 1.—The probabilities of P and Q, at any one trial, are as a to b, that is, it is a to b for P against Q, and b to a for Q against P. A large number of trials $n(a+b)$ is made; what are the chances that the number of Ps which happen shall lie between $na+l$ and $na-l$, and (of course) the number of Qs between $nb-l$ and $nb+l$ (l being small compared with na or nb)?

Rule.—Calculate $(2l+1)\div\sqrt{\left(\dfrac{8\,nab}{a+b}\right)}$; let this be the A of the table (altered as above); then the corresponding B, altered as above, is the probability required.

Example.—It is 2 to 1 that a throw with a die shall give 3, 4, 5, or 6, and not 1 or 2: what is the chance that, in 12,000 throws, the number which give 3, 4, 5, or 6 shall lie between 8000+100 and 8000−100. Here $a=2$, $b=1$, $n=4000$, $l=100$, and the complete calculation by logarithms* (which we insert merely as a guide to the readiest mode of treating more complicated cases) is as follows:—

$$\begin{array}{lrrcr}
n=4000 & & 3{\cdot}6021 & 2l+1=201 & 2{\cdot}3032 \\
a= & 2 & {\cdot}3010 & & 2{\cdot}1646 \\ \cline{5-5}
b= & 1 & {\cdot}0000 & & \\
 & 8 & {\cdot}9031 & 1{\cdot}376 & {\cdot}1386 \\ \cline{3-3}
 & & 4{\cdot}8062 & & \\
a+b=3 & & {\cdot}4771 & & \\ \cline{3-3}
 & & 2)4{\cdot}3291 & & \\ \cline{3-3}
 & & 2{\cdot}1646 & &
\end{array}$$

In the table, A being 1·38, B is ·9490, which is more than near enough for the purpose, say ·95: the result then is that ·95 is the chance in favour of the throws which give 3, 4, 5, or 6 out of 12,000 throws lying between 8000+100 and 8000−100. whence ·05 is the chance against it; that is, it is about 95 to 5, or 19 to 1, that the throws shall so lie. A few instances of this kind will show how completely, in the long run, events may be expected to happen in numbers nearly proportional to what are called, when the precedent circumstances are fully known, their probabilities of happening.

Problem 2.—In the preceding problem, to find l so that there may be a given probability that the Ps shall lie between $na+l$ and $na-l$.

Rule.—Reduce the fraction which represents the given probability to a decimal fraction, and take the A corresponding to the B which is nearest to this fraction in the table; multiply by the square root above described, substract 1, and divide by 2; the whole number nearest to the result is the answer required for l.

Example.—In the preceding example, find l so that it is an even chance that the number of throws out of 12,000 which give 3, 4, 5, or 6 shall lie between $8000-l$ and $8000+l$. Here ½ or ·5 is the given probability, the nearest to it in column B is ·5027 to which A is ·48, which multiplied by the square root (or the number whose logarithm is 2·1646) is 66·9: subtract 1 and divide by 2, which gives 33 very nearly: hence it is an even chance (very nearly) that the number of throws out of 12,000, which give 3, 4, 5, or 6 lie between 8000−33 and 8000+33.

Problem 3.—In $a+b$ trials, nothing whatever being known except what these trials tell, it is found that P happens a times, and Q happens b times; from which it is exceedingly likely that the probabilities of P and Q happening at a single trial would have been nearly as a to b, if we had known enough to form an *à priori* opinion. This we cannot do, by hypothesis: but, judging from the preceding events, with what degree of probability may we infer that if we had been able to form an *à priori* opinion, the odds for P against Q would have appeared to us to lie between $a-k$ to $b+k$ and $a+k$ to $b-k$?

Rule.—Calculate $k\div\sqrt{\left(\dfrac{2\,ab}{a+b}\right)}$; let this be A (in the table): then the corresponding B is the probability required.

Example.—In 600 drawings from an urn, the ball being replaced after each drawing, there were 418 white balls and 182 black ones. What is the probability that the proportion of white and black balls in the urn lies between that of 418−10 to 182+10 and 418+10 to 182−10, or that of 1000 to 471 and 1000 to 402? Here $a=418$, $b=182$, $k=10$; the square root above mentioned has 1·2021 for its logarithm, and 10 divided by this square root gives ·63 nearly. And A being ·63, B is also ·63 very nearly, which is the probability required; or it is 63 to 37, or nearly 2 to 1, that for every 1000 white balls in the urn, there are between 402 and 471 black ones.

Problem 4.—When P happens much oftener than Q, we feel a very high degree of probability (moral certainty) that the same thing would happen in the long run, or would continue how long soever we might go on trying, unless there should arrive some change of circumstances. But when P does not happen much oftener than Q, we do not feel the same degree of assurance; for though Q might really happen oftener than P in the long run, yet the casual fluctuations of events might make the contrary appear in any one set of trials. Suppose then that in $a+b$ trials, P has happened a times, and Q has happened b times, a and b being nearly equal: what presumption can thence be derived that the excess will be on the same side in the long run on which it is in the $a+b$ trials?

Rule.—Divide the difference of a and b by the square root of twice their sum: let the result be A, and find the corresponding B; to this add 1, and divide by 2: the result is the probability required.

Example.—Buffon, in a particular experiment, had to throw a coin (say a halfpenny) 4140 times; the result was 2048 heads and 2092 tails: what is the probability that some excess of tail over head would have continued for ever; that is, that the coin he used had in its construction some mechanical tendency to fall tail rather than head? Here $a=2048$, $b=2092$; the square root is ·48, which being A, B is ·50, and 1·50 divided by 2 is ·75, the probability required. This is ¾, so that it is 3 to 1 that some excess or other of tails would be found in the long run. Observe however that this does not mean an excess to the amount of 44 in every 4140 trials; but only *some* excess, small or great.

The experiment of Buffon, and its particular object, will be found in the 'Essay on Probabilities and Life Contingencies,' in the 'Cabinet Cyclopædia;' in which work will also be found a larger collection of such problems as the preceding, with fuller explanation and more extensive tables. These problems have been here introduced that the reader may have an opportunity of comparing and verifying the general sameness of results which follows from the two (perhaps) apparently differing notions from which the idea of the measure of probability may be derived.

Previously to laying down a few general rules, we shall notice the error to which persons who have not thought on the subject are most liable: this is a confusion between the sort of confidence which is to be given to a result of the theory of probabilities, and that which is claimed by actual demonstration. Many persons are not aware that out of mathematics the greater number of conclusions are *probable* results, many of them, it is true, so highly probable that their chance of falsehood does not amount to that of drawing a black ball from among a million of white ones; but still not absolutely demonstrated. These highly probable results (so probable that the word probable in its common sense is weak as applied to them) form the ordinary knowledge of common life, and being practical certainties, are considered and mentioned as certainties, the imperceptibly small chance that they may not be true being disregarded. Hence it happens that when a result of this theory is announced, with its proper chance annexed, and though the probability of its truth is so high that it may rank with the moral certainties of ordinary life, there is a morbid disposition to dwell rather upon the one way in which the proposition may fail, than upon the million of equally possible ways in which it may be true. Thus if it be said that it is ten millions to one that P will happen, and not Q, therefore it is morally certain that P will happen—it is objected, But how do we know that the very next event will not be precisely the one of ten millions which is Q and not P? The answer is, we do not *know* it in the absolute sense of the word; if we thus knew it, it would be a certainty that P would happen, and whether P would happen or not, would not be a question for the theory of probabilities at all: but we do know it in the common sense of the word, since there are hundreds of conclusions which all men call knowledge, which are not so probable that they can be reasonably shown to have ten millions to one in their favour.

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* In this, and many other cases, the four-figure logarithms lately published by Taylor and Walton on a card, will be found by far the most convenient.

Another way in which the confusion we have mentioned shows itself is in the habit of reasoning against the probable truths just alluded to by arguments which could only be valid against an assertion that these truths were absolutely demonstrated. In compliance with the forms of language, those who advance such truths treat them as (moral) certainties: the opponent overthrows their (mathematical) certainty, and the fallacy lies in his supposing that he has thereby shown them not to possess that sort of truth which was claimed for them. For example, a medical man gives his opinion that a crime committed without any apparent motive is an indication of insanity: a newspaper ridicules this opinion, and asks, Are there no motives then which cannot be discovered? Now, if by apparent was meant apparent on the surface, or with slight examination, and if by indication was meant an absolute indication, certainly inexplicable except by the supposition of insanity, the answer is complete, and the opinion shown to be untenable. But suppose the energies of many acute persons and the resources of a whole nation to fail in making the motive of a crime apparent, and that this is what is meant by there being no apparent motive; suppose moreover that by an indication of insanity is meant a circumstance which renders insanity highly probable: the answer then is wholly irrelevant. The opinion, expanded into an argument, is—a crime committed absolutely without motive or object shows insanity; a motive, if it exist, may almost certainly be discovered by proper exertions; consequently the appearance of no motive, after all exertions to discover one have been tried, makes it most likely that the crime was an act of insanity: it is in fact as likely that the crime was an act of insanity, as it was unlikely that the exertions to discover a motive should have failed, if there had been a motive.

The application of this theory to the art of reasoning, in the numerical sense, is rendered practically impossible by our want of a proper numerical determination of the probability of premises. But the rules which we should follow, if such a numerical determination could be obtained, will show that a result of common sense is perfectly conformable to the theory, namely, that a considerable number of arguments, each of no overpowering force in itself, may, when put together and looked at conjointly, give a very high degree of probability to their common conclusion. Let there be already a conclusion, in favour of which the odds are a to b, and let an argument be introduced which, independently of all previous association, would give to the same conclusion the odds of A to B: then the effect of that argument upon the previous state of mind with respect to the conclusion ought to bring the odds for that conclusion to those of $(A+B)(a+b)-Bb$ to Bb. Thus, let us suppose a person feels it to be 3 to 2 that a conclusion is true; he finds an argument from which alone he would conclude it to be 5 to 4 for the same: he ought then to regard the conclusion on the whole as having $9\times5-2\times4$ to 2×4, or 37 to 8 in its favour. Let another argument be found for the same conclusion, such as would alone give it 4 to 1 in its favour; then the final odds should become $45\times5-8\times1$ to 8×1, or 217 to 8 in its favour, and so on.

The preceding rule leads to this result, that any argument in favour of a conclusion, however weak it may be, adds something to the force of the preceding arguments: thus, if a conclusion have an even chance, or 1 to 1 for it, and if an argument be found for it which has only 1 to a thousand for its chance of being sound, the resulting odds for it are $2\times1001-1\times1000$ to 1×1000, or 1002 to 1000; more than before. This result seems strange at first to many, whether it be announced in connection with this theory or not: but the strangeness arises from confounding a weak argument in favour of a conclusion with a strong argument against it. That weak arguments injure their cause arises from the supposition which they favour, that those who urge them have no strong ones, and from the opportunity which they give opponents to answer the weak ones, and pass over the strong ones. But if both sides were candid and well informed, the weaker arguments on each side would be allowed their due weight.

An argument may fail, and its conclusion not be necessarily false: let us now take the case of arguments on both sides, those which tend to establish the conclusion, and those which tend to establish something contradictory. Let P be the conclusion and Q a proposition, such that P and Q cannot be true together. Two cases arise, according to whether P and Q can both be false, or whether one of them must be true and the other false. Let the arguments for P, supposed to be joined by the preceding rule, give A to a for it; and let the arguments for Q, joined in the same way, give B to b for it. Then—

1. If, of P and Q, one must be true and the other false, it is $A\times b$ to $a\times B$ for P being true. Thus, if the direct arguments for P give 5 to 3 in its favour, and the direct arguments for Q, 2 to 1, it is 5×1 to 3×2, or 5 to 6 for P on the whole question.

2. If P and Q may both be false, it is $A\times b$ to $a(B+b)$ that P is true. Thus, in the last example, if both may be false, it is 5×1 to $3\times(2+1)$, or 5 to 9 for P being true.

The various problems of which the solutions have been given are mathematical consequences of the definition of probability. Every such problem is simply one of combinations, however much the length of detail, and the number of mathematical abbreviations of the process of combining, may tend to make us lose sight of the first principle. At the same time it is found requisite to establish a few simple fundamental propositions, which we shall cite, with some consequences. As we are not writing an elementary treatise, we shall not demonstrate these propositions, referring the student to any of the modern works hereinafter cited. The probabilities of the events A, B, C, &c., are denoted by a, b, c, &c.

1. By the probability of A is meant the fraction which the number of cases favourable to the happening of A is of the whole number of cases, that is, both of those in which A can happen, and those in which it cannot. And the probability that A will not happen is $1-a$.

2. When A and B are events independent of each other, so that the happening of either in no way promotes or retards the happening of the other, the probability that both shall happen is ab; that neither shall happen, $1-a-b+ab$; that one only shall happen, $a+b-2ab$; that one or both shall happen, $a+b-ab$.

3. When A and B are mutually exclusive, that is, when if one happen the other cannot, the probability that one or other shall happen is $a+b$; and that neither shall happen, $1-a-b$.

4. If either A or B must happen, $a+b=1$; and if n trials are to be made, the several terms in the expansion of $(a+b)^n$ are the chances of the arrivals denoted by their exponents. Thus—

a^n is the chance that all are As.

$na^{n-1}b$, that $n-1$ are As and one is B.

$n\frac{n-1}{2}a^{n-2}b$, that $n-2$ are As and two are Bs, &c.

5. When an event has happened which may have sprung from any one of the sets of circumstances which we may describe by A, B, C, D, &c., and it is desired to find what is the probability of the event which did happen having arisen from one or another set, proceed as follows:—Had the circumstances denoted by A certainly existed, and the event been a contingency, let a be the probability that those circumstances would have produced the event; or briefly, let a be the probability that A, when certain, brings about the event. Let b be the same for B certain, c for C, &c. Then the probability that it was A which brought about the event which did happen, is the first of the following set:—

$$\frac{a}{a+b+c+\&c}, \quad \frac{b}{a+b+c+\&c.}, \quad \frac{c}{a+b+c+\&c.},$$

the probability that it was B is the second, that it was C, the third, and so on. Or, when convenient, instead of a, b, c, &c. may be substituted any whole numbers which are proportional to them. For example, let there be three lotteries, containing balls as follows:—

all white,	4 white, 1 black,	2 white, 7 black.

A drawing has been made three times from one of these, but from which is not known, the ball being replaced after the drawing, and every drawing has given a white ball. Required the chances in favour of each of these lotteries having been the one drawn from. If it had been the first, the chance of the event would have been 1 (or certainty); if it had been the second, the chance of the event would have been $\frac{4}{5} \times \frac{4}{5} \times \frac{4}{5}$, or $\frac{64}{125}$; if it had been the third, the chance would have been $\frac{2}{9} \times \frac{2}{9} \times \frac{2}{9}$, or $\frac{8}{729}$. The numerators of these fractions, reduced to a common denominator, are 91125, 46656, and 1000; whence the probability that the lottery drawn from was the first, is

$$\frac{91125}{91125+46656+1000}, \text{ or } \frac{91125}{138781};$$

and the probabilities of the second and third lotteries are

$$\frac{46656}{138781} \text{ and } \frac{1000}{138781}.$$

The preceding question is well calculated to show the meaning of questions in this theory, which is thus seen to be applied to events, not because they are uncertain, but because they are unknown. As soon as the lottery is chosen, it is certain which it is, but since it is not known to the drawer, it is to him as much a contingency as it was before it was chosen.

6. When, in such a case as the preceding, it is required to know the probabilities of the events which may happen at any further trials, the probability of each lottery having been the one in question is to be multiplied by the probability of the new event arising from that lottery, and the results added together. Thus, suppose there are two lotteries, one having all white balls, and the other equal numbers of white and black balls: two drawings have been made from one of them (not known) and both drawings have given a white ball; what is the probability that a third drawing from the same lottery would give also a white ball? The chances for the two lotteries are found by the last to be $\frac{4}{5}$ and $\frac{1}{5}$, while the chances of a white ball from one and the other are 1 and $\frac{1}{2}$. It follows that $\frac{4}{5} \times 1 + \frac{1}{5} \times \frac{1}{2}$, or $\frac{9}{10}$, is the chance of the third drawing giving a white ball.

7. If A or B must happen at every trial, and if in m trials nothing but A has happened, and if we know nothing whatever about the nature of preceding circumstances, then it is $m+1$ to 1 that A shall happen at the next trial, and $m+1$ to k that A shall happen throughout the next k trials. But if in $m+n$ trials A have occurred m times and B n times, it is $m+1$ to $n+1$ that A shall occur at the next trial.

8. Every event that can happen must happen if trials enough be made; and not only must happen, but must happen any number of times in succession. For example, if there be only one white ball to 100 black ones in an urn, and if drawings enough be made, the ball drawn being always returned and the urn properly shaken before a new trial, a person who goes on must at last draw that single white ball 1000 times running. This is a conclusion which the beginner cannot receive, particularly when he is told that 1,000,000 might be written for 1000, or any other number however high. Nevertheless, it will, in the course of his studies, not only be made clear to him, but it will also be shown that it is a conclusion which may be made obvious to common sense without any very profound mathematics.

9. If the odds against an event happening at any one trial be n to 1, there is an even chance of its happening in $\cdot 69 \times n$ trials,* it is 10 to 1 that it happens in $2{\cdot}40 \times n$ trials, 100 to 1 that it happens in $4{\cdot}62 \times n$ trials, 1000 to 1 that it happens in $6{\cdot}91 \times n$ trials, and 10,000 to 1 that it happens in $9{\cdot}21 \times n$ trials. Thus if it be 200 to 1 against success in any one trial, $9{\cdot}21 \times 200$ being 1842, it is 10,000 to 1 that there shall be one success at least in about 1842 trials. But if a person should make 1000 trials without one success, he would have no right to say that it is 10,000 to 1 in favour of one or more successes in the next 842 trials.

10. When any sum depends upon a contingent event, the present value of that sum is such a fraction of it as the probability of the event happening is of unity. Thus 20*l.* to be gained if an event happen against which it is 7 to 1, is now worth only the eighth part of 20*l.*

There are no questions in the whole range of applied mathematics which require such close attention, and in which it is so difficult to escape error, as those which occur in the theory of probabilities. This makes it difficult to lay down in a short space either maxims or examples sufficient to be really of use in advancing the student's progress; and of all subjects, there is no one in which writers of every grade have so frequently or so strangely made mistakes of mere inadvertence. One was pointed out a short time ago (*Camb. Phil. Trans.*) into which both Laplace and Poisson had fallen, one after the other; but the discoverer of their slip proved himself signally liable to greater ones a very little while after. (*Cab. Cyclop.*, 'Probability and Life Insurance,' p. 28.)

We shall conclude by a brief account of the historical progress of this branch of science; referring the reader for more detail to Montucla, and to the Treatise 'On Probability,' in the 'Library of Useful Knowledge.' Those who cultivated games of chance must at all times have had a general notion of combinations which were more probable than others, and must have seen that those cases of which there were most to happen, always did in reality happen most often. They could not fail to know, by reckoning on their fingers, that out of, for instance, all the throws of a pair of dice, there are only six doublets, and thirty other equally possible cases; nor could they have missed knowing that this must be the reason why doublets occur seldom in comparison with other throws. Notwithstanding this, the mathematical history of the subject usually dates from a fragment by Galileo, which merely shows why 10 can be oftener thrown on three dice than 9, and two problems proposed by Chevalier de Meré to Pascal, in 1654, concerning certain points connected with games of chance.

That the history of *correct* investigation dates from this period there can be little doubt, but the subject had been previously considered by Cardan, in a work, 'De Ludo Alem,' published from his manuscript in the first volume of the collected edition of his works, and never separately; and also so badly printed as to be almost unintelligible; circumstances both of which have probably contributed to keep it, as it has been kept, totally out of view. Cardan's theory is perfectly false: he supposes, for example, that since there are six faces to a die, it will happen in the long run that each face will come up once in six throws, which is true when many collections of six throws are averaged; but from this he draws the false conclusion that it is an even chance that any one face comes up in three throws. His numerical reasoning is therefore totally incorrect; but his notions on the general subject of probability are reasonably sound. Fortune, according to him, does not decide the general average of the play, but only the deviations on one side and the other which a small number of cases present; and experiment would, he says, prove that the long run would agree with the predictions of theory. This treatise was written about 1564, and published in 1663. But before this, in 1658, the tract of Huyghens, 'De Ratiociniis in Ludo Aleæ,' was published as an appendix to Schooten's 'Exercitationes Geometricæ,' being not only the first regular treatise, but the first which applies the theory to chances of loss or gain. It was translated into English, with additions, in 1692, the reputed author being Motte, the secretary of the Royal Society. Then followed the 'Analyse des Jeux de Hasard,' by Montmort (first edition 1708, second, enlarged, 1713), a work of higher mathematical pretensions. The 'Ars Conjectandi' of James Bernoulli, posthumously published by his nephew Nicolas, in 1713 (and which, it may be worth noting, is not contained in the collection of James Bernoulli's works), gives the first glimpse of the more difficult class of problems in which processes containing very large numbers are abbreviated by mathematical analysis. This was carried still further by De Moivre, whose first work, a paper 'De Mensura Sortis' (*Phil. Trans.*, 1711), was expanded into his celebrated treatise on the doctrine of chances, first edition 1718 (not 1716, as frequently stated), second edition 1738, third edition, with his 'Treatise on Life Annuities,' 1756. The next step was made by Bayes (*Phil. Trans.*, 1763 and 1764), who first considered the probability of hypotheses as deduced from observed events.

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* The number ·69, 2·40, &c., are all approximations.

The great work of Laplace (first edition 1812, third 1820) had in great part appeared at various previous times in the Memoirs of the Academy of Sciences. It is remarkable, first by the extension of methods which it furnishes, secondly by its giving at one view the whole state of the science and its applications, thirdly by the particular attention given to the application of the theory to the results of observation. [Mean; Least Squares.] The next step in the history is Poisson's 'Recherches sur les Probabilités des Jugemens,' 1837, which gives the grand results of Laplace by a somewhat different analysis, and applies them particularly to the subject indicated in the title. This species of application had been before considered by Condorcet, in his 'Essai sur l'Application de l'Analyse à la Probabilité des Decisions,' Paris, 1785. It may also be worth while to mention the 'Traité de Calcul Conjectural' of Parisot, Paris, 1810, a work which deals largely in the theory of simple combinations. The elementary work of longest standing, which exhibits some view of the higher mathematical applications, is the 'Traité Elementaire du Calcul des Probabilités,' by M. Lacroix (second edition, 1822). The 'Essai Philosophique' of Laplace, which is an introduction to the third edition of his theory, contains no mathematics, and may be usefully read with any elementary treatise. The Instructions Populaires sur le Calcul des Probabilités,' by M. Quetelet, Brussels, 1828, contains the most elementary view of the subject, and uses only simple arithmetic.

In England, since the publication of Simpson's 'Laws of Chance,' 1740, and the 'Laws of Chance,' by Samuel Clark, 1758, little was written on the mathematical theory except so far as it had reference to life annuities and assurance, until a very recent period. About 1830, Messrs. Lubbock and Drinkwater published a tract 'On Probability,' in the 'Library of Useful Knowledge,' giving more general methods of applying modern algebraical investigation than had before appeared in this country. In 1837, the article 'Theory of Probabilities' in the 'Encyclopædia Metropolitana,' written by Mr. De Morgan, gave the results and methods of Laplace on most of the great questions of the theory. The 'Essay on Probabilities, and on their Application to Life Contingencies and Insurance Offices,' published by the same writer in the 'Cabinet Cyclopædia,' 1838, exhibits the principles without mathematical investigation and the results arranged in rules for use. The article on 'Probability' in the new edition of the 'Encyclopædia Metropolitana,' by Mr. Galloway, gives the mathematical investigation of the higher parts of the theory, following the methods of Poisson. This treatise is published separately.

On subjects connected with this article, see Gaming, Risk, Wager, Mean, Least Squares, Observation and Experiment, Weight of Observations, Annuity, Mortality, Reversion, &c.

PROBATE. [Will.]

PROBLEM (πρόβλημα) means simply a thing put forward or proposed. In mathematical language it is anything which is required to be done, and in the earlier writers is distinguished from a theorem, or assertion to be proved, in that the latter does not require any specific object to be effected. Thus, 'all the angles of a triangle are together equal to two right angles' is to be shown or made evident, and is a theorem; but 'to draw a circle through three given points' presents an object to be effected, and is a problem. But it must be remembered that this difference lies more in the nature of the result than in the method; for the solution of this problem, so called, is an intuitive corollary from the theorem that if three points be joined, and perpendiculars be drawn bisecting two of the joining lines, the intersection of these perpendiculars is equidistant from the three points. It is also to be noted that this distinction of theorem and problem appears neither in the Greek of Euclid, Apollonius, nor Archimedes, the general term employed by all three, and in all cases, being πρότασις, which is translated by proposition. The distinction then is of a later date, and is the work of annotators: it appears in Pappus, according to the Latin of Commandine. It does not appear in the translation of Euclid by Athelard[*] (which goes by the name of Campanus); and the first edition of the Elements in which we find it is the subsequent edition of Zambertus. If we leave the modern followers of the old geometers, we find the word problem used in its simple etymological sense of something proposed; but for the most part employed when the something proposed contains, or has contained, a remarkable difficulty. Thus to this day we talk of the problem of three bodies, as being one the methods of which are hoped to be found capable of decided improvement. In algebra the word is variously used, though, according to the antient distinction, the solution of any equation of condition should be called a problem, and the establishment of any identity a theorem.

Perhaps the most correct use of the term is that of our own universities, in which questions proposed for examination are called problems when they are left entirely to the student to solve, not being to be found in the elementary treatises which he is supposed to have read. The adjective problematical is used in the sense of doubtful, but is not a mathematical term.

PROBOSCI'DIANS. [Pachydermata, vol. xvii., p. 116.]

PROBUS, MARCUS AURE'LIUS, a native of Sirmium, served early in the Roman army, and distinguished himself so much that he was made tribune, whilst yet beardless, by the emperor Valerianus, who had great esteem for him, and who recommended him in his letters to his son Gallienus as a young man of great promise. Probus continued to serve with distinction under Gallienus, Claudius II., Aurelianus and Tacitus. Several letters of these emperors, containing encomiums of Probus, are quoted by Vopiscus. Tacitus, immediately after his exaltation, wrote to Probus, saying that he considered him as the main prop of the state, and at the same time he gave him the command of all the legions in the East, with a large increase of emolument. Probus was beloved by the soldiers for the care which he took of them, and the equal justice which he administered. He served in almost every part of the Roman world—beyond the Danube against the Quadi and the Sarmatians, in Libya, in Egypt, where he erected buildings, excavated canals, and made other improvements; he fought against the Palmyrenians under Aurelian, and afterwards served in Gaul. When Tacitus died, six months after his assumption of the empire, his brother Florianus was proclaimed emperor in the West, whilst Probus was proclaimed in the East; but in less than three months Florianus was put to death by the soldiers, and Probus was acknowledged universal emperor. He was then forty years of age. He defeated several pretenders to the empire, Saturninus in the East, and Proculus and Bonosus in Gaul. He encouraged the cultivation of the vine in Gaul and in Pannonia, as well as in Mœsia near Sirmium. He is said to have incurred the displeasure of the soldiers by having said that he hoped shortly that universal peace being established over the empire, their services would no longer be required. An insurrection having broken out in his camp near Sirmium, he took refuge in an iron tower which he had constructed as a watch-tower, but being followed by the mutineers, he was killed, A.D. 282. He is compared by Eutropius with Aurelian for his military abilities, though he was superior to him in refinement and humanity. Vopiscus (*Historia Augusta*) has left a high eulogium of Probus. He reigned six years and four months, and was succeeded by Carus.

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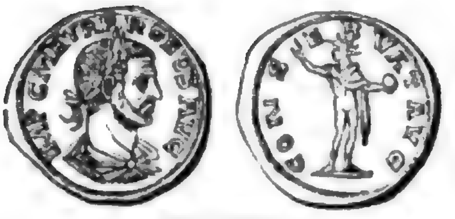
[*] At the time when we published [Geometry] our own unsupported opinion that Athelard, and not Campanus, was the translator, we did not know that Tiraboschi had already affirmed the same thing. Mr. Halliwell ('Rara Math.,' p. 57) makes it most probable that the commentary as well as the translation is Athelard's.



Coin of Probus.
British Museum. Actual size.

PROCACCI'NI, ERCOLE, the Elder, was the head of the celebrated family of artists of that name. He was born in 1520, at Bologna, where the greater number of his works still exist. Authors are divided in opinion respecting his merit; Baldinucci and Malvasia call him a painter of moderate talent, while Lomazzo esteems him to be a happy imitator of the colouring and grace of Correggio. His design may be too minute, and his colouring too languid, but he possessed far more taste than most of his contemporaries, and precision free from mannerism, which eminently qualified him for an instructor of youth. Several eminent artists, among whom were Sammacchini, Sabbatini, Bertoja, and his own three sons, were his disciples. The time of his death is uncertain, but he was living in 1591.

PROCACCINI, CAMILLO, born in 1546, received his first instruction in the school of his father. He afterwards visited Rome, where some biographers say that he studied the works of Michael Angelo and Raphael. His works evidently show that he had been charmed by Parmegiano. He combined a simplicity and spirit by which his works always charm the eye, though it must be owned that they are too often deficient in the higher power of impressing the mind and moving the affections, which indeed we can hardly expect when we consider the prodigious number of his works in Bologna, Ferrara, Ravenna, Reggio, Piacenza, Parma, and Genoa. Sometimes he allowed himself more time, and then his works have less of the mannerist. His St. Rocco at Reggio deterred Annibale Caracci from painting a companion to it. At Piacenza he had less success in painting against Ludovico; yet his picture occupies the principal place. He died in 1626.

PROCACCINI, GIULIO CESARE, the best artist of the family, was born in 1548. He renounced sculpture, in which he had made considerable progress, for painting, which he studied in the school of the Caracci. The works of Correggio were the principal object of his studies, and many judges are of opinion that no painter ever approached nearer to the style of that great artist. In some of his easel pictures and works of confined composition, he has been mistaken for Correggio. A Madonna of his, at S. Luigi de Franzesi, has been engraved as the work of that master; and some paintings still more closely approximating to this style are in the palace of Sanvitali at Rome and in that of Carrega at Genoa. Of his altar-pieces, that at Santa Afra in Brescia is perhaps most like the style of Correggio; it represents the Virgin and Child amidst a smiling group of saints and angels, in which dignity seems as much sacrificed to grace as in the mutual smile of the Virgin and the Angel in the Nunziata at S. Antonio of Milan. He is sometimes blameable for extravagance of attitude, as in the Executioner of S. Nazario, which is otherwise a picture full of beauties. Notwithstanding the number and extent of his works, his design is correct, his forms and draperies select, his invention varied, and the whole together has a certain grandeur and breadth, which he either acquired from the Caracci, or, like them, derived from Correggio. He died in 1626, aged seventy-eight.

PROCACCINI, CARLO ANTONIO, brother of Camillo and Giulio, was born at Bologna, and learned the art from his father. Not having, like his brother, sufficient genius and invention to attain eminence in historical composition, he devoted himself to landscape, in which he acquired considerable reputation, as well as by fruit and flowers, which he designed after nature.

PROCACCINI, ERCOLE, called the Younger, was born in 1596, at Milan. He was the son of Carlo Antonio, and studied under his uncle Giulio Cesare. He frequently painted history and landscapes, but his chief excellence appeared in his flower-pieces, which he painted with great taste and perfection. He died in 1676, at the age of eighty.

PROCELLA'RIA. [PETRELS, vol. xviii., p. 46.]

PROCESS. This term is sometimes used in its original sense as comprehending the whole of the proceedings which take place, and are recorded by the court, in the course of a suit, criminal or civil, previous to final judgment. In this sense the word (processus, procès), is also used in the French, and the Scotch law. In its more ordinary and limited signification the term is applied to the writs which issue out of any court for the purpose of compelling the parties to a suit, and other persons whose co-operation is required, to do some act connected with the progress of the suit. In this sense also process is either civil or criminal.

Civil process was formally, and until lately, practically divided into original, mesne (intermediate), and final process.

Original process, more commonly known as original writs, issued out of the common-law side, or department, of the court of chancery, hence called the officina justitiæ, the shop at which the right of suing in the king's superior courts might be purchased. The price of this privilege was formerly arbitrary, and until the reign of John the render to the crown was more commonly stipulated for in hawks and horses than in money. But since Magna Charta, original writs have been purchasable at a small ad valorem fine of 10*s.* per cent. upon the amount sought to be recovered.

Mesne process was that which issued between the original writ and final judgment, including writs issued for the purpose of compelling the attendance of jurors and of witnesses, and for other collateral purposes. In order to avoid the expense and delay of suing out an original writ, it had long become usual to commence actions by mesne process founded upon a supposed original writ which never had in fact issued. By degrees all process before final judgment, except an original writ out of chancery, acquired the name of mesne process, even in cases where it formed the legal as well as the actual commencement of the suit, as in scire facias, auditâ querelâ, &c.

Final process comprehends writs of execution. [EXECUTION.]

Mesne and final process are sometimes called judicial process, because they issue under the authority of the judges of the court in which the action is pending. A great variety existed in the different forms of process by which actions were commenced in the three superior common-law courts, the inconveniences resulting from which are pointed out in the 'First Report of the Common-Law Commissioners,' presented in 1828, pp. 70 to 101, 121, &c., 132, &c. But now, by 2 Wm. IV., c. 39, it is enacted, that in actions brought in the courts of law at Westminster, the process shall be a writ of summons, in a form prescribed by the statute, which is addressed to the defendant, and requires him to cause an appearance to be entered within eight days from the service of the writ. If the writ be served on the defendant, and he does not enter an appearance, the plaintiff may direct his own attorney to appear for the defendant, and the defendant being actually or constructively in court by an appearance entered by himself or by the plaintiff for him, the action proceeds. If the defendant cannot be served with the writ of summons, a writ of distringas may be sued out, by which the sheriff is directed to distrain the defendant by his goods for the purpose of compelling an appearance, and if he still hold out, the plaintiff may cause an appearance to be entered for him.

Where the proceedings are against a trader who is a member of parliament, the writ of summons informs the defendant that an affidavit of debt for the sum of ....*l.* has been filed in the proper office, according to the provisions of the Bankrupt Act, 6 Geo. IV., c. 16, § 10, and that unless the defendant pay, secure, or compound for the debt, or enter into the bond, as provided by that act, and cause an appearance to be entered within one calendar month after service of the writ, he will be deemed to have committed an act of bankruptcy from the time of the service.

The act contains a provision for commencing actions where it was intended to have the security of the personal detention of the debtor, by writ of capias, if the defendant were at large, and by writ of detainer, if he were already in custody. But by 1 & 2 Victoria, c. 110, arrest upon *mesne* process (as it is called in the statute) is taken away, except in cases where an arrest is ordered by the court or a judge, and all actions must be commenced by summons, though if the court or a judge order an arrest, a capias may issue in the course of the cause already commenced by writ of summons.

By the operation of these statutes the writ of summons is the only process for commencing *personal* actions in the courts at Westminster. And by 3 & 4 Will IV., c. 27, s. 36, all actions *real or mixed*, except writs of dower [Dower], quare impedit [Quare Impedit], and ejectment [Ejectment], are abolished. These excepted actions may still be brought by original writ; which term is commonly confined to an original writ issuing out of chancery; the writ of summons, though really an original writ, not being in modern practice so designated.

By 2 & 3 Vict., c. 27, s. 3, all personal actions in borough courts are directed to be commenced by writ of summons.

Criminal Process.—Where an indictment [Indictment] for treason or felony is found by a grand-jury, process of capias issues to the sheriff, commanding him to arrest the indictee. But where an indictment found, or an information filed, charges the party with a misdemeanor only, the process is at common law a venire facias, being a command to the sheriff to cause the indictee, &c. to come into court, which, under this process, must be done by summoning him. If the indictee, &c. does not obey the summons, and it appears by the return that the indictee, &c. has lands in the county, a writ of distringas issues, commanding the sheriff to compel the indictee to appear, by distraining him by the issues (the produce) of those lands, to appear. If the return to the venire facias shows that the indictee has no lands, process of capias issues. And by 48 Geo. III., c. 58, s. 1, whenever any person is charged with any offence for which he may be prosecuted by indictment or information in the King's Bench, not being treason or felony, and the same shall be made to appear to any judge of the same court by affidavit, or by certificate of an indictment, or of information being filed, against such person in the said court for such offence, such judge may issue his warrant under his hand and seal, and thereby cause such person to be apprehended and brought before him or some other judge of the same court, or before some one justice of the peace, in order to his being bound, with two sufficient sureties, in such sum as the warrant shall express, with condition to appear in the said court at the time mentioned in the warrant, and to answer all indictments or informations for any such offence.

Before any indictment is found, a party charged upon oath with treason or felony may be brought before a magistrate by virtue of a warrant issued for his apprehension by the same or some other magistrate of the district, and may by another warrant be committed to prison for trial, if upon the examination there appear to be grounds to suspect that the party is guilty.

PROCESS-VERBAL (*Procès-verbal*) is a term derived from French jurisprudence, in which it signifies a memorandum or instrument drawn up and attested by officers of justice, containing a statement of the circumstances which have taken place upon the execution of a commission, upon an arrest, upon a precognition or preliminary examination of a party accused, or in the course of other legal investigations, and set forth in the order in which they have occurred. The term is now frequently applied to a contemporaneous detailed minute or note of any formal proceeding, though not occurring in the course of any legal inquiry, *e.g.* a note of the discussions which are taking place during the negotiation of a treaty, &c.

PROCHI'LUS. [Bear, vol. iv., p. 90.]

PRO'CHYTA. [Procida.]

PRO'CIDA, the antient Prochyta (Προχύτη, Strab.), is an island at the north-west entrance of the Bay of Naples, situated between the larger island of Ischia and Cape Misenum. Procida is about eight miles in circumference; it is generally level, with some gently rising grounds, and is fertile and well cultivated. The vineyards produce good common wine. The population exceeds 10,000; the men are mostly sailors and fishermen, and are reckoned among the most enterprising in the kingdom: many of them are engaged in the tunny and coral fisheries. The dress of the women bears some resemblance to that of the women of the Greek islands. The island contains several villages or hamlets, a small fort, and a royal palace or country-seat.

It was an old tradition (Strabo, pp. 60, 258), that Prochyta and Pithecusa were separated from Misenum by a violent convulsion of nature. (Compare Pliny, *Nat. Hist.*, ii. 88; iii. 6.)

PRO'CI'DA, GIOVANNI DI. [Anjou, Dukes and Counts of.]

PROCLAMATION. By the constitution of England, the king possesses the exclusive prerogative of issuing proclamations; for although this authority is exercised by the lord mayor in the city of London, and by the heads of some other corporations in other cities, for certain limited purposes, it is always founded upon custom or charter, and consequently only exists in such cases by delegation from the crown.

The nature and objects of royal proclamations are various. In some instances they are merely an authoritative promulgation of matters of state, or of acts of the executive government which it is necessary that all persons should know, and upon notice of which, as presumed to be conveyed by a public proclamation, certain duties and obligations attach to subjects. Proclamations of the accession of a new king or a demise of the crown, and proclamations for reprisals upon a declaration of war with a foreign state, and for rendering coin current within the realm, are examples of this kind. Another class of proclamations consists of those which declare the intention of the crown to exercise some prerogative or enforce the execution of some law which may have been for a time dormant or suspended, but which a change of circumstances renders it necessary to call into operation. Thus the king might, by a proclamation in time of war, lay an embargo upon shipping, and order the ports to be shut, by virtue of his antient and undoubted prerogative of prohibiting any of his subjects from leaving the realm. And there is no doubt that a breach of the duty imposed or declared by a proclamation of this kind would be punishable, either as a contempt, or as a misdemeanor at common law. Another and by far the most usual class of proclamations issued by the crown consists of formal declarations of existing laws and penalties, and of the intentions of government to enforce them, designed, as some of the early books term it, *quoad terrorem populi*, and merely as admonitory notices for the prevention of offences. A familiar instance of this kind of declaration is the proclamation against vice and immorality appointed to be read at the opening of all courts of quarter-sessions.

It is quite clear that at the present day the royal prerogative does not authorise the creation of an offence by proclamation which is not a crime by the law of the land; in the language of Sir Edward Coke (3 *Inst.*, 162), 'Proclamations have only a binding force when they are grounded upon and enforce the laws of the realm.' In early periods of our history after the Norman conquest, the power of the crown in this respect appears to have been much more extensive, and instances of proclamations may be found in Rymer's 'Fœdera,' and elsewhere, evincing an assumption of almost despotic authority by the crown. In the reign of Henry VIII. it was enacted, by the statute 31 Henry VIII., c 8, that the king, with the advice of his council, might set forth proclamations under such penalties and pains as to them might seem necessary, which should be observed as if they were made by act of parliament; but this statute contained an express declaration that proclamations should not alter the law, statutes, or customs of the realm (Coke's *Reports*, part 12, p. 75), and was repealed about five years afterwards by the stat. 1 Edw. VI., c. 12. A strenuous attempt was made in the reign of James I. to strengthen the crown by increasing the prerogative of making proclamations, which, though encouraged and promoted by the lord chancellor Ellesmere and Bacon, were resisted by Coke, and occasioned great alarm and dissatisfaction among the people. The encroachments which had been made and attempted in this respect are enumerated and complained of in the 'Petition of Grievances' by the Commons, in 1610 (Howell's *State Trials*, vol. ii., p. 524); and in the same year it was expressly resolved by the judges (of whom Sir Edward Coke was one) that the king could not by his proclamation create an offence, which was not an offence before; 'for if so, he might alter the law of the land by his proclamation.' (Coke's *Reports*, part 12, p. 76.)

PROCLUS, a celebrated Neo-Platonist, was born at Constantinople, on the 8th of February, A.D. 412. His parents, who were people of wealth and consideration, resolved to give him the best possible education, and with this view sent him to Xanthus in Lycia, where he was taught reading, writing, and grammar; thence to Alexandria, where he attended the lectures of all the most eminent teachers of philosophy and mathematics; and finally to Athens, where he became a disciple of Plutarchus and Syrianus, two distinguished philosophers of that school. Proclus was the last rector of the Neo-Platonic school at Athens, and died there, A.D. 485, *i.e.* as his successor and biographer Marinus defines it, 124 years after the reign of Julian. (Marinus, *Vita Procli*, c. 36.) As the successor of Syrianus, he is sometimes called Diadochus.

The works of Proclus, which are very numerous, consist principally of commentaries on older writers; of these the best known are his commentaries on the 'Timæus' and 'Parmenides' of Plato, the latter of which has been recently printed as an appendix to Stallbaum's bulky edition of the dialogues. He wrote also commentaries on Hesiod's 'Works and Days;' on Ptolemy's 'Astrology;' and on the first book of Euclid's Elements,* in two books. His original works, besides a few hymns of doubtful merit, are a treatise 'On the Sphere,' published by Bainbridge, London, 1520 (which however is mostly taken from Geminus), and 'Eighteen Arguments against the Christians,' in which he endeavours to prove that the world is eternal.

In his style Proclus is much more perspicuous and intelligible than his predecessor Plotinus; indeed he is on the whole a good writer, and occasionally is almost eloquent. But the matter of his works has not much to recommend it: his propensity to allegorise everything, even the plainest and simplest expressions in the authors on whom he comments, must deduct largely from his merits as an expounder of other men's thoughts; and but for the interest which attaches to him as the last of a school of philosophy, it is not much to be regretted that his works have slumbered so long in the dust of libraries, and have been either wholly neglected or imperfectly edited. 'His life,' says Gibbon, 'with that of his scholar Isidore, composed by two of their most learned disciples, exhibits a deplorable picture of the second childhood of human reason.'

The commentaries on Euclid's first book are valuable for the large number of scattered pieces of information which they give on the history of geometry; but as commentaries they are only useful as showing what kind of discussion took place on geometrical questions at the time when they were written. These commentaries were translated by the late Mr. Thomas Taylor, whose attempts to revive all kinds of Platonism are well known. The original Greek was published by Hervagius at Basle, but from so bad a manuscript, that the Latin of Barocius (Patavii, 1560), taken from more and better manuscripts, is a better authority when it differs from the Greek of the Basle edition.

The reader who has any curiosity to know more of this author may refer to the following books (1) 'Procli Opera,' ed. Victor Cousin, Paris, 1820-27, 6 vols. 8vo.; (2) 'Initia Philosophiæ ac Theologiæ ex Platonicis fontibus ducta, sive Procli Diadochi et Olympiodori in Platonis Alcibiadem Commentarii,' ed. Fr. Creuzer, Francof. ad Mœn., 1820-25, 4 vols. 8vo; (3) 'Ex Procli Scholiis in Cratylum Platonis, ed. J. F. Boissonade, Lips., 1820; (4) Translation of the Six Books of Proclus on the Theology of Plato, &c., by Th. Taylor, Lond., 1815, 2 vols. 4to.; (5) 'The Commentaries of Proclus on the Timæus of Plato,' in 5 books, by Th. Taylor, Lond., 1820, 2 vols. 4to.

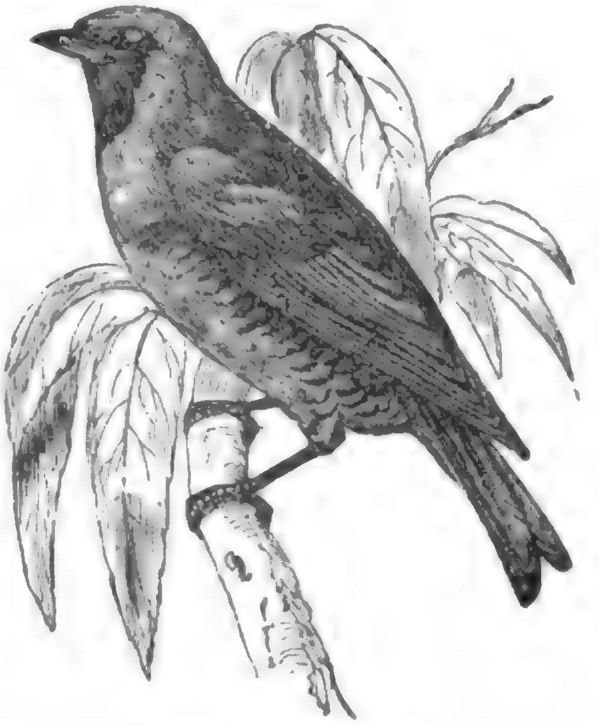
PRO'CNIAS, Count Hoffmansegg's name for a genus of birds placed by Mr. Swainson and others under the subfamily *Bombycillinæ*, Swallow Chatterers.

Generic Character.—Bill very broad; the sides inflected; the tip not hooked. Nostrils nearly naked. Wings pointed; the three first quills longest. Inner toe shorter than the outer. Tail slightly forked. (Sw.)

Example, *Procnias ventralis*, *Swallow Fruit-eater*.

Description.—(*Male.*)—Blue; front, throat, and temples black; middle of the body beneath white, the sides with blackish transverse striæ. Length about 5½ inches. *Female.*—Green; chin and temples grey; body beneath yellowish, transversely striated with dusky-green.

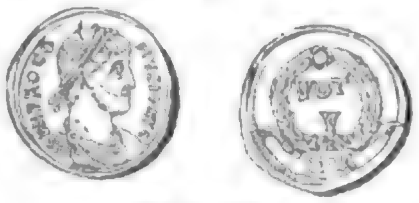
Mr. Swainson (*Zoological Illustrations*, 1st series) remarks that the birds of this genus are remarkable for the enormous width of their mouths, which in some species exceeds that of the Swallow family, thus enabling them with ease to swallow the large *Melastoma* berries and those of other tropical shrubs, on which alone they subsist; not on insects, as Cuvier asserts. Although, he adds, they perfectly resemble the swallows in the construction of their bills, their wings are not formed for rapid flight; and their feet are much stronger, and calculated for searching among branches for their food, in which situations Mr. Swainson frequently saw them. The species noticed is, he observes, a scarce bird; he met with it only three times in Bahia, but he says that it appears more frequent in the southern provinces of Brazil, specimens having been sent to him from Minas Geraes and Rio de Janeiro.



Procnias ventralis. (Sw., *Zool. Ill.*)

PROCONSUL. [CONSUL: PROVINCIA.]

PROCO'PIUS, ANTHE'MIUS, by which latter name he is best known in history, a grandson of Anthemius, who was minister of Arcadius and of Theodosius II., was proclaimed emperor of the West by the nomination of Leo I., emperor of the East, and with the consent of Ricimer, a chief of Suevian and other barbarian mercenaries in the service of the empire, who had assumed the supreme military authority over Italy after the death of Severus. As a condition of his consent, Ricimer obtained the hand of the daughter of Anthemius. After a few years Ricimer quarrelled with his father-in-law, and marched against him. The emperor Leo dispatched the patrician Olybrius to Italy to mediate a peace, but Olybrius, being offered the crown by Ricimer, was tempted by the offer and accepted it. Anthemius, though forsaken by most of his followers, made a stout resistance outside of Rome, but he was defeated and killed, A.D. 472, after five years' reign.



Coin of Procopius.

British Museum. Actual size.

PROCO'PIUS was born at Cæsarea in Palestine, about the end of the 5th or beginning of the 6th century. After studying rhetoric in his native country, he went to Constantinople, where he gave lessons on rhetoric, and appears to have practised also as a lawyer, for such he is styled in the title of some of his works. His reputation for learning and ability reached the court; and the emperor Justin the Elder, in the last year of his reign, appointed him assessor (συγκάθεδρος) to Belisarius, who was about that time sent as governor to Dara on the frontiers of Armenia. Procopius afterwards accompanied that commander in his first war against the Persians (A.D. 530), afterwards in that against the Vandals in Africa (533-5), and lastly against the Goths in Italy (536-9). During these campaigns he appears to have rendered himself very useful through his abilities and activity, and to have been entrusted by Belisarius with important commissions connected with the service of the army. In his capacity of assessor, he was the general's legal adviser, and he was also his private secretary. In the year 538, he assisted Antonina, the wife of Belisarius, in raising troops in Campania, and in sending some by sea to Rome, which was then besieged. On his return to Constantinople, about the year 540, the emperor Justinian made him a senator, as a reward for his services. In 562, he was made prefect of Constantinople, unless perhaps it was another of the name who obtained this dignity in the year 562. He died in that city at an advanced age, but the precise year of his death is not ascertained.

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* In ASTRONOMY, p. 532, for 'Proclus Diadochus (not the commentator of Euclid), A.D. 550, read 'Proclus Diadochus (the commentator of Euclid), A.D. 450.'

Procopius wrote the 'History of his own Times,' in eight books, which has been translated into Latin by Claude Mattret, a jesuit. 'Procopii Cæsariensis Historiarum sui Temporis Libri Octo,' fol. Paris, 1662, with the Greek text. The work has also been translated into Italian, German, and other modern languages. There is a German translation, with notes, by Kanngiesser, Greifswald, 1827-29, 3 vols, 8vo. The 'History' of Procopius is an important work, which forms the connecting link between antient and modern history, between Ammianus Marcellinus and the Byzantine historians. Procopius was well informed and unprejudiced; he was a spectator of, or an actor in, most of the events which he narrates; he was well acquainted with the court of Justinian; and he is generally trustworthy, except perhaps where he stoops to the customary flatteries towards the emperor, the empress Theodora, and his patron Belisarius, for which flattery however he has made ample amends in his secret history of the same personages. His descriptions of the manners of the various barbarous nations which invaded the Roman empire are vivid and interesting. The first two books of his history concern the Persian wars. He begins his narrative with the death of Arcadius, and briefly relates the wars between the Romans and Persians under Theodosius the Younger, Anastasius, and Justinus, and lastly Justinian. As he comes down to contemporary times, his history is more diffuse. He brings his narrative down to the 23rd year of Justinian's reign, A.D. 550. Books 3 and 4 treat of the wars of the Vandals in Africa, and the reconquest of that province by Belisarius. The 5th, 6th, and 7th books are concerned with the history of the Gothic kingdom in Italy founded by Theodoric, and the expedition of Belisarius against Totilas. The 8th book is of a mixed character; it resumes the account of the Persian wars, then speaks of the affairs of the Roman empire in other quarters, in Africa, on the Rhine, and in Thrace, and at last it resumes the narrative of the Gothic war in Italy, the expedition of Narses, the defeat and death of Teia, and the final overthrow of the Gothic kingdom.

A second volume, published likewise at Paris, in 1563, contains two other works of Procopius, in the Greek text, with a Latin translation. One contains an account of the public buildings erected or restored by Justinian throughout the empire, 'De Ædificiis Domini Justiniani Libri VI.' It is written in a laudatory style, but contains much valuable topographical information.

The other work of Porcopius is entitled 'Anecdota, or Secret History,' in thirty chapters. The character of this book has been noticed under JUSTINIANUS. Justinian and Theodora are here painted in the darkest colours. Procopius says that he wrote it to complete his 'History,' in which he could not, through fear of torture and death, speak of living persons as they deserved. Some grossly obscene passages concerning Theodora, who was evidently a very bad woman, have been expunged in most editions. There seems little doubt that Procopius is the author of the work. The Paris edition of Procopius, already quoted, is enriched with copious historical notes, prefaces, and an index.

PROCTOR, an officer of the Ecclesiastical courts, whose business is that of an agent between his clients and the courts to which he is attached. He stands in a similar situation to that of an attorney at common law, or a solicitor in chancery. There are about 120 proctors now practising in the several courts of Doctors' Commons, London, which are four in number, the Court of Arches, the Prerogative Court, the Consistory or Consistorial Court of the Bishop of London, and the Admiralty Court.

In commencing a suit in any of these courts, the proctor is appointed by a proxy executed by the client, by which he constitutes him his agent, and promises to confirm all his acts as by law required in such suit. The proctor then proceeds to collect the facts of the case, and to apply to the court, in his client's behalf, to draw allegations and interrogatories, and summon witnesses, whose evidence is taken down in private by the examiners, who are proctors appointed for that purpose. This evidence is deposited in the registry of the court in which the suit is brought, and is not allowed to be seen by any party until such time as the court may think fit to order publication. No *vivâ voce* evidence is received in these courts. After the necessary information has been collected and arranged, the proctor prepares his client's case, to be put into the hands of the advocates, to be by them brought before the court, if they deem it advisable.

In the case of wills, or administrations with the will annexed, that is, where the deceased has left a will, but has not appointed any executor, the executors or administrators are sworn to the due execution of the will of the deceased; and they make affidavit as to the amount of property, time of death, &c. The proctor then makes a copy of such will or papers, and places it before the registrar of the court to be compared with the original; the copy, when thus compared, is returned to him with the probate under seal of the court attached. In cases of administration, he delivers in a formal account of the claims of the parties who apply for letters of administration, with an affidavit as to the value of the property and other particulars, and prays the court to decree letters of administration also under seal of the court. These instruments are then delivered to the executors or administrators, and are their authority for distributing the property of the deceased according to his will, or, in the absence of a will, according to law.

It is also the business of the proctor to obtain licences for marriage, on the application of either of the parties about to contract such marriage, and to draw an affidavit in which the party applying for the licence declares that he or she knows of no legal impediment to such marriage. It is the proctor's duty to explain the nature of this affidavit to his client, who is then sworn to the truth of it before one of the advocates, who are appointed surrogates, or deputies of the judge. The affidavit is then lodged in the Faculty Office, or office of the vicar-general, and licence obtained under seal: this licence remains in force for three months.

The proctor in many cases has to attest the acts of his client, and for this purpose he is appointed a notary public, but his power as such extends only to proceedings in his own courts, and not to the general business of a notary. The official title of a proctor is 'notary public, and one of the procurators-general of the Arches Court of Canterbury and of the High Court of Admiralty.'

The number of the proctors is prevented from increasing very rapidly by the restrictions on taking 'clerk apprentices:' only the thirty-four senior proctors, and of them only such as are of five years' standing in such seniority, are allowed to take an articled clerk, and in no case to take a second until the first has served five years, and then only by permission of the court. The term of articleship is seven years, which is legally required on account of the notarial capacity in which they have to act. Notwithstanding these regulations, the number has materially increased. In the time of Charles II. there were only thirty-four procurators-general and ten supernumeraries. The proctors wear a gown as a badge of office in court, and in the Arches a cape trimmed with ermine in addition; and on certain occasions, such as upon admission or attending prayers on the first day of Term, a wig similar to that of a barrister. They are exempted from serving as jurors or parish officers.

The appeal from these courts is to the Judicial Committee of the Privy Council, where the proctor conducts the case in the same way as in the courts of Doctors' Commons, but is obliged to call to his assistance a barrister, in addition to an ecclesiastical advocate. There is an appeal court held in Doctors' Commons, but it is only for business preliminary to the cause being heard before the Privy Council.

The courts are held in the common hall of Doctors' Commons, situated in the College, in which are the official residences of the judges and advocates. The proctors have no inn, or regular locality, but are very inconveniently dispersed about the narrow streets near the College.

Attached to the courts of the province of York and to the different bishops' courts are similar bodies of proctors, who differ only in trifling circumstances from those here described. [PROCURATOR.]

PRO'CULUS, one of the tyrants or pretenders to the empire who rose after the death of Tacitus. He was a native of Liguria, and originally a chief of robbers, but afterwards served in the army with distinction under Aurelian, and showed himself a brave though rude soldier. He was proclaimed emperor in Gaul, and fought against the Germans, but being attacked by Probus, who was acknowledged emperor by the senate, was defeated and killed, A.D. 276. (Vopiscus, *Historia Augusta*.)

PROCURA'TOR, a manager or agent, whence the word proctor is formed.

A Roman procurator was a person appointed by another to manage or conduct a cause for him. It required no particular words to constitute a man a procurator; nor was it, as in the case of a cognitor, necessary for the opposite party to consent to his appointment. A man might commence a suit as a procurator, without showing his authority; but it seems that he was obliged to produce it before the judges came to a decision, or to enter into security that the plaintiff would abide by his acts. (Gaius, iv. 84.)

Under the Empire the governor of a province was, in certain cases, called a Procurator, or Procurator Cæsaris. Sometimes this Procurator had not the government of a province, but only managed affairs of revenue (res fisci). [PROVINCIA.]

PRO'CYON. (Astronomy.) [SIRIUS AND PROCYON.]

PRO'CYON. (Zoology.) [RACCOON.]

PRO'DICUS, a native of Cos, or, as some think, of Chios, flourished B.C. 435. He was a disciple of Protagoras, became a celebrated Sophist, and had among his followers Socrates, Euripides, Isocrates, and Xenophon. Prodicus travelled through Greece from town to town, to deliver his lectures, for which he demanded payment of his hearers, sometimes to an extravagant amount. Several antient writers refer to these lectures, or harangues, as worthy of a philosopher. Prodicus however is reported to have been put to death by the Athenians, because they thought that he corrupted the youth by his teaching; and it is further remarkable that he is numbered among the atheists by Cicero (*De Nat. Deorum*, i. 42). None of the writings of Prodicus are extant except a beautiful episode preserved by Xenophon (*Mem.*, ii. 1), usually called 'The Choice of Hercules.' This has been paraphrased in English verse by Shenstone and by Bishop Lowth; and there is a prose translation in the 'Tatler.' Three others of this name are noticed by Fabricius, but very little concerning them is known. (Fabricius, *Bibliotheca Græca*.)

PRODUCT, a term really equivalent to result, but used only when the result is the one obtained by the multiplication of two or more quantities.

PROFANENESS. [BLASPHEMY.]

PROFESSION, PROFESSED. [MONK.]

PROFIT, one of the three parts into which all that is derived from the soil by labour and capital is distributed, the other two being wages and rent: from these three sources arise all the revenues of the community. Profit is therefore the surplus which remains to the capitalist after he has been reimbursed for the wages advanced and the capital consumed during the process of production. To obtain this surplus is the only object for which capital is employed.

Profits have a tendency to fall to the same level in all branches of industry; for if the ratio of profit in proportion to the capital employed be greater in one than in another, more capital will be directed to that which affords the highest profit; and the powers of production being increased, the supply is greater, prices fall, and the equilibrium of profit is restored. A distinction must however be made between real and apparent profit. When the employment of capital is attended with extraordinary risk, profits are nominally high; but after deducting the losses to which it is exposed, the real profits tend to the same level as the ordinary rate. The case is similar in occupations of a disagreeable or agreeable nature, the pleasantness of the latter counterbalancing the low rate of profit. A wholesale merchant and a retail trader both dealing in the same commodities may appear to obtain different rates of profit; but in the latter case wages are confounded with profits, and when they are properly distinguished, the apparent disproportion is diminished. Unless we reduce profits from their apparent to their real value, there is no truth in the maxim that the rate of profit is uniform in the same country at the same time. In different stages of society the rate of profit is subject to certain changes. In all new countries the employment of capital is attended with large returns, and profits are high. As population advances, it becomes necessary to cultivate land of inferior degrees of fertility, or to apply more capital to the land already cultivated. The labourer receives a greater proportional share of the produce, though it may be less absolutely than before this change took place; and more capital being necessary to obtain the same quantity of produce, the proportion of profit to the capital employed is therefore less: that proportion of the produce which is distributed as rent increases.

The natural tendency then of profits (whether arising from capital employed in agriculture or in manufactures) is to decline as the necessities of the population render it necessary to have recourse to inferior soils. Happily, improvements in machinery and in the art of agriculture, better combinations of labour and capital, and greater freedom of commerce, are calculated to arrest this retrograde movement; and to such sources of relief every highly advanced country must look as a means for sustaining its prosperity; for whatever diminishes the necessity of raising food from the poorer soils, tends to maintain the rate of profit.

Two other causes have great influence upon the rate of profit, namely, wages and taxation. A rise in wages will diminish profits, unless industry becomes more productive; but if the latter take place, both may rise at the same time, either in the same or in different proportions according to circumstances.

Taxation will diminish profits, unless wages fall or industry become more productive. Taxes on profits, when they fall alike upon all capital engaged in productive industry, are paid by the owners of capital, who have not the power of charging the tax upon consumers. Consumption is checked and the power to accumulate diminished. When the profits of only certain classes of traders are taxed, they would betake themselves to other occupations not taxed, unless they could charge the consumers with the tax: the tax therefore falls upon the consumers.

The effect of the competition of capitalists in reducing the rate of profit has not been much discussed by writers on political economy. Mr. M'Culloch says:—'Competition cannot affect the productiveness of industry, and therefore has nothing to do with the average rate of profit.' In reply to this assertion it has been remarked (*Edin. Rev.*, No. 142, p. 443) that although the inferior fertility of newly cultivated soils be the immediate cause of the diminution of the rate of profit, yet it is nothing but the competition of capitalists which drives capital to seek the inferior soil, and induces its owners to be content with a lower rate of profit. The capitalists who had accumulated at the old rate of profit are content with a new investment producing a lower rate, instead of consuming their savings unproductively.

(Ricardo, *Principles of Political Economy and Taxation*, chaps. v. and xiii.; Mill, *Elements of Political Economy*, c. ii., sec. 3; and c. iv. sec. 6; M'Culloch's ed. of the *Wealth of Nations*, note vii.; *The Laws of Wages, Profits, and Rent investigated*, by Professor Tucker, Philadelphia, 1837.)

PROGNO'SIS (in Medicine) is the opinion formed respecting the probable future events of any disease, as, for example, whether it will terminate in recovery or in death how long it is likely to continue, what other diseases may be expected to arise in its course, what are the chances of relapse, and what those of some permanent injury of structure or function being produced by the morbid processes.

PROGRESSION. A series of numbers following any law should be called a progression, but the word is usuall restricted to two sorts of progression, which are called, but by no means correctly, arithmetical and geometrical: the analogies pointed out in RECTANGLE give the origin of these terms.

An *arithmetical progression* is one in which the terms continually increase or diminish equally, including, as an extreme case, that in which they do not increase nor diminish at all. Thus

7 7, 7, 7, &c. 7, 8, 9, 10, &c.
10, 9½, 9, 8½, &c. 2, 3¼, 4½, 5¾, &c.

are sets of terms in arithmetical progression. The following proposition contains the principal part of their theory:—

If a be the first term of an arithmetical progression, and Δa the difference between any two terms (negative, if the terms diminish); and if a_n be the nth term from and after a *exclusive*, and S^n the sum of n terms, we have

$$a_n = a + n\,\Delta\,a;$$

$$S_n = na + n\frac{n-1}{2}\,\Delta\,a.$$

From these two equations between a, n, a_n, Δa, and S_n

any three of these being given, the other two can be found, subject however to this restriction, that the problem is unmeaning when n is not a whole number, whether it be given or found. These theorems are only the simplest case of a more general pair, in which, taking any series, and supposing neither the differences nor the differences of the differences, &c. to be equal, an expression is given for any term of a series, or for the sum of n terms, which frequently gives finite forms in the place of indefinite ones. Calculate, as in the article DIFFERENCE, the value of Δa, $\Delta^2 a$, &c., from a, a_1, a_2, &c., and let

$$n_1 = n, \quad n_2 = n\frac{n-1}{2}, \; n_3 = n\frac{n-1}{2}\,\frac{n-2}{3}, \text{ \&c.}$$

Then
$$a_n = a + n_1\Delta a + n_2\Delta^2 a + n_3\Delta^3 a +, \text{ \&c.}$$
$$S_n = n_1 a + n_2\Delta a + n_3\Delta^2 a + n_4\Delta^3 a +, \text{ \&c.}$$

Thus in the series $1 + 5 + 17 + 43 + 89 + 161 +$ &c., the law of whose terms is undiscoverable at first sight, we shall, by what the beginner may, till he knows better, call an accidental circumstance, discover both the law of the terms and that of their sum, as follows:—

$$\begin{array}{cccccc}
1 & & & & & \\
 & 4 & & & & \\
5 & & 8 & & & \\
 & 12 & & 6 & & \\
17 & & 14 & & 0 & \\
 & 26 & & 6 & & 0 \\
43 & & 20 & & 0 & \\
 & 46 & & 6 & & \\
89 & & 26 & & & \\
 & 72 & & & & \\
161 & & & & &
\end{array}
\qquad
\begin{array}{l}
a = 1, \Delta a = 4, \Delta^2 a = 8, \\
\Delta^3 a = 6, \Delta^4 a = 0, \Delta^5 a = 0, \\
\text{\&c.}
\end{array}$$

$$a_n = 1 + 4n_1 + 8n_2 + 6n_3 = n^2 + (n+1)^2$$
$$S_n = n_1 + 4n_2 + 8n_3 + 6n_4$$
$$= \left(n\frac{n-1}{2}\right)^2 + \frac{n(n+1)(2n+1)}{6}.$$

Thus the seventh term (the sixth after 1, $n = 6$) is $6^2 + 7^2$, or 265, and the sum of 6 terms (make $n = 6$ in the second formula, in which remember that S_n is the sum of n terms, not of n terms after a) is $(\frac{1}{2}.6.5)^2 + \frac{1}{6}.6.7.13$, or 316, which may easily be verified. [SUM.]

The apparently accidental circumstance above alluded to, is the vanishing of all the differences of a from and after the fourth. But it is to be observed, that the series was originally constructed so as to make all differences vanish after the fourth, and that the preceding theorem will never change indefinite into definite formulæ, except when all differences after a certain one vanish. The rule is, when a_n is an algebraically rational and integral function of n of the p order, that is, of the form $kn^p + ln^{p-1} +$, &c., all differences after the pth vanish, and then only.

Geometrical progression is when the terms of a series increase or diminish by the use of the same multiplier, whole or fractional, including, as an extreme case, that in which the multiplier is unity. Thus, the multipliers being 1, $\frac{8}{7}$, $\frac{1}{3}$, and 2, the four following sets of terms are in geometrical progression:—

$$7,\ 7,\ 7,\ 7, \text{ \&c.} \qquad 7,\ 8,\ \tfrac{64}{7},\ \tfrac{512}{49}, \text{ \&c.}$$
$$3,\ 1,\ \tfrac{1}{3},\ \tfrac{1}{9}, \text{ \&c.} \qquad 9,\ 18,\ 36,\ 72, \text{ \&c.}$$

If a be the first term, and b the second, the nth term is $a(b \div a)^{n-1}$, and the sum of n terms is

$$\frac{a^n - b^n}{a^{n-2}(a-b)} \quad \text{or} \quad \frac{b^n - a^n}{a^{n-2}(b-a)},$$

according as a is greater than or less than b. But when $a = b$, the sum is of course na. If $b \div a = r$, that is, if the terms be a, ar, ar^2, ar^3, &c., the nth term is ar^{n-1}, and the sum of n terms is

$$a\frac{1-r^n}{1-r} \quad \text{or} \quad a\frac{r^n-1}{r-1},$$

according as r is less than or greater than one. If r be less than one, the series of terms, however far it may be carried, never reaches $a \div (1-r)$, though it may approach this limit with any degree of nearness by making the number of terms sufficiently great.

Thus the following equations,

$$2 = 1 + \tfrac{1}{2} + \tfrac{1}{4} + \tfrac{1}{8} + \tfrac{1}{16} + \text{ \&c.}$$
$$1 = \tfrac{1}{3} + \tfrac{2}{9} + \tfrac{4}{27} + \tfrac{8}{81} + \tfrac{16}{243} + \text{ \&c.}$$

though always erroneous, stop where we may, yet can be brought as near to truth as we please by writing down terms enough on the second side. In the use of the word INFINITE, as explained in the article on that subject, we may then say that the above equations are absolutely true, if the series be carried *ad infinitum*. The general equation, made absolutely true, after stopping at ar^n in the series, is

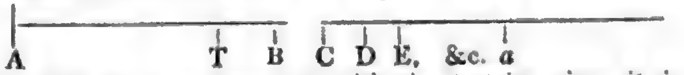
$$\frac{a}{1-r} = a + ar + \ldots + ar^n + \frac{ar^{n+1}}{1-r}.$$

Other points connected with this equation will be mentioned in the article SERIES.

There is no doubt that every whole can be subdivided into parts without limit, or, in common language, can be divided into an infinite number of parts. An old fallacy, mentioned in MOTION, receives its explanation from the preceding. If we make $a = 1 - r$, the equation carried *ad infinitum* becomes

$$1 = (1-r) + (1-r)r + (1-r)r^2 +, \text{ \&c., } ad.\ inf.$$

By giving different values to r, we have therefore an infinite number of ways of subdividing unity into an infinite number of parts. If then we take a problem in which an antecedent is followed by a consequent; and if dividing the antecedent into an infinite number of parts, we consider separately the parts of the consequent which belong to those of the antecedent, we shall of course divide the consequent into an infinite number of parts. It would be a gross fallacy to infer that the consequent must be infinitely great, because it is produced in a never-ending succession of parts, since that never-ending succession was produced by dividing the avowedly finite antecedent into an infinite number of parts. No one could fail to detect the following: 'Let M be divided into an infinite number of parts, a, b, c, &c.; let each of these parts be doubled; then the result is made up of $2a$, $2b$, $2c$, &c., *ad infinitum*; consequently $2a + 2b + 2c +$, &c., being made up of an infinite number of quantities, is infinite.' Nevertheless this fallacy was not only produced in an ingenious form, as a sophism [MOTION], but has even reappeared in modern times as a serious argument. The sophism is known by the name of 'Achilles and the Tortoise.' The swiftest of men runs after the slowest of beasts, without (says the sophism) the possibility of ever overtaking it. For if, when they set out, Achilles be at A and the tortoise at T, then by the time Achilles has run over AT, how fast soever he may run, the tortoise will have gone over some length, say TB, while the hero goes over TB, his dinner (for dinner he may have out of it, in spite of the sophism) goes over BC, and so on *ad infinitum*. How then, asks the objector, is it possible that Achilles can ever come up with the tortoise, since it is unquestionable (and this is perfectly correct), that let him go as far as he may, he must always come up to where the tortoise was before he can reach the point at which he is; so that it requires *an infinite number of parts of time* (but here the sophism quietly introduces *an infinite time*) to catch the tortoise? The answer is, that Achilles will certainly overtake the tortoise at a finite distance from A, say at a: any contrivance which subdivides Aa into an infinite number of parts, does the same with the time in which Achilles runs over Aa; and there is no more reason to say that the time is therefore infinitely great, than to say that Aa is made infinitely great by the subdivision. This would be a sufficient answer, since it would throw upon the sophist the *onus* of showing that the infinite number of parts of time makes an infinite time; but a more complete answer consists in positive proof that it is not so, as follows:—



Let AT be called a, and let Achilles move m times as fast as the tortoise; then TB is necessarily the mth part of AT, BC of TB, CD of BC, &c. Hence, if t be the time in which Achilles moves over AT, this time, added to his times of going over TB, BC, CD, &c., or t, $t \div m$, $t \div m^2$, &c., make up

$$t\left(1 + \frac{1}{m} + \frac{1}{m^2} + \frac{1}{m^3} + \frac{1}{m^4} +, \text{ \&c., } ad\ inf.\right)$$

Now if m be greater than 1 (for unless Achilles move faster than the tortoise, it is admitted he can never catch it), the series above named is $1 \div \left(1 - \frac{1}{m}\right)$, so that the whole time is $tm \div (m-1)$, and the whole length Aa is $am \div (m-1)$, the same answer as would be produced by common methods. The sophism divides this length into the infinite number of parts

$$a \qquad \frac{a}{m} \qquad \frac{a}{m^2} \qquad \frac{a}{m^3} \qquad \text{\&c.;}$$

and taking the times due to each,

$$t \qquad \frac{t}{m} \qquad \frac{t}{m^2} \qquad \frac{t}{m^3} \qquad \text{\&c.,}$$

assumes the sum of the latter to be infinite.

In the work of a celebrated political economist there is the following argument, to show that a tax on wages must fall on the labourers; for if it did not so fall, wages would rise, whence the price of goods would rise, which would again cause a rise of wages, and this again a rise in goods, and so on *ad infinitum*, which is inferred to be absurd. This is of course precisely a repetition of the preceding case; and granting all the premises, the conclusion by no means follows. For that conclusion is that the rise would go on without limit, which need not be the case.

PROHIBITION, a writ to prohibit a court and parties to a cause then depending before it from further proceeding in the cause. It will be convenient to define,—1, out of what courts it may issue; 2, to what courts it may be addressed; 3, under what circumstances it is grantable; 4, at whose instance it may be obtained; 5, at what time it may be obtained; 6, the form and incidents of the proceeding.

1. A writ of prohibition may issue from any of the three superior courts of common law at Westminster, and also from each of the common-law courts of Chester and Lancaster. It is generally stated that a writ of prohibition may issue from the Court of Chancery; but the Court of Chancery acts by injunction addressed only to the parties, and does not interfere with the court. [INJUNCTION.]

2. It may be addressed by any of the three superior courts to any other temporal court; such as to the Admiralty courts, to courts-martial, a court baron, any other inferior court in a city or borough, to the Cinque-Ports courts, the duchy or county palatine courts, the chancery of Chester, the Stannary courts, the Court of Honour of the Earl-Marshal, to the Commissioners of Appeals of Excise, to any court by usurpation without lawful authority, or to a court whose authority has expired. When any one has a citation to a court out of the realm, a prohibition lies to prevent his answering. It seems also that it might issue to the Court of Exchequer and to the Court of Common Pleas; but not to the Court of Chancery, nor is there any instance of a prohibition to the King's Bench. It may be granted by any of the three superior common-law courts to any spiritual court, and by the common-law courts of Chester and Lancaster to the spiritual courts within the county palatine and duchy.

3. The writ is grantable in all cases where a court entertains matter not within its jurisdiction; or where, though the matter is within its jurisdiction, it attempts to try by rules other than those recognised by the law of England. Matter may be said to be not within the jurisdiction of a court in two senses: 1, when the subject-matter entertained is in its nature not cognizable by the court; 2, where the subject-matter is in its nature cognizable by the court, but lies out of the local district where only that court has jurisdiction; or, in the case of a court whose jurisdiction is general, when the subject-matter lies in a local district exempt from the general jurisdiction of the court or where the subject-matter of the cause relates to persons over whom the court has no jurisdiction.

In order to ascertain those cases which fall under the first head, we must consider the nature and character of the subject-matters over which the jurisdiction of the court extends. It is obvious, that if we have those clearly defined, we shall see whether the subject-matter in question is or is not within that jurisdiction. This general rule may be useful, because the cases that may occur in which a prohibition will lie, are endless. The examples of cases which have occurred will assist in the application of it. To begin with those relating to temporal courts. A prohibition will lie if one sue another in a court-baron, or other court not a court of record, for charters concerning inheritance or freehold; or in the county court for trespass vi et armis; or in the county courts or courts baron for a matter of 40*s*. or upwards,—and the plaintiff cannot evade the prohibition by dividing his demand into smaller sums; to the courts of Admiralty, if they entertain questions of a contract made or to be executed within the kingdom; to an inferior court, if an action be brought in it on a judgment in one of the superior courts; to the court of honour of the earl-marshal, if it holds plea of things determinable by the common law. To a spiritual court a prohibition will lie, if it takes cognizance of any plea concerning a title to lands or tenements, or an advowson of a church, or an office, or goods, money, or chattels; and this applies even in the case of goods or ornaments given to a church, or matters of a criminal nature punishable only temporally: in short, as it has been said, anything for which a remedy exists at common law. Yet it has been held that a pension which commenced by the grant of the patron or ordinary may be sued for either in the temporal or spiritual court. Lord Coke however goes further, and says that prohibition lies to a spiritual court in any case, though of a spiritual nature, where a remedy is given by statute in a temporal court, unless the jurisdiction of the spiritual court is saved by the same statute. Perhaps this assertion cannot be maintained to the full extent. In some cases it has been so held, as where a suit in an ecclesiastical court was instituted for preaching without licence or marrying without banns, these having been created offences by act of parliament. Still a prohibition does not lie in a suit for small tithes or for contribution to the repairs of the church, though other remedies are given in these cases by statute (7 and 8 Wm. III., c. 6, and c. 34), and perhaps in some other cases. In cases where no remedy exists elsewhere, a spiritual court may still be restrained from entertaining questions as to matters not within its jurisdiction.

With regard however to the spiritual courts, various exceptions and restrictions must be applied to what has been said. A spiritual court can hold plea for goods, money, and chattels to which a spiritual character attaches; as for instance, tithes, provided they are under a fourth part of the value of the church, or oblations, mortuaries, &c., that is, payments by communicants, or payments for marriages, christenings, churchings, and burials, or pensions; or a sum promised to be given as a marriage portion. It can also hold plea for matters testamentary, such as a legacy, even of a chattel real. Though a will disposes of land as well as personalty, the granting of probate belongs to the spiritual court; but this grant in no way determines the validity of the will so far as relates to the land. A spiritual court has also jurisdiction as to offices merely spiritual, but not for lay offices, even though they are in the spiritual court. It has also jurisdiction over offences committed within the spiritual court itself, as perjury or extortion in all officers of the court, or for brawling and committing a nuisance within a churchyard, or for defamation where no damages are demanded, or where a crime either merely or in part spiritual is imputed, or the words spoken are mere words of passion. Where violence has been done to a spiritual person, he may maintain a suit in the ecclesiastical court, to punish the party by ecclesiastical censures. The spiritual court also has cognizance of a suit for maintaining a way to the church, or where the question is not of a right of way generally, but solely as to the right of way to a church, or a way by which a parson carries off his tithes.

Prohibition lies equally both where the matter of the suit is not cognizable by the court, and where, though the substance is cognizable, matter arises during the progress of it, and is clearly about to be tried, over which the court has no cognizance. As to this, perhaps some confusion and contradiction will be found in the authorities. It has been said that where a suit is brought in the spiritual court for a thing within the cognizance of that court, and temporal matter becomes *incident*, it shall be determined there, and there can be no prohibition. (12 Co., 65.) However this must always have been understood with the condition, that as to such things the ecclesiastical court was bound to try according to course of common law. Perhaps it was only applicable to cases where parties neglected to apply for prohibition till after sentence, and where no want of jurisdiction appeared on the face of the proceedings. More recent cases have clearly established that if in a cause properly cognizable by a spiritual court a question arises and is necessarily about to be tried as to the existence of a custom, or a prescription, or the limits of a parish, or where in a suit for tithes there is plea of a modus, or that the lands are discharged by statute, or tithes are claimed of things for which no tithes are due, or the defendant makes title by lease, &c., a prohibition will lie immediately.

It has been laid down broadly that the ecclesiastical courts cannot try any matter triable at common law. It is otherwise however where the construction of a statute may come in question: prohibition will not lie on the mere suggestion that the spiritual court is not competent to construe it.

A prohibition is in all cases grantable where a court allows illegal or disallows legal evidence, as where the commissioners of appeals for the excise determine by the minutes of evidence taken by a justice of the peace, instead of examining the witnesses vivâ voce, or a spiritual court disallows proof of payment, &c. because proof of it is made only by a single witness, or where it has misconstrued an act of parliament, or disallows an award when it is good by law.

Where a suit is for matter within the cognizance of the court, which is combined with things over which the court has no cognizance, prohibition will issue as to that over which the court has no cognizance. But in those cases where both parties to the suit are spiritual persons, as where the question is whether the tithes belong to the rector or the vicar, no prohibition lies.

Where the matter is cognizable by the court, but lies out of its local jurisdiction, the question is merely one of boundary; as in cases where an inferior court holds plea of matter out of its limits, the duchy courts or courts palatine of land out of the duchy, &c. This is also the case where one spiritual court trespasses on the district of another, as if a man resident in one diocese or peculiar be cited to appear in another; in this case it is however to be observed that no prohibition will lie if the proper ordinary refuses or neglects to act in the case, or is party to the suit, or, under certain circumstances provided for by the canons, refers the matter to his immediate superior.

A prohibition will also lie where a court attempts to extend its jurisdiction to parties over whom it has none, as where a court-martial inquires into the conduct of a person not a soldier or sailor; the Stannary courts, where neither parties are tinners, nor the matter in question respecting tin, &c.

4. A prohibition may be obtained at the instance of either party to an ecclesiastical suit. In the case of a suit for tithes against a lessee, it may be obtained by the reversioner. Where a court has no jurisdiction over the matter of the suit, a prohibition is grantable at the request of a mere stranger.

5. If a court has no cognizance of the matter of a suit, prohibition will lie immediately after appearance, and it may be obtained by either plaintiff or defendant at any future time, even after sentence, appeal, and affirmation; or after judgment and execution, provided it appears by the libel, or by the libel and the proceedings, that the court had no jurisdiction. Where the court has cognizance of a cause, prohibition will not lie until the matter out of its jurisdiction has not only arisen, but is also clearly in progress of being tried. If that matter is then admitted by the litigant parties, the court is still entitled to entertain cognizance of the suit. If not admitted, and these circumstances, though not appearing on the face of the proceedings, are duly brought forward before sentence, a prohibition will then lie. If however a prohibition is not then applied for, but the party submit to the trial in the court where the suit has been commenced and sentence is pronounced, no prohibition will lie unless it appear on the libel, or the libel and the proceedings, not only that matter out of the jurisdiction of the court has arisen, but also that the matter has been wrongly decided. (Gould *v.* Gapper, 5 East, 345; Byerly *v.* Windus, 5 B. & C. 1.) If a spiritual court has cognizance of part of the charge and not of the rest, the court will not grant a prohibition after sentence. In cases where the suit is determined, it would appear that these observations can at all events only apply to permanent courts, and where something still remains to be done. In the case of an occasional court, as a court-martial, it would be impossible to carry the principle into execution.

6. A writ of prohibition is applied for by motion in court, which sets out the proceedings in the suit. If the proceedings are not sufficient to show the want of jurisdiction in the court against which prohibition is prayed, suggestions must be added, verified by affidavit, showing such want of jurisdiction.

If the court grants a rule, the other party is heard in answer. The court may then decide, either to refuse the prohibition, or, if they incline to grant it, direct the party applying to declare in prohibition. The mode of doing this is regulated by 1 Will. IV., c. 21. The declaration must contain a concise statement of the grounds of the application, and conclude by praying that the writ may issue. To this the other party may demur on the ground that no sufficient cause appears for a prohibition, or he may plead such matters as he thinks proper to show that the writ ought not to issue, and conclude by praying that it may not issue. If matters of fact are put in issue, they are tried by a jury. Judgment is given either on the demurrer or after nonsuit or verdict. The party succeeding is entitled to the costs of these proceedings, and, if a trial takes place, the jury may assess damages. If the court decide in favour of the party applying, the writ issues and forbids the court and other party from further proceeding. In such case, if the ground of application was that the court had no jurisdiction at all in the suit, the writ of prohibition is final. But, if the ground is that something had arisen not cognizable by the court, during the progress of a suit, concerning a matter properly within its jurisdiction, the prohibition is not final. In such case the question is referred to the proper tribunal for trial, and if found against the applicant, the suit may be then resumed. In either case, where the court decides in favour of the party against whom prohibition is prayed, or the verdict has been afterwards in his favour, the court awards a consultation, as it is called, by which the cause is again remitted to the original court. If parties proceed after a writ of prohibition has been obtained and served, they are liable to an attachment for contempt. No prohibition for the same matter lies after a consultation has been awarded upon the merits.

(Comyns's *Digest;* Bacon's *Abridgment;* Viner's *Abridgment;* tit. 'Prohibition,' 2 *Inst.*, 599; 3 Bl. *Com.*, c. 7.)

The right of the common-law courts to issue writs of prohibition, and the mode in which they exercised that right, have often been the subject of great dispute between the common-law judges and the ecclesiastics. The latter have several times exhibited many articles of grievance before the parliament and privy council against the former. The most famous of these are the 'Articuli cleri,' exhibited by Archbishop Bancroft, in the name of the whole clergy, in the third year of the reign of James I. They are given at length by Lord Coke (2 *Inst.*, 599), with a full view of the nature of the controversy between the parties, and the unanimous answers of the judges.

PROITHERA. [Night-Jars, vol. xvi., p. 228.]

PROJECTILES, THEORY OF. This subject usually comprehends the investigation of the relations between the space described, the time of motion, and the velocity acquired by a body when impelled in any direction by some motive force.

The circumstances of a body descending from a high place towards the earth by the action of gravity, and those of a body projected vertically upwards from the earth, on the supposition, in both cases, that the body moves in a non-resisting medium, have been noticed in the article Fall of Bodies; and the circumstances attending the motion, both in a resisting and a non-resisting medium, of a body impelled by fired gunpowder, when the impulse is in a direction parallel or oblique to the horizon, have been investigated in the article Gunnery. It is intended therefore in this place only to consider the laws of the vertical ascent and descent of bodies in resisting media, the force of gravity, or of terrestrial attraction, being supposed to be constant; and in non-resisting media, under the condition that the force of gravity is variable.

Let a spherical body descend vertically from a state of rest in a resisting medium (air, water, &c.) supposed to be of uniform density; and let it be admitted, agreeably to the Newtonian hypothesis (*Princip.*, lib. ii., sec. 1; *Schol.*), that the resistance of the medium is proportional to the square of the velocity, v, acquired at any moment in the descent; then, if we suppose U to be the velocity which a body falling towards the earth in the resisting medium would acquire when that resistance becomes equal to the accelerative force of gravity, the latter being, as usual, represented by g (=32·2 feet), we shall have $U^2 : g :: v^2 : \frac{v^2}{U^2}g$; and the last term represents the resistance of the medium at the instant when the velocity is v; hence the accelerative force by which the falling body is urged at such moment is expressed by $g-\frac{v^2}{U^2}g$.

Now s being the space descended by the body in the time t, and v being the velocity as before, an accelerative force is represented by $\frac{dv}{dt}$ and by $\frac{d^2s}{dt^2}$. [Force.] Therefore $\frac{dv}{dt}=$

$g - \frac{v^2}{U^2}g$; whence $g\,dt = \frac{dv}{1-\frac{v^2}{U^2}}$; and integrating this equation, observing that $v = 0$ when $t = 0$, we have $t = \frac{U}{2g}$ hyp. log. $\frac{U+v}{U-v}$, or $\frac{2gt}{U}$ = hyp. log. $\frac{U+v}{U-v}$; or again, passing from logarithms to numbers, $\frac{U+v}{U-v} = e^{\frac{2gt}{U}}$ (e being the base of the hyperbolic logarithms); whence $v = U\frac{e^{\frac{2gt}{U}}-1}{1+e^{\frac{2gt}{U}}}$, and this second member being developed, gives $v = gt - \frac{g^3t^3}{3U^2}$ + &c. Substituting, in this equation, $\frac{ds}{dt}$ for v, and again integrating, we have $s = \frac{1}{2}gt^2 - \frac{g^3t^4}{12U^2}$ + &c.

These equations for s and v give the space descended and the velocity acquired at the end of any given time t from the moment when the motion commenced. For tables of the values of U (the terminal velocities) for iron balls, see Dr. Hutton's 'Tracts,' tract 37.

Next, let a body be projected vertically upwards in a uniformly resisting medium with an initial velocity $= V$; and let the body be of a spherical form so that U may be the same as before: then, the force of gravity and the resistance of the medium acting in a direction opposite to that of the projectile force, we have now $\frac{dv}{dt} = -g - \frac{gv^2}{U^2}$; whence $-g\,dt = U\frac{d.\frac{v}{U}}{1+\frac{v^2}{U^2}}$. This equation, being integrated, gives $-gt = U$ arc tan. $= \frac{v}{U}$ + *const.*; and considering that $v = V$ when $t = 0$, the constant is equal to $-U$ arc tan. $= \frac{V}{U}$; putting $-C$ to represent this term, we have $\frac{C-gt}{U}$ = arc tan. $\frac{v}{U}$; and passing from arcs to tangents, we have $\frac{v}{U} = \tan.\frac{C-gt}{U}$, or $v = U \tan.\frac{C-gt}{U}$. Multiplying both members of the last equation by dt, and putting dx for its equal $v\,dt$, this equation becomes $dx = U \tan.\frac{C-gt}{U}dt$; which integrated gives $x = \frac{U^2}{g}$ hyp. log. cos. $\frac{C-gt}{U}$ + *const.* The constant is determined by considering that $x=0$ when $t=0$; whence *const.* $= -\frac{U^2}{g}$ hyp. log. cos. $\frac{C}{U}$: therefore $x = \frac{U^2}{g}$ hyp. log. $\frac{\cos.\frac{C-gt}{U.}}{\cos.\frac{C}{U}}$

Making $v = 0$ in the above equation for v, we get the value of t when the body has attained its greatest height; and substituting the value of t so found in the last equation for x, we have that greatest height.

When arrived at the greatest height, the body would begin to return towards the earth; and it may be shown that the velocity acquired by the body on arriving at the place from whence it was projected would be less than the initial velocity; also that the time of the descent would differ from the time of ascent.

If we imagine the earth to be perforated in the direction of a diameter; and if a body be allowed to descend towards the centre in a non-resisting medium from any point in the line of perforation: the law of attraction being in such a case directly proportional to the distance of the body at any time from the centre of the earth (Newton, lib. *i.*, prop. 73), the relation between the space descended and the time of descent may be thus investigated.

Let r be the radius of the earth, and let the force of gravity at the surface be represented by g; then x being any distance from the centre, the attracting force acting on the body at that distance will be $\frac{gx}{r}$. Therefore since the distance of the body from the centre diminishes, while the time reckoned from the moment of departure increases, we shall have $\frac{d^2x}{dt^2} = -\frac{gx}{r}$. This equation will be found to be verified by assuming $x = a \cos.\, t\sqrt{\frac{g}{r}} + b \sin.\, t\sqrt{\frac{g}{r}}$; which being differentiated once, gives $\frac{dx}{dt} = -a\sqrt{\frac{g}{r}} \sin.\, t\sqrt{\frac{g}{r}} + b\sqrt{\frac{g}{r}} \cos.\, t\sqrt{\frac{g}{r}}$. Now, in the equation for x, making $x = r'$ (any given distance from the centre) when $t=0$, we have $a=r'$; and in the equation for $\frac{dx}{dt}$, making $\frac{dx}{dt}$ (the velocity) $=0$ when $t=0$, we have $b=0$. Consequently $x = r' \cos.\, t\sqrt{\frac{g}{r}}$; whence x is found when t is given: but when $x=0$, we have $t\sqrt{\frac{g}{r}} = \frac{\pi}{2}$ (where π represents the half circumference of a circle whose radius is equal to unity) whatever be the value of r'. Therefore $t = \frac{\pi}{2}\sqrt{\frac{r}{g}}$ will express the time of falling from the surface to the centre of the earth.

Let it now be required to investigate the relations between the times, the spaces described, and the acquired velocities when a body falls in vacuo from a point at such a distance from the earth that the attraction of gravity upon it may be considered as variable; and when, agreeably to the law of nature, its intensity is inversely proportional to the square of the distance. (*Princip.*, lib. i., prop. 74.) Then, if r be the radius of the earth, p the distance from the centre of the earth to the point above the latter from whence the body is let fall; and if x be the space descended in any time t: also if g be the force of gravity at the earth's surface, we shall have $\frac{1}{r^2} : g :: \frac{1}{(p-x)^2} : \frac{r^2g}{(p-x)^2}$; and the last term expresses the force of gravity at the place of the body when the space descended is x and the time of descent is t: therefore $\frac{d^2x}{dt^2} = \frac{gr^2}{(p-x)^2}$.

In order to integrate this equation, multiply both sides of it by $2dx$; and then the first integral will be $\frac{dx^2}{dt^2} = \frac{2gr^2}{p-x}$ + *const.* The constant may be found on considering that $\frac{dx}{dt}$ (the velocity) $= 0$ when $t = 0$, when also $x = 0$; therefore *const.* $= -\frac{2gr^2}{p}$, and $\frac{dx^2}{dt^2} = 2gr^2\left(\frac{1}{p-x} - \frac{1}{p}\right)$; whence $\frac{dx}{dt} = \sqrt{\left\{\frac{2gr^2}{p}\cdot\frac{x}{p-x}\right\}}$. This equation may be put in the form $\frac{(p-x)\,dx}{\sqrt{px-x^2}} = \frac{2gr^2}{p}dt$; and by the rules of integration we have $t\sqrt{\frac{2gr^2}{p}} = \sqrt{px-x^2} + \frac{1}{2}p$ arc cos. $= \frac{p-2x}{p}$: there is no constant to be added, because $x=0$ when $t=0$. From this equation t may easily be found when x is given: likewise from the equation for $\frac{dx}{dt}$ we have the velocity when x is given. And if x be made equal to $p-r$, the whole distance of the body from the surface of the earth, we shall obtain the whole time of the descent and the velocity acquired at the end of that time.

Again: let it be supposed that a body may be projected vertically upwards in vacuo from the surface of the earth, and be subject to a variably accelerative force of attraction downwards. Let r be the semidiameter of the earth as before; and now let x be the height ascended from the surface at the end of the time t: also let h be the height due to the initial velocity, supposing the latter to have been acquired by a body falling in vacuo with a uniformly accelerative force; then $2gh$ will express the square of that velocity. By the law of attraction we have $\frac{1}{r^2} : g : : \frac{1}{(r+x)^2} : \frac{gr^2}{(r+x)^2}$; and the last term expresses the intensity of the attractive force at the end of the time t from the commencement of the ascent. Hence $\frac{d^2x}{dt^2} = \frac{gr^2}{(r+x)^2}$.

In order to integrate this equation, multiply both sides by $2dx$; then we get $\frac{dx^2}{dt^2} = -\frac{2gr^2}{r+x} + const.$: and to find the constant, it must be observed that $x=0$ when $\frac{dx^2}{dt^2} = 2gh$; therefore $const. = 2g\,(h+r)$ and $\frac{dx^2}{dt^2} = 2g\,(h+r) - \frac{2gr^2}{r+x}$, or $= \frac{2g\{hr+(h+r)x\}}{r+x}$. Taking the square roots and transposing, we have $\frac{\sqrt{r+x}}{\sqrt{\{hr+(h+r)x\}}}\,dx = \sqrt{2g}\,.\,dt$, and this equation may be put in the form

$$\frac{(r+x)dx}{\sqrt{\{hr^2+(2h+r)rx+(h+r)x^2\}}} = \sqrt{2g}\,.\,dt;$$

or (h being small compared with r) rejecting h when added to r, the equation becomes

$$\frac{(r+x)dx}{\sqrt{\{hr^2+r^2x+rx^2\}}} = \sqrt{2g}\,.\,dt.$$

Now, multiplying the numerator and denominator of the first member by $2r$, and putting the whole in the form

$$\frac{(r^2+2rx)dx}{2r\sqrt{\{hr^2+r^2x+rx^2\}}} + \frac{r\,dx}{2\sqrt{\{hr^2+r^2x+rx^2\}}} = \sqrt{2g}\,.\,dt,$$

the rules of integration give

$$\frac{1}{r}\sqrt{\{hr^2+r^2x+rx^2\}} + \frac{\sqrt{r}}{2}\,\text{hyp. log.}\left\{\frac{r^{\frac{3}{2}}}{2} + x\sqrt{r} + \sqrt{\{hr^2+r^2x+rx^2\}}\right\} + const. = \sqrt{2g}\quad t.$$

The constant may be determined by considering that $x = 0$ when $t = 0$; and thus t may be found when x is given.

What has been stated respecting the vertical descent and ascent of bodies may be understood to apply also to bodies descending and ascending on inclined planes; the force of gravity on the plane being represented by g sin. a, where a is the inclination of the plane to the horizon.

In Dr. Hutton's Tracts there is given a problem for determining the height ascended by a ball when projected vertically upwards with a given velocity, and resisted by the the air; the force of gravity being supposed to be constant, and allowance being made for the decrease in the density of the air as the ball ascends. (*Tract* 37, prob. v.) In the same tract there is also given (prob. xi.) an investigation of the circumstances attending the motion of a body in air when projected horizontally on a smooth surface so that the action of gravity may produce no effect on the motion of the body, the resistance varying as the square of the velocity. Also in Poisson's 'Traité de Mécanique,' the following remarkable circumstance is demonstrated:—If a body be projected, as in the last case, and if the resistance of the air vary as the square root of the velocity; the motion of the body will at first diminish gradually till it becomes equal to zero; and afterwards it will go on increasing indefinitely. (Tom. i., no. 136, ed. 1833.) But for the demonstrations of these problems our limits oblige us to refer the reader to the works just mentioned.

PROJECTION. The practical parts of this most important application of geometry are noticed in the articles MAP, PERSPECTIVE, GNOMONIC, GLOBULAR, ORTHOGRAPHIC, STEREOGRAPHIC, MERCATOR, &c. The present article is merely intended to point out the general principle of all projections, and also to note the theoretical importance of the subject.

Imagine a surface of any kind, through every point of which passes a curve the character of which depends upon that point, insomuch that, given a point of the surface, the curve which passes through that point is given. If any second surface be taken, which is cut by all the curves emanating from the points of the first, every point of the first surface has a point corresponding to it on the second. Thus if the curve passing through A on the first surface cut the second surface in a, the point A is said to be projected on the second surface at a by means of the projecting curve Aa. Similarly any line on the first surface is projected into a line on the second, which last contains the projections of all the points on the first; and the projections of the several boundaries of a figure on the first surface are boundaries of a figure on the second, which is the projection* of the first figure.

It is not perhaps usual to make so wide a definition of projection in general, since the only cases which are commonly considered are those in which the projecting lines are all straight, and either parallel to one another, as in the orthographic projection, or all passing through the same point, as in common perspective. But such a conception of projection is necessary: in Mercator's projection, for example, the points of a sphere are projected on a circumscribing cylinder, not by straight lines passing through a point, but either by straight lines disposed according to a complicated law, or by curves. If a relation between any point and its projection be given, so that either can be found from the other, the passage from one to the other may be made either on a straight line or on an infinite variety of curves: but it may happen that the law which the disposition of the projecting straight lines follows may be of a more difficult character than that which would be required if a curve, not in itself so simple as a straight line, were substituted.

When the foundations of plane geometry were fixed, and the first principles of solid geometry were superadded, it was natural that the very simple idea of the perspective projection should excite attention. In a country in which the first principles at least of drawing were practically known, the following problem must have suggested itself to the geometers: If through a given point lines be drawn through all the points of the boundary of a plane figure, until they are stopped by another plane, required the figure traced out upon the second plane. A straight line was known thus to give a straight line: a moment's consideration of the circle, the only other line then considered, would show that a projection of a circle and a plane section of a cone are the same things. Hence probably the first idea of a conic section; and thus, if the conjecture be correct, the attention was turned from that point, which would, if properly kept in view, have led to the theory of projections in place of one isolated branch of it. The properties of the conic sections, as deduced in the antient manner from the cone, are neither so general nor so easy as they might be made; and it may be confidently expected, considering the progress which the doctrine of projections has made of late years, that the method of considering the ellipse, hyperbola, and parabola as projections of the circle, will become established in elementary teaching, in preference to the detached geometrical and algebraical methods now in use.

We have already spoken of the geometry of projections [GEOMETRY, p. 156]: unfortunately there is no elementary work which gives a general view of its first principles; and until such a work shall appear, the student must search for himself the writings of Monge, Carnôt, Chasles, Poncelet, &c. The 'History of Geometry,' by M. Chasles, referred to in the article cited, will furnish many more references; and the 'Propriétés Projectives des Figures,' by M. Poncelet, is perhaps the work in which the student may most easily make an advantageous beginning of the subject.

The basis of the theory of projections must be the investigation of properties which, being true of a figure, are therefore true of its projections. Some of these are evident enough: thus the projection of an intersection of two lines is the intersection of its projections; if two curves touch one another, their projections touch at a point which is the projection of the point of contact. But the following property, which is projective, that is, true of the projections of every figure of which it is true in the first instance, will give a good idea of the facility with which certain properties of the conic sections may be deduced from the circle.

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* The projection of a line or figure has seldom any other name; in astronomy however the projection of a planet's distance from the sun on the plane of the ecliptic is sometimes called the *curtate* distance.

Let there be any figure in which the product of certain straight lines is equal to, or in any absolutely given ratio to, the product of certain others, each line being denoted by an initial and terminal letter in the usual way. We might say, in more geometrical language, let there be any number of ratios which, compounded together, give either a ratio of equality or a given ratio. Two simple conditions being fulfilled, this property will be as true of the projections as it is of the figure itself. These conditions are, first, that every initial and terminal letter shall occur the same number of times on both sides of the equation; secondly, that for every line on the first side, there shall be a distinct line on the other side, which is in the same straight line. For example (the reader may draw the diagram for himself), let each of the sides of the triangle ABC cut one circle, namely, AB in P and Q, BC in R and S, CA in T and V; the order of the points being APQBRSCTVA. Then by the properties of the circle, it is easily seen that

$$\mathrm{AV.\,AT.\,CS.\,CR.\,BQ.\,BP} = \mathrm{AP.\,AQ.\,BR.\,BS.\,CT.\,CV.}$$

In this equation, A, B, and C occur twice on each side, and each of P, Q, R, S, T, once. Moreover, out of AB there are two segments, AP and AQ, on the first side, and as many, BQ and BP, on the second; and the same of BC and CA. He then who is acquainted with the theory of projections, immediately knows that this property is true of any projection of a circle, or of any conic section: but he would be an energetic algebraist who should attempt to prove this (or still more the equally demonstrable similar property in the case of a polygon of *n* sides) by the common algebraic methods.

The proof of the preceding general *projective* property is not difficult. Take a point O outside the plane for the centre of projection, and let $\mathrm{OA} = a$, $\mathrm{OB} = b$, &c.; moreover let the angle made by a and b be called (ab). Let A′, B′, &c. be the projections of A, B, &c., let $\mathrm{OA}' = a'$, $\mathrm{OB}' = b'$, &c., and let $(a'b')$ be the angle of a' and b', which is $= (ab)$. Moreover let [AB] mean the perpendicular let fall upon AB from O, &c. It is then easily proved that

$$\mathrm{AV} = \frac{av.\ \sin\,(av)}{[\mathrm{AV}]},\ \ \mathrm{AT} = \frac{at.\ \sin\,(at)}{[\mathrm{AT}]},\ \&\text{c.}$$

Substitute these values in the equation, and it will be readily seen that the existence of the two conditions above named amounts to all the quantities except the sines of the angles being eliminable by division. There remains then

$$\begin{aligned} \sin\,(av).\ \sin\,(at).\ \&\text{c.} &= \sin\,(ap).\ \sin\,(aq).\ \&\text{c.} \\ \text{or}\ \sin\,(a'v').\ \sin\,(a't').\ \&\text{c.} &= \sin\,(a'p').\ \sin\,(a'q').\ \&\text{c.} \end{aligned}$$

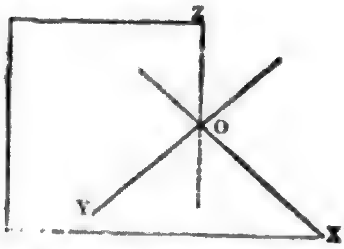
In this write a', b', [A′V′], &c. where there were previously a, b, [AV], &c., which will amount (by the conditions) to multiplying both sides by the same quantities: there will then remain an equation which is obviously

$$\mathrm{A'V'.\ A'T'.}\ \&\text{c.} = \mathrm{A'P'.\ A'Q'.}\ \&\text{c.},$$

and in the same way any other case may be proved.

PROJECTION OF MATHEMATICAL DIAGRAMS.

The diagrams by which mathematical students (and even writers) represent their solid figures are generally so imperfect, that it may be worth while to explain how, in all cases of sufficient importance, a good drawing may be made with very little trouble. The demonstration may be found in the 'Cambridge Mathematical Journal,' No. 8, p. 92. The projection is supposed to be the **Orthographic**, in which the eye is at an infinite distance, and all parallels are projected into parallels, &c.



Let O X, O Y, O Z, be the intended projection of the three axes of co-ordinates, the dark lines being supposed to belong to that quarter of space in which lies a line drawn to the eye from the origin O. Each of the angles Y O Z, Z O X, X O Y, is then greater than a right angle. The following table contains numbers sufficiently near for the purpose, proportional to the square roots of the sines of twice the angles written in the opposite columns.

90°—180°	000	105°—165°	707	120°—150°	931
———	132	———	718	———	935
91—179	187	106—164	728	121—149	940
———	229	———	738	———	944
92—178	264	107—163	748	122—148	948
———	295	———	757	———	952
93—177	323	108—162	767	123—147	956
———	349	———	776	———	959
94—176	373	109—161	785	124—146	963
———	396	———	793	———	966
95—175	417	110—160	802	125—145	969
———	437	———	811	———	972
96—174	456	111—159	818	126—144	975
———	474	———	826	———	978
97—173	492	112—158	834	127—143	980
———	509	———	841	———	983
98—172	525	113—157	848	128—142	985
———	541	———	855	———	987
99—171	556	114—156	862	129—141	989
———	571	———	869	———	991
100—170	585	115—155	875	130—140	992
———	599	———	882	———	994
101—169	612	116—154	888	131—139	995
———	625	———	894	———	996
102—168	638	117—153	900	132—138	997
———	650	———	905	———	998
103—167	662	118—152	911	133—137	999
———	674	———	916	———	999
104—166	685	119—151	921	134—136	1000
———	696	———	926	———	1000
				135—135	1000

The lines between the degrees are to be understood as representing half degrees: thus opposite to 991 should come 129½°—140½°. The use of this table is as follows:—suppose the angles Y O Z, Z O X, X O Y, to be severally 123°, 104½°, and 132½°: thus:—

Y O Z = 123°	956	x
Z O X = 104½°	696	y
X O Y = 132½°	998	z

Opposite to the angles put down the numbers belonging to them in the table, and opposite to each number the co-ordinate whose capital letter does not appear in the angle. Then opposite to x, y, and z, we have 956, 696, and 998. These numbers show the proportions which the projections of equal lines bear to one another on the three axes. Thus a foot parallel to x is to a foot parallel to y, as 956 to 696 in the projection. If then a card be taken, and the angle Z O X be cut out; and if a slit be made in the direction of O Y, just wide enough to permit a pencil to travel, scales of equal parts may be laid down on O X, O Y, and O Z, which shall represent the projections of equal lines in the three directions; and this may be done once for all. It would be easy enough to make a general scale by which the equal parts proper for any angle should be taken out at once.

The isometrical perspective of Professor Farish [Perspective, p. 492] is the simplest case of this, namely, that in which the angles are each 120°. The only difference between this particular case and any other is, that the former requires only one scale of equal parts, whereas the latter requires either two or three. In other respects this method of using them is precisely the same.

PROJECTION OF THE SPHERE, SHADOWS, &c. [Perspective.]

PROKOPHIEV, IVAN PROKOPHIEVITCH, an eminent Russian artist, was born at St. Petersburg, January 25, 1758. At the age of twelve he began to study sculpture under Gilet, one of the professors at the Academy of Fine Arts, and during the eight following years obtained medals and prizes for various bas-reliefs, to which branch of the art he afterwards more especially applied himself. Having gone through the course of studies at the academy, he was sent, at its expense, in September, 1779, to perfect himself under Julien, at Paris, where, in the following year, he executed a bust in marble of Prince Gagarin, and a relief in terra-cotta representing Moses, which last, and a similar one of Morpheus, are in the Academy at St. Petersburg. Having passed a few months at Berlin and Stettin, on his way home, he returned to Petersburg in the summer of 1784; and from that time till within a few years preceding his death, he continued to practise his art most industriously. His productions are so numerous that even a mere list of them would extend to a considerable length; but the majority of them were certainly not of the kind to excite much public attention, as they consisted chiefly of bas-reliefs, medallions, and works of that class, on a comparatively small scale, and executed for private individuals. Many of them besides were only in terra-cotta. Taken generally however they are allowed to display considerable powers of invention and ability in composition. In the Imperial Library at Petersburg there are sixteen small caryatides and twenty-eight bas-reliefs by him. His last work was a bust of the Polish poet Trembecki; soon after the completion of it he was attacked by a complaint that deprived him of the use of his right hand, at least rendered him incapable of employing it either in modelling or designing. He died at St. Petersburg, February 10, 1828, in his 71st year.

The earlier productions of this artist have, with much beauty, somewhat also of the French mannerism of that day in sculpture, caught, no doubt, from his instructor Julien; but he afterwards completely corrected that fault, and his later works display a more noble and classical style.

PROLOCU'TOR. [Convocation.]

PROLOGUE (πρόλογος, from πρὸ, *before*, and λόγος, *speech*) is usually applied in English to the short poem or verses which are sometimes prefixed to new plays to recommend them to the favour of the reader or spectators. In the comedies of Plautus and Terence we find prologues of this kind. Aristotle (*De Poetic.*, c. 12) gives the name of prologue to that part of the Greek tragedy which precedes the Parodos, or first speech of the chorus.

PROMERO'PIDÆ, PRO'MEROPS. [Upupidæ.]

PROME'THEUS (Προμηθεύς). The story of Prometheus takes different forms in the Greek legends, but they agree generally in representing the close connection between him and the human race. He is represented by Æschylus as one of the Titans, who incurred the resentment of Zeus for taking the part of mortals when Zeus intended to crush them and to send them to the abode of Hades, and also for giving them fire and teaching them all the arts. As a punishment, Zeus binds him to a rock in Scythia, and appoints a vulture to prey on his liver. This is the subject of the 'Prometheus Desmotes,' or 'Prometheus Bound,' of Æschylus.

Another old form of the legend, which closely resembles that which Æschylus followed, is given in the 'Theogony' of Hesiod. Hesiod says that when the gods and men were engaged in a controversy with one another at Mecone (an antient name of Sicyon), Prometheus, wishing to deceive Zeus, took an ox, and dividing it, placed the flesh and the viscera in the hide, and the bones of the ox in the inside fat, and then asked Zeus to make his choice. Zeus, though aware of the deception, chose the bones and the fat, 'designing evil in his mind against mortal man,' and in revenge withheld fire from man. Prometheus however secretly stole fire from heaven and gave it to man, and Zeus in return bound Prometheus with chains to a pillar, and sent an eagle to prey upon his liver. Zeus also, in order to injure man, created Pandora, and, after bestowing upon her numerous gifts, sent her to man a 'beautiful mischief, for from her is sprung the race of women, of whom the race is thoroughly destructive.' Hesiod, in his poem entitled 'Works and Days,' gives at greater length the legend of Pandora, and says that Zeus sent her to Epimetheus; and that he, not following the advice of Prometheus, who had told him never to receive a gift from Zeus, but to send it back again, took her into his house. These stories are supposed to have a meaning: Prometheus is the personification of *fore-thought*, and Epimetheus of *after-thought*.

There is another form of the legend respecting Prometheus, in which he is represented not merely as the friend and protector of the human race, but as their creator. This form is an old one, though neither Hesiod nor Æschylus has followed it. There is a fragment of Callimachus, in which he says, 'If Prometheus formed thee, and thou art not sprung from some other clay.' Plato has adopted this form of the legend in the 'Protagoras,' but with the variation that Prometheus is not the creator, but only the person who endowed man with his senses. He says that the gods formed all mortal animals within the earth, out of the mixture of earth and fire, and of as many things as are mingled with earth and fire, and that they entrusted to Prometheus and Epimetheus the business of providing them with all the faculties necessary for their preservation. He then proceeds to say that Epimetheus begged of Prometheus that he might have the business himself in the first place, and that Prometheus should overlook his work when he had done it. Epimetheus accordingly proceeds to his work, and bestows upon the different animals the means of preserving themselves; but when man came to be provided for, who was to be superior to all other animals, Epimetheus had been so prodigal of all his resources, that he had nothing left to bestow upon man. Prometheus, being at a loss how to remedy the omission of Epimetheus, steals from Hephæstus and Athena fire and the intelligence which is displayed in works of art, and gave them to man; so that by means of this wisdom, and fire as its instrument, men were endowed with the power of providing for themselves.

Some modern writers suppose that, in the earliest form of the legend, Prometheus was not considered as a deity, but simply as the representative of the human race, and that afterwards he was made a god, the friend and protector of man, and at last their creator.

PROMISSORY NOTES. [Bill of Exchange.]

PROMO'TUS, ÆLIUS (Αἴλιος Πρόμωτος), an Alexandrian physician, whose date is not exactly known. Villoison (*Anecd. Gr.*, tom. ii., p. 179, not. 1) says that he lived after the time of Pompey the Great, but Passevin (*Bibl. Select.*, p. 17), and Ant. Bongiovanni, in his letter to Giov. della Bona (Io. à Bona, *Tract. de Scorbuto*, Veronæ, 1781, 4to.), consider him to be much more antient. He is probably the person mentioned by Galen (*De Compos. Medicam. sec. Loca*, lib. iv., cap. 6); and he is the author of several Greek medical works, which are still in MS. in different European libraries. The prologue to one of these, entitled δυναμερὸν, i.e. *Congeries Medicaminum secundum Loca*, together with some extracts from it, is to be found in Bona's treatise quoted above, and is reprinted by Kühn, in his 'Additam. ad Elench. Medicor. Vet. à Io. A. Fabricio exhibit.,' 4to., Lips., 1826. The extracts consist of recipes for different diseases. The work exists in MS. in St. Mark's Library at Venice, No. ccxcv., 4to. (Morell, *Bibl. Inst.*, *cum Græc. tum Latin.*, i. 170.) Fabricius mentions another of his works, entitled ἰατρικά, φυσικὰ, καὶ ἀντιπαθητικά, which exists in MS. at Leyden among the books belonging to Voss. Schneider says (*Præfat. in Nicand. Alexipharm.*, p. 19) that, judging from an extract sent him by Ruhnken, the work is so full of absurdities as not to deserve to be published. Another of his works, entitled περὶ ἰοβόλων καὶ δηλητηρίων φαρμάκων, is to be found in the libraries at Rome and at Paris. Mercuriali has inserted a few fragments in his 'Variæ Lectiones' (lib. iii., cap. 4), and several times quotes it in his work 'De Venenis, et Morbis Venenosis,' lib. i., cap. 16; lib. ii., cap. 2), from which it appears (lib iii., cap. 4) that he agreed with Ælian (*De Nat. Anim.*, lib. vi., cap. 20), Apollodorus (ap. Plin., *Hist. Nat.*, lib. xi., cap. 30), and Nicander (*Ther.*, v 769, &c.), in dividing scorpions into nine species. Kühn tells us (*loco cit.*) that Weigel also meditated an edition of the δυναμερὸν.

PRONOUNS, the name given by grammarians to certain words which are used as substitutes for the names of persons and things. Pronouns properly so called are commonly divided into personal, demonstrative, relative, and interrogative pronouns; but it appears probable that all pronouns, at least with the exception of the first and second personal pronouns, were originally demonstrative. William Humboldt remarks that the first and second personal pronouns 'are not mere substitutes for the names of the persons for whom they stand, but involve the personality of the speaker and of the person spoken to, and the relation between them:' and in writing and conversation there is frequently hardly any name which can so clearly designate the person intended as the appropriate personal pronoun. The third personal pronoun in English appears to have been originally a demonstrative, and to contain the same root, *ta*, *sa*, or *ha*, which occurs in the demonstrative pronoun in the Latin, Greek, and other cognate languages. The different forms of the demonstrative pronoun in these languages is explained under Article, and its declension, as well as that of the first and second personal pronouns, is given under Language, p. 310.

The relative pronoun may also be regarded as a demonstrative; for whether the pronoun is used to denote an object pointed out at the time by the speaker, or an object mentioned just before, or one which is to be immediately brought before the hearer's mind, it is equally demonstrative. In the last of those cases the pronoun is called a relative, as 'I saw the man *whom* you mentioned.' In English we have two forms for the relative, *that* and *who* or *which*. The former is the same word as the demonstrative; the latter contains the same root as we find in the Latin *qui*, the Sanscrit, Zend, and Lithuanian *ka*, and the Gothic *hver* and *hva*. The interrogative pronoun is the same as the relative in English and many of the cognate languages, and only differs from the relative in referring to something subsequent and unknown; whereas the latter refers to an antecedent and definite subject.

PRONUNCIATION. [ORATORY.]

PRONY, GASPARD CLAIR FRANÇOIS MARIE RICHE DE, was born at Chamelet, in the department of the Rhone, July 22, 1755. His father was a member of the 'parliament,' or chief civil court of the antient principality of Dombes; and at the College of Thoissey in that principality Prony received his education 'till 1776, when he entered the Ecole des Ponts et Chaussées.' Here his assiduity was such as to lead Perronnet to foretell that he would one day occupy his own position, that of head of the establishment. He first became known as an author by an Essay on the 'Thrust of Arches,' published in 1783, about which time he began to be employed, under Perronnet, upon several public works, among which may be mentioned the restoration of the port of Dunkirk (1783), and the erection of the bridge of Louis XVI. (1787-90), of which last the engineering plan is said to have been drawn up and its execution superintended by Prony.

In 1790, he published the first volume of his 'Hydraulic Architecture.' The second appeared in 1796. Prior to this, the only work of the kind accessible to the engineer was the standard work bearing the same title, by Belidor, published in 1737-53, so that, as Delambre observes, the progress which the theory of mechanics had made in the hands of Euler, D'Alembert, Lagrange, and Laplace, had lain without real application to the arts of construction. Prony's work is perhaps the first of an elementary character in which the directions of forces, and the systems on which they act, are referred to rectangular co-ordinate axes. It contains a clear exposition of the steam-engine, at a time when the steam-engine was scarcely known on that side of the Channel; but his empirical formulæ for determining the elasticity of steam, the investigation of which occupies a considerable portion of the second volume, have been entirely superseded by more recent researches. His method of determining the diameter of a steam-cylinder Tredgold designates as 'little better than telling the artist to guess at it, and correct his guess by an intricate formula.' The same author remarks that the labours of Prony in this department 'afford the strongest evidence that mere mathematical talent is not sufficient for the promotion of mechanical science, otherwise the principle of the steam-engine would not have remained to be investigated.'—(Tredgold *On the Steam-Engine*, Lond., 1838, 4to., i., p. 33.)

Among other scientific projects of the French revolutionary government at this period, was that, suggested by Carnot and others, of computing a set of mathematical tables, by which it was supposed two objects would be attained:—the application of the decimal division of moneys, weights, and measures, then recently introduced, would be facilitated; and the world astonished by the 'most vast and imposing monument of calculation which had ever been executed or even conceived.' The direction of this laborious undertaking was confided to Prony in 1792 (year ii.), and with him were associated three or four of the principal mathematicians of Paris, including Legendre. It was however easy to foresee that their joint efforts, and the exclusive devotion of the rest of their lives, would alone be inadequate to the completion of the task they had undertaken. Occupied with this discouraging reflection, Prony opened by accident a volume of Adam Smith's 'Wealth of Nations,' at a part where the author is instancing the manufacture of needles, in illustration of the principle of the division of labour. 'Why,' thought Prony, 'should not the same principle be applicable, and with equal advantage, in the manufacture of logarithms?' Pondering on the practicability of this, he retired into the country, and in a few days returned with his plan of operations fully digested. He divided his assistants into three sections; the first, of which Legendre was the president, was occupied in selecting from 'amongst the various analytical expressions which could be found for the same function, that which was most readily adapted to simple numerical calculation, by many individuals employed at the same time.' (Babbage, *Economy of Manufactures*, p. 191.) These expressions included several very elegant formulæ investigated by Legendre, for determining directly the successive differences of the sines. The second section 'consisted of seven or eight persons of considerable acquaintance with mathematics; and their duty was to convert into numbers the formulæ put into their hands by the first section, an operation of great labour; and then to deliver out these formulæ to the members of the third section, and receive from them the finished calculations.....The third section, which consisted of from sixty to eighty members, received certain numbers from the second section, and using nothing more than simple addition and subtraction, they returned to that section the tables in a finished state.' (Babbage, pp. 191-2.) The whole of the calculations, which, to secure greater accuracy, were performed in duplicate, and the two MSS. subsequently collated with care, were completed in the short space of two years. They occupy seventeen 'enormous' folios, and consist of—1, An introduction, containing the analytical formulæ and the mode of using the tables; 2, 10,000 natural sines to 25 places of decimals, with seven and eight columns of differences; 3, The logarithms of 100,000 sines to 14 places of decimals and 5 columns of differences; 4, The logarithms of the ratios of the first 5000 sines to their corresponding arcs to 14 decimal places; 5, A similar table of the ratios of the tangents to their arcs; 6, The logarithms of 100,000 tangents; 7, The logarithms of numbers from 1 to 100,000 to 19 decimal places, and from 100 to 200,000 to 14 decimal places, with 5 columns of differences. In 1820 a distinguished member of the Board of Longitude, London, was instructed by our government to propose to the Board of Longitude of Paris, to print an abridgment of these tables at the joint expense of the two countries· 5000*l* was named as the sum which our government was willing to advance for this purpose, but the proposal was declined, and the great 'Tables du Cadastre' are still confined, in manuscript, to the library of the Paris Observatory.

Prony was appointed professor of mechanics to the Ecole Polytechnique in 1794, the year of its institution, and the same year he became directeur-général des Ponts et Chaussées. As professor to the Ecole Polytechnique he was indefatigable in endeavouring to bring the researches of modern mathematicians within the comprehension of his pupils. This was the object of his 'Mécanique Philosophique,' Par., 1800, 4to. It is an analytical synopsis of mechanics, hydrostatics, and hydraulics. The right-hand pages are each divided into four columns, headed notation, definition, theorems, problems; while those to the left are occupied with so much of investigation and reasoning as is just sufficient to connect the several results in the mind of the student.

In 1798 Napoleon invited him to become a member of the Institute of Egypt, which however he declined, and his refusal was never entirely forgotten or pardoned. Nevertheless, after Napoleon's coronation as king of Italy (1805), Prony was charged with the engineering operations for protecting the province of Ferrara from the further inundations of the Po; and about the same time, or earlier, he was employed in superintending the works then carried on by the French government in the ports of Genoa, Ancona, Pola, and in the Gulf of Spezzia, including some very intricate investigations connected with the tides, currents, and deposits of the Adriatic and canals within the Venetian territory. Napoleon's animosity towards Prony appears to have been counteracted only by a regard for his abilities. We are told by Arago that Prony's researches relative to the thrust of embankments ('poussée des terres'), and on the proper dimensions of lining-walls ('murs de revêtement') Paris, 1802, 4to., with the obvious practical utility of the results to which they led, were the means of securing Napoleon's suffrage. On a later occasion, when the emperor was distributing the new dignities which he had created, a secretary of state reminded him of Prony, to which he merely replied, 'Il ne faut pas mettre son rabot en dentelles; on ne pourrait plus s'en servir pour raboter.'

In 1810 he was appointed (in conjunction with Count Fossombrone of Florence) chief of the Commissione de l'Agro Romano, which had for its object the more effectual drainage and improvement of the Pontine Marshes. 'The results of his labours in this very important task, which he prosecuted with extraordinary zeal and success, were embodied in his "Description Historique et Hydrographique des

Marais Pontins," which appeared in 1823, and which contains a very detailed account of the past, present, and prospective condition of those pestilential regions, and a very elaborate and scientific description of the principles which should guide us in all similar cases in order to effect their permanent restoration to healthiness and fertility.' [Pomptine Marshes.] (*Edinburgh Journal of Science*, xv., p. 527.)

After the Restoration he continued to be employed in various important works, among which was the formation of extensive embankments near the mouth of the Rhone. In 1817 he became a member of the Bureau de Longitude: the following year he was elected one of the fifty foreign members of the Royal Society, London: in 1828 he was created a baron by Charles X.; and in 1835 a peer of France. He died at Aonières, near Paris, the latter end of July, 1839.

In his professional character Prony was the reverse of imperious. He gave his opinion on all occasions with exemplary frankness. Those who were associated with him in any of his undertakings continued ever after his friends, and there is no instance of a pupil claiming his support without its being cordially granted. That he was mindful of his obligations to others is shown by his calling on Arago in 1837, and desiring him not to omit in his 'Eloge of Carnot,' then about to be published for the first time, that the latter had saved his (Prony's) life in 1793. As a mathematician and philosopher, though inferior to some of the great men of his day, he was certainly one 'of whom his country may justly be proud, whether we consider the extent and character of his scientific attainments, or the variety of important, practical, and useful labours in which his life was spent.'

The following works, with those already mentioned, will, we believe, nearly complete the list of Prony's literary labours:—1, 'Experimental and Analytical Essay on the Laws of Expansion observed by Elastic Fluids, and on the Expansive Force of the Vapours of Water and Alcohol at different Temperatures,' Par., 1794, 4to. (also printed in the first volume of the 'Journal de l'Ecole Polytechnique'); 2, 'Plan of Instruction for the Students of the National School des Ponts et Chaussées, for the year vii.,' Par. 1795; 3, Analysis of the 'Exposition du Système du Monde' of Laplace, Par. 1801, 8vo.; 4, 'Plan of Instruction for the Polytechnic School so far as regards the Equilibrium of Bodies,' Par. 1801, 4to.; 5, 'Report made to the Mathematical and Physical Class of the National Institute, upon divers inventions of Jean Pierre Droz, relative to the Art of Coining,' Par. 1801, 4to.; 6, 'Report on the Memoir of Ducros relative to the supply of Water requisite for Canals,' Par. 1801, 8vo.; 7, 'Results of Experiments for determining the Relation between the French Mètre and the English Foot,' Paris, 1802; 8, 'On the supply of Water requisite for the Canal Saint Quentin' ('Sur le Jaugeage des Eaux Courantes qui doivent alimenter le bassin du passage du Canal Saint Quentin'), Par. 1802, 4to.; 9, 'Physico-Mathematical Researches in the Theory of Flowing Waters,' Par. 1804, 4to.; 10, 'On the Computation of Latitudes and Longitudes,' Par. 1806, 4to.; 11, 'On the Variations in the Inclination of the Seine, and its Amount for each day of the years 1788-89-90, together with the Report made to the Academy of Sciences, January 29, 1791, by Lavoisier, Laplace, and Coulomb,' Par. 1806, 4to.; 12, 'Summary of Lessons on the Motion of Solids and on the Equilibrium and Motion of Fluids,' Par. 1809, 4to.; 13, 'Lessons in Analytical Mechanics delivered to the Royal Polytechnic School,' Par. 1815, 4to.; 14, 'On Bréguet's Metallic Thermometers,' Par. 1821, 4to.; 15, 'On the work of M. Sept-Fontaines relative to the Cubature of Timber,' 4to., no date; 16, 'On Swing-Bridges' ('Ponts à Bascules'), 4to., no date; 17, 'New System of Trigonometrical Levelling,' Par. 1822, 8vo.; 18, 'On the large Logarithmic and Trigonometrical Tables adapted to the new Decimal System of Weights and Measures,' Par. 1824, 4to.; 19, 'On the recently instituted Professorship of the Harp in the Royal School of Music,' Par. 1825, 4to., 12 pages; 20, 'Synopsis (Résumé) of the Theory and Formulæ relative to the Motion of Water in Tubes and Canals,' Par. 1825; 21, 'Report on the Old and New Steam-Engines erected at Paris, au Gros-Caillou,' Par. 1826, 8vo.; 22, 'Fragments of an unedited Memoir,' Lyon, 1827, 8vo. (16 pages); 23, 'Elementary Instructions on the Calculation of Musical Intervals by assuming either the Octave or the Twelfth Octave as the Unit of Comparison;' 'Analytical Formulæ for calculating the Acoustic Logarithm of any proposed Number, &c., with applications to Musical Instruments,' Par. 1832, 4to.; 24, 'Examination of the proposals for levying a Toll ('Projets de Barrage') on the Seine near Hâvre,' Par. 1831, 8vo. (also in the 'Annales des Ponts et Chaussées'); 25, 'On the Inflexions which, after the lapse of twenty years, had taken place in certain straight lines drawn upon the bridge Louis XVI., prior to the removal of the centering, with Formulæ and Tables for calculating the change which settlement ('le tassement') produces in a circular arch,' Par. 1832, 20 pages; 26, 'Formules pour calculer les Hauteurs des Remons occasionés, soit par des Rétrécissements, soit par des Barrages (avec écoulements de fond) pratiqués dans les Lits des Eaux Courantes,' Par. 1835, 8vo. (also in the 'Annales des P. et C.'); 27, 'On the Measurement of the Dynamical Effects of Rotatory Machines,' Par., 4to., no date; 28, 'On Regulating the Duration of the Oscillations of the Pendulum,' Par., 4to., no date.

To the *Recueils de l'Institut* he contributed—1, 'Notice of the Life and Works of Pingré,' tom. i., 1798; 2, 'On the Conversion of Circular Movement into Rectilinear,' ii., 1799. To the *Journal de l'Ecole Polytechnique*—1, 'On a Course of Elementary Analysis, by Lagrange,' tom. i., 1794; 2, 'Course of Mechanics for the Year V.,' ii., 1795; 3, 'Eloge de Lamblardie,' ib.; 4, 'On the Principle of Virtual Velocities and the Decomposition of Circular Motions,' ib.; 5, 'Introduction to Pure Analysis and of Analysis as applied to Mechanics,' ib.; 6, 'Theory of Rotation about a Free Axis,' ib.; 7, 'On the Particular Solutions of Differential Equations and their Application to Engineering,' iv., 1810; 8, 'On the Hydraulic System of Italy,' ib.; 9, 'Detailed Analysis of the Questions relative to the Motion of a Body acted upon by any Powers whatever,' ib.; 10, 'On the New Sluice of M. de Baucourt,' viii., 1809. See also the *Bulletin de la Société Philomathique*; *Annales des Mines*; *Encyclopédie Méthodique* ('Forêts et Bois'); *Connaissance des Temps*, after 1800.

('Discours prononcé par M. Arago, le 3 Août, 1839, sur la tombe de M. de Prony,' given in the *Annuaire* for 1840; *Biographie des Contemporains*; *Edinburgh Journal of Science*, vol. xv.; 'Note sur la Publication proposée par le Gouvernment Anglais, des grands Tables Logarithmiques and Trigonometriques, de M. de Prony,' Paris, 1820, quoted by Babbage in his *Economy of Machinery and Manufactures*, London, 1832; *Parliamentary Papers*, 1823, xv., p. 9, &c.; Querard's *Dictionnaire Bibliographique*; *The Works of Prony*, &c.)

PROOF. [Demonstration; Evidence; Miracle; Oath; Probability.]

PROPE'RTIUS, SE'XTUS AURE'LIUS, a native of Hispellum, or, according to others, of Mevania in Umbria. The year of his birth is not stated by any antient authority, but he himself (iv. 1, 127, &c.) says that he took the toga libera (which was generally taken at the age of fifteen) at the festival of the Liberalia, soon after the battle of Philippi, which was fought in 42 B.C., so that he must have been born about the year 56 B.C. His family was of equestrian rank (iv. 1, comp. with Plin., *Epist.*, vi. 15, and ix. 22), and when, after the campaign of Philippi, Augustus rewarded his veterans with assignments of lands, the family of Propertius was, like many others who had supported the cause of Antony, deprived of their estates. About this time or soon afterwards, young Propertius went to Rome, where he devoted himself entirely to poetry (iv. 1, 134). In Rome he soon attracted the attention and gained the friendship of contemporary poets, such as Ovid, who always speaks of him with fondness (*Trist.*, ii. 465; iv. 10, 53; v. 1, 17; *Ars Amat.*, iii. 334; and in other places). He also enjoyed the patronage of Mæcenas, and lived on the Esquiline, perhaps in the gardens of his patron himself. His property seems to have been very small, for no estate or villa of his is mentioned. Mæcenas tried to induce him to write an epic poem, in which he was to celebrate the achievements of Augustus (ii. 1), but Propertius refused to comply with the wish of his patron, at least partly; and seems purposely to have described himself as a man given to sensual enjoyments, in order that no such lofty claims might be made upon him. The fourth book of his 'Elegies' however contains a series of poems on Roman legends, especially those of a religious nature. Now, as Augustus restored many old religious forms, it does not seem improbable that the poet here at least partially intended to fulfil the wish of Mæcenas. It has been supposed that Propertius died at a very early age, but Nobbe (*Observationes in Propertii Carmina*, 1817) has shown that the first book of his 'Elegies' was not written before the year 33 B.C.; the second not before 24 B.C.; the third not before 21 B.C., and the fourth not before 16 B.C.; and according to these dates he must at least have lived until the year 16 B.C., to the age of forty. An accurate Life of Propertius is still a desideratum in the history of Roman literature. His connections of friendship, to which allusions are made in his poems, as well as those of his contemporaries, might furnish some materials towards it.

Propertius, in his poetry, took Callimachus and Philetas as his models, and his ambition was to be considered the Roman Callimachus, to which a sneering allusion is made by Horace (*Epist.*, ii. 2, 100). We possess four books of Elegies of Propertius; whether he wrote more is uncertain. In the first three books he sings of his beloved Cynthia, whose real name is said to have been Hostia; the fourth, which by some editors has been subdivided into two, is chiefly occupied with heroic and religious legends, in which the poet seems to have possessed considerable learning; and he delights in showing it, though he thereby weakens the effect of his poetry. The Elegies addressed to Cynthia, who herself was a woman of eminent talents, form a kind of romance, and, considering the character of the age, evince an almost unparalleled faithfulness and constancy between the lovers. But Propertius has nothing of the effeminate sentimentality of Tibullus, and, notwithstanding his passionate love, he always retains his manly character, and shows great energy and independence of mind. The agreeable effect which this kind of poetry might produce is impaired by the artificial character of his style, in which he followed the Greek poets of the Alexandrian period. The antients however looked upon him as a great poet. (Plin., *Epist.*, ix. 22; Quintil., x. 1.)

Propertius used formerly to be edited together with Catullus and Tibullus, as in the editio princeps, Rome, 1472, and in that of Scaliger, Paris, 1577, reprinted in 1582 and 1600. A separate edition of Propertius appeared in 1702, 4to., at Amsterdam, with a commentary by Broukhusius. The most complete edition is that of P. Burmann, which was published after his death, in 1780, by Santen. For the establishment of a correct text much has been done in the editions of Lachmann (Leipzig, 1816), Paldamus (Halle, 1827), and Jacob (Leipzig, 1827).

Propertius was translated into French prose, in 1655, by De Marolles; and in 1821 appeared the second edition of a translation into French verse, by Mollevant. Among the numerous German translations it is sufficient to mention that of J. H. Voss (Braunschweig, 1830), and another by Gruppe (Leipzig, 1838), with critical notes on the Roman Elegy. Some of the Elegies of Propertius were translated into English in the 'Miscellaneous Poems by Oxford Hands,' London, 1685; in 1782 was published, in London, 'The Book of the Elegies of Propertius, entitled Cynthia, translated into English verse, with classical notes,' &c.

PROPERTY is derived, probably through the French language, from the Latin word Proprietas, which is used by Gaius (ii. 89) as equivalent to ownership (dominium), and is opposed to possessio. [POSSESSION.] The etymology of the word proprietas (proprius) suggests the notion of a thing being a man's own, which general notion is contained in every definition of property. Blackstone (ii. 1) defines 'the right of property' to be 'that sole and despotic dominion which one man claims and exercises over the external things of the world, in total exclusion of the right of any other individual in the universe.' A foreign writer defines ownership or property to be 'the right to deal with a corporeal thing according to a man's pleasure, and to the exclusion of all other persons.'

This definition excludes incorporeal things, which however are considered objects of property in our law, and were also considered as objects of property in the Roman law, under the general name of jura or iura in re; they were considered as detached parts of ownership, and so opposed to dominium, a word which represented the totality of the rights of ownership. (Savigny, *Das Recht des Besitzes*, 5th ed., p. 166.) This definition also describes property as consisting in a right, by which word right is meant 'a *legal* power to operate on a thing, by which it is essentially distinguished from the mere possession of the thing, or the physical power to operate upon it. Consequently such a right is not established by the possession of the thing; and it is not lost, when the possession of the thing is lost. Such a right can also be enforced by him who possesses the right by an actio in rem against every person who possesses the thing, or disputes his right to it.' (Mackeldey, *Lehrbuch des heutigen Röm. Rechts*, ii., p. 1-36.) This definition, which is characterised by a precision and accuracy which are altogether wanting in that of Blackstone, is here adopted. By property then is here understood only that which the positive law of a country recognises as property, and for the protection or recovery of which it gives a remedy by legal forms against every person who invades the property, or has the possession of it.

Austin observes ('An Outline of a Course of Lectures on General Jurisprudence') that 'dominion, property, or ownership is a name liable to objection. For, first, it may import that the right in question is a right of unmeasured duration, as well as indicate the indefinite extent of the purposes to which the entitled person may turn the subject. Secondly, it often signifies property, with the meaning wherein property is distinguished from the right of possession. [POSSESSION.] Thirdly, dominion, as taken with one of its significations, is exactly co-extensive with *jus in rem*, and applies to every right that is not *jus in personam*.' The first sense of the word property is expounded by determining, as hereafter explained, the quantity and quality of an estate as understood in English law. As to the second, possession is of itself no right, but a bare fact, and its relation to rights in rem is the same as the physical to the legal power to operate on a thing. The doctrine of possession is therefore distinct from and should precede the doctrine of property. [POSSESSION.] The third sense of property has reference to the legal modes of obtaining the possession of a thing in which a man can prove that he has property and a present right to possess.

A complete view of property, as recognised by any given system of law, would embrace the following heads, which it would be necessary to exhaust, in order that the view should be complete. It would embrace an enumeration of all the kinds or classes of things which are objects of property: the exposition of the greatest amount of power over such things as are objects of property, which a man can legally exercise—and connected with this, the different parts or portions into which the totality of the right of property may be divided, or conceived to be divided: the modes in which property is legally transferred from one person to another, that is, acquired and lost: the capacity of particular classes of persons to acquire and transfer property as above understood; or, to take the other view of this division, an enumeration of persons who labour under legal incapacities as to the acquisition and loss of property.

The following general outline of property is adapted to the English system of Law. It may be filled up by references to other articles in this work, or to treatises.

1. The kinds or classes of things which are objects of property.

The general division is into Things Real and Things Personal, the incidents to which are so different in the system of English Law that they must be separately considered.

Things Real are comprehended under the terms of Lands, Tenements, and Hereditaments. The word Hereditaments is the most comprehensive of these terms, because it comprehends every thing which may be an object of inheritance, both Things Real, and also some Personal Things, such as heirlooms, which are objects of inheritance.

Hereditaments are divided into Things Corporeal and Incorporeal. A Corporeal Hereditaments is land, in the legal sense of the term. An Incorporeal Hereditament is defined by Blackstone to be 'a right issuing out of a thing corporate (corporeal), whether real or personal, or concerning or annexed to, or exerciseable within the same.' Perhaps the definition is not quite exact, and it would not be easy to make an exact definition. The Things Incorporeal of the English law correspond in their general character to the Res Incorporales of the Roman Law, one distinguishing character of which is that they are incapable of tradition or delivery (Gaius, ii. 28): the Res Corporales of the Roman Law are things which are capable of tradition, whether moveable, as a horse, or immoveable, as a house. The Incorporeal hereditaments enumerated by Blackstone are, Advowsons, Tithes, Commons, Ways, Offices, Dignities, Franchises, Corodies or Pensions, Annuities, and Rents.

2. The greatest amount of power over such things as are objects of property which a man can legally exercise.

To this head belongs the English doctrine of Tenure, or the various ways in which land is said to be *held*. Though this was a much more important part of English law than it now is, it is still of importance; for Tenure always exists wherever there is the relation of landlord and tenant. As all land in the kingdom is held mediately or immediately of the crown, it follows that a man cannot have a Property in land which shall not be subject to this right of the crown. He cannot operate upon his Property in land in any way so as to destroy this right; and consequently the utmost amount of Property in land which a man can have, is limited. The interest which a man can have in any land, tenement, or hereditament, is called an Estate; and this word comprises the greatest amount of power and enjoyment, both as to time and manner, which a man can legally have over and in any of the three things just enumerated, as well as the smallest legal amount of such power and enjoyment: it also comprises, under the notion of time, the determination of the period when his power and enjoyment shall commence, as well as when they shall cease. Lands, tenements, and hereditaments then being objects of Property, a man may either have the most complete property in such things which is legally allowed, or he may have the least property in them which the law allows; and both this complete and this limited Property is expressed by the word Estate. An estate in a thing is Property in a thing, and Property in a thing is legally considered to be capable of division into defineable parts, called Estates, each of which estates has its defineable legal incidents. With reference to an estate the time during which the right of enjoyment continues is usually expressed by the term Quantity of Estate. The manner in which the enjoyment is to be exercised during this time is often expressed by the term Quality of Estate: thus a man may enjoy an estate solely or in joint-tenancy; his enjoyment may be co-extensive with the largest amount of legal enjoyment of any estate, or it may be limited by the contemporaneous Rights of others in or to the Property in which he has an Estate, that is, he may have the legal enjoyment for a determinate time, subject to various limitations and abridgments of the fullest enjoyment of Property. The time when the enjoyment of the Estate shall commence is also considered a part of its Quality; and the time of enjoyment commencing is either present, that is, contemporaneous with the acquisition of the estate, or future. It may not be useless to remark that here and elsewhere, where the word Estate is used in its technical sense, it does not mean the thing enjoyed, but the quantity and quality of enjoyment of the thing.

Independent of the quality and quantity of an estate, there is another modification of property which requires notice. A person may have the estate both as to quantity and quality in the sense above explained, either with or without the right to the beneficial enjoyment. The person who has merely the Estate in quantity and quality, has the bare legal Estate. He who has not the right to the Estate in quantity and quality, as above explained, but merely to the enjoyment of such estate, while the other has not, is said to have the equitable estate. The term quality of estate might be used to express this equitable interest; but inasmuch as we want a word to express the manner and mode of enjoying an estate as distinct from the time of enjoyment, and as quality is the word used to express that manner and mode, it must not be used in a different sense. The explanation of the nature of an equitable as distinguished from a legal estate belongs to Uses and Trusts.

It has been said that this distinction between legal and beneficial or equitable property is peculiar to the English law. (Lord Mansfield, 1 *T. R.*, 759, n.) But these two kinds of property existed in the Roman law, and the theory of the division of ownership or property into Quiritarian or legal, and bonitarian, beneficial, or equitable, was fully developed. Its origin in the Roman law is not certain; but it is a probable conjecture that its origin so far resembled the origin of the like division in English law, that it was due to the attempt to get rid of the difficulties attending the alienation of property by the old legal forms. 'There is,' says Gaius (ii. 40), 'among other nations (peregrini) only one kind of ownership or property (dominium), so that a man is either owner or not; and it was the same in the old Roman law, for a man was either owner 'ex jure quiritium,' or he was not. But ownership was afterwards divided, so that one man may now be owner of a thing ex jure quiritium, and another may have the same thing in bonis. For if in the case of a res mancipi, I do not transfer it to you by mancipatio, or in jure cessio, but only deliver it, the thing indeed will become yours beneficially (in bonis), but it will remain mine legally (ex jure quiritium), till you have acquired the property by usucapion; for as soon as the time of usucapion is completed, from that time it begins to be yours in full ownership (pleno jure), that is, the thing begins to be yours both in bonis and in jure, just as if it had been transferred by mancipatio or in jure cessio.' This passage seems to suggest a conjecture as to the origin of the distinction between legal and equitable property which was of so much importance in Roman law. The distinction between the two kinds of ownership or property was as clearly marked as in our system, though it was not applied to all the purposes to which this divided or double ownership is applied in our system.

3. The modes in which property is legally transferred from one person to another.

Property may either be acquired in a single thing, or in several things of the same kind at one time: or it may be acquired in a great variety of different kinds of things at the same time, which pass to the new owner, not as individual things, but as the component parts of a whole property. The Roman law designated the former mode of acquisition by the term acquisitio rerum singularum; and the latter by the term acquisitio per universitatem. Though the two modes of acquisition exist in our law, there are no names for them by which they are placed in opposition to one another. The case of acquisitio per universitatem, or of universal succession, occurs when a man is made a bankrupt or insolvent, and an assignee or assignees are appointed. [BANKRUPT, p. 396; INSOLVENT, p. 496]; in which cases the whole of a man's property real and personal, as well as his rights and obligations generally, become the legal property of the assignee or assignees, and is applicable and must be applied according to the rules of law in the cases of bankruptcy and insolvency. With respect to personal property, universal succession occurs when a man by his last will appoints an executor; and an administrator with the will annexed, or without the will annexed when there is none, thereby acquires the whole personal property of the intestate. Both the heir and devisee also, in a sense, take by universal succession.

As to both singular and universal succession, the modes of acquisition of estates in things real are reducible to two general heads—descent and purchase. 'Descent or hereditary succession is the title whereby a man on the death of his ancestor acquires his estate by right of representation as his heir at law' (Blackstone); and an estate so acquired is commonly called an estate of inheritance.

Purchase, which is corrupted from the Latin word perquisitio, is defined by Littleton (i. 12) to be 'the possession of lands or tenements that a man hath by his deed or agreement, unto which possession he cometh not by title of descent from any of his ancestors, or of his cousins (consanguinei), but by his own deed.' Purchase as thus defined comprehends all the modes of acquiring property by deed or agreement, and not by descent; but it is not a complete description of purchase, as now understood, for it omits the mode of acquisition by will or testament, which however, when Littleton wrote, was of comparatively small importance, as the power of devising lands did not then exist, except by the custom of particular places. Blackstone makes the following enumeration of the modes of purchase—Escheat, Occupancy, Forfeiture, and Alienation. As to escheat, there is some difficulty in the classification, as the title appears to be partly by descent and partly by purchase.

The head of alienation comprehends every form by which a man transfers property to another: it comprehends therefore both alienations made by a person during his life, and the disposition of his property by his last will and testament. The disposition of property by will has this peculiarity about it, that though the instrument must be completed in legal form during the lifetime of the giver, the persons to whom the property is given do not thereby obtain the property; they only obtain it by the death of the giver, who by that event becomes incapable of giving, but whose continuing intention to give is testified by the continuing existence of the instrument of gift.

The particular modes of alienation by deed are to a certain extent determined by the estate which the alienor possesses, and the estate or estates which he intends to transfer. The forms of alienation are noticed under their various heads.

4. The legal capacity for the acquisition of estates in

lands, tenements, and hereditaments, is most briefly and conveniently shown by the enumeration of the classes of persons who labour under legal incapacity; and in like manner, as to the alienation or loss of estates, it is most conveniently shown by enumerating the persons who, owing to mental incapacity, infancy, or other causes, labour under legal incapacity to transfer or lose estates. This division comprehends so much of the status of aliens, infants, lunatics, and married women, as relates to the acquisition or loss of estates.

Personal Property is not sufficiently described by the term 'moveables,' for certain estates in land are personal property, and are comprehended under the term Chattels Real. Terms for years are an example of chattels real; and they pass together with the rest of a man's personal estate to the executor, the universal successor. Chattels Personal are all other personal property, and are said by Blackstone 'to be properly and strictly speaking things *moveable*, which may be annexed to or attendant on the person of the owner, and carried about with him from one part of the world to another. Such are animals, household stuff, money, jewels, coin, garments, and everything else that can properly be put in motion, and transferred from place to place.' Personal property as thus defined corresponds to the mobilia or res mobiles of the Roman law; but this is a very inadequate description of personal property as recognised by the English law. And herein we first perceive the greater certainty and distinctness of the law relating to real property compared with the law relating to chattels; the things which can be the objects of real property are defineable, as well as the estates that can be had in them; the things that can be the objects of personal property are hardly determinable, and the estates, or more properly the interests, which a man may have in them, are perhaps also less determinate. As examples of objects of personal property, which in no way come within Blackstone's description, we may instance patent-rights, which are things incorporeal, though not hereditaments, and are the objects of property.

A quantity of stock in the public funds is not money, though often talked of as such, but still it is property. Even debts due to a testator or intestate are considered as property with respect to probate and letters of administration: still they are not expressed by the term goods and chattels in the letters of administration, but by the term 'credits,' for as debts are not the property of a man to whom they are due, so they cannot became property because he happens to die. Things can be assigned by the person who has a claim to them, though they may be things which cannot be called his property: a chose in action is an instance of this. Blackstone observes: 'the money due on a bond is a chose in action; for a property in the debt vests at the time of forfeiture mentioned in the obligation, but there is no possession till recovered by course of law.' He had just before spoken of the nature of property in action being such that a man 'hath not the occupation, but merely a bare right to occupy the thing in question.' From this it appears that he treats a debt due to a man as a property belonging to him, whereas the debt due merely gives a right of action to recover a determinate sum of money, or a sum which is less than some determinate sum. In this instance, says Blackstone, 'the property or right of action depends upon an express contract or obligation to pay a stated sum.' Here he uses property and right of action as synonymous, which is incorrect; for property implies a determinate thing, and a right of action may be either for a determinate thing or to compel a person to do some determinate act. The thing claimed is properly enough called a 'thing in action,' but the action is not to have a thing, but that the defendant shall do a certain act. Blackstone observes, in a note, that the same idea and the same denomination of property prevailed in the civil law, but this is a mistake. In the first passage (*Dig.* 41, tit. 1, s. 52), to which he refers in support of his statement, it is clear that a corporeal definite thing is spoken of, which the commentator could hardly have doubted about, if he had given in his note the whole of the passage instead of a part of it. The passage is this: 'a thing is a man's *in bonis*, whenever he can defend his possession of it by a plea (exceptio), or recover it when lost by an actio.' This actio would be in rem: the declaration of the plaintiff would affirm that the thing was his. In the other passage quoted by Blackstone (*Dig.* 50, tit. 16, s. 49), things which consist 'in actionibus, petitionibus, persecutionibus' are included among the things *in bonis*; but the things in action so spoken of are things which a man has not, as contrasted with things which a man has, in his possession, and these are things corporeal, things determinate. Besides, even if we should admit that the Roman law treated a debt as a thing *in bonis*, it did not treat it as property, for a thing in bonis was not property in the sense in which Blackstone is here using property. Further, when a Roman claimed a debt, his declaration was that something ought to be given to him or done for his benefit by the defendant; and this 'giving' always meant giving something which did *not* belong to the plaintiff, for it was a principle of Roman law that you could not give to a man what already belonged to him. But the Roman law had a precision in these matters of which the commentator had not the slightest idea.

From these remarks it will appear, first, that there is a difficulty in classifying the things that are objects of personal property; second, that things, as choses in action, are not property, and yet they can be transferred (in equity) as if they were property. Accordingly it happens that it is sometimes difficult to say whether a particular thing is an assignable thing or not, whether in its nature it is capable of any transfer.

Property in Chattels may, like property in Things Real, vary as to quantity and quality of interest, though things personal are not capable of such extended and various modifications, analogous to estates, as things real are. As to quantity, that is, duration, a man may have the use of a personal thing for life, and another may have the absolute property in it after his death. As to quality, persons may own a thing personal as joint tenants and as tenants in common. There is an equitable property in chattels as well as in things real. Money, for instance, is often paid to a trustee, in order that he may give the interest of it to one person for life, and after his death pay the money to another. The trustee, so long as he holds the money, has the legal property in the money, and in the thing in which the money is invested. A legatee has only an equitable interest, even in a specific legacy, after his testator's will is proved, until the executor gives the thing to him, or in some clear way admits his right to it.

The modes of acquiring and losing personal property are reduced by Blackstone to the following principal modes: Occupancy; Prerogative, whereby a right accrues to the crown or the crown's grantee; Forfeiture, which is a punishment for a crime or misdemeanour; Custom, as heriots, &c.; Succession, by which term Blackstone understands the capacity of a corporation aggregate to take what their predecessors had: Marriage, by which the husband acquires the chattels of the wife, and the right of suing for her choses in action, and a peculiar kind of interest in her chattels real; Judgment; Gift or Grant; Contract; Bankruptcy, so far as relates to chattels; Testament; Administration. The enumeration taken from Blackstone is not here offered as one that is complete or altogether unexceptionable. Under Contract Blackstone includes sale, as to which it may be observed that the formalities required by the law for the transfer of ownership in things personal are few; but the difficult questions which arise as to the transfer of property in personal things are probably much more numerous than in the case of estates in things real.

Under Contract he also comprehends bailment, by which 'a special qualified property is transferred from the bailor to the bailee together with the possession.' This qualified property, as it is called, gives the bailee a right of action against all persons who injure or take away the chattels; and Blackstone, as usual, finds a reason for this right of action. This right of action is however really founded on the right of possession, and it is just the same right of action that a man has who finds a thing, against any person, except the owner, who injures or takes away the thing. This right, when understood, is in all respects consistent with sound principles; and there is no objection to calling it a right founded on a qualified property, when the term qualified property is rightly understood. Under contract, he also includes hiring and borrowing, and these also are contracts which, he says, may transfer a qualified property to the hirer or borrower. The same remarks apply to this kind of property as to that acquired by bailment. There is however a case in which a man must acquire an absolute property by borrowing, as in the case of the Roman Mutuum, when the thing borrowed is a thing which consists 'pondere, numero, or mensurâ,' as, for instance, so many pounds of butter. The distinctions of the Roman Law between Hiring, 'Locatio et Conductio,' Lending, 'Mutuum,' 'Commodatum,' and 'Depositum,' are founded on unchangeable principles, and are expounded in that system with a clearness which, in this respect, ours perhaps does not admit.

The incapacities of persons as to acquiring Personal Property are fewer than those as to Real Property; and the incapacities to transfer and lose are also fewer. But a complete enumeration of the classes of persons who labour under either of these incapacities, and the particular incapacities of each of such classes, would probably be more difficult than a like enumeration as to Estates in Real Property.

PROPHECY (προφητεία, a foretelling, or the power of foretelling), in its popular acceptation is a foretelling, or a thing foretold. It may however be more correctly defined a speaking by inspiration, whether the things spoken relate to the present, the past, or the future; but it must be observed that this definition assumes inspiration as an historical fact.

In the Septuagint, *propheteia* (προφητεία) answers to *nevuah* (נְבוּאָה), from *nava* (נָבָא), which, according to Gesenius is to 'bubble forth,' and so, to utter words copiously, as persons do who speak under a divine afflatus, or a strong excitement. In classical Greek, *prophêtes* (προφήτης) corresponds with the Latin *vates*, which indeed may be regarded as the same word without the preposition. Thus St. Paul uses *prophetes* (*Tit.*, i. 12), which is rendered 'prophet' in the authorised version, but 'poet' by Tyndale; and probably Epimenides is meant. S. Chrysostom (*Hom. in* 1 *Cor.*) says that *prophetes* is the same as *herméneutes* (ἑρμηνευτής), an interpreter; and Festus says that the chief priests of the temples and interpreters of the oracles were by the antients called prophets. In *Exod.* vii. 1, God says to Moses, 'I have made thee a God to Pharaoh, and Aaron thy brother shall be thy prophet,' *i.e.* interpreter; or, as it is expressed (iv. 16) 'He shall be to thee instead of a mouth.' Abraham is called a prophet (*Gen.*, xx. 7), *i.e.* an intercessor between God and man. In the New Testament, prophesying is several times used in the sense of interpreting the hard places of the Old Testament, as Themistius calls a man who interpreted the obscurities of Aristotle, 'the prophet of Aristotle.' 'The sons of the prophets' appear to have been pupils in the schools of the prophets, and to have been trained for the office of instructing the Jewish people orally upon the principles laid down in the Mosaic law. Some of the Jewish prophets were particularly distinguished as writers, and their instructions mingled with predictions (called by the general title of prophecies) were added to the other sacred books, and became of canonical authority. These prophets thus carried on, enlarged, and spiritualised the code which had originally been given by Moses; and they probably handed down through each generation certain doctrines made known to the patriarchs, which the law was not designed to unfold.

Under ORACLE it is observed that there were current in antient Greece numerous so-called prophecies, such as those of Bacis and Musæus, mentioned by Herodotus (viii. 20, 77, 96; ix. 43). Dr. Barrow is of opinion that, 'though many of these prophecies were dark and ambiguous, or captious and fallacious, yet some were very clear and express, according as God was in his wisdom pleased to use the ministry of those spirits, which immediately conveyed them in directing men for their good, or misguiding them for their deserved punishment, such as were for instance that concerning Cyrus his conquering the Lydians; that concerning the battle at Salamis; that concerning the battle of Leuctra; and divers others which occur in stories composed by wise men of the wisest nations.' (*Sermon* ix. *on the Creed.*) When however such prophecies come to be rigidly examined, they will be found of the kind of productions concerning which Lord Bacon says, 'That that hath given them grace, and some credit, consisteth in three things. First, that men mark when they hit, and never mark when they miss. . . . . The second is, that probable conjectures, or obscure traditions, many times turn themselves into prophecies, while the nature of man, which coveteth divination, thinks it no peril to foretell that which indeed they do but collect. . . . . The third and last (which is the great one) is, that almost all of them, being infinite in number, have been impostures, and by idle and crafty brains merely contrived and feigned after the event past (Bacon's *Essays.*) But this was not the case with the prophecies recorded in the Bible. Some of these were extant in books written long before the events took place to which they refer, such as the prophecy concerning Abraham's posterity, their extraordinary increase, their sufferings in Egypt four hundred years, their sojourning in the wilderness, and their possessing at length the land of Canaan; the prophecy concerning Josiah (1 *Kings*, xiii. 2), who was expressly named 361 years before the occurrence of the event in which he was the chief agent (2 *Kings*, xxiii. 15, 16); the prophecy concerning Cyrus, who is also mentioned by name (*Isaiah*, xliv., xlv.); his conquests, his restoring the Jews from exile, and his rebuilding of Jerusalem; the prophecy of Jeremiah concerning the Captivity, and its duration 70 years; the prophecy of Daniel (viii.) concerning the profanation of the Temple by Antiochus Epiphanes, with a description of this man's temper, countenance, &c., 408 years before the accomplishment of the event. These prophecies relate to the Jewish people in particular; but there are others relating to Tyre, and Egypt, and Nineveh, and Babylon, which, in a manner no less striking, present, in all their circumstances of delivery and fulfilment, a perfect contrast to the supposed predictions of the ancient pagans. The numerous prophecies in the Old Testament pertaining to the Messiah, with their accomplishment recorded in the New Testament, and the prophecies of Jesus and his Apostles, are so familiar to the minds of all, that they need not be specified. The prophecies of the Old and New Testament, which have been long fulfilled, afford altogether an amount of evidence which, if really understood, it seems impossible to resist, in proof of the Bible being a revelation from God. Upon the question when prophecy ceased to be given among the Jews, and when among the Christians, and upon the subject of unfulfilled prophecy, we must abstain from entering.

The prophecies of the Old and New Testament are understood by all believers in scriptural prophecy to be predictions of future events pronounced by persons who, on the occasion of delivering such predictions, were directed and governed by the Deity. The first thing to establish in the examination of these prophecies is the genuineness of the books in which they are contained. The question is, whether the prophecies in the form in which we have them, were delivered before the events to which it is alleged that they refer. This is purely a matter of historical criticism, and in no respect differs in the manner of carrying on the investigation, from an inquiry of a like kind as to any other book. The next inquiry is to compare the alleged prophecy with the events of which it is alleged that it was a prediction. This, though apparently the easier part of the inquiry, is one wherein much difference of opinion may exist. Some of the prophecies are clear and precise in their terms; and when the former part of the inquiry has had a satisfactory result, no unprejudiced person can doubt that the prophecies do refer to certain definite events. Some of the prophecies are in their terms vague and general; and others refer to events which, it is admitted, have not yet been accomplished. So far as it is admitted that any prophecy has not been accomplished, so far it must be admitted that prophecy fails in being substantiated by the only evidence that can establish its truth. It is then on those events which all believers allege to be events accomplished, in conformity to genuine predictions, that the proof of prophecy depends. The method of investigation is that which has been already mentioned, and every man should come to it with an unprejudiced mind.

On prophecy in general the reader may be referred to John Smith's *Select Discourses*, 4to., Cambr., 1673, and 8vo., London, 1821; Sherlock's *Use and Intent of Prophecy*, 8vo, London, 1725; Bishop Newton's *Dissertations on the Prophecies*, often printed; with other well-known works treating directly or indirectly on the subject.

PROPITHE'CUS, Mr. Bennett's name for a genus of quadrupeds allied to the *Lemurs*, and thus characterised by him:—

Muzzle moderate. Hinder extremities longer than the anterior ones. Index abbreviated. Tail long, hairy.

Dental Formula:—Incisors $\frac{4}{4}$; canines $\frac{1}{1}\ \frac{1}{1}$; molars —;

(upper) two first cuspidate, the third elongated, externally bituberculated, the fourth like the preceding; (lower) first unicuspidate, second and third plurituberculate

Example, *Propithecus Diadema*.

Description.—Face nearly naked, with short blackish hairs about the lips, and equally short yellowish-white hairs in front of the eyes. Above the eyes, the long, silky, waved, and thickly-set hairs which cover the body commence by a band of yellowish white crossing the front and passing beneath the ears to the throat. This is succeeded by black, extending over the back of the head and neck, but becoming freely intermingled with white on the shoulders and sides, the white gradually increasing backwards so as to render the loins only slightly grizzled with black. At the root of the tail fulvous, that colour gradually disappearing until the extreme half of the tail is white with a tinge of yellow. Outer side of the anterior limbs, at the upper part, of the slaty grey of the sides, below which it is pale fulvous. Hands black except tufts of long fulvous hairs at the extremities of the thumb and fingers, extending beyond and covering the nails. Outer sides of the hinder limbs, after receiving a tinge of fulvous from the colour surrounding the root of the tail, of a paler fulvous than the anterior limbs; this becomes much deeper on the hands, which are fulvous except on the fingers, where there is a very considerable intermixture of black, the terminal tufts, equally long with those of the anterior hands, being, as in them, fulvous. The under surface white throughout, except the hinder part of the throat, where it is of the same colour with the sides of the body.

Hairs generally long, silky, waved, erect, and glossy; shorter and more dense on the crupper, where they offer a sort of woolly resistance. General character of those on the tail, that of the body hair, but shorter.

Thumb of anterior hands slender, placed far back, and extremely free; length 1½ inch, extremity of its penultimate phalanx ranging slightly beyond the end of the metacarpal bone of the index. Index 1½ inch in length, its extremity ranging with the middle of the penultimate phalanx of the second finger. Length of second finger 3 inches; that of third finger 3¾ inches. Length of carpus and metacarpus 2 inches.

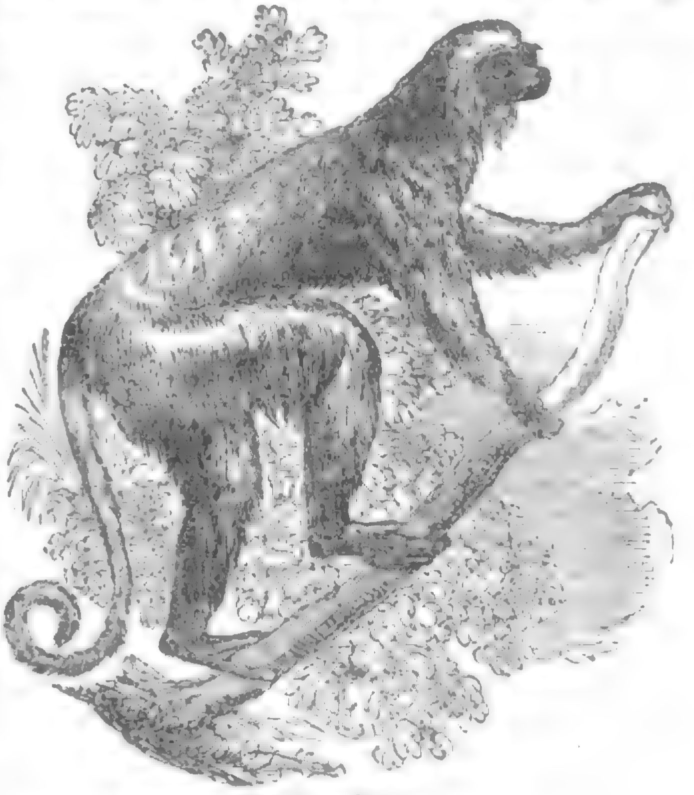
Thumb of hinder hands very strong, placed forwards and ranging with the fingers, 2 inches long; index 2½ inches, the pointed nail extending half an inch beyond: length of second finger, 3½ inches; of tarsus and metatarsus, 3 inches.

Length of body and head, measured in a straight line, 1 foot 9 inches; of the tail, 1 foot 5 inches. Anterior limbs, exclusive of hands, 7½ inches in length from the body; posterior limbs, 15½ inches.

Muzzle shorter than in the *Lemurs* generally; the distance from the anterior angle of the orbit to the tip of the nose (1¾ inch) being equal to that between the eyes. Ears rounded, concealed in the fur: length 1 inch; breadth 1½ inch.

Affinities, &c.—Mr. Bennett remarks that *Propithecus* is essentially distinguished from *Lemur*, the genus to which it most nearly approaches, by the number and form of its teeth, and especially by the form of the incisors of the upper jaw, which constitute apparently a regular series, a structure unknown in any other Lemuridous animal. This difference, striking as it is, is however, he observes, more of an apparent than a real deviation from the type of the family, inasmuch as a tendency to dilate laterally towards their cutting edges is to be found in the upper incisors of a *Lemur*, and it is only the extreme development of this dilatation that gives to the teeth of *Propithecus* a peculiarity of character rather resembling at first sight that of the *Monkeys* than the *Lemurs*. The number of the incisors of the lower jaw, he adds, differs from that of *Lemur*, but occurs in another genus, *Indri* [Lichanotus], and he remarks that in *Propithecus*, as in *Indri*, the canine teeth of the lower jaw close behind those of the upper, a conformation which tends to invalidate the opinion of M. Geoffroy St. Hilaire, that the outer of the six incisors of the lower jaw ought rather to be regarded as canine teeth, the usual position of the lower canines when the mouth is closed being anterior to the upper. The number of false molars, continues Mr. Bennett, in *Propithecus*, is one less in each jaw than in *Lemur*, and they are less smooth and not so acutely triangular; the second in the upper jaw being in fact somewhat tuberculate on its outer edge, and forming, as it were, a transition from the false to the true molars, between which it is placed. The posterior molars were not examined. Mr. Bennett concluded by observing that the external characters by which *Propithecus* is distinguished from *Lemur* are its shorter muzzle, terminated by more approximate nostrils, the upper margin of which appears to be only slightly lobulated; its rounded ears; the marked disproportion in length between its hinder and anterior extremities; the greater length of its hands, especially of the anterior; the shortness of its anterior thumb, which is also placed much farther back; the marked abbreviation of the anterior index; the development and power of the hinder thumb, which is nearly an equal opponent to the whole of the fingers; and the comparative shortness of the hairs by which the tail is covered.

Locality.—Madagascar, whence the specimen was sent and presented to the Zoological Society by C. Telfair, Esq., Corr. Memb. Z. S. Habits unknown. (*Zool. Proc.*, 1832.)



Propithecus Diadema.

PROPONTIS. [Marmara, Sea of.]

PROPORTION. There must be in the mind of every person, antecedently to all mathematical instruction, a perfect conception of proportion, though not perhaps of the manner of measuring magnitudes with a view to express their proportions by means of numbers. All who can trace the resemblance of a drawing to the original, or have the least notion of the use of a map, are in possession of the fundamental notions on which a theory of proportion can be founded. The term Ratio is that under which the first part of the subject should be treated, and the article cited will contain matter preliminary to the present one. It will be sufficient for our present purpose to state that the ratio or relative magnitude of two magnitudes is to be measured by the number of times or parts of times which one is contained in the other, whenever the two are commensurable; and we shall now confine ourselves to the purely mathematical treatment of the theory of proportion, and shall avoid, as much as the nature of the subject will admit, all discussion of the notion of ratio considered as a magnitude.

We cannot well explain the nature of the difficulty which occurs in the theory of proportion, without a prior reference firstly to the purely arithmetical treatment of the subject, and, secondly, to the *practical* sufficiency of this method which is the necessary consequence of our physical constitution.

If all magnitudes of the same kind were necessarily commensurable, that is, if any one among them being taken as a unit, the rest were all expressible by multiples, aliquot parts or submultiples, and multiples of aliquot parts, of the unit chosen, no difficulty would arise in making the subject of proportion purely arithmetical. For let a and b represent the units, parts of units, or both, in two magnitudes of the same kind (as two lines); any sufficient demonstration of the rule for the division of one fraction by another will show that a contains b precisely a number of times and parts of times. If then we say that a is to b in the same proportion as c to d, we mean that a contains b precisely such times and parts of times as c contains d, that is, we assert the equation

$$\frac{a}{b}=\frac{c}{d}:$$

the mathematical treatment of which is so easy, that no one who can solve a simple equation can be stopped for a moment by the difficulty of any consequence of it. The following proposition, which may be proved generally, contains all the consequences which are most useful. Let a, b, c, and d be (in the arithmetical sense) proportional: take any two functions of a and b, which are homogeneous and of the same dimension (such as $ab+b^2$ and a^2-b^2). Take corresponding functions of c and d (which are $cd+d^2$ and c^2-d^2); then the four numbers so obtained are also proportional (that is, $ab+b^2$ contains a^2-b^2 as many times and parts of times as $cd+d^2$ contains c^2-d^2).

In measuring magnitudes of which the numerical representatives are afterwards to be submitted to calculation, it necessarily follows, from the imperfections of our senses, that some imperceptible amount of magnitude must always be neglected or added; so that, for example, that which we call a line of 3 inches long means something between 2·9 and 3·1, or 2·99 and 3·01, or 2·999 and 3·001, according to the degree of accuracy of the measurement. All magnitudes therefore are practically commensurable; for suppose, in the case of weights for example, that a grain is taken as the unit, and that the ten-thousandth part of a unit is considered as of no consequence; then by taking every weight only to the nearest ten-thousandth of a grain, they may every one be expressed arithmetically with a conventional degree of precision, which for every purpose of application will do as well as though it were perfectly accurate.

The discovery of INCOMMENSURABLE magnitudes, one of the most striking triumphs of reason over the imperfection of the senses, was made at a very early period; since the demonstration of their existence, the classification (to a certain extent) of their species [IRRATIONAL QUANTITIES], and the means of overcoming the difficulties which they present, appear in the writings of Euclid. A moment's consideration will show that a property of numbers, a relation of figure in geometry, a general law of nature, may be inferred from induction with a degree of probability which will amount to moral certainty, both as to the exactness and universality of the property, relation, or law. But the existence of incommensurable magnitudes can never be made certain, except by absolute deduction: no attempt at measurement, a *minimum visibile* existing, could show the non-existence of any common measure, however small. Suppose for instance that, having provided means of measurement which can always be depended on to show the *thousandth* of an inch, but nothing less, a person should accurately (as the word is commonly used) lay down squares of one, two, &c. inches in the side, with a view to render the existence of a common measure to the side and diagonal exceedingly improbable by experiment. If not before, he would be baffled by the square whose side is 2378 inches, the diagonal of which could not by his measures be distinguished from 3363 inches, from which it differs only by about the *five-thousandth* part of an inch. And let any greater degree of exactness be attained in the means of measurement, short of positive accuracy, a reasoner on the subject could still predict a square which should defeat the object sought to be attained.

The mere existence of incommensurables, to say nothing of their frequent occurrence, and the impossibility of avoiding them, renders the arithmetical theory of proportion inexact in its very definition. If we would say, for instance, that the diagonal of a larger square is to its side as the diagonal of a smaller square is to its side, we enunciate a proposition the meaning of which is unsettled. For if we mean to assert that the larger diagonal contains the larger side as many times or fractions of times as the smaller diagonal contains the smaller, it is answered, by those who wish for precise notions, that neither diagonal contains its side any exact number of times or parts of times. If we should say that the larger diagonal lies between 1·414213 and 1·414214 times the larger side, and that the smaller diagonal also lies between 1·414213 and 1·414214 times the smaller side, and if we should show this to be true, we certainly show that we could produce lines very nearly equal to the diagonals, which are, under the arithmetical definition, proportional to the sides; and that this might be done without altering either diagonal by so much as the millionth part of the side. And the ten-millionth, hundred-millionth, or any aliquot part of the side, however small, might be substituted for the millionth, without detriment to our power of showing the truth of the proposition. If we use the means by which this process may be carried on *ad infinitum*, we may perhaps be said to have established the truth of the proposition that the diagonals of squares are as their sides. But if we in any manner stop short of this, we destroy the rigorous character of geometry, and produce a system of mathematics which, like a common table of logarithms, is true to a certain number of places of decimals, and not farther. It is obvious that such a system of mathematics, like the table with which we have compared it, is sufficient for the purposes of practical application; nor have we the least quarrel with those who, desiring an instrument only, take one which is sharp enough for their purpose. We only complain of them when they assert and teach others that their tool has an edge keen enough to separate the minutest truth from the minutest falsehood; whereas, on examining it with a powerful microscope, we find the so-called sharp edge capable of being magnified into a plane of any dimensions, though it may appear a sharp edge to the unassisted senses.

The imperfection of the arithmetical definition of proportion is universally admitted, while the complexity of the rigorous definition by which Euclid supplied its place is almost as universally felt to be a grievance. Many attempts have been made to avoid the trouble without incurring the reproach of inaccuracy. One or two of these we shall notice.

Legendre, in his otherwise excellent work on geometry, refers the student to works on arithmetic for the theory of proportion: and, having stated that when A is to B as C to D, it is known that A×D=B×C, adds (twelfth edition, page 61), 'This is certainly true for numbers; it is true also for any magnitudes, provided they can be expressed, or that we imagine them expressed by numbers, and this we may always suppose.' A system of geometry which tells the learner in so many words that he may always suppose that which is not true, needs no further comment, even though Legendre were its author. It is true that in subsequent parts of the work we find demonstrations adapted to the case of incommensurable quantities, but they want that most important element of a proposition involving proportions, namely, a definition of what the term means; these demonstrations turn upon the theorem that when four quantities are proportional, the first is greater than, equal to, or less than the second, according as the third is greater than, equal to, or less than the fourth; but it has not been previously stated what the author means by four quantities being proportional. In the English translation of the preceding work, a preliminary chapter is added on proportion, in which the definition given as to incommensurable magnitudes amounts to the following:—when A and B are incommensurable, and also C and D, the four are said to be proportional when A' and C' can be found, as near as we please to A and C, and which, being commensurable with C and D, are proportional to them, in the arithmetical sense of the term. This is a sufficient definition; but it really amounts to that of Euclid (as do all sufficient definitions which we have seen), and is not so easily used.

M. Lacroix (*Elémens de Géométrie*, p. 5) makes the approximate finding of a common measure stand in place of an exact process, and, fairly stating that the error of the process may be made too small to be visible, rests the exactness of his geometry on its not being sensibly erroneous.

The author of the 'Elements of Geometry,' in the 'Library of Useful Knowledge,' states the proportion of incommensurable magnitudes to consist in 'their ratios admitting of being approximately represented by the same numbers, *to how great an extent soever* the degree of approximation may be carried.' In virtue of the words in italics, this definition may be considered as being, when properly used, capable of forming the basis of an exact theory; and that it is properly used in the work cited we fully admit, since its first application is to the establishment of the definition of Euclid. The only objection we should make to the work in question is that its expressions (page 48) would lead the student to imply that commensurability is the general rule, and incommensurability the exception; an extended theory is given, because magnitudes are not always commensurable. Now it is important the student should know, and should always bear in mind, that of two magnitudes of the same kind taken at hazard, or one being given and the other deduced by a geometrical construction, it is very much more likely that the two should be incommensurable than that they should be commensurable. So that the apparently cumbrous theory of proportion is not introduced to meet a few cases which sometimes occur, but to prevent the majority of instances from being treated incorrectly.

The definition of proportional quantities given by Euclid is as follows:—'Magnitudes are said to have the same ratio to one another, the first to the second, and the third to the fourth, when equimultiples of the first and third, and equimultiples of the second and fourth, whatever the multiplications may be, yield a multiple of the first, greater than, equal to, or less than, that of the second, according as the multiple of the third is greater than, equal to, or less than, that of the fourth.' That is, if A, B, C, and D be the four magnitudes, and *m* and *n* any two whole numbers whatsoever, *m* A must be greater than, equal to, or less than *n* B, according as *m* C is greater than, equal to, or less than *n* D. Otherwise thus, whatever whole numbers *m* and *n* may be, A must exceed, equal, or fall short of *n*-*m*ths of B, according as C exceeds, equals, or falls short of *n*-*m*ths of D. A person practised in algebra would comprehend the definition most easily when stated thus: $mA-nB$ must have the same sign as $mC-nD$, for all whole values of *m* and *n*.

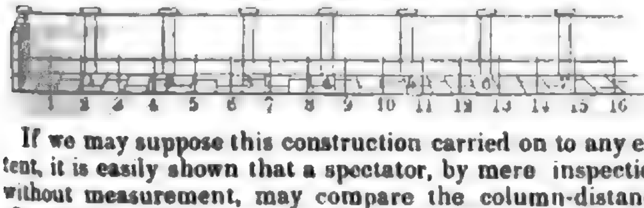
This definition equally applies whether A and B be commensurable or incommensurable, since no attempt is made to measure B by an aliquot part of A. The two questions which must be asked, and satisfactorily answered, previously to its reception, are as follows:—

1. What right had Euclid, or any one else, to expect that the preceding most prolix and unwieldy statement should be received by the beginner as the definition of a relation the perception of which is one of the most common acts of his mind, since it is performed on every occasion where similarity or dissimilarity of figure is looked for or presents itself?

2. If the preceding question should be clearly answered, how can the definition of proportion ever be used; or how is it possible to compare every one of the infinite number of multiples of A with every one of the multiples of B?

To the first question we reply, that not only is the test proposed by Euclid tolerably simple, when more closely examined, but that it is, or might be made to appear, an easy and natural consequence of those fundamental perceptions with which it may at first seem difficult to compare it. To elucidate this, suppose the following case:—

There is a straight colonnade composed of columns at equal distances from each other, the first being distant from a bounding wall by a length equal to the distance between any two successive columns. In front of the colonnade let there be a row of railings* equidistant from each other, the first being at the same distance from the wall at which the railings are from each other. Let the columns be numbered from the wall, and also the railings; remember also that it is not supposed that there goes any exact number of railings to the interval of two columns, but that the interval of the columns may be to the interval of the railings in any ratio, commensurable or incommensurable.



If we may suppose this construction carried on to any extent, it is easily shown that a spectator, by mere inspection without measurement, may compare the column-distance (C) with the railing-distance (R), to any degree of accuracy. For example, since the tenth railing falls between the fourth and fifth columns, it follows that 10 R is greater than 4 C and less than 5 C, or that R lies between $\frac{4}{10}$ of C and $\frac{5}{10}$ of C. To get a more accurate notion he may examine the ten-thousandth railing: if it fall between the 4674th and 4675th columns, it follows that 10,000 R lies between 4674 C and 4675 C, or R lies between $\frac{4674}{10000}$ and $\frac{4675}{10000}$ of C. There is no limit to the degree of accuracy thus obtainable; and it can also be shown that the ratio of C and R is determined when the order of distribution of the railings among the columns is assigned ad infinitum: or, which is the same thing, when the position of *any* given railing can be found, as to the numbers of the columns between which it lies. Any alteration, however small, in the place of the first railing, must at last affect the order of distribution. Suppose for instance, that the first railing is moved farther from the wall by one part in a thousand of the distance between the columns, the second railing must then be pushed forward twice as much, the third three times as much, and so on: those after the thousandth are pushed forward more than a thousand times as much, that is, by more than the interval between the columns; or the order with respect to the columns is disarranged.

Let it now be proposed to make a model of the preceding construction, in which *c* shall be the distance between the columns, and *r* that between the railings. It needs no definition of proportion, nor anything more than the conception which we have of that term prior to definition (and with which we must show the agreement of any definition we may adopt) to assure us that C must be to R in the same proportion as *c* to *r*, if the model be truly formed. Nor is it drawing too largely on that conception of proportion if we assert that the distribution of the railings among the columns in the model must be everywhere the same as in the original; for example, that the model would be *out of proportion*, if its 56th railing fell between the 18th and 19th columns, while the 56th railing of the original fell between the 17th and 18th columns. Here then the question as to the dependence of Euclid's definition upon common notions is settled; for the obvious relation between the construction and its model which has just been described contains the collection of conditions, the fulfilment of which, according to Euclid, constitutes proportion. According to Euclid, whenever *m* C exceeds, equals, or falls short of *n* R, then *m c* must exceed, equal, or fall short of *n r*: by the most obvious property of the preceding constructions, according as the *m*th column comes after, opposite to, or before the *n*th railing, in the original, the *m*th column must come after, opposite to, or before the *n*th railing, in the correct model.

That the test proposed by Euclid is necessary, appears from the preceding; and also that it is sufficient. For, admitting that, to a given original, with a given column-distance in the model, there is one correct model railing-distance (which must therefore be the one which distributes the railings among the columns as in the original), we have seen that any other railing-distance, however slightly different, would at last give a different distribution: that is, the correct distance, and the correct distance only, satisfies all the conditions required by Euclid's definition.

Let us now, by the *distribution* of one set of magnitudes among those of another set, agree to mean the placing of the first magnitudes among those of the second set, the latter having been previously arranged in ascending order of magnitude. Thus, in the following instance, we distribute the multiples of 3 among those of 8, the latter being in Roman numerals:—

3 6 viii 9 12 15 xvi 18 21 xxiv 27 30 xxxii &c.
24

This use of the word distribution having been well learnt, the following way of stating the definition will be easier* than that of Euclid. 'Four magnitudes, A and B of one kind, and C and D of the same or another kind, are proportional when all the multiples of A can be distributed among the multiples of B in the same intervals as the corresponding multiples of C among those of D.' Or, whatever numbers *m* and *n* may be, if *m* A lies between *n* B and $(n+1)$ B, *m* C lies between *n* D and $(n+1)$ D.

If the preceding test be always satisfied from and after any given multiples of A and C, it must be true before those multiples. For instance, let the test be always satisfied from and after 100 A and 100 C; and let 5 A and 5 C be instances for examination, falling before 100 A and 100 C. Take some multiple of 5 which will exceed 100, say 50 times, and let it be found on examination that 250 A lies between 678 B and 679 B; then 250 C lies between 678 D and 679 D. Divide these by 50, and it follows that 5 A lies between $13\frac{28}{50}$ B and $13\frac{29}{50}$ B, and still more between 13 B and 14 B. Similarly 5 C lies between $13\frac{28}{50}$ D and $13\frac{29}{50}$ D, and still more between 13 D and 14 D. Or 5 A lies in the same interval among the multiples of B in which 5 C lies among the multiples of D: and the same demonstration applies to any other instance.

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* By the terms column and railing we mean throughout to designate vertical lines which are the axes of the columns or railings.

* The Greek of Euclid's definition is very short, and can only be intelligibly rendered into English by circumlocution. Ἐν τῷ αὐτῷ λόγῳ μεγέθη λέγεται εἶναι, πρῶτον πρὸς δεύτερον καὶ τρίτον πρὸς τέταρτον, ὅταν τὰ τοῦ πρώτου καὶ τρίτου ἰσάκις πολλαπλάσια τῶν τοῦ δευτέρου καὶ τετάρτου ἰσάκις πολλαπλασίων, καθ᾽ ὁποιονοῦν πολλαπλασιασμὸν, ἑκατέρου ἢ ἅμα ἐλλείπῃ, ἢ ἅμα ἴσα ᾖ, ἢ ἅμα ὑπερέχῃ ληφθέντα κατάλληλα.

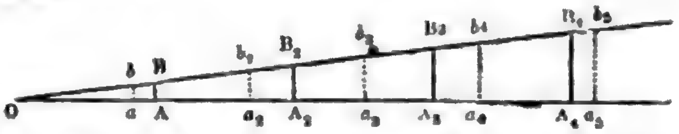
Again, the test is also satisfied if the multiples of any multiple (*m*) of A are distributed among the multiples of any multiple (*n*) of B in the same manner as the multiples of *m* C among the multiples of *n* D: for instance, if the multiples of 3 A be distributed among those of 5 B in the same manner as the multiples of 3 C among those of 5 D. Let 11 A and 11 C be given for examination: take any multiple of 3 greater than 5, say 3 × 3, or 9, and examine 11 (9 A) and 11 (9 C), or 33 (3 A) and 33 (3 C). Let 33 (3 A) lie between 27 (5 B) and 28 (5 B); then by hypothesis 33 (3 C) lies between 27 (5 D) and 28 (5 D). Divide all by 9, and we find that 11 A lies between 15 B and $15\frac{5}{9}$ B, while 11 C lies between 15 D and $15\frac{5}{9}$ D. Hence 11 A lies between 15 B and 16 B, while 11 C lies in the same interval among the multiples of D: and in the same manner any other instance may be proved.

The principles of the fifth book of Euclid are by many supposed to be inevitably connected with the apparatus of straight lines drawn parallel to one another, by which Euclid represents his magnitudes and their multiples. This is not the case; and the simple algebraical expression of magnitudes by large letters, and of numerical multipliers by small ones, will very much facilitate the demonstrations, without altering anything but mere modes of expression.

The next point to be considered is the infinite character of the definition of proportion; four magnitudes are not to be called proportional, until it is shown that every multiple of A falls in the same intervals among the multiples of B, in which the same multiple of C is found among the multiples of D. So that this definition is a negative one, like that of parallel lines, which may be thus stated: two lines are parallel when every point of one of them, however far produced, is on one side of the other. We might expect then to find that the test of *disproportion* is simple and positive, and an examination of the illustration already produced will confirm this.

Suppose that the distribution of the railings among the columns should be found to agree in the model and the original as far as the millionth railing. This proves, as we have seen, only that the railing-distance of the model does not err by the millionth part of the corresponding column-distance; for if it did err so much, the multiplication of the error a million-fold would have placed the millionth railing (if none before it) wrong by at least one interval. It is then obvious that no examination of individual cases, however extensive, will enable an observer of the construction and its model to affirm the proportion or deny disproportion: all that it can do is to enable him to fix limits (which he may make as small as he pleases) to the disproportion, if any. But a single instance may enable him to deny proportion or affirm disproportion and also to state which way the disproportion lies. Let the 19th railing in the original fall beyond the eleventh column, while the 19th railing of the (so called) model does not come up to the eleventh column. It follows from this one instance, that the railing-distance of the model is too small relatively to the column-distance, or that the column distance is too great relatively to the railing distance. That is, the proportion of *r* to *c* is less than that of R to C, or the proportion of *c* to *r* is greater than that of C to R. Similarly, with respect to two straight lines, no examination of pairs of points, one in each, will enable the examiner to affirm their parallelism or deny their intersection: while, at the same time, the examination of one pair of points may enable him to affirm intersection or deny parallelism. Hence it appears that, obvious as the notion of proportion may be, it is more easy, in a mathematical point of view, to define disproportion, and to make proportion consist in the absence of all disproportion. Similarly, obvious as is the notion of parallelism, and the connection of the non intersection of two straight lines with that of their always keeping the same distance with each other, it is more easy to define this relation by the absence of all intersection than by any of its positive properties.

The negative character of the definition of parallels does not prevent it from being very easily proved that such lines exist; and an examination of the first or last propositions of the sixth book of Euclid will show that the existence of proportional quantities is as easily established on the definition given as on any other. To take an instance however in which nothing but lines shall be the objects of consideration, we shall here prove, in a different manner, the second proposition of Euclid's sixth book, or one to the same effect.



Let OAB be a triangle, to one side of which *ab* is drawn parallel, and in OA produced set off AA_2, A_2A_3, &c. equal to OA, and aa_2, a_2a_3, &c. equal to O*a*. Through every one of the points so obtained draw parallels to AB, meeting OB produced in b, b_2, B_2, &c. Then it is easily proved that bb_2, b_2b_3, &c. are severally equal to O*b*, and BB_2, B_2B_3, &c. to OB. Consequently a distribution of the multiples of OA among those of O*a* is made on one line, and of OB among those of O*b* on the other. The examination of this distribution in all its extent (which is impossible, and hence the apparent difficulty of using the definition) is rendered unnecessary by the known property of parallel lines. For since A_3 lies between a_3 and a_4, B_3 must lie between b_3 and b_4; for if not, the line A_3B_3 would cut either a_3b_3 or a_4b_4. Hence without inquiring where A_m *does* fall, we know that if it fall between a_n and a_{n+1}, B_m must fall between b_n and b_{n+1}: or if $m \times OA$ fall in magnitude between $n \times Oa$ and $(n+1) \times Oa$, then $m \times OB$ must fall between $n \times Ob$ and $(n+1) \times Ob$. Thus it is established that OA is to O*a* as OB to O*b*.

The propositions of the fifth book become very simple when the definition is fully elucidated, and algebraical expression is substituted for the words at length of Euclid. They will be found thus treated in Playfair's or Lardner's editions of Euclid, and in the 'Connection of Number and Magnitude' (London, 1836).

When quantities are commensurable, a multiple of one may be found which is exactly equal to a multiple of the other: thus if $A = 3\frac{4}{13}B$, $13A = 43B$. In this case the arithmetical definition of proportion is sufficient, and the other may be shown to follow from it. Let $A = 3\frac{4}{13}B$, and $C = 3\frac{4}{13}D$, so that, arithmetically speaking, A is to B as C to D. Let mA lie between nB and $(n+1)B$, or $(3\frac{4}{13}m) \times B$ lies between nB and $(n+1)B$. Then the number or fraction $3\frac{4}{13}m$ must lie between n and $n+1$; whence $(3\frac{4}{13}m)D$ lies between nD and $(n+1)D$, or mC lies between nD and $(n+1)D$.

It is however perfectly allowable to leave out of sight the possible case in which a multiple of A is exactly equal to a multiple of B; since if the test be true in all other cases, it is therefore true in this. For, if possible, let $4A = 7B$, and $4C$ be (say) greater than $7D$. Then $m(4C)$ exceeds $m(7D)$ by m times this difference, which may be made as great as we please, or $4mC$, and multiples succeeding it, may be made to fall in an interval as many intervals removed from that of $7mD$ and $(7m+1)D$ as we please. But $4mA$ is equal to $7mB$, whence $(4m+1)A$, &c. must fall among the multiples of B in intervals of given nearness* to the interval of $7mB$ and $(7m+1)B$. Consequently the multiples of A following $4mA$ cannot always fall among the multiples of B in the same intervals as the same multiples of C among those of D; and the rest of the test cannot be true, unless $4C = 7D$; that is, if the rest of the test be true, then $4C = 7D$.

The following question will enable the reader to see for himself how far he is able to apply the method of Euclid. Returning to the illustration, suppose that the columns, instead of being mathematical lines, are of a given thickness, and that the columns in the model are of a proportionate thickness; let it also be supposed that when a railing is projected upon the column, there are no means of determining on which side of the axis of the column it falls. It is to be shown that if the distribution be according to the definition as to every railing which is not so projected, and about which there is therefore no doubt, it must also be true as to every case in which the doubt exists.

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* We leave the reader to put this demonstration into a more exact form.

The advantages of the study of proportion in the manner laid down by Euclid, or some other equivalent in extent and strictness, are precisely the advantages of accuracy over inaccuracy, and of real demonstration over a false and slovenly appearance of it, which, though a close resemblance, is therefore all the more dangerous. And it must be remembered what we mean by demonstration, namely, the process of obtaining a conclusion by sound logic from premises known to be true. If the prolixity of Euclid's method could be avoided by an assumption, we should not object, provided the assumption were both true and easily seen to be true. For instance, if the theory of PARALLELS could be established without its axiom by means of a hundred long and intricate propositions, we should agree with those who would refuse to place those propositions before beginners, on the ground that unimpeachable demonstration is already given, namely, an assumption which those who would rather dispense with it do not deny to be both true and easy (or capable of being made easy), and logic which is uncontested and incontestible. But the vice of the system which is substituted for that of Euclid consists in the entrance of an assumption which is *not* true; for to reason upon all magnitudes as if they were commensurable, and to assert conclusions derived from such reasonings, is to assume that all magnitudes are commensurable, which is not true. The method of Lacroix, as above explained, is sound as far as it goes: he asserts that the propositions of geometry are sensibly true, or if false, imperceptibly false, and this he proves. But he makes geometry cease to be an exact science. That of Legendre, on the other hand, though it proves no more than that of Lacroix, professes to prove more: it treats geometry as an exact science, while it avowedly states that an assumption may be made which is demonstrably incorrect.

We do not deny that a mind well versed in the doctrine of limits would have a process of its own, by which it would rigorise the method of Lacroix, arguing as follows: The same means which show the propositions of geometry to have no error perceptible to our senses, would also show them to have no error perceptible to any imperfect senses, however near to perfection they might be; and that error which is less than any assignable error, must be no error at all. All this, when properly extended, we might admit; but how are we to suppose, in the student who has just left the fourth book of Euclid, a perception of the truths of the doctrine of limits, the notorious want of which creates the difficulties of the differential calculus? Sound teaching makes a true theory of proportion one, out of many previous helps, to the attainment of the differential calculus: but the inversion of the process not only adds difficulty to the latter, by intercepting proper illustration, but introduces falsehood into the former, and such teaching is the most vicious of all vicious circles, because it propagates its kind.

The mathematical writers of this country have, taken all together, shown a superiority in exactness of demonstration over those of any other of modern times, and the deep and early root which the sound principles of Euclid have taken has been mainly the cause of this. If those principles be abandoned, that superiority will cease to exist; but this of itself would be of little consequence; not so the loss of a large amount of formation of accurate habits, which would certainly follow the substitution of a gross and (so called) practical instrument of calculation for an exact and liberal science.

Those to whom the mathematical sciences are taught as aids to the power of distinguishing truth from falsehood, logic from fallacy, the exact consequence from all incorrect inference, very many times exceed in number those who only wish for an instrument to be used in the study of physics and the arts of life. If then practical mathematics mean those mathematics which best answer the purpose of the great majority of learners, the more they are rigorous the more they are practical. But the enticing word *practical* has been otherwise appropriated; and 'exact enough for practical purposes' is the phrase applied to many a result of which the practical use belongs to the astronomer, mechanician, surveyor, engineer, or computer. To such a meaning of the word practical there is no objection as opposed to liberal or disciplinatory, when it is *knowledge* or *science* which is spoken of; but as applied to *art*, practical is opposed to unpractical, which cannot be carried into practice, or useless, for that which cannot be practised is useless in art. But those who would consider the use of knowledge in steadying the mind and making it a judge between the true and the false, and a safe guide to the methods of finding truth, must beware, in mathematics, how they allow the notions which art attaches to the word practical any influence over their method of studying science. For want of such a caution many have missed all comprehension of the higher branches even of the art to which they aspired, to say nothing of the loss of that science to which it should seem they did not mean to aspire.

PROPORTION. Much of the beauty of architecture depends upon proportion, or, in other words, that well-balanced regulation of the different parts of a structure which affects the eye and mind agreeably, all the members seeming agreeably adjusted to the whole, and the lesser details similarly adjusted to the separate features or larger members to which they belong. Accordingly great stress has been laid upon proportion by architectural writers, yet what they have said respecting it amounts to little more than artistical jargon; for not only do they generally restrict the term to proportion as regards individual parts, without reference to anything further, ascribing to them a positive charm, but some of them deny such merit altogether to any other styles than those of antient Greece and Rome and modern Italy. By proportion, in its technical sense, of course beauty of proportion is meant: yet it is surely a fundamental error to suppose, as some would have us do, that because what constitutes such beauty and such congruity of all the parts in the classical orders is not to be traced in the Gothic and other styles of the art, these latter can possess no corresponding beauty of their own. It would be about as rational to affirm that a horse has no proportions, or is an ill-proportioned misshapen animal, because its limbs are differently moulded and proportioned from those of a man.

What is it, if not the beautiful adjustment of parts to parts, that captivates us more or less in the productions of Gothic architecture? or wherefore do some buildings in that style charm us so much more than others, equally or even more meritorious perhaps in other respects, if not either by the harmony of their proportions, or the effect produced by some particular one, such for instance as loftiness, &c.? Indeed so very far from being devoid of proportions, Gothic architecture admits of infinitely greater variety in this respect than the columnar ordinances of the antients and moderns do; consequently, instead of being at all deficient in the elements and principles constituting proportion, it contains them in much greater abundance. It is indeed not the poverty but the copiousness of the Gothic, as regards diversity of proportions, that renders it almost impossible to systematise it, and to reduce it, as we have done the 'orders' (for we cannot say the Grecian and Roman *styles*), to a few positive rules which may be learned mechanically. So far it is beyond all comparison more difficult; and yet in one respect it seems conveniently easy, because conveniently accommodating, inasmuch as it affords very great latitude, and has no particular rules the infringement of which strikes at once as a solecism. Nevertheless this apparent facility is attended with some of the greatest difficulties, as is, unfortunately, too frequently made evident in our modern Gothic structures, which, even where the separate features or component parts are well proportioned in themselves, are rarely well put together, and agreeably proportioned upon the whole; or else, *vice versâ*, if the general proportions are good, those of the parts are not.

In respect to the Grecian orders [CIVIL ARCHITECTURE] and those derived from them, architecture has certainly not been benefited by the system-makers, who would establish certain fixed proportions for each, and thereby reduce each order to a single pattern for a column and its entablature. Neither is it easy to comprehend why such very great merit, or indeed any merit at all, should be ascribed to doing that which may be done altogether by rule, and without the slightest exercise of any mental faculty. Yet, though they insist upon the strictest regard to certain proportions, as far as the order, or the columns and entablature alone, of a building are concerned, they make amends for such rigour by liberally tolerating the utmost laxity as to proportion in all other respects. Provided the order be of legitimate proportions in itself, it may be quite out of proportion to the whole of the structure, and every other part may be out of proportion to the columns: either large windows may be introduced between diminutive columns, and consequently placed at considerable intervals from each other; or else two or even more tiers of diminutive windows may be placed between huge columns running through several stories, without offending the criticism that would be absolutely shocked at meeting with columns half a diameter more or less in height than the fixed standard, no matter what reason there might be for deviating from it, nor how judiciously soever it might be done.

Were the orders and their proportions so absolutely and unconditionally beautiful in themselves, as has been contended, many modern buildings ought to produce a very different effect from what they actually do. We find too that buildings of the same order are totally different in their proportions and in the relation which their other parts bear to the columns and entablatures. The only kind of proportions in regard to which positive directions can be laid down, and which are therefore prepared for all alike without other study than that included in the usual course of elementary instructions, are those which relate to columns, doors, windows, niches, &c. For all these, certain relations between height and breadth have been established, originating in convenience and fitness, and not in any abstract notions of geometrical harmony or beauty. Were the latter the case, the square and equilateral triangle would recommend themselves as the most perfect forms, the one for windows, the other for pediments. This is so far from being the case, that no kind of square apertures are admissible, or capable of being rendered agreeable even where dictated by convenience, except for mezzanine windows, for if a window requires to be made of wide proportions, so as to approach a square, it must be divided into separate upright compartments or apertures, after the manner of what is called a Venetian window; otherwise, even although its dimensions should not be such as to render a single aperture inconvenient, it would produce a disagreeable effect, and look like a mere glazed gap, or as a Gothic window of wide proportions would do without its mullions. With regard to arches again, or rather the spaces or openings covered by them, the proportions that are pleasing in some cases are quite unsuitable for others: in spacious apertures of the kind, that is, of considerable breadth as regards the other features, the proportions ought to vary little from a double square in height, or two circles inscribed within the aperture, of which half of the uppermost one will be the outline of the arch; whereas in narrower apertures of the kind, and in arched windows, greater proportionate height is allowable. As in almost every other respect, Gothic architecture affords greater freedom and latitude, not only as regards the form of the arch itself, but also the general proportions of the entire *voiding* covered by it, which may be of lofty proportions in comparison with its breadth; but in the Roman or modern Greco-Roman style (where the arch is adopted together with the Grecian features and detail), other proportions than those above mentioned cannot very well be departed from, because the excess as to height which would produce the grandeur of loftiness would in the same degree occasion the effect of narrowness, narrow and lofty being almost convertible terms as regards proportion. There are cases in which propriety and fitness not only reconcile us to proportions that would else be positively disagreeable, but in which positive admiration is excited by what would in general be termed utter disproportion. Of this we have proof in bridges, where beauty and grandeur are occasioned by proportions that would be absolutely monstrous elsewhere, by arches of prodigious span or width, springing from exceedingly low piers.

As to the internal proportions of buildings, we shall only observe that beauty and harmony of proportions depend very much upon the particular purpose for which an apartment is intended, and also upon the particular character aimed at. Even loftiness and lowness of proportion are not necessarily either a merit or defect, as their being so depends in very great measure not only on the nature of the apartment itself, but also on the architectural treatment of it. Whether in interior or exterior design, it is requisite that the individual features should be not only well proportioned in themselves, but so well balanced and adjusted that the ensemble shall at once produce a pleasing impression upon the spectator; which kind of *eurythmia*, or general harmony of proportions, admits of so many modifications, and depends so greatly upon the precise nature and character of the particular design, that direct precepts avail but little towards its attainment, on which account it must be acquired chiefly by taste guided by study and observation.

PROPORTION, in Music, is either Harmonical or Rhythmical.

Harmonical Proportion is when, of three numbers representing the relations of sounds, the first has the same proportion to the third as the difference between the first and second has to the difference between the second and third; as in the numbers 6, 8, 12; where

$$6 : 12 :: 8-6 : 12-8;$$

that is to say, $6 : 12 :: 2 : 4$.

When four numbers are in Harmonical Proportion, then the first has the same proportion to the fourth as the difference between the first and second has to the difference between the third and fourth; as in the numbers 6, 8, 12, 18; where

$$6 : 18 :: 8-6 : 18-12;$$

that is to say, $6 : 18 :: 2 : 6$.

The proportions of the sounds of the diatonic scale [DIATONIC] are as follows:—

The Key-note	1 : .
2nd	9 : 8
3rd (major)	5 : 4
4th	4 : 3
5th	3 : 2
6th	5 : 3
7th	15 : 8
8th, or octave	2 : 1

[SCALE; ACOUSTICS.]

Rhythmical Proportion is the proportion, in relation to time or measure, between the notes representing duration. Thus, the semibreve to the minim is 2 : 1; the semibreve to the crotchet, 4 : 1; the minim to the semiquaver, 8 : 1; &c. That is, the semibreve is twice as long in time as the minim: four times as long as the crotchet, &c.

PROPORTIONAL COMPASSES. [COMPASSES.]

PROPORTIONAL LOGARITHMS, also called logistic logarithms. Suppose it frequently required to calculate the fourth term of a proportion of which the first term is one given quantity, say A: that is, required a fourth proportional to A, p, and q. Common logarithmic calculation here requires three inspections of the table, one addition, and one subtraction. But if A be always the same thing, a new table may be framed, which shall only require two inspections and one addition, as follows:—Opposite to p in the table, write $\log A - \log p$ instead of $\log p$, and call the former the proportional logarithm of p, which must be considered as the abbreviation of 'logarithm of p proper to be used in proportions of which the first term is A.' The rule then is;—to find a fourth proportional to A, p, and q, add the proportional log of p to that of q, and the sum is the prop. log. of the answer. For $\log A - \log p$, and $\log A - \log q$, added together, give

$$\log A - \log \frac{pq}{A};$$

which is, by definition, the prop. log of $pq \div A$, the answer required.

In tables made to be used with the old Nautical Almanac in which the moon's motion was given for every three hours A was made $= 3^h = 10800^s$; and p and q were given in the table, not in seconds, but reduced to hours, minutes, and seconds. Thus the question—

$$3^h : 1^h\,23^m\,18^s :: 14^m\,13^s : x,$$

could be answered, and x found, by two inspections and an addition. But the convenience of this table lay much more in the arrangement into hours, minutes, and seconds, than in the nature of the substitute for the logarithm: and since a similar arrangement is now made to accompany common tables of logarithms, it may be doubted whether the day of logistic logarithms is not past.

PROPORTIONAL PARTS, a name given in logarithmic and other tables to small tables which are annexed to the differences of the tabular number, and which consist merely in setting down the several tenths of the differences or the nearest whole numbers to them. Thus, in the case of 953, the table of proportional parts is as follows:—

	953
1	95
2	191
3	286
4	381
5	477
6	572
7	667
8	762
9	858

Thus, 286 is the whole number nearest to 3-tenths of 953; from which we infer that 29 is the whole number nearest to 3-hundredths of 953. If then we would have ·74 of 953 to the nearest whole number, we take

7 tenths	.	667
4 hundredths	.	38
		705

or 705 is the nearest whole number required, subject to the possibility of an error of a unit, which is of no consequence in the matters for which such tables are used. This is the process required in logarithmic interpolation, when tables of seven decimal places are used.

PROPORTIONS, DEFINITE. [Atomic Theory.]

PROPOSITION. [Organon.]

PROPYLÆA. [Civil Architecture.]

PROROGATION. [Parliament, p. 271.]

PROSE comprehends any species of composition which is not written in metre. Modern writers have differed much respecting what constitutes the distinction between prose and poetry. Many writers maintain that the whole class of compositions, which have pleasure for their *main* object, ought to be regarded as poetry; but Whately, on the other hand, contends that metre is the essence of poetry, and consequently defines poetry as 'elegant and decorated language, in metre, expressing such and such thoughts,' and good prose-composition 'such and such thoughts expressed in good language' (*Rhetoric*, p. 348). [Poetry.]

PRO'SELYTE (*προσήλυτος*, connected with *προσέρχομαι, to come to*), a new comer. This word is not found in classical Greek, but occurs many times in the Septuagint, and a few times in the New Testament. It answers to the Hebrew, גֵּר, a stranger. 'Proselytes,' says Suidas, 'are they who have come out of the Gentiles, and live according to the divine laws.' The word is applied almost exclusively to persons converted to the religion of the Jews. Of proselytes, two kinds are mentioned by Jewish writers, proselytes of the gate, who observed only a few prescribed rules, and proselytes of righteousness, who followed the entire Mosaic ritual; but such a distinction does not appear to be recognised in the Scriptures. (Joseph Mede's *Discourses*.)

PROSE'RPINA, called by the Greeks Persephone (Περσεφόνη) and Persephoneia (Περσεφόνεια), was the daughter of Zeus and Demeter. (Hesiod, *Theog.*, 913.) She was carried off by Pluto while gathering flowers in the Nysian plain (Homer, *Hymn in Demet.*, 17), and made the queen of the regions of the dead. Demeter, inconsolable for the loss of her daughter, afflicted the world with sterility; till at length Zeus consented to the return of Proserpina to her mother; but as she had eaten food in the regions below, she was obliged to spend one third of the year with Pluto, and was allowed to pass the other two-thirds with Demeter. The tale of the rape of Proserpina is related at length in the Homeric Hymn to Demeter, and by Ovid and Claudian. The last two writers state that Proserpina was gathering flowers near the city of Enna in Sicily, when she was carried off by Pluto. In Homer, Persephone is mentioned as the goddess of Hades (*Od.*, xi. 217); but her rape by Pluto is not mentioned either in the 'Iliad' or 'Odyssey.'

Proserpina is frequently called Kora (Κόρη), that is, the 'Maiden,' by the Attic writers. This goddess and her mother Demeter were also worshipped under the name of the 'Great Goddesses' (*αἱ μεγάλαι θεαί*, Pausan., viii. 31, § 1).

The etymology of Persephone and Proserpina is doubtful. Some writers connect her name with *φέρω, φέρβω*, 'to feed,' and *φάω, φαίνω*, 'to show,' and interpret it to mean the 'shower of food,' in allusion to her being the daughter of Demeter; but this explanation is far from satisfactory [Demeter; Pluto.]

PROSI'MIA, the name given by Brisson and Storr to some of the *Lemurs*. [Lemuridæ.] The *Prosimii* of Illiger (belonging to his *Pollicata*) consist of the genera *Lichanotus*, *Lemur*, and *Stenops*.

PRO'SODY (*προσῳδία*) is derived from a Greek word, which has exactly the same meaning as the Latin *accentus* and was used by the Greeks in the same sense. (Quintil., *Inst. Orator.*, i. 5, p. 38, ed. Bipont.; Aulus Gellius, xii. 6.) Most modern writers however make a distinction between prosody and accent, understanding by the former what is usually called *quantity*, that is, the duration of a sound. Thus it is said that the principle of Greek and Roman versification is *quantity*, while that of the poetry of the modern European languages depends on *accents*. It is not however improbable that what the antients meant by *quantity* was not very different from what we call *accent*. [Accent.] For further information on this subject the reader is referred to an able article in the fourth volume of the 'Journal of Education,' p. 337, &c.; and to the article Oratory.

PRO'SOPIS, a name which occurs in Dioscorides, and which has been injudiciously applied to a tropical genus, without any proof of the species of this, having any resemblance to the original plant. The genus consists of trees or shrubs, with flowers in spikes, pinnate much-divided leaves, with or without thorns, and edible legumes, of which several are found in South America, and called algaroba by the Spaniards. One species is found in India, which resembles the South American species in its legume, when ripe, containing, besides the seeds, a large quantity of a brown mealy substance, which is eaten by the natives of the country. This species, known to the natives by the name of Chanee, grows to the size of a tree, and is found in the interior of the peninsula of India, as well as in the north-western provinces. It was referred to Adenanthera by Dr. Roxburgh. The genus is characterised by having polygamous flowers, a five-toothed calyx, five free petals, ten stamens, with the filaments scarcely united at the very base. Legume continuous, filled with pulp, linear, cylindrical, slightly compressed, torulose, at length crumbling to pieces. It is the above pulp which is edible both in India and in South America.

PROSTYLE. [Civil Architecture.]

PROTA'GORAS was born at Abdera in Thrace, and is said to have been originally a porter, and to have received instruction from Democritus, who was so pleased with the skilful manner in which Protagoras arranged his load, that he afforded him the means of prosecuting the study of philosophy. Some modern writers have disbelieved the whole account, but it seems certain, from the unanimous testimony of the antients, that Protagoras was of an inferior condition in life, and owed his education to Democritus. (Aul. Gell., v. 3; Diog. Laert., ix. 50, 53; Athenæus, viii., p. 534, c.; Suidas, &c.) The principal circumstance which has led some writers to doubt whether Protagoras ever received instruction from Democritus arises from the fact that the former was in all probability older than the latter. Democritus was born B.C. 460. [Democritus.] Plato represents Socrates in the 'Meno' (c. 29, p. [illegible]1) speaking of Protagoras as already dead, and also states that he lived nearly seventy years. Now as Socrates died B.C. 399, Protagoras, according to this account, must have been born at least as early as B.C. 470, though the carelessness of Plato on such subjects renders this by no means certain. Philochorus however, according to Diogenes Laertius (ix. 55), said that the death of Protagoras was alluded to in the 'Ixion' of Euripides, which must consequently have happened before that of Euripides, that is, before the end of B.C. 406. If however both these statements can be depended upon, there is still no reason for disbelieving that Protagoras received instruction from Democritus; for, as Mr. Clinton has remarked, Democritus, who belonged to one of the most eminent families at Abdera in rank and station, might discern the merit and encourage the genius of Protagoras, although younger himself than Protagoras.

None of the writings of Protagoras have come down to us; but it is evident that he was a man of great powers of mind. Some of his doctrines are discussed in the 'Theætetus' of Plato. [Plato, p. 237.] He travelled through Greece for the purpose of giving instruction in philosophy and eloquence, and is said to have been the first person who adopted the name of Sophist (*σοφιστής*), to distinguish more decidedly one who made others wise, especially one who taught eloquence and the political art. He is also said to have been the first among the Greek philosophers who received money for the instruction which he gave. Wherever he went, he was sure to obtain numbers of pupils; and Plato, in the dialogue entitled 'Protagoras,' has given an amusing account of the enthusiasm with which he was received by the young men at Athens on his visit to that city. Diogenes Laertius says (ix. 52) that his instruction was so much in demand, that he sometimes received a hundred minæ; and Plato informs us (*Meno*, c. 29, p. 91) that, during the forty years in which Protagoras taught, he made more money than Phidias and ten other sculptors.

Protagoras visited Athens at least twice. Two of his visits are spoken of by Athenæus and Plato (Athen., v., p. 218, b; xi., p. 506, a; *Protag.*, c. 5), and the date of his second visit is determined by the former writer, who says (v., p. 218, c) that it took place after the Κόννος of Ameipsias and before the Κόλακες of Eupolis, that is, between B.C. 423 and 421. During one of his visits to Athens, probably subsequent to those which have been mentioned, he was banished from the state, and his books burned in the market-place, because he had stated at the beginning of one of his works that he did not know whether the gods existed or not. (Diog. Laert., ix. 51, 52; Cic., *De Nat. Deor.*, i. 23.) According to some accounts, he was drowned in his passage to Sicily, and, according to others, died on the voyage. (Diog. Laert., ix. 55.)

Protagoras appears to have been the first who taught oratory as an art. He possessed, if we may judge from the specimen given by Plato in the 'Protagoras,' a lively imagination and great copiousness of words. He was well acquainted with the literature of his own country, especially the works of the antient poets, whom he frequently quoted in his speeches, which appear to have been very popular. He is said to have taught Isocrates, and his oratorical exercises are referred to by Cicero, who says that they were called in his time 'communes loci' (*Brut.*, c. 12). Protagoras was the first who introduced artificial divisions into discourses. (Diog. Laert., ix. 53, 54.) He also appears to have written works on language and oratory: his ορθοέπεια, which is referred to by Plato (*Phædr.*, c. 114, p. 267), is supposed by Spengel (Συναγωγὴ τεχνῶν, p. 40, Stuttgardt, 1828) to have been a work of this description. A list of the writings of Protagoras is given by Diogenes Laertius (ix. 55) and Fabricius (*Bibl. Græc.*, vol. ii., p. 668, ed. Harles). Cicero refers to his work 'On the Nature of Things' (*De Orat.*, iii. 32).

For further information on the Life of Protagoras, the reader is referred to Herbst, *Des Protagoras Leben und Sophistik aus den Quellen zusammengestellt*, in Petersen's 'Phil.-Histor. Studien auf dem Akad. Gymnasium in Hamburg,' Hamburg, 1832, heft i., p. 88.

PROTEA'CEÆ. [XYLOMELUM.]

PROTECTOR. [SETTLEMENT.]

PROTELES. [AARD WOLF.]

PROTEOSAU'RUS. [ICHTHYOSAURUS.]

PROTEST. [BILL OF EXCHANGE; NOTARY; PARLIAMENT.]

PROTESTANT, a general term comprehending all those who, professing Christianity, yet are not in the communion of the general church or confederacy of Christians of which the pope is the head and the city of Rome the centre or capital. There is great variety of opinion among persons thus separated, in points of faith, church order, and discipline, but this term covers and comprehends them all, leaving the varieties in opinion to be marks of specific differences only under the genus Protestant.

The term originated in Germany, and the occasion was this:—At the diet at Spire, in 1526, decrees had been passed which were so far favourable to the progress of the Reformation that they went to forbid any peculiar exertions against it. The consequence was that the spirit of reformation gained strength, and spread itself more extensively in Germany. Then arose also commotions which were attributed to the reformed and to the spirit kindled by them. Both the pope and the emperor looked with increasing alarm on the aspect of affairs, and at another diet, held at the same place in 1529, the emperor directed an imperial brief to the persons assembled, to the effect that he had forbidden all innovation, and proscribed the innovators in matters of religion, who had notwithstanding increased since the decrees of 1526, but that now, by virtue of the full powers inherent in him, he annulled those decrees as contrary to his intentions. The peremptory tone of these letters alarmed the persons present at the diet; and particularly the elector of Saxony is reported to have said to his son that no former emperor had used such language, and that he ought to be informed that their rights were more antient than the elevation of his family.

This strong measure of the emperor had also the effect of uniting, at least on this point, the two great sections of German reformers, the Lutherans and the Sacramentarians, of whom Zuinglius was the head. However the party opposed to the Reformation was the stronger, and the emperor's brief received the sanction of the diet. Then it was that the reformers took the high ground of declaring that this was not a business of policy or temporal interests, with respect to which they were ready to submit to the will of the majority, but it affected the interests of conscience and futurity. On this and other grounds they founded a *protest*, which was delivered in on the 19th day of April, but refused by the rest of the diet. A second protest, larger than the former, was presented on the succeeding day. The princes and the cities who favoured the Reformation joined in it, and thenceforth it became usual to call the reformers *Protestants*.

It is often found that a particular incident or occasion leads to the construction of a name for a religious party, which becomes extended, as in this instance, to parties who have no immediate connection with the particular incident, or interest in the question with which it is connected. The term Protestant in fact seems to have as much to do with the constitution of the Germanic confederacy as with the principles of the Reformation; and certainly neither England nor Scotland had any thing to do with the proceedings of the emperor or with the diet of Spire. The Reformed Church might seem to designate the church of England or the church of Scotland more appropriately than the Protestant church. However it must be owned that few things are more difficult than to coin terms by which to designate a religious community which shall not be open to objection and cavil.

PROTEUS, Laurenti's name for one of the genera of *Perennibranchiate Batrachians*, namely, those *Batrachians* which preserve their branchiæ throughout life, whereas the *Caducibranchiate Batrachians* only possess them during their early or tadpole state. [FROGS.] This preservation of the branchiæ does not interfere with the presence of true lungs, so that these *Perennibranchiata* may, as Cuvier observes, be regarded as the sole vertebrated animals that are truly amphibious. The same distinguished comparative anatomist says: 'The simultaneous existence and action of branchial tufts and lungs in these animals can no more be contested than the most certain facts of natural history; I have before me the lungs of a *Siren* of three feet in length, where the vascular apparatus is as much developed and as complicated as in any reptile: nevertheless this *Siren* had its *branchiæ* as complete as the others.' [SIREN.] Cuvier further observes that whilst the branchiæ subsist, the aorta, in coming from the heart, is divided into as many branches on each side as there are *branchiæ*. The blood of the *branchiæ* returns by the veins, which unite towards the back in a single arterial trunk, as in the fishes; it is from this trunk, or immediately from the veins which form it, that the greatest part of the arteries which nourish the body, and even those which conduct the blood for respiration in the lung, spring. But in the species which lose their *branchiæ* naturally, the branches which go there become obliterated, except two which unite in a dorsal artery, and of which each gives off a small branch to the lung. 'It is,' adds Cuvier, 'the circulation of a fish metamorphosed into the circulation of a reptile.'

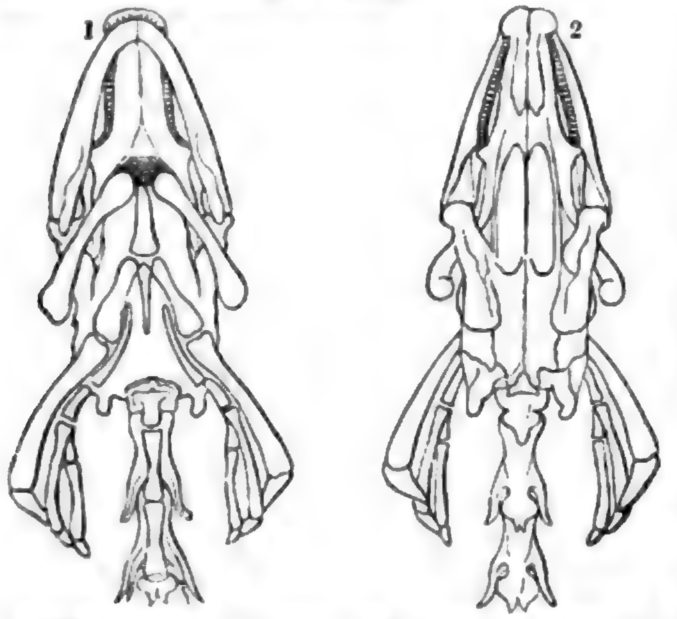
The genera of these *Amphibia*, or *Proteidea*, as they have been termed, are the *Axolotls* [AXOLOTL]; *Menobranchus*, Harlan [NECTURUS]; *Proteus*, of which we are about to treat; and *Siren* which will be noticed under that title.

ORGANIZATION.

The *Proteus* of Laurenti (*Hypochton* of Merrem) has four feet. There are three toes on the anterior feet and two only on the posterior feet. The skeleton bears considerable resemblance to that of the *Salamanders*; indeed, Cuvier, we believe, has somewhere termed the fossil *Salamandra gigantea*, the *Homo diluvii testis* of Scheuchzer, *Protée gigantesque*: but *Proteus* has many more vertebræ than the Salamanders, and less of the rudiments of ribs, and its bony head is entirely different from theirs in its general conformation.

But one species of *Proteus* appears to be known, the *Proteus anguinus* of authors, *Hypochton Anguinus*. Cuvier describes it as more than a foot long, of the size of a human finger, with a tail vertically compressed, and four little legs; the muzzle elongated and depressed; both of its jaws furnished with teeth;* the tongue with but little motion, but free in front; the eyes excessively small and hidden by the skin, as in the Rat-Mole (*Spalax*); the ears covered by the flesh, as in the Salamander; its skin smooth and whitish.

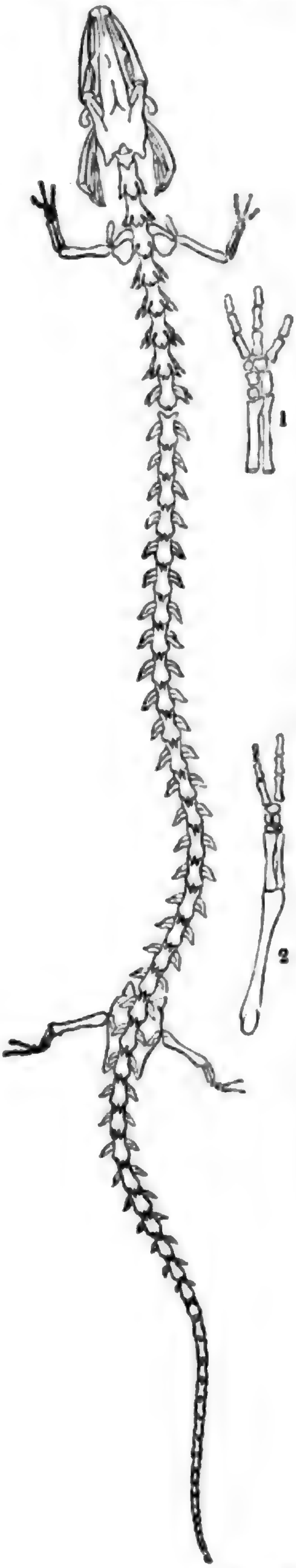
Those which we have seen alive have been of a light flesh-colour with coral-red branchiæ.



1. Skull, &c., and three first vertebræ, of the Proteus, seen from below. 2, Same seen from above, eight times larger than nature. (Rusconi.)

In November, 1837, Dr. Martin Barry, of Edinburgh, exhibited one of these singular and interesting animals, living, to the Zoological Society of London, and read the following communication from Professor Rudolph Wagner, of Erlangen in Bavaria:—

'I was so fortunate'—it is the Professor who speaks—'at the end of last summer, as to obtain three living *Protei*; of which I have examined two, just killed, that proved to be a male and female, and have given the third, alive, to my friend Dr. Barry, who may perhaps have an opportunity of bringing it forward at a meeting of the Zoological Society. The results of my examination correspond perfectly with the statements of Cuvier, R. Owen, J. Müller, and others, on the *Proteidea*; but are opposed to several of the views lately put forth by Rusconi. (*Observations sur la Sirène*, 1837.) I have, for instance, no doubt that the pulmonary sacs or vesicles really perform the function of lungs. Each lung contains a large artery and a still larger vein, which are connected together by means of large and numerous vessels. To me the most important point was the examination of the blood-globules and the generative organs. I conjectured, on various grounds, that the *Proteidea* would be found to have, of all animals, the largest blood-globules:—first, because the size of the latter in the naked *Amphibia* in general is the largest in the animal kingdom; secondly, because, remarkable as it is, the blood-globules are here (in the naked Amphibia) so much the larger, the longer the gills continue in the larval state; hence the land and water salamanders have much larger blood-globules than the frog. I conjectured also that the *Protei* (probably also the *Siren*, &c.), because they permanently have both gills and lungs—being therefore permanently *larvæ*—would be found to have the largest blood-globules. The latter are indeed gigantic; flat, oval, resembling those of the salamander, and from $\frac{1}{30}$ to $\frac{1}{10}$ of a Paris line in length; hence, as minute points, visible to the naked eye. They are from once to twice the size of the blood globules of the salamander, nearly three times as large as those of the frog, and about twelve or fifteen times the size of those of man. In a female I found the *ova* very beautifully developed; their structure, as well as that of the ovary, corresponding perfectly with that of the other naked *Amphibia*, especially the *Triton*. The smallest *ova* consist of a delicate *chorion*, yellow yolk, large germinal vesicle, and *manifold* germinal spot. I regret to say that in the otherwise tolerably developed testes of the male there were no *spermatozoa*. I conjecture however that the *spermatozoa* of this animal resemble those of the *Triton*. I would just remark, that the form and size of the blood-globules, the formation of the *ova*, and the form of the *spermatozoa*, in different animals,



Skeleton of Proteus, seen from above. 1, bones of anterior foot, magnified; 2, bones of posterior foot, magnified. (Rusconi.)

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* Mr. Swainson (*Classification of Amphibians*) erroneously states that it has no teeth. See the cut, and Professor Owen's work on the teeth, where a figure of those of *Proteus* is given.

have a great zoological and physiological interest. Already is it in my power from a drop of blood or *semen* placed before me, to determine with the microscope, not only the class, but frequently the genus and the species from which these fluids have been taken.'

Dr. Barry then stated that, from his own microscopical examination, he was able fully to confirm the correctness of Professor Wagner's observations upon the size and shape of the blood-globules in the *Proteus*. (*Zool. Proc.*, 1837.)

Locality, Habits, &c.—Sir Humphry Davy, in his 'Consolations in Travel,' gives a very graphic account of finding these subterranean aquatics in Illyria. In a conversation given as taking place in the Grotto of the Maddalena at Adelsberg, many hundred feet below the surface, after a lively description of that extraordinary cavern, *Eubathes*, one of the prolocutors, says, 'I see three or four creatures, ike slender fish, moving on the mud below the water.'

'*The Unknown.*—I see them; they are the *Protei;* now I have them in my fishing-net, and now they are safe in the pitcher of water. At first view, you might suppose this animal to be a lizard, but it has the motions of a fish. Its head and the lower part of its body and its tail bear a strong resemblance to those of the eel; but it has no fins,* and its curious branchial organs are not like the gills of fishes; they form a singular vascular structure, as you see, almost like a crest, round the throat, which may be removed without occasioning the death of the animal, which is likewise furnished with lungs. With this double apparatus for supplying air to the blood, it can live either below or above the surface of the water. Its fore feet resemble hands, but they have only three claws or fingers, and are too feeble to be of use in grasping or supporting the weight of the animal; the hinder feet have only two claws or toes, and in the larger specimens are found so imperfect as to be almost obliterated. It has small points in place of eyes, as if to preserve the analogy of nature. It is of a fleshy whiteness and transparency in its natural state, but when exposed to light, its skin gradually becomes darker, and at last gains an olive tint. Its nasal organs appear large; and it is abundantly furnished with teeth, from which it may be concluded that it is an animal of prey; yet in its confined state, it has never been known to eat, and it has been kept alive for many years by occasionally changing the water in which it was placed.'

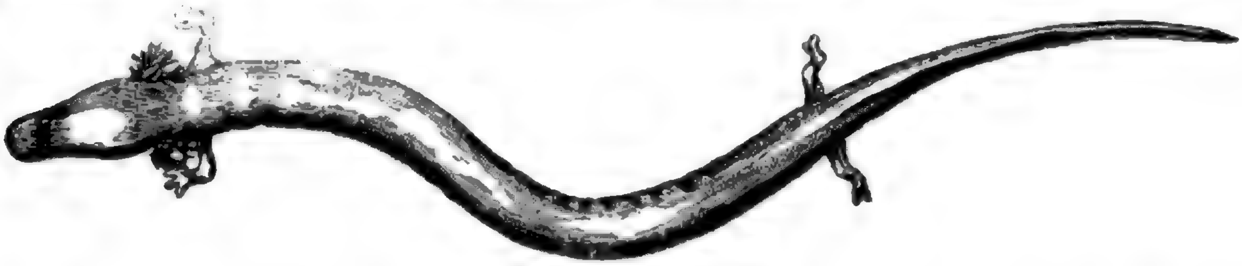
Eubathes.—'Is this the only place in Carniola where these animals are found?'

The Unknown.—'They were first discovered here by the late Baron Zöis; but they have since been found, though rarely, at Sittich, about thirty miles distant, thrown up by water from a subterraneous cavity; and I have lately heard it reported that some individuals of the same species have been recognised in the calcareous strata in Sicily.'

Eubathes.—'This lake in which we have seen these animals is a very small one; do you suppose they are bred here?'

The Unknown.—'Certainly not: in dry seasons they are seldom found here, but after great rains they are often abundant. I think it cannot be doubted that their natural residence is in an extensive deep subterranean lake, from which in great floods they sometimes are forced through the crevices of the rocks into this place where they are found; and it does not appear to me impossible, when the peculiar nature of the country in which we are is considered, that the same great cavity may furnish the individuals which have been found at Adelsberg and at Sittich.'

Eubathes replies, 'That this is a very extraordinary view of the subject, and proceeds to inquire whether it is not possible that it may be the larva of some large unknown animal inhabiting those limestone cavities?'—which ingenious theory the *Unknown* very properly disposes of by showing that it is not an animal in a state of transition, but a perfect animal of a peculiar species.



Proteus anguinus.

With reference to the subject of this article, the student should carefully go over Professor Owen's paper on the *Lepidosiren annectens*, in the eighteenth volume of the 'Linnean Transactions.' This most interesting animal, though undoubtedly a fish, is one of those beautifully fine and harmonious links by which the whole golden chain of nature is connected. We direct attention to one or two points in the structure of this *Proteideous* fish. In *Lepidosiren* the nostrils are situated at the under part of the upper lip, within the opening of the mouth. They appear as two small perforations leading to blind sacs. In the *Siren*, as well as in the *Proteus*, Cuvier expressly states that the nasal cavities communicate with the mouth.

The muscles of the trunk of the *Lepidosiren* present, Mr. Owen tells us, all the simplicity and uniformity characteristic of the class of fishes; the ventral series occupy the place of the true abdominal muscles, which first begin to be developed in the strictly air-breathing Reptiles. The muscles of the mandibular, hyoidean, branchial, and scapular arches resemble in some points the arrangement of the same muscles in the Perennibranchians, and in other points that in the true fishes; and, notwithstanding the entirely fish-like disposition of the muscles of the trunk, the lower Perennibranchians and the larvæ of the higher Batrachians offer, he observes, a similar agreement in this part of their organization to the class of fishes. Again, we are told that the brain bears a closer resemblance to that of the Perennibranchiate Reptiles than to the brain of any fish that has yet been described. In the low development of the cerebellum and in the large size of the pineal gland, the *Lepidosiren* deviates remarkably, both from the osseous and cartilaginous fishes. The orifice of the pharynx is much smaller and more suddenly contracted than in fishes generally, or the Perennibranchiate Reptiles. The abdominal cavity, which commences about half an inch behind the pectoral filamentary fins, and extends about half an inch beyond the anus, is separated anteriorly from the pericardiac cavity, as in fishes and Perennibranchiate Reptiles, by a distinct transverse septum. The heart of *Lepidosiren* consists of a single auricle, a ventricle, and a *bulbus arteriosus*. The *vena cava* terminates in the right side of the large auricle; it is joined by two superior *cavæ*, and by the single large pulmonary vein; this vein does not however communicate with the sinus, but passes along entire and adherent to the inner surface of the *vena cava*, as far as the auriculo-ventricular aperture, where it empties its contents into the ventricle by a distinct orifice, protected by a cartilaginous valvular tubercle. 'It needed only,' proceeds Mr. Owen, 'that the pulmonary vein should have been dilated before its termination, in order to have established a biauricular structure of the heart, as in the *Siren*. The same functional advantage is however thus secured to the *Lepidosiren*, with the maintenance of the simple dicœlous type of the heart of the fish; the continuation of the pulmonary vein preventing the admixture of the respired with the venous blood, until both have arrived in the ventricle.' The *branchiæ* of the *Lepidosiren*, it appears, resemble in form those of the *Siren*, consisting of separate elongated filaments, attached only by one extremity to the branchial arch: but these extremities are fixed directly to the branchial arch, and not to a common pedicle extended therefrom, as in the *Siren*. Viewed with a moderate lens, Professor Owen found the tripinnatifid structure beautifully displayed in each branchial filament. The gills do not form any external projection, as in the gill-bearing Perennibranchians; but although the organs for respiration through the medium of water correspond in all essential points with those of the true fishes, yet the gills approximate in their filamentary form to those of the Perennibranchiate Reptiles. The *tra*

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* It has a sort of tail-fin.

chea, too, or *ductus pneumaticus*, is a short, wide, membranous tube, as in the Perennibranchiate Reptiles, and there are regular lungs, but having the same relative position as the air-bladder of fishes.

Our limits will not permit us to go further into this interesting comparison, but we particularly recommend attention to the concluding observations of the Professor's acute, accurate, and satisfactory memoir. [PROTOPTERUS.]

PROTOCACCUS. [SNOW, RED.]

PROTO'GENES (Πρωτογένης), one of the most celebrated of the Greek painters, was born at Caunus in Caria, a town subject to the Rhodians. Suidas says that Protogenes was a native of Xanthus in Lycia; but this appears to be a mistake, since he is called a Caunian by Pausanias (i. 3, § 4), and is expressly said by Pliny (*Hist. Nat.*, xxxv. 36, § 20) to have been born at Caunus. He was a contemporary of Apelles, and was at the height of his reputation in the 112th Olympiad, that is, about B.C. 332. (Plin., *Hist. Nat.*, xxxv. 36, § 10.) He lived at Rhodes during the greater part of his life.

Pliny says that Protogenes was originally in very poor circumstances, and that it was not known from whom he received instruction. He did not produce many paintings, in consequence of the long time and great labour which he devoted to each. Quintilian (*Inst. Orat.*, xii. 10, p. 369, Bipont) says that 'cura' was the distinguishing characteristic of his paintings; and Apelles is said to have remarked that Protogenes did not know when to take his hand from his pictures. (Plin., *Hist. Nat.*, xxxv. 36, § 10.) Of all the paintings of Protogenes the most celebrated was the one called Ialysus, upon which he is said to have been engaged seven years. (Ælian, *Var. Hist.*, xii. 41.) Pliny says that he lived, during the time he was painting it, upon moistened lupines, and also informs us that each colour was laid on four times. A dog in this painting, which was represented panting and foaming at the mouth, was greatly admired. It is related that Protogenes was for a long time unable to represent the foam in the manner which he wished, till at length, disheartened by repeated failures, he threw his sponge at the mouth of the dog, which accidentally produced the effect he had been endeavouring to obtain. The fame of this painting was so great, that Demetrius Poliorcetes, when besieging Rhodes, did not set fire to that part of the city where Protogenes lived, lest he should destroy the picture. (Plin., *Hist. Nat.*, vii. 39; xxxv. 36, § 20.) Aulus Gellius, in relating the same circumstance, says (xv. 31) that Protogenes was dead, and that the painting was preserved in a public library outside the walls of the town. In the time of Pliny it was preserved in the temple of Peace at Rome.

Among the other paintings of Protogenes mentioned by Pliny was a portrait of the mother of Aristotle, who advised him to paint some of the exploits of Alexander the Great. Paintings of Alexander and of Pan were among the last of his works. Pausanias (i. 3, § 4) also mentions a painting of the Thesmothetæ by Protogenes, which was preserved at Athens in the senate-house of the Five Hundred (βουλευτήριον).

Protogenes is always mentioned by the antient writers in terms of the highest admiration. (Petron., *Sat.*, c. 83; Cic., *Brut.*, 18; *Ad Att.*, ii. 21; Varro, *De Ling. Lat.*, ix. 12, ed. Müller; Columella, *De Re Rust.*; Præf. in lib. i., p. 21, Bipont.) He is said by Pliny to have also executed works in bronze.

Suidas says that Protogenes wrote two books on the art of painting and on figures (περὶ γραφικῆς καὶ σχημάτων).

(Junius, *Catalogus Architectorum, Mechanicorum, Pictorum*, &c., Art. 'Protogenes,' Roter., 1694.)

PROTO'PTERUS. Under this name Professor Owen, in the MS. catalogue of the Museum of the College of Surgeons, in June, 1837, recorded the principal characters of an extraordinary animal which he supposed to belong to the Malacopterygious fishes. In the same year, Dr. Natterer published an account of a nearly allied animal under the name *Lepidosiren paradoxa*. This account appeared in the annals of the Museum of Vienna,* and is drawn up from two specimens discovered by the author of the paper in South America. The memoir of Dr. Natterer on the South American *Lepidosiren* was followed by one from Professor Owen, in the 'Linnean Transactions' (vol. xviii., part 2, p. 327), in which that anatomist describes in detail both the external characters and internal anatomy of the *Protopterus* above mentioned; and as he found this animal must be referred to the same genus as that discovered by Dr. Natterer, he adopted his generic term, and applied the name of *Lepidosiren annectens* to the species. The last-mentioned animal, says Professor Owen, 'was presented to the Royal College of Surgeons, June, 1837, by Thomas C. B. Weir, Esq., together with a smaller dried specimen enclosed in indurated clay baked hard by the sun. Several species of insects peculiar to the Gambia, or African forms, accompanied these specimens.' 'It is a female, with the ovaria well developed, and measures twelve inches eight lines in length; its greatest circumference is four inches and a half. The head commences by an obtuse muzzle, and gradually enlarges in all its dimensions to the gill-openings, which are situated immediately anterior to the base of the pectoral extremities: the length of the head, from the snout to the gill-opening, is one inch eleven lines. The anus, or rather the cloacal vent, is a small elliptical aperture marked with radiating lines, which is situated three lines behind the ventral filaments, and offers the same peculiarity as does that of the *Lepidosiren paradoxa* in not being situated on the median plane; in the present specimen it was on the right side of a longitudinal fold of integument which occupied the middle line. The distance from the vent to the end of the tail is five inches. The trunk gives a wide elliptical transverse section, and maintains a pretty uniform size, slightly decreasing in breadth to the ventral filaments. Beyond these the tail becomes more rapidly compressed, and after a short distance diminishes also in vertical dimension, till it ends in a thin point. A membranous dorsal fin commences at the distance of four inches from the snout, and, gradually increasing to the height of five lines, is thus continued into the caudal membranous expansion. This fin is supported by numerous soft, elastic, transparent rays, articulated to the extremities of the superior and inferior peripheral spines of the caudal vertebræ; the under part of the caudal fin commences about one inch behind the vent. The entire body is covered with cycloid scales, which are relatively larger, but have the same general structure and disposition as in the *Lepidosiren paradoxa*. They present a subcircular form, with a diameter of about three lines; their posterior margin adheres to the strong cuticle with which they are removed, as in other fishes; the anterior lies freely in a corresponding groove of the chorion. When viewed with a low magnifying power, they present a series of canals radiating somewhat irregularly from a centre near the posterior edge of the scales, and maintaining a uniform diameter. These canals are united together by cross canals, which do not form regular concentric lines. The meshes formed by this reticulation are small and of a subquadrate form at the anterior part of the scale, but are more elongated in the middle of the scale: they are again smaller and shorter at the circumference. With a magnifying power of 150 linear diameters, the interspaces of the larger canals are seen to be occupied by a finer network of apparent tubes, and from an angle of each of these spaces a short obtuse process, projecting slightly backwards, is developed on the external surface of the scale; the internal surface is quite smooth There are three or four faint concentric lines of growth at the circumference of the scale, but this body is evidently one continuous organised whole. The subcuticular tissue of the scale is a kind of dense elastic cartilage, not yielding any gas bubbles on the application of acid. The scales are continued upon the base of the caudal natatory fold of integument.

'The disposition of the mucous pores and ducts upon the head is very similar in the two species of the *Lepidosiren*, judging from the figure given by Dr. Natterer. A linear series of mucous pores encircles each eye, and from the posterior angle of this series the lateral line commences. This line extends backwards nearly parallel with the dorsal line, situated a little more than one-fourth of the vertical diameter of the body of that line, until it nearly reaches the ventral extremities, where it bends down to midway between the dorsal and ventral margins, and so continues to the end of the tail.

'The rudimentary filamentary fins, the analogues of the four ordinary extremities in the Vertebrata, permanently represent in the present singular animal the earliest embryonic condition of the pectoral and pelvic members

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* '*Lepidosiren paradoxa*, eine neue Gattung, aus der Familie der Fischähnlichen Reptilien, von Johann Natterer,' in 'Annalen des Wiener Museums der Naturgeschichte,' 1837, ii., p. 166.

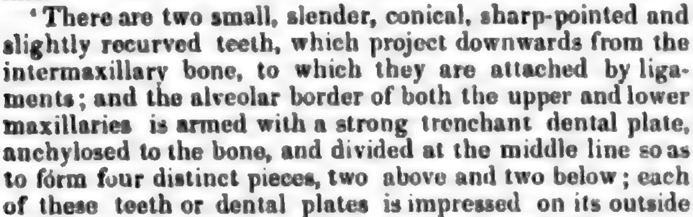
They are round, filiform, gradually attenuated to an undivided point, resembling tentacles or feelers rather than fins or legs, and doubtless restricted to their tactile functions. Each filiform member is supported by a single-jointed, soft, cartilaginous ray. The pectoral tentacles are somewhat shorter and more slender than the ventral ones; the former are two inches, the latter two inches four lines in length.

'The branchial apertures are narrow vertical slits four lines in extent. The eyes appear externally as two small round flat spots of a lighter colour than the surrounding integument; they are situated seven lines from the end of the snout, and nearly the same distance apart from one another. Each of these simple visual organs measures one line and a half in diameter; it is not defended by any palpebral folds of the skin; the cornea is thin, sufficiently transparent to allow the lens to be visible even in the specimen preserved in spirits. The nostrils are situated at the under part of the upper lip, within the opening of the mouth. They appear as two small perforations leading to blind sacs afterwards to be described. The opening of the mouth is wide and defended by well-developed fleshy lips. The skin at the angles of the mouth is thinner than at the rest of its circumference, and the upper lip folds over the lower one from the angle to near the fore part of the mouth; here the lips are thick, smooth, and rounded; the lower lip is the thickest.

'About a line behind the lower lip, between it and the teeth, there project six soft papillose processes, of a triangular form; two of these, which are situated in the middle line, consist of a transverse row of papiliæ; the posterior ones are membranous, and the papillæ are confined to their margin and outer surface: they occupy the notches of the broad and strong dental plate.

'Behind the upper lip there are eight similar papillose processes, four on each side; the mesial placed one line behind or within the margin of the lip; the outermost, three lines from the same part; immediately anterior to the interspace of the two outer lamellæ is the orifice of the nostril, which is elliptical, and one line in the long diameter; the olfactory cavity itself is three lines in the long diameter, and its closed posterior part is occupied with two rows of small transverse lamellæ, about twenty in a row, divided by a transverse line.

'There are two small, slender, conical, sharp-pointed and slightly recurved teeth, which project downwards from the intermaxillary bone, to which they are attached by ligaments; and the alveolar border of both the upper and lower maxillaries is armed with a strong trenchant dental plate, anchylosed to the bone, and divided at the middle line so as to form four distinct pieces, two above and two below; each of these teeth or dental plates is impressed on its outside with two notches, extending almost through the whole breadth of the plate, and dividing it into three angular processes, which, from the direction of the notches, appear to radiate from the inner and posterior angle of the tooth: the two anterior divisions in both the upper and lower jaws are the most produced in the vertical direction, and are pointed so as to be adapted for piercing: the posterior divisions are most extended in breadth, and least in height, and terminate in a sharp trenchant edge; the middle divisions present an intermediate structure. These teeth, in their paucity, relative size, and mode of fixation to the maxillæ, resemble those of the chimæra and some of the extinct cartilaginous fishes, as *cochliodus* and *ceradodus*; but they are unlike these in their microscopic structure, and differ from any known dental apparatus in the class of fishes, in the modifications of the working surface which at once adapt them for piercing, cutting, and crushing. The strength of the jaws, and the size of the muscles which work them, are proportionate to the size and formidable character of the maxillary dental plates.



There are no lingual, palatine, pterygoid, vomerine, or pharyngeal teeth.

'The general colour of the specimen was a mixed tint of dark olive-green and brown, growing lighter towards the belly, with irregular dark spots, as big as the largest scales, chiefly confined to the tail: the mucous pores and lines were black.'

The skeleton of this curious fish is partly cartilaginous and partly bony, and the osseous portions are of a green colour, as in the common Gar-fish (*Belone vulgaris*).

In reviewing the principal characters of the skeleton of the *Lepidosiren*, 'we obtain,' says Professor Owen, 'good evidence of its ichthyic nature. If indeed the species had been known only by its skeleton, no one could have hesitated in referring it to the class of fishes; but in that class it would have offered a most singular and interesting combination of the cartilaginous and osseous types.

'The central elements of the vertebral column, the basis of the skeleton, exhibit a persistence of its primitive embryonic condition, such as has hitherto been witnessed only in the sturgeon and cyclostomous fishes; but the superior arches and spinous appendages, instead of retaining the cartilaginous state, are converted into the tough elastic fibrous texture characteristic of the skeleton of fishes. The cranium in like manner presents an extremely novel combination of the cartilaginous and bony states, both as regards its partial ossification and the condition of the ossified parts.

'It is only in the higher cartilaginous fishes, *e.g.* that the maxillary, palatine, and pterogoid bones are blended together to form the simple superior dentigerous arch, or upper jaw. The composition of the lower jaw corresponds with that which characterises most of the osseous fishes, and is more simple than in the Amphibia. The confluence of the cranial vertebræ reminds one of the condition of the skull in the siren; but no vestige of a preopercular bone is present in any of the Perennibranchiates. The sphenoideum basilare, as it exists in the sturgeon, is here seen in its fully ossified state. As the basis of the vertebral column presents a condition analogous to that which characterises the early embryonic periods of the higher vertebrata, so also the extremities retain their simple structure as when they first bud forth, and are devoid of any trace of digital divisions: still the march of development has begun, and we perceive by the numerous joints of the cartilaginous ray, that its direction is towards the ichthyic modification of the great vertebral plan.'

Our limits will not admit of our following Professor Owen through the various peculiarities of the internal anatomy of this anomalous animal, which has been regarded by some naturalists as one of the *Amphibia*. In many points of its structure it certainly does approach that group of animals, especially in the condition of its air-bladder or lungs and its branchiæ; but as regards the former we find considerable advances are made towards the reptilian structure by some other fishes; and it may be remarked that the present animal still differs widely from the *Amphibia* in possessing distinct large scales. There is another character which it appears is of the highest importance in determining the class to which the *Lepidosiren* belongs, namely, the structure of the nostrils. 'In the organ of smell,' says our author, 'we have at last a character which is absolute in reference to the distinction of fishes from reptiles. In every fish it is a short sac communicating only with the external surface; in every reptile it is a canal with both an external and an internal opening. According to this test, the *Lepidosiren* is a fish; by its nose it is known not to be a reptile; in other words it may be said that the *Lepidosiren* is proved to be a fish, not by its gills, not by its air-bladders, not by its spiral intestine, not by its unossified skeleton, not by its generative apparatus, nor its extremities, nor its skin, nor its eyes, nor its ears, but simply by its nose; so that at the close of our analysis we arrive at this very unexpected result, that a reptile is not characterised by its lungs nor a fish by its gills, but that the only unexceptionable distinction is afforded by the organ of smell.' 'Yet it must be confessed that the physiological consequences of the modifications of the nasal cavity above alluded to, would have been far too insignificant to have established the ichthyic nature of the *Lepidosiren*, if, with coexisting gills and lungs, the modifications of the other organic systems had agreed with those of the Perennibranchians instead of with those of fishes.'

In conclusion the author states, 'From every group of fishes however the *Lepidosiren* is sufficiently distinct to form a type not merely of a genus, but of a family; and in the natural system it forms a link connecting the higher *cartilaginous* fishes with the Sauroid genera *Polypterus* and *Lepidosteus*; and at the same time makes the nearest approach in the class of fishes to the Perennibranchiate reptiles."

The South American *Lepidosiren* (*L. paradoxa*) greatly resembles the species above described, but differs somewhat in its proportions. The whole length of *L. paradoxa* includes eleven lengths of the head, measured from the end of the mouth to the gill-openings; in the *L. annectens* the total length of the animal includes little more than six lengths of the head. This species is therefore distinguished from the *L. paradoxa* by the shorter relative length of the trunk as compared with the head.

One of Dr. Natterer's specimens of *Lepidosiren paradoxa*, which measured upwards of three feet in length, was found in a swamp on the left bank of the Amazon above Villa Nuova; the other, which was nearly two feet long, was taken in a pond near Borba, on the river Madeira, a tributary of the Amazon.

PROTOROSAU'RUS, M. Hermann Von Meyer's name for the fossil Monitor of Thuringia. (Cuv., *Oss. Foss.*, tom. v., p. 300, et seq. pl. 9, f. 1, 2.)

PROTRACTOR. Any instrument for laying down angles is so called, such as the graduated semicircle which is found in cases of instruments, the rectangular ruler with graduated edges, and various other more expensive contrivances. But the truth is that the easiest and safest protractor is a table of CHORDS, a scale of equal parts, and a pair of compasses: those who have not a sufficient table of chords should take the chord from a table of sines by the formula—

$$\text{chord of } x = \text{diameter} \times \text{sine of half } x.$$

Even the scale of chords laid down on the rulers, used in the usual manner, is a better protractor than the graduated semicircle, which is worthless, except for very rough work. A good table of chords carried to every minute under 180°, is, we believe, not yet published in this country.

PROVENÇAL. [PROVENCE.]

PROVENCE, a maritime province of France according to the division which existed before the Revolution. It was bounded on the east by the principality of Nice, or Nizza, in Italy, from which it was separated by the Maritime Alps and the river Var; on the north it was bounded by the district of Gapençois in Dauphiné; on the north-west by Le Comtat (or county) Venaissin and Le Comtat (or county) d'Avignon [COMTAT, LE]: on the west by Languedoc, from which it was separated by the Rhône; and on the south by the Mediterranean Sea. Its greatest length was from east by north to west by south, between the two extremities of the coast-line, 152 to 155 miles; its greatest breadth from the coast inland 97 miles. Few of the provinces of France possessed greater variety of soil and climate than Provence. The plains, sheltered on the northern and eastern sides by the branches of the Alps, and the lower slopes of the mountains which had a southern exposure, produced fruits which were not found in other parts of France, at least not of equally fine quality, as the orange, the lemon, the pomegranate, the almond, the olive, &c. The length of coast-line on the Mediterranean Sea induced at an early period a commercial spirit upon the people, and contributed to the revival of letters and refinement earlier than in the rest of France.

The subdivisions of Provence were fiscal, judicial, or ecclesiastical. While the provincial states-general continued, viz. until 1639, there were two principal fiscal divisions: the first was called Le Pays des Vigueries; and the second included the four districts of La Vallée (the Valley) of Barcelonette, Le Val de Barrême, Le Comté de Sault, and Les Communautés des Terres adjacentes et Villes franches. Les Vigueries (the Magistracies) were twenty-one, viz. those of Aix (22,575), Annot, Apt (5707), Aulps (3083), Barjols (3512), Brignoles (5940), Castellane, Colmars, Digne (3932), Draguignan (9804), Forcalquier (3036), Grasse (12,716), Hyères (10,142), Lorgues (5444), Moustiers, Seyne (6732), Sisteron (4429), Saint Maximin (3637), Saint Paul, Tarascon (10,967), Toulon (28,419). There was formerly another Viguerie, that of Guilleaumes, but it was broken up in 1760, on occasion of an exchange of territory between France and Sardinia. In Les Communautés des Terres adjacentes et Villes franches were Marseille (145,115), Arles (20,236), Salon (5987), Richebois, Les Baux, Notredame de la Mer, or Les Saintes-Maries, Aureille, Foutvielle or Fontvieille (2056), Aurons, St. Tropez (3736), Entrevaux, Le Mas, Montdragon, Grignan and its county, which last included the Communautés of Montségur, Chantemerle, Salles, Collonselles, Allan, and Réauville Le Comté de Sault comprehended the Communautés of Sault, Aurel, Monioux, Sainte-Trinité, La Garde, and Ferrassières. The figures subjoined to the above names indicate the population of the respective communes in 1831. After the discontinuance of the States (who appear to have been appointed and to have acted only for Le Pays des Vigueries) the local taxation was adjusted by general assemblies, comprising thirty-six deputies from the Vigueries and principal Communautés, with the representatives of the clergy and provincial noblesse. The judicial divisions do not require to be mentioned. The ecclesiastical divisions consisted of seventeen dioceses, including those of Avignon, Carpentras, Vaison, and Cavaillon in Le Comtat Venaissin and Le Comtat d'Avignon. Provence is now divided into the departments of Basses Alpes, Var, and Bouches du Rhône; some portions are included in the department of Vaucluse.

The name of Provence is derived from the designation Provincia, given by the Romans here as elsewhere, to those countries and districts beyond the limits of Italy which they brought under their dominion, and from being at first a merely descriptive term, it has come to be appropriated as a proper name. In Cæsar's time the 'Provincia' of the Romans included not only the modern Provence, but the adjacent and more extensive districts of Dauphiné and Languedoc, and parts of Savoy and Switzerland; and it is in this more extensive application of the term that it is employed by Cæsar in his 'Commentaries. When his conquests and those of his successors had extended the Roman dominions, new provinces, as Lugdunensis or Celtica, Aquitania, and Belgica were formed; and the original 'Provincia' was distinguished as Narbonensis. At a later period Narbonensis was subdivided into the five smaller provinces of Narbonensis Prima, Narbonensis Secunda, Viennensis, Alpes Maritimæ, and Alpes Graiæ and Penninæ. The modern Provence includes portions of Narbonensis Secunda, Viennensis, and Alpes Maritimæ. In the overthrow of the Roman empire Provence was divided between the Visigoths, who held the coast, and Burgundians, who occupied the inland part, the Durance being the boundary. In 511 the Visigoths ceded their portion to Theodoric, the Ostrogothic king of Italy, and he wrested it from the Franks, by whom it had been seized. In A.D. 530, the Burgundian portion was conquered by the sons of Clovis; and in 534 the other part was ceded to them by Vitiges, one of the successors of Theodoric. The whole was included in the empire of Charlemagne.

On the division of the states of the emperor Lothaire (A.D. 855), Provence was included in and gave name to the kingdom of his youngest son Charles, on whose death (A.D. 863) his kingdom lost its separate existence. On the revival of the kingdom of Bourgogne by Boson (A.D. 879), Provence was included in his dominions, which are sometimes called the kingdom of Provence. This kingdom came by the cession of Hugues (who possessed the royal authority without the title of king) into the hands of Rodolph II., king of Transjurane Bourgogne, who united the whole into one extensive kingdom, under the title of the kingdom of Arles, Gaule Cisalpine, or Bourgogne Jurane. [BOURGOGNE.] It extended from the Jura to the Rhône and the Mediterranean. Upon the death of Rodolph III. (A.D. 1032), the kingdom of Arles was united to the German empire, of which Provence was long considered as a part.

Under the kings of Bourgogne, the greater part of Provence was governed by counts, who fixed their residence and took their title from Arles. The city of Marseille was under its viscounts, from whose superiority the citizens gradually emancipated themselves; and other neighbouring districts became the territories of feudal nobles. Gradually the counts of Arles rendered their county hereditary, and took the title of counts of Provence. The weakness of Rodolph III., the last king of Bourgogne, and the remoteness of the seat of government, after Provence was annexed to the empire, facilitated the aggrandizement of these nobles.

In the year 1112 or 1113, Raymond Bérenger I., count of Barcelona, in Spain, became, in right of his wife, count of Provence; but in 1125 he ceded to Alfonse-Jourdain, count of Toulouse, all that part of his territories which were north of the Durance, including Le Comtat and part of what was afterwards comprehended in Dauphiné. This ceded portion

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was known for a time as the Marquisate of Provence, in contradistinction to the part which remained to Raymond Bérenger, and which retained the designation of the County of Arles or Provence. The following century was distinguished by wars, occasioned by disputed succession, by the rivalry of the counts of Provence with those of Toulouse and others of the neighbouring nobles, or by other causes. But amidst these disorders the prosperity of the country seems to have advanced; and the cities of Aix, Arles, Avignon, Marseille, and Nice profited by the confusion to renounce all but nominal subjection to the counts, and to become practically municipal republics. All of them did not indeed retain their freedom; Arles returned under its former master, the count of Provence, though with restrictions on his authority, and Avignon was taken (A.D. 1226) by Louis VIII. of France, in his campaign against the Albigeois or Albigenses. Among the counts of Provence in this troubled period, Raymond Bérenger IV. (A.D. 1209-1245) was one of the most remarkable. He left four daughters, two of whom, Eléonore and Sancie, were married to Henry III. of England, and his brother Richard, earl of Cornwall and king of the Romans; and the other two, Marguerite and Beatrix, to St. Louis, king of France, and his brother Charles, count of Anjou and Maine. Beatrix, though the youngest, inherited the county of Provence, which thus passed into the Anjevin branch of the royal family of France.

It was under the counts of the house of Barcelona that Provence became the seat of that literature which has given the chief celebrity to its name and the chief interest to its history. Its comparative freedom after the age of Charlemagne from those foreign invasions which retarded in other parts the settlement of society and language, and its situation on the shores of the Mediterranean, which promoted commerce and opened a channel of communication with Constantinople and the Levant, and the generally wise administration of the counts who preceded Raymond Bérenger I., had contributed to bring the language, laws, and customs of the country into a comparatively settled state. The Provençal language gradually supplanted the Latin, which a succession of foreign admixtures had barbarised; and the new tongue, though not employed in deeds and contracts, was employed as the vehicle of reviving literature. [FRANCE; *Historical Sketch of the French Language and Literature*, vol. x., p. 432-3.] 'The succession of Raymond Bérenger to the sovereignty of Provence gave a new impulse to the national spirit, by the intermixture of the Catalans with the Provençals. Of the three branches of the Romanzo used by the Christians of Spain, the Catalan, the Castilian, and the Gallician or Portuguese, the first was almost exactly like the Provençal. . . The Catalans therefore perfectly understood the language of the Provençals, and by their meeting in the same court, each imparted refinement to the other. The Catalans had made considerable improvement, both by their wars and communications with the Moors of Spain, and by the activity of commerce at Barcelona. This city enjoyed the amplest privileges; the citizens appreciated their liberty, and caused it to be respected by their princes; while the wealth which they had acquired, by increasing the productiveness of the taxes, allowed the display of a magnificence at the court of their counts which was unknown to other princes. Raymond Bérenger and his successors brought with them into Provence the spirit of liberty and that of chivalry, a taste for elegance and for the arts, and the scientific knowledge of the Arabs. From this combination of noble sentiments sprang the poetry which in Provence and in the whole of the south of Europe burst out all at once, as if an electric spark had, in the midst of the thickest darkness, kindled in every part at the same time the brightest flames.' (Sismondi, *La Littérature du Midi de l'Europe.*)

The literature of Provence differed materially from the contemporary productions of northern France. These partook of the epic, the Provençal of the lyric character. The theme of the troubadours, or Provençal poets, was love; and they exhibit the passion in their songs with a purity, delicacy, and tenderness, derived probably from the Arabs, with whom their Catalan connection brought them into contact. Yet the actual relaxation of manners among the nobility in the south of France was at this time very great. 'It might be said that men lived only for gallantry; the ladies, who scarcely appeared in public, except when married, prided themselves on the reputation which their charms derived from their lovers; they delighted in the praises of their troubadours; they took no offence at the diffusion of the gallant and often licentious poetry of which they were the theme: they themselves cultivated 'the gay science,' as poetry was called, and expressed their own sentiments in their turn, in tender and impassioned verses; they had instituted 'courts of love,' in which questions of gallantry were gravely discussed, and determined by their suffrages; in a word, they had brought the whole of the south of France into a state of carnival, which forms a singular contrast to the ideas of reserve, virtue, and modesty which we ascribe to the good old times.' (Sismondi, *Littérature, &c.*) It was from the Arabs, through the medium of the Provençal troubadours, that rhyme was introduced into the poetry of modern Europe, according to Sismondi; but others think that it is not clear that rhyme was not used in Europe before the conquest of Spain by the Arabs.

The Provençal language spread, with the poetry of the troubadours, into the various courts of Europe; several of the princes of the West, our own Richard Cœur-de-Lion among others, wrote in it, and it became the most copious and flexible of any of the languages of Western Europe of that period. It was the exclusive vehicle of amorous, warlike, political, and satirical poetry; and the crusades in particular furnished a variety of incidents for those who cultivated it.

The acquisition of Provence by Charles I. of Anjou in right of his wife Beatrix (A.D. 1246) augmented its political importance. Charles had to struggle with the independent spirit of the large towns. Avignon and Arles, which had rejected his authority while he was in Egypt with his brother St. Louis, were obliged to submit, but upon terms which secured to them valuable privileges. Marseille was also reduced, and suffered considerable loss of freedom by the subjection. The death of Beatrix, and the assumption of the sovereignty of Provence by Charles in his own right, led to an opposition to his title by the queens of France and England, sisters of the deceased countess: but as the two kings did not undertake the matter, the opposition was fruitless, and Charles transmitted Provence (A.D. 1285) to his son Charles II., who was then a prisoner in the hands of the king of Aragon. Charles resigned Anjou and Maine to his cousin Charles of Valois, and contested the possession of Naples and Sicily, which his father Charles I. had conquered with the king of Aragon. He also united Piedmont to Provence (A.D. 1306), and died (A.D. 1309) in the neighbourhood of Naples. His son and successor Robert took an active part in the struggle of the Guelphs and Ghibelines in Lombardy. These Italian wars of the Anjevin princes materially injured Provence by draining it of its population; but in other respects Robert appears to have governed well, and his death was regretted by his subjects (A.D. 1343). He was succeeded by his grand-daughter Jéanne or Joan [JOAN I.], who granted or sold to the pope the city and lordship of Avignon. Provence was, during her reign, claimed by John of Gaunt, son of Edward III. of England, in right of Eléonore, wife of Henry III. of England, from whom he was descended; and by Louis, duke of Anjou, governor of Languedoc for his brother Charles V. of France, who founded his claim on the cession of the kingdom of Arles made to him by the emperor Charles IV. Provence was invaded by Louis's forces under Bertrand Duguesclin, but without success; and John of Gaunt was obliged to submit his claims to the decision of the pope. On the death of Jeanne, who was taken at Naples, and put to death by Charles of Durazzo (A.D. 1382), Provence came to Louis, duke of Anjou, to whom the deceased countess had bequeathed it. He ceded Piedmont to Amadeus, count of Savoy, and died (A.D. 1384) in the kingdom of Naples, of which he had tried in vain to secure possession. Louis II. succeeded his father, and renewed the attempt to gain possession of Naples, but with like ill success. On his death (A.D. 1417) Louis III. succeeded, and pursued his hereditary claim to Naples, which brought him into a struggle with Alfonso V., king of Aragon [ALFONSO V.], who took Marseille (A.D. 1423). [MARSEILLE.] On the death of Louis (A.D. 1434), his brother René, surnamed Le Bon (the Good), succeeded. He united under his sway the duchy of Anjou and the county of Provence, and was competitor of Antoine de Vaudemont for the duchy of Lorraine [LORRAINE], which he succeeded in acquiring. He also attempted to acquire Naples, but met with the same ill success which had attended the efforts of his predecessors. The earlier part of his reign was actively employed in warlike enterprises; but the latter part he quietly spent in Provence, cultivating the sciences and the fine arts, and living in the midst of his subjects 'like a father amid his family.' He had resigned Lorraine to his son, to whose charge he also gave up the prosecution of the war in Naples. René le Bon died at Aix, A.D. 1480. Charles, Count of Maine, his nephew and successor, had to defend Provence against the invasion of a competitor, René II. of Lorraine, grandson by his mother of René le Bon; by the support of Louis XI. of France, he succeeded in repelling him, and dying soon after (A.D. 1481), bequeathed his dominions to Louis. René of Lorraine still asserted his claim, but was unable to maintain it, and Provence was finally annexed to the crown of France by Charles VIII., the successor of Louis XI. (*L'Art de vérifier les Dates;* Simonde de Sismondi, *Littérature du Midi de l'Europe.*)

PROVERB (from the Latin *proverbium*, i.e. *pro-verbum*, in which respect the form of the word bears analogy to *prœludium*, and other words of the kind), a by-word, which meaning is also conveyed by *adagium*, 'adage,' and the Greek *paroemia* (παροιμία). Of the many definitions which have been given of a proverb, the best appears to be the following by Erasmus: 'Parœmia est celebre dictum scitâ quâpiam novitate insigne;' 'A proverb is a well-known saying, remarkable for some elegant novelty;' or, as Dykes translates it, 'A proverb is a celebrated saying, famous for its remarkable elegancy, wit, and novelty.' Synesius, a Christian writer of the early part of the fifth century, quotes from a work of Aristotle, now lost, a description of a proverb to this effect: 'A proverb is a remnant of the antient philosophy preserved amidst very many destructions on account of its brevity and fitness for use.' 'Proverbs,' says Daniel Heinsius (*Dedication* prefixed to Elzivir edition of Apostolius), 'are nothing else but abridged remains of the wisdom which is not comprehended in books, and is conveyed down from hand to hand like an heir-loom.' To collect and explain such portions of wisdom has engaged the attention of some of the most learned men. Aristotle, Theophrastus, Chrysippus, and others, according to Laertius, made collections of proverbs. With the works of Plutarch is printed (*Opera Moralia*, vol. v., ed. Wyttenbach) a collection of 131 proverbs, with explanations; and, though this collection has not been uniformly acknowledged as Plutarch's, there is good reason to believe it to be his genuine work. Zenobius or Zenodotus, a Sophist who lived at the beginning of the second century, made an epitome of the proverbs of two older writers, Tarraeus and Didymus, in number 552. Diogenianus lived about the same time as Zenobius, and made a collection of proverbs, amounting to 775. These two collections, together with 1400 proverbs out of Suidas, and an appendix of 353 from the Vatican Library, and a selection of proverbs in metre, were well edited by Andrew Schott, 4to., Antwerp, 1612. Michael Apostolius of Byzantium, who lived in the middle of the fifteenth century, collected 2027 antient proverbs, of which he wrote explanations. The best edition is that of the Elzivirs, 4to., Lugd. Batav., 1653. The adages of Erasmus, in number 4151, are too well known to require any description. They are presented in their most useful form in the Epitome of them published by the Elzivirs, 12mo., Amst., 1663. Many other modern writers have published collections of proverbs from various languages. The name of our own countryman, John Ray, is familiar to all the lovers of natural history. In 1672 he published his collection of proverbs, which has been often reprinted. Modern languages contain a great number of proverbs, some of which have been transmitted from the remotest ages, and are the common property of all civilised nations; others are peculiar to individual nations, and are capable of being traced to a modern origin. The Spanish language is particularly rich in proverbs, many of which have obviously had their origin in national peculiarities of character and usage. There is a small and valuable collection of English proverbs with lengthened explanations, and an ingenious preface, by Oswald Dykes, 8vo., Lond., 1708.

According to the definition given by Erasmus, two things are especially required to constitute a proverb; 1, that it be recognised by all classes of men as common property; 2. that it be marked by a peculiar turn of expression, so as to be at once distinguished from ordinary speech. The former quality belongs to a proverb, inasmuch as it derives its origin, real or supposed, from oracles, philosophers, poets, orators, and historians; from the manners and customs common to all men; from the habits of the brute creation; and from the general operation of the laws of nature. The latter quality is essential, inasmuch as quaintness, or elegance, or even obscurity of expression, will invest what is old with the appearance of novelty, and make the sentiment striking, and secure such attention as the language of ordinary intercourse never could.

Proverbs generally convey moral instruction, and that in the most direct and effectual way; but moral instruction is not essential to the nature of a proverb. Such proverbs as 'Old birds are not caught with chaff;' 'Birds of a feather flock together;' 'Tis an ill wind that blows nobody good;' 'Money makes the mare to go;' do not, directly at least, teach any moral lesson. Such proverbs as 'Honesty is the best policy;' 'Be just before you are generous;' 'Take care of number one;' and others of the kind, as 'Every man has his price,' seem adapted to make men satisfied with a very low standard of morality. But these are abuses of proverbial teaching, and are of course to be avoided, while due regard is paid to its legitimate use. Good proverbs judiciously employed will 'never fail of exciting by their quaintness, of delighting by their shortness, of persuading by their authority.' (Dykes's *Preface.*)

A full and excellent account of antient and modern collectors of proverbs is given in the third volume of the 'Bibliotheca Græca' of Fabricius. On the general character and use of proverbs, the reader will be gratified by consulting the works of Ray and Dykes already mentioned.

PROVERBS OF SOLOMON, one of the canonical books of the Old Testament. The Hebrew מָשָׁל, translated *proverb*, denotes a similitude, from מָשַׁל, *to liken, compare*, and is rendered in the Septuagint by παροιμία, but oftener by παραβολή. In reference to this book, the use of the Hebrew word is the same as that of the English *proverb;* and Erasmus's definition, as given in the preceding article, will apply to the Proverbs of Solomon.

This book has always been ascribed to Solomon, though he was not the author of all its contents. The thirtieth chapter is entitled 'The words of Agur the son of Jakeh,' and the thirty-first chapter, 'The words of King Lemuel;' and it is not improbable that many of the proverbs in the preceding part of the book were in current use long before the time of Solomon. The portion from the tenth chapter to the end of the twenty-fourth comprises what may more strictly be called the 'Proverbs of Solomon.' The first nine chapters form a kind of introduction, and the remaining chapters after the twenty-fourth may be regarded as an appendix to the whole.

The Book of Proverbs is classed by Bishop Lowth among the didactic poems of the Hebrews (*De Sacra Poesi Hebr., Prœl.* xxiv.). The attentive reader of the original will discover the utmost exactness in the choice and arrangement of words, and will be able with ease to carry out the principles laid down by Lowth relating to the structure of Hebrew metre.

The Proverbs of Solomon are all pre-eminently adapted to teach the lessons of prudence, morality, and religion. They are a precious treasury, from which men may be supplied with the best rules for the conduct of life. They may be compared to so many jewels put together without any visible order or connection, but each shining with its own peculiar beauty, a beauty which is increased rather than obscured by this apparently accidental association of one with another. In a word, to use language furnished by the book itself, 'they are like apples of gold in pictures of silver' (xxv. 11). 'Let a man,' says Bishop Patrick, 'but consent to one thing, which this book desires, to make these precepts familiar to his mind, saying unto wisdom, thou art my sister, and calling understanding his kinswoman, and he will not fail to be happy.' (Patrick *On the Proverbs of Solomon;* Horne's *Introduction.*)

PROVIDENCE is the superintending care with which God watches over his whole creation, and especially over the human race. It has been generally held, as a direct consequence of the existence of a God who has created all things, that he must also uphold by his constant care everything which he has created. This doctrine however has been denied by the antient Epicureans and the modern Theists, who, while admitting that God created the universe, and impressed upon it the laws by which it is governed, have contended, that having done this, he has left those laws to work out their own results without his further interference. The arguments for a superintending providence are derived from the order of the material universe, which we find to be governed by ever-active principles, of which no other explanation can be given than that they are the results of the power of God in continued exercise; from the events which are recorded in history, and which are daily occurring, such as the punishment of guilty nations and individuals, the exaltation of the virtuous, the adaptation of great men to the exigencies of their times, not to mention other circumstances in the history of individuals, which might be considered of a more doubtful character; and lastly, from the unequivocal statements of Scripture. The whole sacred narrative is evidently intended to show how God's providence wrought for the accomplishment of his own designs. Moreover, individuals are mentioned, such as Pharaoh, Nebuchadnezzar, and Cyrus, whom God raised up expressly in order to use them as instruments to effect certain objects. Two books of the Old Testament, those of Job and Esther (we might perhaps add those of Ruth, Jonah, and even others), appear to have been written for the very purpose of confirming our faith in the providence of God; and numerous passages might be quoted which teach the care of God over the whole universe (*Col.* i. 17; *Heb.* i. 3; *Rev.* iv. 11), over all men, whether good or wicked (*Job.* xxv. 3; *Matt.* v. 45; *Acts* xvii. 28; *James*, i. 17), and especially over his own people (*Matt.* v. 25-34, &c.).

The providence of God has been divided by theologians into *immediate*, or that which he exerts without the intervention of second causes, and *mediate*, where ordinary means are employed; into *ordinary*, which relates to occurrences in the common course of nature, and *extraordinary*, where that course is departed from, as in the case of miracles; into *common*, of which the whole world is the object, and *special*, which regards the church; and into universal, which describes the care of God for his whole creation, and *particular*, which is exercised for the benefits of individuals.

PROVIDENCE. [Rhode Island.]

PROVIDENCE, NEW. [Bahamas.]

PROVINCE OF POINT WELLESLEY. [Penang.]

PROVI'NCIA may be defined generally to be a conquered country, beyond the limits of Italy, which was subject to the Roman state. In contemplating the history of Rome, the most instructive part of it, next to a study of the internal organization of the state, is the system of provincial government by which the language and laws of Rome were established on a foreign soil. The effects of this system are permanently embodied in the political system of every European state. In order to exhibit a complete view of Roman provincial government it would be necessary to write the history of Rome, but the following outline may be useful.

The geographical sense of the word Provincia was not the original meaning; originally the term expressed the Imperium, which was granted to a consul or prætor beyond the limits of the city. The precise meaning of the word is not certain, and the common etymology is perhaps doubtful (pro, vinco*); its primary sense however certainly was a power as above explained. In the time of Cicero provincia had undoubtedly obtained the meaning given at the head of this article; and in the latter part of the Republic the Roman state consisted of two distinctly organised parts, Italy and the Provinces. This distinction, though with considerable modifications, continued under the Empire.

With the extension of the Roman conquests beyond Italy, commenced the system of provincial governments. The oldest provinces were Sicily (B.C. 243) and Sardinia (B.C. 237). Upon the conquest of a country, the commander of the army either gave the conquered country a general organization, subject to the approval of the senate; or the country was organized according to the instructions of the senate, by the commander and a body of commissioners chosen from the senate, and appointed by it. This original organization often made very important changes in the existing political forms, but still the conquered people retained their national existence, and were not in all senses incorporated into the Roman state. Originally prætors were appointed to govern the provinces [Prætor]; but subsequently the prætors received a province after the expiration of their year of office at Rome, and were then called proprætores; and towards the close of the republic the consuls in like manner received provinces, which were hence called consulares, and they were styled proconsules. The division of the provinces was made by lot, and sometimes by agreement among the persons entitled to hold them. By a law of C. Gracchus (Sempronia lex), the provinces of the consuls were annually determined before the election of the consuls, for the purpose of preventing all disputes.

By a senatus consultum of the year 55 B.C., it was enacted that prætors and proconsuls should not have the government of a province till five years after the expiration of their prætorship or consulship. The term for which a province was originally held was one year; but the time was often enlarged. The authority of the governor of a province commenced as soon as he left Rome. His functions in the province were both military and civil; he possessed the Imperium, but he was not called a magistratus. In the later Roman writers the common name for governor is præses (Gaius, i. 6), and sometimes the term proconsul seems to be used generally for the governor of a province. The governor was assisted in the discharge of his duties by a quæstor, who looked after the revenue; and by legati, who assisted in the administration, and were generally appointed by the senate, but sometimes by the governor with the permission of the senate. He had also a numerous train of friends and companions, sometimes called contubernales; and also a regular body of clerks, interpreters, and other servants, who formed a prætorian cohort, a name which was also given, and with more propriety, to the soldiers who formed the governor's body-guard. On a new governor arriving in his province, the former governor was required to leave within thirty days.

The province was treated as a conquered country, though the towns retained somewhat of their municipal freedom, but the constitution of many of them at least was refashioned upon the model of Rome, though in this respect there were probably considerable varieties. Under the emperors the political organization of the whole empire became more uniform. The towns had the management of their revenue, and the right of coining; but only towns of the highest class could coin silver. They had a senate like those in the Italian towns, but no magistrates with corresponding powers. The religion of the people was not interfered with.

In some cases part of the land of conquered foreign countries was seized by the Roman state and let by the censors; or the forfeited land was restored, subject to the payment of a rent. All provincial land differed in some essential particulars from Italian land: it could not be the subject of quiritarian ownership, that is, it had not the privileges of Italian land, and it was capable of being transferred without the forms required in the case of Italian land. There was private property in provincial lands, but the ultimate ownership, in the Imperial period at least, was considered to be in the Cæsar or in the Roman state (populus Romanus). (Gaius, ii. 7.) All provincial lands paid taxes (vectigalia et tributa). But certain provincial towns received as a special favour the Jus Italicum, the legal effect of which was to give the land included within the limits of such town all the qualities of Italian land, and consequently freedom from taxation. Such towns also received, as a part of the Jus Italicum, a free constitution like that of the Italian towns, and with it the various magistrates, decemviri, quinquennales (censors), ædiles; and also jurisdictio, or the power of holding courts of justice. Various towns which enjoyed this privilege are enumerated, in Spain, Illyria, Gaul, and elsewhere. The origin of this privilege is assigned by some writers to the Imperial period; but perhaps it commenced earlier. In all the provinces the regular jurisdiction was in the hands of the Roman governor, who exercised it by himself and his quæstor and legati; and for this purpose he made circuits in his province. In reference to this part of his duties, the governor is sometimes called Judex Ordinarius under the later emperors. These circuits, sometimes called conventus, formed what we may call the divisions of a province for judicial purposes. Thus Pliny (iii. 3) says that Hispania Citerior was divided into seven conventus, which he enumerates. The towns which had the Jus Italicum were not comprised in the conventus; they had their magistrates, in the Italian sense of the term, who had jurisdictio; but there was an appeal to the governor. At these conventus there were present a great number of Roman citizens, who were engaged in commerce in the province, or who were publicani, farmers of the revenues. These conventus, which are frequently mentioned by the Roman writers, were not accidental assemblages of persons, but meetings at stated times and places appointed by the governor, and principally for the purpose of judicial decision on matters in dispute, both between Roman citizens, and Roman citizens and the provincials. The judices were chosen, after the Roman fashion, from the persons who attended the conventus, or circuit courts. It appears that the fundamental laws of a province were not interfered with, for, as we have seen, the soil retained its former legal character, and was not invested with that of Italic soil, and the personal status or condition of Roman citizens was not communicated to the provincials merely as such. Some of the provinces, as Sicily, obtained the Latinitas [Latinum Jus] from Julius Cæsar, and the Civitas, or complete Roman citizenship, was given to the Sicilians after his death (Cic., *Ad Att.*, xiv. 12); but this was not the general rule. By means of the edict, which the prætor published on entering upon his duties, and which was often framed upon the prætorian edict at Rome [Prætor], many important changes must have been gradually introduced into the legal system of the provinces, and particularly with reference to matters of contract and forms of procedure, in which there could be no ground for the same distinction that was maintained between provincial and Italic land, and which necessarily influenced the rights of landholders and the forms of action. Special enactments (leges) were also sometimes made at Rome with reference to provincial affairs. The prætor had complete jurisdiction in criminal as well as civil matters, and both over provincials and Roman citizens; but a Roman citizen could appeal to Rome in a criminal matter.

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* *Provicia may be the true orthography.*

A province consisted of a variety of parts. Some towns included in it had from the commencement an alliance with Rome, and were in all respects free. Others, which had been subdued, were declared free, and were not under the immediate jurisdiction of the prætor. The provinces also contained numerous colonies, and both colonies of Roman citizens and colonies of the class called Latinæ. [Latinum Jus.] Thus towards the close of the republican period a province contained, besides those parts of it which were subject to the complete jurisdiction of the governor, allied towns, free towns, Roman colonies, and Latin colonies. According to this view, the provincia properly comprised those parts and towns which were subject to taxation and to the prætor's immediate jurisdiction. Some writers assert that the Roman and Latin colonies which were sent from Italy into the provinces were in all respects like such colonies in Italy, and that these colonies had quiritarian ownership of the soil, and consequently freedom from taxes. But there is some difficulty about this part of the subject. The privileges called Latinitas, or Latium, were often given to particular towns, one effect of which was to release them from the immediate jurisdiction at least of the Roman governor, and to give them a jurisdictio, or power of holding courts: citizens who filled certain offices (magistratus in such towns), thereby obtained the Roman citizenship. (Strabo, p. 186, speaking of Nîmes. See our article, p. 234.)

The taxes which were raised in the provinces varied in the different countries, according to the products of the provinces, and probably also according to the system of taxation which the Romans found established; for they seem in their administration to have avoided the error of changing more than was necessary. The taxes generally consisted in a capitation tax and a property tax: the latter was sometimes paid in money and sometimes in kind. The state did not collect the taxes, but they were sold or farmed: thus, after the Sempronia lex, those of the provinces of Asia were sold by the censors at Rome, and those of Sicily, with some exceptions, were sold in the respective districts of the country, according to a practice established by Hiero. There was also money paid for the use of the open pasture-lands, which the Roman state appropriated to itself. The tolls and port duties, as well as the pasture-land tax (scriptura) were farmed by the publicani. [Publicani.] Besides these and other regular sources of revenue, the province was subjected to occasional demands of an additional tenth, and to many exactions, some of which had a kind of legalised form, and others were merely gifts made to satisfy the demands of the governor, or to secure his favour.

The governor had to give an account of his administration from his own books and those of his quæstor. Originally he gave in this account at Rome; but after the Julian law (B.C. 61), he was required to deposit two copies in the two principal towns of his province, and to send one to the Ærarium at Rome. If the province had ground of complaint against him for mal-administration (repetundæ, peculatus), which was no uncommon thing, application was made to the Roman senate; and the great Romans, who were the patrons and friends of the cities which made the complaint, were also applied to for their aid and interest. If he had betrayed the interests of the Roman state, he was guilty of the offence of majestas. A regular mode of inquiry and trial (quæstio) were adopted for such occasions. Yet little was done without bribing the powerful men at Rome: and the chance of redress against a governor who had even grossly misconducted himself was very small: it was more frequently obtained through the influence of the powerful Romans, stimulated by motives of private hostility to the accused, than through the justice of the case.

With Augustus commenced a new period. He took under his own care the more important provinces, and those which required a large military force; the rest he left to the care of the senate and the Roman people. This arrangement continued, with some modifications, to the third century. Of the provinces of the senate, two were yearly given to consular men, and the rest to those who had been prætors: these governors were all called proconsuls, and they were assisted by legates. They had the jurisdictio both of the prætor urbanus and peregrinus. Quæstors were also sent with them to their provinces: the quæstors had the same jurisdictio that the ædiles had at Rome. It seems however that the power of the proconsuls in their provinces was considerably diminished. The emperor considered himself as the proconsul of his own provinces; and he governed them, though residing in Rome, by his representatives called legati Cæsaris, who had prætorian power. They were selected from those who had held the office of prætor and consul, or were senators of inferior rank. The Imperial governor of Egypt was called præfectus, and he was always an Eques. They held their office so long as the emperor pleased, and received all their powers directly from him. These governors of the emperor's provinces were called præsides and correctores in the later periods, though the name præses was applied under the emperors to a governor either of a senatorial or an Imperial province. They had also legati under them; but in the place of quæstors there was a procurator Cæsaris, who was an Eques or a freedman of the Cæsar; he looked after the taxes and other dues of the emperor, paid the troops, and attended generally to the business of the fiscus. After the time of Claudius, the procurator had jurisdiction in matters that concerned the fiscus. There were also procuratores Cæsaris appointed by the emperor in the senatorian provinces, who collected certain dues, even in those provinces, for the fiscus, independent of what was the due of the Ærarium, or public treasury. Sometimes a small province, or a part of a larger one, was governed by a procurator Cæsaris, with the full power of a præses; this was the case with Judæa, which was a part of Syria, and governed by a procurator who was under the præses of Syria. The general constitution of the provinces remained the same, though, as before observed, a greater uniformity in administration was gradually introduced, and from the time of Hadrian the Imperial rescripts and the writings of the Roman jurists contributed to form a body of common law for the whole empire. The taxes continued as before, and were partly paid in money, and partly in kind; but the object of the Romans was always to have them paid in money. The basis of the taxation was a general census of persons and property, which Augustus introduced, and which was taken from time to time. Certain taxes, as tolls and duties, were let, as before, to the publicani. The towns, at least under the early emperors, seem to have retained their privileges; though some modifications were very early introduced; for instance, Augustus indirectly deprived the citizens of the colonies of their suffrage at Rome, a measure which seems to have led the way to other changes. Numerous colonies, chiefly i. not exclusively of the class called military, were also established by the emperors in the provinces; and it is to this period that some writers refer the gift of the Jus Italicum to provincial cities.

The inhabitants of the provinces were now divided into three classes as to political rights, Roman citizens, Latini, and Peregrini. The Roman citizens were either Italians resident in the provinces; or members of Municipia and colonies which had the Roman citizenship; or those who had individually obtained this right. The two latter classes had all the privileges of Italians, except with some restrictions as to attaining the senatorian dignity: but many of them obtained the rank of Equites. The Latini had not the connubium only and the commercium, but they could obtain the civitas in several ways. The Peregrini had neither the connubium nor commercium; in fact, they had none of those rights which characterised a Roman citizen; but yet they served in the army. By a constitution of Antoninus Caracalla (A.D. 211-17), the citizenship was given to all persons within the Roman empire, and accordingly the distinction of Civis, Latini, and Peregrini ceased, and the two latter classes henceforward only existed among manumitted slaves.

The administration of the provinces gradually came more under the power of the emperor, and particularly as to matters which required a legal decision. The governors not only received general instructions from the emperor, but they made special application to him in cases of difficulty. The constitution of Caracalla must have had the immediate effect of extending the Roman law, for in making all persons Roman citizens, it established all the relations of personal status that existed at Rome; and it seems that a province became in nearly every respect assimilated to Italy, with perhaps the exception as to the soil, when the special privilege was not given to it. Indeed Italy itself was assimilated to the form of a province by Hadrian, who divided it, with the exception of a district that was immediately appropriated to the praetor urbanus, into four divisions, which he placed under the care of consulares. Under M. Aurelius, the consulares were replaced by juridici, a word which indicates their function of dispensing justice. The privileges of the towns, as to jurisdiction, were gradually encroached upon by the Imperial power and those to whom it was deputed, a change the commencement of which is traced by Savigny to the time when Cisalpine Gaul ceased to be a province and was incorporated with Italy. In the provinces justice was administered generally by the praeses and his legati, though not always in the first instance, and the privileges of the free towns were in course of time impaired. The praeses and his legati had full jurisdiction; there was an appeal from the legati to the praeses, and from him to the emperor; and it was not uncommon for the proconsul to refer a matter of law to the emperor even in the first instance. The praeses had complete jurisdiction in criminal matters; yet he could not pronounce sentence of deportation. He had also ample powers both civil and military for maintaining tranquillity in his province, and there were soldiers stationed in all the provinces in permanent camps, many of which remain to the present day, and others were the origin of existing towns.

The condition of the provinces under the Christian emperors would require a separate and lengthened notice.

This general and necessarily very incomplete view may be completed by those who can refer to Savigny's *Geschichte des Römischen Rechts im Mittelalter*, vol. i.; to Walter's *Geschichte des Römischen Rechts*, &c., Bonn, 1840; where abundant references to original authorities are given. The statements in Adam's *Roman Antiquities* are generally correct. Incidental information will also be found in the following essays:—'Das Ackergesetz des Sp. Thorius,' *Zeitschrift*, x.; 'Ueber den Inhalt der Lex Rubria de Gallia Cisalpina,' *Ibid.*, x.; 'Ueber das Jus Italicum,' *Ibid.*, vol. v.)

The enumeration of the provinces is given under ROME.

PROVINCIALISM. The difference between the languages of a family and the dialects of a language is only a difference of degree. For example, the Sanscrit, Persian, Teutonic, Greek and Latin, Slavonic, and Celtic, are languages of the Indo-Teutonic family [LANGUAGE, vol. xiii., p. 309]; and the Doric, Ionic, and Æolic are dialects of the Greek language. Although the dialects of a language may present considerable differences both in the roots and forms of their words, the differences are less considerable than those which obtain between languages of the same family. Thus a historian tracing the origin of the Romance languages might doubt whether he ought to consider them as altered dialects of the Latin language, or as cognate languages of the same family. If the Italian, Spanish, and French languages were considered as modern Latin dialects, their various dialects (such as the Sicilian, Venetian, Milanese, Walloon, Valentian, &c.) would be regarded as mere varieties, analogous to the varieties of the Doric dialect as spoken by the different states of the Doric race. (Müller's *Dorians*, app. v.)

Every language which is spoken by a large population over a wide extent of country, contains several dialects. The number and variety of these is in some cases very great; and considering the importance of this fact as bearing on the origin and history of languages, it has not been sufficiently observed by philologists.

The cause of a want of attention to the multiplicity of dialects in a language is to be found in the ascendency which one dialect of a language always acquires over the others, and the obscurity and neglect to which the latter are consequently consigned. Whenever a country reaches a sufficient height of civilization to admire and produce literary works, some one of the various dialects of its language is selected by the poets and other native writers, and is cultivated by them. In general, this choice is determined not by any quality of the dialect itself, such as its superior harmony or energy, but by some external circumstance, such as its prevalence near the birth-place or home of the writer, or near the king's court and seat of the government. The influence of the latter circumstance is illustrated by the following remarks of Dr. Jamieson, in his preface to his dictionary of the Scottish language, respecting the cause of the decline of that language:—'The union of the crowns (he says), although an event highly honourable to Scotland, soon had an unfavourable influence on the antient language of the country. She still indeed retained her national independence; but the removal of the court seems to have been viewed as an argument for closer approximation, in language, to those who lived within its verge. From this time forward, as living authors in general avoided the peculiarities of their native tongue, typographers seem to have reckoned it necessary to alter the diction even of the venerable dead. In thus accommodating our antient national works to the growing servility of their times, they have in many instances totally lost the sense of the original writers. In this manner even the classical writings of our ancestors have been gradually neglected.' When a dialect, by any of the means above described, has been distinguished from and raised above the others, it is adopted for all the native literary compositions, both in poetry and in prose. Hence it is still further cultivated, and is moreover thereby rendered more susceptible of ulterior cultivation and refinement. It becomes the general language of the government, of education, of literature, and of polished society; new words are introduced into it from other languages, antient or modern; and it is learned by foreigners.

The rise and progress of one dialect, according to the general description just given, may be observed to have taken place in every civilised country. In *Greece*, on account of the multiplicity of independent states into which the nation was divided, each dialect of the language received a separate cultivation. The early historians and philosophers wrote in the Ionic dialect, and lyric poetry was composed in the Doric and Æolic dialects. But after the Persian war, and the great predominance of the Athenians, both in political power and in literature, the Attic dialect obtained the ascendant in Greece and became the common literary language. (Müller's *History of Greek Literature*, c. 20, § 1, 2.) In like manner, the Tuscan dialect, chiefly on account of the pre-eminence of the Tuscan writers, became the literary language of *Italy*, and threw into the shade the Sicilian dialect, in which the first essays of Italian poetry were made. But notwithstanding the predominance of the literary Tuscan in Italy, both as the literary language and as a means of communication between inhabitants of different parts of Italy, yet every Italian city or territory has its own dialect, which is habitually spoken, not only by the lower and middle classes, but also by the upper classes when persons from other parts of Italy or strangers are not present. [ITALY, vol. xiii., p. 62, 63.] In *France*, the dialect of the *langue d'oil*, spoken in and about the seat of government, has not only thrown into the shade the other dialects of that language (such as the Walloon, Picard, Norman, &c.), spoken in the northern portion of the kingdom, and reduced them to the condition of mere patois, but it has also superseded the *langue d'oc*, the language of the south, which had been raised to considerable literary importance by the poems of the Troubadours. [FRANCE, vol. x., p. 432.] The Castilian dialect has obtained a similar ascendency in *Spain* through the influence of the Castilian writers; and the high German of Saxony has become the literary language of *Germany* mainly through the influence of Luther's translation of the Bible; although the Suabian dialect received a literary cultivation in the lays of the Minnesingers before any other of the German dialects. [GERMANY, vol. xi., p. 193.] The classical *English* is mainly formed upon the dialect spoken in Middlesex, Surrey, Kent, and the other counties in the neighbourhood of London. Its forms differ materially from those of the dialects spoken in the more distant counties, as Devonshire, Somersetshire, Cheshire, Lancashire, and Yorkshire; and still more from those of the dialect of the English which is spoken in the lowlands of Scotland, and in the border counties of England. The latter dialect has received considerable literary cultivation not only from early writers, such as Buchanan, Barbour, and others, but also from Burns, Walter Scott, and their imitators, who have used it with great skill and success for ballad poetry and tales of fiction.

A peculiar dialect of the English has been formed in the New England States of the American Union, a specimen of which may be seen in the humorous work by Mr. Haliburton, entitled 'The Clockmaker.' The American dialect of the English contains a few words which are peculiar to the country (such as *caucus*, *mocassin*, *pappoose*, *squaw*); but most of the American expressions have been borrowed from English provincialisms, and are still current in different parts of England (as, *I reckon* and *I guess*, *roile*, *snag*, *spry*, &c.). See Pickering's *American Vocabulary*, Boston, 1816.

By a provincial word is meant a word which is not received in the literary language of the time, but which is current among the inhabitants of some district; and provincial words may be divided into the following classes:—

1. Words formerly current in the literary dialect of the language, but which have ceased to be so, and are current only as provincialisms. For example, the word *cantle*, meaning a piece or fragment, and *shard*, meaning cowdung, are used provincially in parts of England, though obsolete in the literary language. They were however literary words in the time of Shakspere.

> 'See how this river comes me cranking in,
> And cuts me from the best of all my land,
> A huge half-moon, a monstrous *cantle* out.'
>
> 1 *Hen. IV.*, act iii., sc. 1.
>
> 'Ere to black Hecate's summons
> The *shard-born* beetle, with his drowsy hums,
> Hath rung night's yawning peal, there shall be done
> A deed of dreadful note.'
>
> *Macbeth*, act iii., sc. 2.

(See *Craven Glossary* in v. 'shard.')

So *clumb*, the preterit of *climb*, occurs in Chaucer and other old writers, but is now only a provincialism.

Sometimes an antient classical word, though current provincially in ordinary discourse, is used as a literary word only in poetry or as a technical term. Thus the old words *craven* for coward, and *dank* for damp, which are still used familiarly in the provincial language of some districts, could only be employed as literary words in poetry or in poetical prose; and the old word *soller*, meaning an upper floor, which is current as a provincialism in many parts of the country, is only recognised by the literary language as a legal term, being thus used in the general words of a conveyance ('cellars, sollers,' &c.).

2. Words which are not known to have ever been received in the literary language of the country. Many words of this class will occur to any person who consults a provincial glossary of any language. In some cases the word differs widely from any word which occurs either in the modern literary language or in old writers; more frequently however the difference consists mainly in the form. The Scotch dialect presents obvious examples of all these varieties. Sometimes a provincial word is not a dialectical variety of form, but is a corruption arising from ignorance, as *atomy* for *anatomy*, *rusty* for *restive*.

From the manner in which provincial dialects are preserved, it is natural that many archaisms of language should remain current in them after they have been lost in the literary language. Thus Buttmann, in his 'Lexilogus,' explaining the word ἀκοστεῖν, which occurs in Homer, cites statements of grammarians that ἀκοστή meant barley, among the Cyprians and Thessalians, and proceeds to remark as follows:—'That Homer never used the word ἀκοστή itself, is no objection to this derivation, any more than that it was borrowed from the Cyprians or Thessalians. Heyne has judiciously observed, that old words which disappeared from common use were still visible much later in certain dialects. Such idioms were noted while Greek was still a living language, in part for the very purpose of explaining Homer and other antient writers; and thus such words as this were introduced into the glossaries. Ἀκοστή therefore was a genuine old name for barley, and though in Homer's time and in his particular country it might not have been the common name for it, still an expression taken from this word might very well have been in use in the language of common life' (p. 76, Engl. Trans.). It may be here remarked that words peculiar to any dialect were called by the Greeks γλῶσσαι (Aristot., *Poet.*, c. 21); whence γλωσσάριον, or glossary, meant originally a collection of such γλῶσσαι.' (*Quarterly Review*, vol. xxii., p. 305.) Afterwards a *gloss* came to mean any comment, and was applied to the commentaries on the *Corpus Juris* made in Italy in the middle ages.

Provincial dialects are chiefly preserved among the humbler and illiterate classes; educated persons generally speak the literary language of the country. Moreover they are chiefly preserved in rural districts; and thus many of the provincial words relate to agricultural subjects. (Preface to Boucher's *Glossary*, p. xliv.) In Fielding's time, country gentlemen in England often spoke the provincial dialect of their county, as may be seen by Squire Western's language in 'Tom Jones.'

Provincialisms, being either antient classical words, actually obsolete in the literary language, or diverging words or forms in a parallel dialect, are genuine remains of the antient language of the country. In this respect they differ materially from the following classes of words:—1. Low, vulgar, or obscene words, which are of universal or general currency, and are not confined to any particular locality. (Grose's *Dictionary of the Vulgar Tongue*, and the *Dictionnaire du Bas Langage*.) 2. Slang or cant expressions, used by gypsies and thieves for the purpose of concealing the subject of their conversation in the presence of persons who are not their accomplices (called *gergo* by the Italians, *ergot* in French, and *germania* in Spanish). A glossary of the slang of the London thieves (which however seems to be very variable) is appended to Hardy Vaux's 'Memoirs.' A slang or cant language is often formed among classes of persons following any peculiar pursuit; thus there is a slang of the prize-ring and the stable in this country, and there is said to be a slang among bull-fighters in Spain. 3. Technical words, such as the peculiar language of sailors or miners. 4. Neologisms, such as the words *talented*, *jeopardise*, in English.

Collections of provincial words are important in a philological point of view, as throwing light on the formation, structure, and analogies of languages; they are also important in a historical point of view, as illustrating the changes in the language of a country.

The glossaries of provincial words which have been published in different countries are very numerous, though in general they have been made with little philological skill or knowledge, and are meagre in the explanations and illustrations of the meanings of the words. The limits of the present article do not permit us to give a list of the title-pages of even the principal provincial glossaries; but we will enumerate some of the dialects of the chief European languages of which glossaries exist. For the Italian there are glossaries of the Sicilian, Neapolitan, Venetian, Bolognese Ferrarese, Veronese, Mantuan, Brescian, Bergamasque, Milanese, and Piedmontese dialects. There are also short popular poems published in all or most of the Italian dialects. (Denina, *Mémoires de l'Académie de Berlin*, 1797; *Classe des Belles-Lettres*, p. 64-90; Adelung's *Mithridates*, vol. ii., p. 496-528.) We are not aware of the existence of a glossary of any Spanish dialect; an account of the Catalonian dialect, which closely resembles the *langue d'oc*, may be seen in the 'Mélanges sur les Langues et Patois,' p. 297-431, Paris, 1831. Dictionaries of the *langue d'oc* and of some of its varieties, as the Provençal and Limousin, exist. Copious specimens of the dialects of the French, or *langue d'oil*, may be seen in the 'Mélanges sur les Langues et Patois,' above cited. There are likewise glossaries of the Walloon French, and of the French of Geneva. For the German language glossaries exist of the dialects of the following countries and districts:—Austria, Bavaria, Esthonia and Livonia, Frisia, Hamburg, Henneberg, Holstein, Mark of Brandenburg, Meissen, Upper Palatinate, Pomerania and Rügen, Prussia, Saxony and Thuringia, Lower Saxony, Silesia, Suabia, German Switzerland, Westerwald, Westphalia. There are likewise general glossaries of Low German (platt-deutsch), of Southern German, and of the dialect of the German Jews (Jüdisch-deutsche Mundart). For the English language there are glossaries of the dialects of Norfolk, Suffolk, Sussex, Devonshire, Somersetshire, Cornwall, Herefordshire, Cheshire, Lancashire, Yorkshire, Cumberland, Westmoreland, and Northumberland; to which may be added Jamieson's 'Scottish Dictionary.'

A copious list of works illustrating the provincial dialects of England has been recently published in London.

As several persons appear to be engaged at present in making collections of provincial words in England, we may be permitted to remark that the principal defect of the provincial glossaries which have been hitherto published in this country consists in the brevity and vagueness of the explanations of the words, and the want of illustrative examples of their usage in conversation.

PROVINS. [Seine et Marne.]

PROVISIONS, PROVISORS. [Præmunire.]

PROVOST, a term having its origin apparently in the Latin *præpositus*, which denotes the chief of any society, body, or community. In France the corresponding word *prévôt* approaches nearer the original form. In that country it is applied to the persons who discharge the functions of many different offices, but in England it is rarely used: we believe the only instances are those of the heads of certain colleges, as Eton, King's College (Cambridge), &c. But in Scotland it is used to designate the chief officer in cities, as the provost of Edinburgh or of Glasgow, where in England the same officer is called the mayor.

PROVOST-MARSHAL, a term adopted from the French, who call an officer with similar functions the prévôt des maréchaux de France, or at least did so before the Revolution. The English provost-marshal is attached to the army, his duty being to attend to offences committed against military discipline, to seize and secure deserters and other criminals, to restrain the soldiery from pilfering and rapine, to take measures for bringing offenders to punishment, and to see to the execution of the sentences passed upon them.

PROX, Mr. Ogilby's name for his last genus (the sixth) of *Cervidæ*, the type being *Prox moschatus* (*Cervus Muntjac*). [Deer, vol. viii., p. 362.]

The following are the genera comprised under Mr. Ogilby's family *Cervidæ*, which he makes the second of the order *Ruminantia*, the *Camelidæ* being the first, and the *Moschidæ* the third; assigning to *Cervidæ* the following character:—

Feet bisulcate; *horns* solid, generally deciduous, in the male only or in both sexes; incisor teeth (*dentes primores*) above, nine; below, eight.

Genera.

1. *Camelopardalis*. Horns in both sexes permanent, simple, covered with skin.
2. *Tarandus*. Horns in both sexes, subpalmated, deciduous. Type.—*The Reindeer*, *Cervus Tarandus*.
3. *Alces*. Horns in the male only, palmated, deciduous. Type.—*The Elk*, *Alces Machlis* (*Cervus Alces*, Linn.).
4. *Cervus*. Horns in the male only, ramose, deciduous. Types.—*The Stag*, *C. Elaphus* and *Cervus Saumer*, or *Hippelaphus*, Cuv.
5. *Caprea*. Horns in the male only, subramose, deciduous. Type.—*The Roe*, *Caprea Capreolus*.
6. *Prox*. Horns in the male only, subramose, deciduous. Type.—*The Muntjak*.

PROXY. [Lords, House of.]

PRUDE'NTIUS, AURE'LIUS, born in Spain, A.D. 348, followed the profession of the law, and was employed in some official situation in his native country under the reign of Honorius. About the year 407 he repaired to Rome, partly on business, and partly, it seems, from religious motives. He afterwards returned to Spain, where he spent the rest of his life in pious practices and studious pursuits. The precise time of his death is not known. Prudentius wrote several works in Latin verse. Two books are entitled 'Orations' against Symmachus, prefect of Rome, who had addressed a petition to the emperor in the name of the senate of Rome for the re-establishment of the temples and rites of the old religion. [Orosius.] Prudentius exposes the absurdity and abominations of the heathen mythology, and the corruption resulting from the want of a moral check, in which the old heathen religion was deficient. Towards the end of the second, he eloquently descants against the cruel practice of gladiators' combats for the amusement of the people; and in order to show their brutalising influence, he instances a vestal attending in the amphitheatre, and witnessing the struggles and agonies of the fallen gladiators in the arena, exclaiming with joy that such sights were her delight, and giving without compunction the signal to dispatch the fallen:

> 'Et quoties victor ferrum jugulo inserit, illa
> Delicias ait esse suas; pectusque jacentis
> Virgo modesta jubet, converso pollice, rumpi.'

Arnobius (b. iv.) towards the end casts a similar reproach upon the vestals.

Prudentius wrote also: a series of sacred hymns, which have considerable poetical merit, and some of which have been inserted in the Liturgy of the Roman Catholic church; 'Psychomachia,' which is a description of the struggles between passion and duty in the human soul; and several books against the Marcionites and other heretics. One of the best editions of the works of Prudentius is that of Parma, 2 vols. 4to., 1788.

PRUNING. [Planting.]

PRUNUS is a genus of arborescent Rosaceous plants, which belongs to the Amygdaleous division of the order, and comprehends several of our domestic fruits. The Cherry, Bird Cherry, Plum, Damson, Sloe, Bullace, and Apricot are all comprehended in the genus as limited by Linnæus. But, in the opinion of some modern botanists, the true Plums require to be separated from the others, and should exclusively constitute the genus Prunus, while the others are to be considered as belonging to two other genera represented by the Cherry and the Apricot. In this view of the subject, each genus is characterised thus:—

Armeniaca, or the *Apricot*. Drupe woolly outside. Stone blunt at one end, sharp-pointed at the other, with a furrow passing all round it, and an even surface. Young leaves rolled up.

Cerasus, or the *Cherry*. Drupe smooth, without bloom. Stones roundish, smooth. Young leaves folded flat.

Prunus, or the *Plum*. Drupe smooth, covered with bloom. Stone sharp-pointed at each end, furrowed all round, and smooth on the surface. Young leaves rolled up.

Of the Plum genus, thus restricted, there is in common use the Garden Plum (Prunus domestica), with all its numerous varieties, the Bullace (P. insititia), and the Sloe (P. spinosa). These plants are distinguished specifically by botanists, but apparently without reason. It is the opinion of the best experimental physiologists that the Sloe of our hedges was the origin of the others; and certainly there is not more difference between a Sloe and a Greengage than there is between a German Quetsche and an English White Magnum-Bonum. Several other species belong to the genus, but they are of no moment, with the exception of a plant called Prunus Coccomilia, which inhabits the mountains of Calabria, and has a great reputation in Italy on account of the tonic qualities of its bark.

PRURI'GO is a disease of the skin characterised by an eruption of small pimples and a most intense burning sensation of itching. The pimples are usually but slightly if at all red, and the skin between them has its natural colour. They are generally seated about the shoulders, back, and neck, but often also on the limbs, and in severe cases even on the face and over a great part of the body. Their course is always very slow, and they are not infectious.

There are three principal varieties of Prurigo, namely, P. mitis, P. formicans, and P. senilis; and besides these, some others are distinguished by the names of the parts which are in each exclusively or chiefly affected.

The Prurigo mitis is the mildest form of the disease. The pimples are very small, and so pale that they can scarcely be discerned, till, by the scratching, which is almost unavoidably resorted to in order to relieve the intolerable itching, their tops are torn off, and become covered by little black scabs of dried blood.

In P. formicans all the symptoms of the disease are more severe, and the itching by which they are accompanied is united with a painful burning sensation in the skin, as if, patients say, hot needles were constantly piercing it. Both this and the preceding form of Prurigo may disappear with a slight desquamation in a few weeks, but more commonly a succession of eruptions follow one another, and the disease is prolonged for months or even years. Both of them occur in persons of all ranks and ages, but they are most common in the young and in the old, and among those who enjoy fewest of the comforts of life. They are not attended by any important constitutional disorder.

Prurigo senilis, which is by far the worst form of the disease, occurs almost exclusively in enfeebled children and old people. It usually lasts for years, producing all the time almost intolerable suffering by the intense itching that attends it, and which scarcely admits of relief by any known means. The pimples are usually very numerous, and often hard and prominent; the skin between them is also often thickened and indurated, other eruptions break out upon it, and if cleanliness be not carefully observed, it becomes infested with swarms of lice.

The treatment of the two first forms of Prurigo must consist of a mild antiphlogistic regimen, tepid baths, and the use of alkalis both externally and internally. Stimulants of all kinds greatly increase the pain and itching, but they may sometimes be relieved by the application of ointments or lotions containing small quantities of opium, or Prussic acid, or cyanuret of potassium. In the Prurigo senilis the regimen must be more nutritious, and tonic medicines are useful; but in this form, as well as in the others, stimulants must be avoided. If the skin is infested with pediculi, the most effectual mode of destroying them is fumigation with the vapour of cinnabar. In this form also sulphur-baths are among the few means that will produce any relief. The alkaline lotions, which may be used in all cases, may be composed of one or two drachms of carbonate of potash to the pint of water, or of from one to three drachms of sulphuret of potash to the same quantity of water, the strength being determined by the irritability of the skin, and being always made less than sufficient to excite any heat or redness in it.

PRU'SIAS. [BITHYNIA.]

PRUSSIA consists of two great divisions, which are unconnected with one another. The western and smaller portion is situated on both sides of the Rhine, and called Rhenish Prussia (Rhin-Preussen). It extends between 49° and 52° 15′ N. lat., and between 6° and 9° 30′ E. long., and on the south borders on the French department of Moselle. On the west of it lies Belgium and Holland, and on the north the kingdom of Hanover. Portions of the last-mentioned country, with Brunswick, Lippe, Waldeck, and the electorate of Hesse, extend along its north-eastern boundary-line, and separate it from the larger portion of the Prussian monarchy. Farther south it borders on Nassau, Hesse-Darmstadt, and that portion of Bavaria which lies west of the Rhine. It comprehends an area of about 18,550 square miles, or about three-fourths of the area of Scotland.

The eastern and larger portion of the Prussian monarchy, more properly called Prussia, though, strictly speaking, only the eastern portion of it bears that name, extends from 49° 50′ to 55° 50′ N. lat. and from 9° 50′ to 12° 50′ E. long. On the north-west of it lies Mecklenburg; on the west Hanover, Brunswick, and the electorate of Hesse. Along the southern boundary are the duchies of Saxony, the kingdom of Saxony, and several portions of the Austrian monarchy, and along the eastern side are the kingdom of Poland and Russia. The area of this portion is about 91,620 square miles, or about 7000 square miles more than the surface of Great Britain. The whole Prussian monarchy has a surface of 110,170 square miles, which is about 2000 square miles less than that of the British Islands.

Surface and Soil.—I. Rhenish Prussia is divided into two equal portions by the Rhine, and each of these divisions consists of an elevated table-land and a low plain. The table-land on the west bank of the Rhine is connected on its south-eastern border with the Hardt Mountains, as the northern extremity of the Vosges is called. It extends over that part of Bavaria which is situated on the west side of the Rhine. The Hardt Mountains attain an elevation varying between 1100 and 1600 feet, and the highest summit, the Calmet or Kalmuck, is above 2000 feet. From this mountain-region the table-land extends northward to the parallel of the towns of Bonn and Aachen (or Aix-la-Chapelle). Along the south-eastern banks of the river Moselle is the highest part of the table-land, which appears in the shape of a range elevated on a very high base. Part of this range is called the Hochwald, and another part the Soonwald: its mean elevation is more than 2000 feet above the sea-level, while the highest summit, called the Walderbsenkopf, attains nearly 2690 feet. The larger part of the table-land lies to the north of the Moselle river, and is called the Eifel, and in its northern districts the Hohe Veen. The mean elevation of this part is about 1600 feet, and it may be called a plain; neither the eminences nor the depressions are great. A few hills rise from 500 to 700 feet above it. This region has lately attracted much attention, on account of the unequivocal traces of volcanic action which it presents in its basalts and trachytic formations. Geologists have discovered some craters which are now filled with water and are thus converted into small lakes. Tracts of lava are frequent, and amidst them are conical hills resembling in form active volcanoes. The soil of the table-land is very poor, and produces only moderate crops of oats and potatoes, where it is cultivated. The tracts which are not cultivated are partly rocks, overgrown with peat and moss, and partly swamps, which are very extensive on the Hohe Veen. In other places tracts of sand occur. The soil in the valleys with which the edges of the table-land are furrowed, is much better, and especially the valleys of the Moselle and Rhine; but even here the fertility is only moderate, with the exception of a district surrounding the town of Trier (Treves), where good crops of wheat are raised. As far as this region lies within Prussia, it does not appear to contain metals or any useful minerals.

The level country which extends from the northern border of the Eifel and Hohe Veen, between the Rhine and the Maas, is nearly a flat which sinks imperceptibly as we proceed northward. Its fertility is considerable, and it produces rich crops of all kinds of grain.

Opposite the table-land of the Eifel, on the right bank of the Rhine, is a similar table-land, which extends southward through Nassau, where it rises along the banks of the Main and Rhine to a more elevated ridge known under the name of Taunus, which, like the Hochwald and Soonwald, attains a mean elevation of 2000 feet; and its highest summit, the Feldberg, is 2550 feet. From the Taunus the table-land extends northward, and terminates on the northern bank of the river Ruhr, an affluent of the Rhine. It extends about 40 miles farther north than the table-land west of the Rhine, and, between the Lahn and Sieg rivers, is called Westerwald; and, between the Sieg and Ruhr, Sauerland. The mean elevation of this district does not differ from that of the Eifel, being also about 1600 feet above the sea-level. But the surface is more uneven, especially that of the Westerwald, which contains several high summits, among which the Salzburgerkopf is 2172 feet high. Lava, trachyte, and basalt are also frequently met with in the Westerwald, but not north of the Sieg river. The soil of the whole region is poor; and it is unsuited for the production of any grain except oats, which supply the inhabitants with bread. The population is considerable, especially on the Sauerland, which is, without exception, the most manufacturing district in Germany, a circumstance owing to the abundance of iron and coals which this part of the table-land contains.

The Rhine separates the two table-lands just mentioned, and runs in a narrow valley which is noted for its picturesque beauties. It begins to run between the mountains at Bingen, where its surface is a little more than 200 feet above the sea-level. It leaves the mountain-region at Bonn, where it is not more than 120 feet above the sea. In a course of about 70 miles it falls more than 80 feet. Between Bonn and Düsseldorf, a distance of nearly 50 miles, the fall is only 26 feet.

That portion of Rhenish Prussia which lies to the north of the Sauerland, and extends to its northern limits has a soil which varies greatly in fertility. The western portion of it, from the Rhine to the banks of the Ems, is nearly a desert: the cultivable ground, which only occurs in isolated places, is only a small portion of the whole. On the east of the Ems the soil is much better, especially as we approach the hilly country, which extends along the western side of the river Weser, where wheat is raised: some good tracts occur also along the northern declivity of the Sauerland, but they are not extensive.

II. The Eastern and larger portion of Prussia is a part of the great plain of Eastern Europe, which extends from the Straits of Dover to the foot of the Uralian Mountains. Mountains occur only along the southern boundary. On the boundary of Prussia and Bohemia is that mountain-range which bears the general name of the Sudetes, and whose northern portion is called Riesengebirge, or Giant Mountains. There are mountains also on the line which separates Prussia from Saxony. Where the south-western angle of Prussia is intersected by the duchies of Saxony and the territories of he princes of Reuss, and partly also by Hanover, it comprehends parts of the two mountain-systems of the Thüringerwald, or mountains of Thuringia, and of the Harz

The Sudetes are not connected with the Carpathian Mountains. At the north-western extremity of the last-mentioned range there is a nearly level plain, between 45 and 50 miles wide, on which the Oder rises. This plain is only 600 or 700 feet above the sea-level; and it descends on the north along the course of the river Oder with a gentle slope, but rapidly towards the south. On the north-western edge of this plain the southern extremity of the Sudetes commences with the mountain-plain of Glatz, which is surrounded by elevated ranges. It rises with a steep ascent, and extends in a north-western direction for about 70 miles, when it again descends with a similar slope. Its interior, the mountain-plain of Glatz, is between 1200 and 1300 feet above the sea; but the ranges which surround it rise to 3500 and 4300 feet. The highest summit, which lies at the south-eastern corner of the mountain-mass, is called the Altvater, and is 4281 feet above the sea. The whole region occupies a width of about 27 miles, and is called the Mountains of Glatz. Between the northern extremity of this range and the Giant Mountains is a tract the surface of which is chiefly occupied by high hills and low mountains; but its mean level above the sea does not exceed 1500 feet. It is followed in the same north-western direction by the Giant Mountains, which, for more than 30 miles, continue as a chain of equal elevation, whose upper part is nearly 4800 feet above the sea. In the middle of the chain, where the river Elbe rises, on its western declivity, is the Schneekoppe, also called Riesenkoppe, which is 5291 feet above the sea-level, and is the highest mountain in Germany except the Alps. The width of this range is about 14 miles, and the country at its north-eastern base is from 1500 to 1800 feet above the sea. The greatest part of this mountain-system is covered with wood, chiefly pine and fir, and only a small part of the valleys, which are rather narrow, is fit for cultivation. The higher part of the mountains rises above the line of trees, but does not attain the snow-line.

The Thüringerwald, which is at the south-western extremity of this part of Prussia, is a mountain-range nearly fifty miles long, but only from eight to twelve miles wide. The mean elevation may be 2000 feet above the sea, and the highest summit, the Great Beerberg, is 3258 feet. A very small part of this range lies within the boundary of Prussia. The Harz is about fifty miles distant from the Thüringerwald on the north. The western and higher portion of this mountain-system lies within the kingdom of Hanover. Only the eastern and lower portion belongs to Prussia: in this part the range attains an elevation of about 1500 feet. The Brocken, which is 3729 feet high, stands near the point where the boundary-line between Hanover and Prussia runs across the range. The greater part of the country which lies between the Thüringerwald and the Harz belongs to Prussia; its general level may be about 900 feet above the sea, but some hills rise several hundred feet higher. The soil of the valleys, most of which are wide, is generally of excellent quality.

The great plain is not a dead level, like some parts of the interior of Russia, but the surface is diversified by several moderate elevations. Two of these traverse this portion of Prussia from east to west in its whole extent. The northern elevation runs generally parallel to the Baltic, and the southern in its eastern portion parallel to the Sudetes. The northern elevation is a portion of that high ground which extends eastward from the mouth of the river Elbe, at a varying distance from the Baltic, to the sources of the river Volga, through a space of more than 1000 miles. It is remarkable for the number of lakes dispersed over its broad surface and on the upper part of its slopes, and for the quantity of erratic blocks of granite which are imbedded in the surface. On the eastern boundary of Prussia it occurs near 54° N. lat., and it runs near its southern boundary between 23° and 19° E. long., but is comprehended within the territories of Prussia. The mean height of this part of the elevated ground may be about 450 feet above the sea-level, and the lakes are more numerous than in any other part of it, and some are of considerable extent. The lake of Spirding occupies an area of more than twenty square miles, and is nearly 400 feet above the sea-level; the lake of Mauer is nearly as large, and about 410 feet above the sea. The larger lakes taken together occupy a surface of 312 square miles, and the smaller lakes are very numerous. The soil is sterile, chiefly consisting of loose sand, covered in many places with heath, and in others with stunted pines. The portion of cultivable land is very small; that which supplies indifferent pasture for cattle and sheep is not much larger.

From this elevation the country slopes to the shores of the Baltic with an undulating surface, which is seldom varied by a hill. The soil improves as we advance northward, and as we approach the shores of the Frisches Haff and the banks of the rivers Pregel and Niemen it contains extensive tracts of great fertility. The most productive parts occur along the banks of the Niemen and Vistula, where the low river-bottoms are of great extent, and are protected against the inundations by embankments. The embankments were erected along the Vistula, more than six hundred years ago, by the Teutonic knights: they are above 150 miles long. The country which is thus secured from inundations contains an area of nearly 750 square miles, and is by far the most fertile tract in the Prussian monarchy.

The elevation is interrupted by the wide valley of the Vistula, and on the west side of the river it does not rise opposite to the termination of the eastern portion, but much farther to the north. It begins about twenty-five miles south-west of Danzig, with a rather steep ascent, and attains its greatest elevation in the Thurmberg near Schönberg, which is nearly 1070 feet above the sea, and is the highest hill between the Harz and the Ural mountains. From this place it extends in a south-western direction towards Behrendt, and thence to Märkisch Friedland, which is on the boundary-line between Prussia Proper and Pomerania. So far it resembles in all its features a mountain-system of a diminutive size. It continues with a less elevation and more extended slopes along the boundary-line between the provinces of Pomerania and Brandenburg, and terminates in abrupt hills not far from the banks of the Oder opposite Schwedt and Oderberg. The soil of this elevation is much better in this part than it is farther east, but it is only of very moderate fertility. To the south-east of the higher portion of the elevation extends the greatest waste in the Prussian monarchy, called the Tuchler Heide (Heath of Tuchel), which is fifty miles in length and from twenty to twenty-five in width. The soil is sandy, and, with the exception of shrubs and stunted pines, it produces scarcely anything which is useful to man. The spots of cultivable ground are few and of small extent. Towards the south, where it approaches the river Netze, an affluent of the Warta, the soil improves, and it is still better between the two last-mentioned rivers, but even here the fertility is not great. Between the Warta, where that river runs north, and the Vistula, there is a large tract of country which yields abundant crops of wheat and other grain. The tract which extends along the lower course of the Warta to the banks of the river Oder, is much less fertile. On the northern side of the elevation the country is of moderate fertility, but it improves as we approach the shores of the Baltic. A few miles from the sea there is a tract several miles wide, which may be called fertile, but the shores consist of sand-hills which extend two or three miles inland, and occupy the whole coast from the eastern mouth of the Oder to the fertile delta of the Vistula near Danzig.

The Western portion of the elevation begins on the west of the Oder, between Schwedt and Oderberg, and runs west-north-west until it enters the duchy of Mecklenburg, through which it extends to Holstein and the banks of the Elbe. Its mean height is here probably less than 300 feet above the sea-level, and the surface is rather uneven, several hills rising from 100 to 200 feet above it. The soil of that part which is within Prussia is of moderate fertility; but along its northern declivity, and as far as the shores of the Baltic, including the island of Rügen, it consists of very good land, which yields large crops of grain.

The Southern elevation of the Prussian plain is connected at its eastern extremity with the mountains of Sandomir in Poland [POLAND], and with those surrounding the mining town of Olkusz, north-east of Cracow. From this point it runs in a west-north-west direction along the eastern boundary-line of the province of Silesia, where it rises to about 1000 feet above the sea-level north of the town of Breslau. In this part it is called the Heights of Trebnitz. The elevation is interrupted by the valley of the Oder between Leubus and Great Glogau, and farther on by the Bober, Neisse, and Spree; but it appears south of Berlin, where it is called the Fleming, and is 400 feet above the sea, or 300 feet above the site of the Prussian capital. It terminates not far from the banks of the Elbe, between Magdeburg and Burg; but a continuation of it appears on the western side of the Elbe, and after leaving the Prussian dominions, continues between the Elbe and the Weser to the vicinity of the North Sea between the mouths of these two rivers. In these parts it is very wide, and comprehends the Heath of Lüneburg, which belongs to the kingdom of Hanover.

The country which lies between the two elevations, west of the meridian of 19°, is not distinguished by fertility, except in some of the river bottoms. Berlin lies in a sandy desert, which contains only small isolated tracts of fertile ground; and this sterile country, in some parts overgrown with fine forests, extends northward to the boundary-line of Mecklenburg, and southward to the Fleming. To the east and west of this waste, on both sides of the river Oder, and towards the banks of the Elbe, the country is much better, but still not very fertile.

The country to the south of the southern elevation is more favoured by nature than the other parts of the Prussian monarchy. Completely sterile tracts are rare, and of small extent, with the exception of one which forms the southern district of Silesia, and is contiguous to the boundary-line of the Austrian dominions and of Poland. The remainder of Silesia is fertile, especially the plain, which extends on the left bank of the Oder from Oppeln to Liegnitz. The same observation applies to the province of Saxony, as far as it lies south of the southern elevation; the country about the town of Magdeburg is noted for its fertility, and is considered the granary of Berlin.

Climate.—Numerous meteorological observations have been made in all parts of the Prussian monarchy, and their results have been compared. The difference of temperature in the provinces is considerable. Berghaus has divided Prussia, as to climate, into three sections, the western, central, and eastern divisions. The first is formed by Rhenish Prussia, and the last by Prussia Proper; the remainder of the monarchy constitutes the central division. He gives the following table:—

			Mean Temperature of Fahrenheit.				
	Latitude.	Elevation above the Sea-level.	Of the Year.	Of the Summer.	Of the Winter.	Coldest Month.	Warmest Month.
Western division	51°	feet. 250	49¼°	63°	35°	33°	64°
Central division	52° 30′	210	48°	64°	33°	29°	65°
Eastern division	54° 30′	40	43°	61°	26°	24°	62½°

From this table it is evident that the difference of the mean temperature in winter in the western and eastern divisions amounts to nine degrees, but in summer it does not exceed two degrees and a half. If we compare the climate of these divisions with that of London, we find that the mean annual temperature of London is about one degree greater than that of the western division, and exceeds by nearly eight degrees that of the eastern. But as the mean temperature of the summer in London is only 61·2°, the western and central divisions of Prussia experience at that season a greater degree of heat than the British metropolis. The winter however in London is much milder, as the average temperature of this season is 39·3°. Berghaus observes, that the mean annual quantity of rain in the western division amounts to twenty inches, and only to fifteen inches in the eastern division, but it is nearly impossible to determine this point, as the latter division annually experiences very heavy falls of snow, which it is nearly impossible to estimate, on account of the drift-storms, which accumulate the snow in some places to a great depth, whilst other places, which are exposed to their whole force, are quite bare. The prevailing winds in Prussia, as all over the west of Europe, blow from the west, and frequently with great force.

Rivers.—In Rhenish Prussia is the Rhine, which traverses this division of the monarchy from south to north, and is navigable for large vessels as far as it flows through the Prussian dominions. As far as Cologne (Köln) it may be ascended by sea vessels of moderate size. Its course above Bonn is rapid, and in some places eddies occur, but they are not dangerous. Several rivers join the Rhine from the east and west. From the east it receives the Sieg, on which timber is floated, and which is also navigable for four or five miles from its mouth; the Wipper, farther north, which is only navigable for a short distance from its mouth; and the Ruhr and the Lippe, both of which are navigable for 30 or 40 miles from their junction with the Rhine. On the left the Moselle falls into the Rhine, and is navigable in the whole of its course through the Prussian dominions, an extent of more than 150 miles.

In the eastern provinces of Prussia four large rivers, the Elbe, Oder, Vistula, and the Niemen, traverse the elevations which run through them from east to west. Between the two elevations however the affluents of these rivers run east and west, and as many of them are navigable for river boats, they facilitate the intercourse between the countries on their banks. The navigable affluents of the Elbe, from the west, are the Saale, which begins to be navigable where it enters Prussia, the Unstrut, and the Elster; and from the east, the Havel, which is joined by the Spree: the course of the Havel is nearly 250 miles, measured along the windings, and it is navigable for about two-thirds of that distance. The navigable affluents of the Oder from the east are the Klodnitz, in southern Silesia; the Bartsch, which is navigable from Militch downwards; the Warta, which is navigable before it leaves Poland and enters Prussia, with its navigable tributary the Netze; and from the west, the Bober, the Neisse, and the Finow. The lake into which the Oder discharges its waters before it enters the Baltic, receives the two navigable rivers, the Ucker and the Peene; by the latter sea vessels of moderate size can ascend to the town of Demmin. The Vistula receives from the west the Brahe, which becomes navigable at the town of Bromberg. Between the Oder and the Vistula is the Persante, which runs more than 100 miles, and is navigable more than 20 miles from its mouth in the Baltic. The Elbing river rises in the lake of Drausen, and though its course is not long, it is navigable, and of great importance to the town of Elbing: it falls into the Frisches Haff. Farther east the same lake receives the Passarge, which is navigable for small sea vessels to the town of Braunsberg, four miles from its mouth. The Pregel, which also falls into the Frisches Haff, is navigable as far as Insterburg for large river vessels, and to the town of Königsberg for vessels of 300 tons burden. A river, which is united with the Pregel by a canal, runs to the Kurisches Haff; it is navigable for large river boats, and called the Deime. The Niemen or Memel is navigable in the whole of its course through Prussia; it receives from the north the river Yura, which about ten miles from its mouth is navigable for small river boats; and from the south the Scheschuppe, which is navigable about 25 miles upwards. The last river which requires mention is the Dange, which comes from Russia, and enters the Kurisches Haff at its most northern extremity where it forms a part of the harbour of the town of Memel. Vessels of more than 500 tons burden can enter the river and unload in the middle of the town.

Natural Productions.—Prussia does not possess a great variety of natural productions, but it has all those the cultivation of which has been gradually introduced into central Europe, and the most indispensable of them in sufficient abundance for its own consumption, and for the obtaining of foreign luxuries and comforts. Of domestic animals, according to the latest accounts that we have seen, and which appear to have been published about six years ago, there are—horses 1,500,000, the breed of which has been much improved of late years, especially in the eastern provinces, by numerous studs; horned cattle 513,160; sheep, at least 12,650,000 in round numbers, viz. 2,600,000 Merinos, 5,450,000 of an improved breed, and 4,600,000 not improved; goats, 200,000, are bred only in the mountainous parts of Silesia, Saxony, and Westphalia; swine, 2,000,000, are chiefly bred in Pomerania, Saxony, the provinces of the Rhine, and above all in Westphalia, the hams of which country have long been celebrated. There are likewise asses, chiefly in Westphalia, and mules. Of wild four footed animals there are: 1, fit for food—stags, fallow-deer wild boars, hares, and rabbits. The great northern hare is sometimes met with. 2, Beasts of prey and fur-bearing animals—wolves, foxes in abundance, bears rarely, lynxes, beavers, badgers, pole-cats, otters, weasels, and martens; the ermine is very rare. Domestic poultry of all kinds abounds; and of wild-fowl, besides what we call game, as pheasants and partridges, there are such immense numbers of wild geese as frequently to do great injury to the farmers. Smoked geese are an important article of exportation from Pomerania. Of birds of prey, there are the eagle, the sparrow-hawk, the kite, and some others. Fish of various kinds are extremely abundant, as well in the numerous rivers as on the long line of coast on the Baltic. In all the provinces where there are heaths, buckwheat, and lime-trees, great quantities of bees are bred, in all 600,000 hives. The breeding of silkworms has been greatly increased within the last twenty years, and promises to become very important.

Agriculture.—Agriculture is the chief source of the national wealth, and is carried on with great care in most of the provinces. Wheat, rye, oats, and barley are raised both for home consumption and exportation; there are likewise peas, beans, vetches, millet, maize, rapeseed, and linseed. Potatoes are cultivated in all the provinces. Flax, hemp, hops, tobacco, succory, beet-root, and garden vegetables of all kinds are raised; but of the first three articles not enough for home consumption. Fruit might be more extensively cultivated than it is. Considerable pains are taken with it in Pomerania; but the most productive provinces are Saxony and Rhenish Prussia. The cultivation of the vine has been greatly extended since the peace of 1815. The most and best wine is made in Rhenish Prussia; of 55,000 acres of vineyards, 44,000 are in that province. On the whole Prussia has abundance of timber the principal forests are in Prussia proper and Silesia; but some provinces, for instance part of Saxony, have not sufficient. The mineral products are salt from salt-springs, of excellent quality and in great abundance, amber, and coals in large quantities; alum, vitriol, saltpetre, alabaster, basalt, granite, porphyry, marble, slate, freestone, chalk, lime, porcelain-clay, pipe-clay, &c. The metallic products are silver, copper, lead, iron, zinc, cobalt, arsenic, and calamine. The precious stones are the onyx, agate, jasper, and cornelian.

Manufactures.—The principal manufactures are:—linen in all the provinces, but chiefly in Silesia; woollen cloths and cotton goods, especially in the province of the Rhine, at Elberfeld, Barmen, Crefeld, &c.; silk, leather, iron and copper ware, cutlery, articles of gold and silver, succory, paper, china, glass, earthenware, snuff and tobacco, sugar (the manufacture of beet-root sugar is making great progress), gunpowder, &c.; the breweries and brandy distilleries are very considerable.

Commerce.—The abundance of products of various kinds, and the active industry of the people, give occasion to an extensive commerce, which is highly favoured by the advantageous position of the country in the centre of Europe, the great extent of coast on the Baltic, and by the great rivers (the Rhine, the Elbe, the Oder, and the Vistula) which traverse the country and are connected by navigable tributary streams and numerous canals. The commerce of Prussia extends to almost all the states of Europe, to America, and even to China; but its chief commerce is with Austria and the other states of Germany, with England, Russia, Sweden, Denmark, and the Netherlands. The principal articles of export are the natural productions and the most important of the manufactures enumerated under the two preceding heads. The chief articles imported are:—raw and refined sugar, coffee, tea, spices, cotton, silk, tobacco, hops, tin, saltpetre, dye-stuff, wine, glass, and various manufactures, chiefly printed calicoes, silks, and fine hardware. It is not easy to ascertain the annual value of the exports and imports previously to 1831. That of the imports, says Dieterici, cannot be less than from ten to twelve millions sterling. The exports seem to have exceeded that sum. In 1831 the celebrated Prussian or German commercial league commenced, and has been since been gradually joined by almost all the German states. The effect of this league (or, as it is called in German, Zollverein, *i.e.* customs union) is not yet fully developed. The object is to establish an entire freedom of trade among the German states, and to subject foreign trade to such restrictions only as the protection of national manufactures or the financial circumstances of the state may render necessary. The result in the years 1831-1836 has been published, from official sources, by Dr. Dieterici, in a very elaborate work, in 1838. The harbours are:—Memel, Pillau, Neufahrwasser near Danzig, Stolpermünde, Rügenwalde, Kammin, Schweinemünde, Peenemünde, Greifswald, Stralsund, and Barth. The most considerable commercial towns are:—Berlin, Königsberg, Danzig, Breslau, Stettin, Magdeburg, Cologne, Elberfeld, and Aix-la-Chapelle. The great fairs are those of Breslau, Frankfurt-on-the-Oder, and Magdeburg.

Religion.—There is, properly speaking, no state religion That of the royal family and of the majority of the people is Calvinism; but Christians of all denominations are equally admissible to all public employments. The year 1817, which was the three hundredth anniversary of the Reformation, was remarkable for the union of the Calvinists and Lutherans in Prussia, and in some other parts of Germany, into one religious body, under the name of Evangelical Christians. These amount in Prussia to about 8,000,000, the Roman Catholics to about 5,000,000, the Mennonites and Moravians to about 15,000: there are likewise French Protestants, the descendants of the refugees; and nearly 200,000 Jews.

Education.—The Prussian government pays great attention to the diffusion of useful knowledge, and manifests equal zeal in encouraging the lowest as well as the superior institutions. For the education of the people, there are in all the towns elementary schools, Sunday and infant schools, schools for mechanics, &c.; in fact, so much is done in this respect, that many persons complain of the too great extent and variety of things taught in these institutions. In 1835 there were 21,790 elementary schools, in which about 2,000,000 of children of both sexes were instructed: for the higher branches of education, there were, in 1832, 124 gymnasia, in which 24,461 scholars were educated. There are universities at Berlin, Bonn, Breslau, Greifswald, Halle, and Königsberg, to the support of which the government applies large sums. As to education generally in Prussia, see SCHOOL. The literary and learned societies are very numerous.

Revenue.—In the year 1835 the revenue amounted to nearly 8,000,000*l.* sterling, and has not much varied since that time. The expenditure for the same year was estimated at an equal sum, of which about 1,200,000*l.* was appropriated to pay the interest of the public debt, and to the gradual redemption of it, and above 3,000,000*l.* to the war department. The debt amounted, on the 1st January, 1835, to about 27,000,000*l.* sterling, bearing interest at 4 per cent.

Army.—All subjects of the Prussian monarchy are bound to military service, which they perform successively in the standing army, the landwehr (militia) of the first and second ban, and in the landsturm (which answers to the French *levée en masse*). All men able to bear arms from twenty to twenty-five years of age belong to the standing army; they serve three years, and are then discharged for two years, during which they are liable to be called out as the reserve All those who have served in the standing army belong to the landwehr of the first ban, from the age of twenty-six to thirty-two, both inclusive. In time of war this ban is on the same footing as the standing army, and equally liable to serve both at home and abroad. It is called out every year to exercise, in one year for a fortnight, in the next for a month, and is equipped and clothed while it serves. The second ban, which is called out only in time of war, and is then chiefly employed in reinforcing the garrisons, includes all men capable of bearing arms till the age of thirty-nine. All older men fit for service belong to the landsturm. The army consists of eight corps, besides the guards, amounting to—

	War establishment.		Peace establishment.
	Officers.	Men.	
Infantry of the line.	3,000	128,412	66,536
Cavalry of the line .	932	21,600	18,000
Artillery. . . .	899	20,970	15,570
Engineers and pioneers	219	4,050	1,800
Garrison troops . .	161	5,400	5,400
Total . .	5,211	180,432	107,306
Besides—			
Landwehr of the first ban .			
Infantry . . .	2,658	118,481	
Cavalry. . . .	918	20,400	

The 6400 invalids are not included. Thus Prussia is able in time of war to have on foot an army of 8787 officers and 319,313 men; and, with the addition of the second ban of the landwehr, amounting to 180,000 (destined only to defend the country within the frontiers), a force of 500,000 men. The state maintains likewise several bodies of gendarmes. There are six fortresses in the western and twenty in the eastern provinces. The Duke of Wellington is the only field-marshal in the Prussian army.

The whole Prussian monarchy is divided into eight provinces, and these into twenty-five governments.

The following table shows the extent of the whole Prussian monarchy, the population of the provinces and governments, the number of inhabitants in a German geographical square mile (equal to about twenty-one English square miles), the principal towns, and the population, according to the return of 1837, the latest published:—

View of the Area and the Population of the Prussian Monarchy at the end of 1837.

Provinces.	Governments.	Area in German Square Miles.	Population at the end of 1837.	Inhabitants on a Square Mile.	Towns with more than 5000 Inhabitants.	
					Names of the Towns.	Population.
I. Prussia.	1. Königsberg	408·13	746,462	1829	1 Königsberg	64,200
					2 Memel	9,034
					3 Braunsberg	7,746
	2. Gumbinnen	298·21	558,192	1872	1 Tilsit	17,179
					2 Insterberg	8,386
					3 Gumbinnen	6,255
	3. Danzig	152·28	349,218	2293	1 Danzig	56,257
					2 Elbing	18,725
					3 Marienburg	5,594
	4. Marienwerder	319·41	499,001	1562	1 Thorn	7,668
					2 Marienwerder	5,246
					3 Culm	5,201
					4 Graudenz	5,182
	Total	1178·03	2,152,873	1827	13 towns with more than 5000 inhab.	
II. Posen.	5. Posen	321·68	788,578	2451	1 Posen	32,450
					2 Lissa	8,667
					3 Rawitsch	8,216
					4 Krotoschin	6,337
					5 Kempen	6,156
					6 Fraustadt	6,064
	6. Bromberg	214·83	381.128	1774	1 Bromberg	7,396
					2 Gnesen	5,447
	Total	536·51	1,169,706	2180	8 towns with more than 5000 inhab.	
III. Pomerania.	7. Stettin	236·88	464,440	1960	1 Stettin	33,786
					2 Stargard	10,693
					3 Anklam	7,434
					4 Pasewalk	5,381
					5 Demmin	5,318
	8. Cöslin	258·56	365,417	1413	1 Colberg	6,657
					2 Stolpe	7,798
					3 Cöslin	6,900
	9. Stralsund	79·02	160,428	2030	1 Stralsund	14,900
					2 Greifswald	10,291
	Total	574·46	990,285	1724	10 towns with more than 5000 inhab.	
IV. Brandenburg.	10. Potsdam, with Berlin	382·61	1,005,322	2628	1 Berlin	265,394
					2 Potsdam	25,560
					3 Brandenburg	13,283
					4 Prenzlau	10,508
					5 Neu Ruppin	7,925
					6 Charlottenburg	6,376
					7 Wittstock	6,163
					8 Spandau	6,753
					9 Schwedt	5,616
					10 Luckenwalde	5,417
					11 Wriezen	5,274
					12 Rathenow	5,030
	11. Frankfurt	348·43	736,089	2112	1 Frankfurt on the Oder	23,378
					2 Landsberg on the Warthe	9,970
					3 Guben	9,256
					4 Cottbus	8,216
					5 Cüstrin	5,240
					6 Königsberg (Neu Mark)	5,018
	Total	730·94	1,741,411	2382	18 towns with more than 5000 inhab	
V. Silesia.	12. Breslau	248·14	1,027,799	4112	1 Breslau	88,869
					2 Brieg	10,947
					3 Schweidnitz	9,476
					4 Glatz	7,094
					5 Oels	6,037
					6 Frankenstein	5,565

Provinces.	Governments.	Area in German Square Miles.	Population at the end of 1837.	Inhabitants on a Square Mile.	Towns with more than 5000 Inhabitants.	
					Names of the Towns.	Population.
V. Silesia (*continued*).	13. Oppeln . .	243·06	807,393	3322	1 Neisse	10,785
					2 Oppeln	6,821
					3 Ratibor	6,558
					4 Leobschütz	5,681
					5 Gleiwitz	5,377
	14. Liegnitz .	250·5[illegible]	844,281	3370	1 Görlitz	13,670
					2 Glogau	11,645
					3 Liegnitz	11,607
					4 Grünberg	9,935
					5 Goldberg	7,093
					6 Herschberg . . .	7,080
					7 Jauer	5,970
					8 Sagan	5,607
					9 Lauban	5,549
	Total .	741·74	2,679,473	3612	20 towns with more than 5000 inhabitants.	
VI. Saxony.	15. Magdeburg .	210·13	598,981	2850	1 Magdeburg, without suburb	42,528
					2 Halberstadt . . .	17,227
					3 Burg	14,025
					4 Quedlinburg . .	12,903
					5 Aschersleben . .	9,730
					6 Salzwedel . . .	7,285
					7 Schönebeck . . .	7,344
					8 Neustadt Magdeburg .	8,816
					9 Stendal . . .	6,099
	16. Merseburg .	188·76	652,591	3457	1 Halle, on the Saale .	26,447
					2 Naumburg . . .	11,925
					3 Zeitz	9,992
					4 Merseburg . . .	9,413
					5 Wittenberg . . .	8,400
					6 Weissenfels . . .	7,668
					7 Eilenburg . . .	7,699
					8 Eisleben . . .	7,523
					9 Torgau . . .	6,534
					10 Sangerhausen . .	5,133
	17. Erfurt . .	61·74	312,615	5063	1 Erfurt	24,308
					2 Mühlhausen . . .	12,051
					3 Nordhausen . . .	12,163
					4 Suhl	7,442
					5 Langensalza . . .	7,142
	Total .	460·63	1,564,187	3396	24 towns with more than 5000 inhab.	
VII. Westphalia.	18. Münster . .	132·17	405,275	3066	1 Münster . . .	19,763
	19. Minden . .	95·68	417,276	4361	1 Minden . . .	7,966
					2 Paderborn . . .	7,895
					3 Herford . . .	6,852
					4 Bielefeld . . .	6,097
	20. Arnsberg .	140·11	503,916	3597	1 Iserlohn . . .	9,313
					2 Soest	7,639
					3 Dortmund . . .	6,861
					4 Hamm . . .	5,372
	Total .	36·796	1,326,467	3605	9 towns with more than 5000 inhab.	
VIII. The Rhenish Province; sometimes called Rhenish Prussia.	21. Cologne . .	72·40	426,694	5894	1 Cologne . . .	69,051
					2 Bonn	13,871
	22. Düsseldorf .	98·32	766,837	7799	1 Barmen . . .	28,975
					2 Elberfeld . . .	26,770
					3 Düsseldorf . . .	21,858
					4 Krefeld . . .	23,008
					5 Wesel . . .	10,634
					6 Burtscheid with Leichlingen	10,384
					7 Hohescheid and Merscheid	10,255
					8 Neuss . . .	8,656
					9 Mühlheim on the Ruhr	8,172
					10 Cleves . . .	7,687
					11 Dursberg . . .	6,477
					12 Kronenburg . .	5,838
					13 Lennep . . .	6,025
					14 Ronsdorf . . .	6,115
					15 Essen . . .	5,571
					16 Emmerich . . .	5,515

Provinces.	Governments.	Area in German Square Miles.	Population at the end of 1837.	Inhabitants on a Square Mile.	Towns with more than 5000 Inhabitants.	
					Names of the Towns.	Population.
VIII. The Rhenish Province (*continued*).	23. Coblenz	109·64	461,907	4213	1 Coblenz and Ehrenbreitstein 2 Creuznach 3 Neuwied	15,878 8,062 5,685
	24. Treves	131·13	446,796	3407	1 Treves 2 Saarbrück	14,941 7,498
	55. Aix-la-Chapelle	75·65	371,489	4911	1 Aix-la-Chapelle 2 Erepen 3 Düren 4 Burtscheid	38,878 11,678 7,439 6,467
	Total	487·14	2,473,723	5078	27 towns, with above 5000 inhabitants.	
The whole Monarchy, without Neufchâtel		5077·41	14,098,125	2776	129 with above 5000 civil inhabitants, viz. 8 towns with above 30,000 inhab. 12 between 15,000 and 30,000 20 between 10,000 and 15,000 89 between 5,000 and 10,000	
The Principality of Neufchâtel		13·95	56,073	4020	1 La Chaux de Fonds 2 Locle 3 Valangin Neufchâtel Val de Travers	7,874 6,206 6,104 6,001 5,079
Sum Total		5091·36	14,154,198	2668		

The Constitution is an unlimited monarchy, hereditary in the male and female line. Prussia had formerly a representative body called the Estates. In process of time the power of the crown increased, and the government was carried on without the intervention of the estates, which fell into disuse. After the conclusion of the wars of the Revolution, the late king Frederic William III. issued, on the 22nd of May, 1815, an ordinance, which promised that each province should have its own estates; and it was understood that at a subsequent time there should be a general representation of the whole kingdom. Accordingly, in July, 1823, a law was promulgated for the institution of provincial estates, which have been since regularly convoked in all the provinces; but the king did not take any steps towards the institution of a general national representation. On the accession of the present king Frederic William IV., it seems to have been expected that he would fulfil what were understood to have been his father's intentions, and while he was at Königsberg, in Sept. 1840, to receive the homage of the estates of the province of Prussia, that assembly resolved, by a great majority, to insert in their address to his majesty a clause reminding him of the ordinance of 22nd May, 1815, and requesting him to fulfil the promise of a national representation. The king, however, in his answer declares, that his father, soon after the issuing of that ordinance, was induced by the events that took place in other countries, to take into serious consideration the meaning that might be given to his words; that reflecting on the sacred duties of the royal office confided to him by God, he resolved to fulfil his promises, but keeping aloof from the prevalent notion of a general national representation, he should follow, for the real good of the people committed to his care, and with the sincerest conviction, the most natural course, and which, conformably to historical tradition, was the best adapted to the German national character. The result was the establishment of provincial and district assemblies in all parts of the monarchy.

Prussia as a member of the German Confederation, is the second in rank; its contingent to the army is 79,234 men, viz. 58,357 infantry of the line, 3071 light infantry, 11,319 cavalry, 5075 artillery and train with 100 pieces of cannon, 792 pioneers and pontoneers. This contingent, which forms the 4th, 5th, and 6th corps of the army, is for the German provinces; Posen and Prussia being no part of the Confederation. It contributes 2000 florins per annum to the expenses of the Diet; and in the full council has, like the other kings, four votes.

History.—The history of Prussia is brought down to the latter end of the eighteenth century, in the articles BRANDENBURG and FREDERIC WILLIAM the Great Elector, and his successors, to the end of the reign of Frederic William II. His son Frederic William III. ascended the throne on the 16th of November, 1797, and immediately commenced a general reform in the administration, which was very much needed. In the war of the European powers against France, he maintained a neutrality as stipulated in the treaty of Basle, in 1795, and profited by this season of peace to promote the prosperity of the people, and especially to introduce economy into the public expenditure. Peace being concluded at Luneville, in 1801, by which the left bank of the Rhine was ceded to France, Prussia obtained by the decision of the diet of the Empire in 1803 an accession of territory of nearly 4000 English square miles, with above 400,000 inhabitants. In the war of the third coalition against France, which broke out in 1805, Prussia still preserved its neutrality; but the unexpected march of a French and Bavarian army through part of the Prussian territory, and a visit of the emperor Alexander to Berlin, induced the king secretly to join the coalition against France, on the 8th of November, 1805, upon certain conditions. After the battle of Austerlitz, peace was concluded between Austria and France. A few days before, on the 15th of December, 1805, the Prussian ambassador, Count Haugwitz, concluded a preliminary convention between Prussia and France, by which Prussia ceded Anspach to Bavaria, and Cleves and Neufchâtel to France, which made over the electorate of Hanover to Prussia, and Prussia in fact took possession of that country. This led to a declaration of war by England against Prussia. Various negotiations followed, which ended in a war between Prussia, in alliance with Saxony, and France. Hostilities began on the 9th of October, on the Saale, and on the following day the advanced guard of the Prussian army was repulsed at Saalfield, on which occasion the brave Prince Louis of Prussia was killed. The battles of Jena and Auerstadt, on the 14th October, decided the fate of the Prussian army. The most important fortresses between the Weser and the Elbe surrendered in rapid succession, and Napoleon entered Berlin on the 27th of October. Frederic William retired to Memel, collected a new army, and, together with his ally the emperor of Russia, marched to oppose the advance of the enemy in East Prussia. The battles of Eylau and Friedland led to the peace of Tilsit, 9th July, 1807, by which the king lost half of his dominions, and the French troops continued to occupy the other half. The French did not evacuate Berlin till December, 1808, so that the king could not return to his capital till the end of 1809. Frederic William now laboured with incessant zeal and firmness to heal the wounds which war had inflicted, and to give an entirely new form to the internal administration. The army was reduced to 42,000 men.

In December, 1808, accompanied by his queen, he went to St. Petersburg to confirm his alliance with the emperor Alexander. After a stay of some weeks, he returned to Königsberg, and on the 23rd December, 1809, made his entry into Berlin. But the joy of the king and of the people was damped by the unexpected death of the queen Louisa, on the 19th July, 1810. On the 24th February, 1812, he concluded an offensive alliance with France, and when war broke out between Russia and France, in June, 1812, he sent 30,000 men to join the 10th French corps under Marshal Macdonald, which was employed in the siege of Riga. On the rapid retreat of the French from Russia, the Prussian corps was likewise obliged to retire, but General York, who commanded it, concluded a convention with the Russian general Diebitsch, by which the Prussian corps was declared neutral and separated from the French army. The Prussian people now began to entertain hopes of seeing their country delivered from the yoke under which it had so long suffered, when the king called the nation to arms. The enthusiasm with which this call was answered enabled the king to bring into the field, in 1813, a numerous and well-disciplined army. The campaign of 1813, the advance of the allies to Paris, the capture of that city in March, 1814, the deposition of Napoleon, his removal to the island of Elba, and the restoration of the Bourbons, followed in rapid succession. After the conclusion of the peace of Paris, the king of Prussia visited London in company with the emperor Alexander, in June, 1814, and he afterwards attended at the congress at Vienna. The return of Napoleon from Elba in 1815 led to a new alliance between Prussia, Austria, Russia, and England, who declared war against him. The battle of Waterloo led to the general peace of Europe, which has not since been interrupted. Frederic William continued till his death, on the 7th June, 1840, to devote all his attention to improve the manufactures, commerce, and administration of his dominions: the most important transaction of his reign was the conclusion of the commercial league of which we have already spoken.

PRUSSIA, properly so called, formerly designated by the name of the Kingdom of Prussia, and afterwards divided into the two provinces of East and West Prussia, now forms only one province, which is called the Province of Prussia. It is situated between 52° 54′ and 55° 53′ N. lat. and between 16° 42′ and 22° 45′ E. long. It is bounded on the north by the Baltic, which washes the coast for about 270 miles, on the east by Russia, on the south by the kingdom of Poland and the province of Posen, and on the west by Brandenburg and Pomerania. Its area is 24,780 English square miles, of which 800 are water, and the population is 2,152,873. The climate is temperate and healthy, though very cold in winter, very changeable on the coast, and generally rather damp. The face of the country is level, broken here and there by low ranges of hills. The forests which cover the sandy plains are estimated at two millions of acres. The principal rivers are the Vistula, the Pregel, and the Memel, or Niemen. There are some hundreds of small lakes, namely, 300 in East and 150 in West Prussia; but no large ones, unless we reckon as such the two Haffs, which communicate with the sea only by canals, and have fresh water. [Curisches Haff; Frisches Haff.] Of the smaller ones, M. Preuss names 34 of various sizes, from 5 to 10 or 15 square miles in extent; the two largest are the Mauer lake, 40 square miles, and the Spirding lake, 70 square miles in extent. With regard to the natural productions, the province produces corn, pulse, flax of excellent quality, hemp, tobacco, hops, madder, potatoes, and timber. There are good breeds of the usual domestic animals, abundance both of fresh-water and sea fish, and bees. The mineral kingdom is very poor; iron however, in various forms, is abundant, and that singular production amber is far more plentiful in this province than in any other part of the world. [Amber.] We extract a few particulars from the journey of Messrs. A. von Humboldt, Ehrenberg, and Rose, performed in the year 1829. 'Formerly the collection of amber was under the direction of persons appointed by the government. As much the larger portion is cast up by the sea, and it is therefore easy for the inhabitants of the coast, especially fishermen, to collect it on their own account, they are subject to very annoying restrictions; they cannot enjoy an aquatic excursion without subjecting themselves to a strict search by the officers appointed for the purpose; they can put to sea from certain places only, and if they are found elsewhere, they are liable to be sent to Königsberg or Fischhausen, which, even if they should be found innocent, causes a loss of one or more days. These considerations induced the government of Königsberg, in 1809, to propose to the inhabitants to farm the amber, but the negotiation failing, the right of collecting amber was farmed in 1811 to a Mr. Douglas for 10,000 dollars per annum. Mr. Douglas showed our travellers his warehouse, which, on account of the inflammable quality of the amber, is made fire-proof and closed with massy iron doors. There were at that time 150,000 pounds in the warehouse. This was a larger stock than usual, because the demand from Constantinople, which is the chief market, was much diminished, partly by the wars in which the Porte was engaged, partly by the ordinances of the Sultan to restrict luxury. Mr. Douglas had farmed only the collection from Memel to the territory of Danzig; that which is collected about Danzig is farmed by the city itself. It is remarkable that the quantity of amber collected annually has always remained the same, as appears on examining the accounts from 1531 to 1811.' The manufactures of the province are confined to the towns, of which the principal are Danzig, Elbing, and Königsberg. The commerce of the province has greatly declined in comparison with its once flourishing state, as the many great warehouses that stand empty in all the ports afford a melancholy proof. The rigorous prohibitory system of Russia is the chief if not the only cause of this decline.

After the Goths left the shores of the Baltic, they were succeeded by different Sclavonian tribes. Conrad, duke of Masovia, being unable to defend his country against these mercenaries, called to his assistance the Teutonic knights, to whom he assigned, in 1230, a tract of land on the Vistula, where they built Thorn and Culm. The power of the Order gradually increased; their territory became very rich and flourishing; but the heavy war-taxes and the prodigal magnificence of the knights caused the nobles and the great towns to put themselves under the protection of Poland, and, by a treaty concluded at Thorn in 1466, West Prussia was ceded to Poland, retaining however its own constitution. The German empire, to which the territory of the Order was considered to belong, refused to recognise the treaty of Thorn, and the knights, who retained possession of East Prussia, refused to do homage to the king of Poland, and chose Albert of Brandenburg, son of the margrave Frederic the Elder, of Anspach and Baireuth, for their grand-master, hoping by the help of his house to be able to throw off their vassalage to Poland. But the German empire did nothing, and on the peace of 1525 the Prussian territory of the Order was accepted by the prince for himself and for his own and his brother's male descendants as a fief dependent on Poland, under the title of a grand-duchy. Albert being a Protestant, the Reformation spread over the whole province.

(A. C. Preuss, *Beschreibung von Preussen*, 8vo., 1835; Blumenbach, *Gemälde der Preussischen Monarchie*, 8vo., 1835; Dieterici, *Statistische Uebersicht der wichtigsten Gegenstände des Verkehrs und Verbrauchs im Preussischen Staate, &c.*, 8vo., 1838; J. G. Hoffmann, *Die Lehre von den Steuern*, 8vo., 1840; J. C. Müller, *Geographisches Wörterbuch des Preussischen Staates*, 4 vols. 8vo., 1836; J. W. Heidemann, *Topographisch-Statistisches Wörterbuch der Preussischen Monarchie*, 2 vols. 8vo., 1836; Stein; Hörschelmann; Cannabich, &c.)

PRUSSIAN BLUE. [Blue.]

PRUSSIC ACID. [Hydrocyanic Acid.]

PRUTENIC TABLES. [Reinhold, Erasmus.]

PRUTH, a large navigable river in the Carpathian mountains, in the circle of Stanislawow. It flows for about 30 miles to the north, and then to the east through the Buckowina into Moldavia. From the point at which it leaves the Buckowina, it has formed for the whole remainder of its course, since the peace concluded at Bucharest in 1812, the boundary between Russian and Turkish Moldavia. After a course of about 500 miles it falls into the Danube below Galacz. It is remarkable in history for the narrow escape of Peter the Great in 1711, who was here completely surrounded by the Turks and Tartars near Falezyn. He was happily extricated from his dangerous situation by the address of his consort Catherine I., who, seconded by field-marshal Scherematoff, made proposals of peace to the grand-vizir, supported, it is said, by powerful arguments in the shape of presents of money and jewels. Peace was concluded on the 23rd of July, 1711, by which Peter obtained his own deliverance and that of his army by the cession of Azoff and some other places.

The Pruth is the Porata (Πόρατα) of Herodotus (iv. 48).

PRYNNE, WILLIAM, an eminent compiler of records, and a distinguished political character in the reign of Charles I. and during the Commonwealth, was born in the year 1600, at Swainswick near Bath, and received his early education in the grammar-school of that city. He became a commoner of Oriel in 1616, and took his bachelor's degree at Oxford in 1620. Soon after taking his degree, he removed to Lincoln's Inn, in which Society he was called to the bar, and subsequently became bencher and reader. His name scarcely appears in the Law Reports of his time, and he never practised at the bar to any considerable extent. He applied himself much to the study of controversial divinity, and became a devoted follower of the well known Puritan divine Dr. John Preston, who was at that time lecturer at Lincoln's Inn. In accordance with the doctrines of the Puritans respecting church government, he published, soon after he came to Lincoln's Inn, several tracts against Arminianism and prelatical jurisdiction, by which, as well as by promoting and encouraging motions in the superior courts for prohibitions to the High Commission Court, he greatly exasperated Archbishop Laud and the clergy against him. In the year 1632 he published a virulent pamphlet called 'Histrio-Mastrix, or a Scourge for Stage-Players,' in which he denounced in coarse and scurrilous language the prevailing fashion of the day for masques, interludes, and other similar entertainments. Amusements of this kind being the favourite recreation of the court (the queen herself having performed in a Pastoral at Somerset-house), Prynne's book gave great offence, and the attorney-general prosecuted him for it in the Star-Chamber. The court fined him 3000*l.*, ordered him to be expelled from the university of Oxford and the Society of Lincoln's Inn, and degraded from the bar, to be set twice on the pillory, and to lose both his ears; to have his book burned by the common hangman, and to be imprisoned for life. In conformity with this sentence, he was formally degraded in the university of Oxford, in April, 1634, and his named erased from the lists. Three years afterwards, while imprisoned in the Tower under the above sentence, he published another pamphlet, entitled 'News from Ipswich,' reflecting severely upon the hierarchy generally, and upon Laud and several of the bishops in particular. For this publication he was again prosecuted in the Star-Chamber, and sentenced to pay a fine of 5000*l.*, to be set on the pillory, to be branded on both cheeks with the letters S. and L. (Seditious Libeller), to lose the remainder of his ears, and to be closely imprisoned for life in Caernarvon Castle. These outrageous sentences were rigidly executed; and the usual consequence of undue severity appeared in the popular sympathy and party spirit which it excited. The Puritan friends of Prynne flocked to Caernarvon Castle in such numbers, that it was thought necessary to change the scene of his confinement; and after he had been at Caernarvon about ten weeks, he was illegally removed by a warrant from the lords of the council to the castle of Mont Orgueil in the island of Jersey. Here he remained until the beginning of the Long Parliament in 1641, when, upon his petition to the House of Commons, he was released by a warrant from the Speaker, and resolutions were passed declaring both the sentences against him in the Star-Chamber to be contrary to law. Clarendon and Anthony Wood describe the extraordinary demonstrations of popular feeling in his favour on his landing at Southampton and on his journey to London. (*History of the Rebellion*, vol. i., p. 199; *Athenæ Oxonienses*, vol. iii., p. 848.) Soon afterwards he was returned as a member of parliament for Newport in Cornwall, and about the same time was made a bencher at Lincoln's Inn. In 1643 he was employed with Clement Walker by the parliament to conduct the prosecution of Colonel Fiennes for cowardice in surrendering the city of Bristol, and seems to have been busily and cordially engaged in the proceedings of the Commons at that eventful time. Serjeant Hyde having been dismissed from his office of recorder of Bath, in consequence of the ordinances of parliament passed in September and October, 1647, Prynne was elected recorder by a considerable majority of the corporation. He took no part in the violent proceedings of the later years of the Long Parliament; and immediately before the king's trial he was ordered into the custody of the serjeant-at-arms for 'denying the supremacy of parliament' in a pamphlet entitled 'The Memento.' (Rushworth's *Collections*, vol. ii., p. 1389.) On the 6th of December he was arrested by the army, and, together with many of his party, ejected from the House of Commons. From this time he became a bitter enemy of Cromwell and the army party; and in consequence of his writings against them, was again imprisoned for several years at Dunster Castle in Somersetshire and Pendennis Castle in Cornwall. Being expressly disabled by parliament 'to officiate or be in any office concerning the administration of justice within the Commonwealth,' he was, in September, 1652, discharged from his office of recorder of Bath; to which however he was again elected shortly after the Restoration. (*Council Book of the Corporation of Bath.*) In the early part of the year 1660, having returned to his seat in the House of Commons as an excluded member, he is said, in a letter to General Monk (Wimwood's *Memorials*, vol. iii.), to have 'exceedingly asserted the king's right,' but with so much of his characteristic bitterness and imprudence, that Monk sent for him and admonished him to be quiet. Upon the dissolution of the parliament, in March, 1660, he was elected to serve in this new parliament for the city of Bath.

Soon after the Restoration he was appointed keeper of the records in the Tower, an office for which his habits of study peculiarly fitted him, and which furnished him with the opportunity of compiling his laborious and useful collections respecting constitutional and parliamentary history. After this period, his pragmatical disposition again brought him into difficulty by the publication of a pamphlet against the proposal bill for regulating corporations. This paper, being considered by the House of Commons to be a seditious libel, he was reprimanded by the Speaker, and threatened with expulsion and prosecution; but upon his making a full confession and recantation, no proceedings were taken against him. He died in Lincoln's Inn, in October, 1669.

Prynne was a most laborious and voluminous writer. A catalogue of his works (which consist of nearly 200 volumes) is given, after an account of his life, in Wood's *Athenæ*, vol. iii., p. 844, edit. Bliss. They are justly characterised by Wood as displaying 'great industry, but little judgment. The most useful among them are his 'Calendar of Parliamentary Writs,' and his 'Records.' The latter work, consisting of 3 vols. in folio, professed to illustrate and prove the supremacy of the kings of England in all ecclesiastical affairs within the realm, by records taken from the earliest periods of English history to the reign of Elizabeth, but the author did not live to carry his design farther than the reign of Henry III.

PRYTANIS (Πρύτανις), the name of the chief magistrate in many of the Grecian states. In some states the Prytanis had the superintendence of all matters relating to religion, thus corresponding to the king archon at Athens. (Compare Aristot., *Polit.*, vi. 5.) We read of this office in Corinth, Corcyra, Miletus, Tenedos, Pergamos, Cos, Rhodes, &c. (Wachsmuth, *Hellen. Alterth.*, i., p. 194.)

At Athens, the name of Prytanes (*πρυτάνεις*) was given to the members of the senate of five hundred, who acted as presidents of the senate and of the assemblies of the people. The senate of five hundred was divided into ten sections of fifty each, who were chosen respectively from the ten tribes into which the Athenian people was divided. Each tribe presided in turn during 35 or 36 days, as the case might be, so as to complete the lunar year of 354 days (12×29½). Their period of office was called a prytany (*πρυτανεία*). As however fifty was too large a number to conduct business conveniently, every fifty was divided into five bodies of ten each, who presided for seven days over the rest, and were therefore called proëdri (*πρόεδροι*); and from these proëdri an *ἐπιστάτης* was chosen for one day to preside as chairman in the senate and the assembly of the people; during his day of office he was entrusted with the keys of the treasury and archive office, and with the state seal.

The prytanes had a building to hold their meetings in, where they were entertained at the public expense during their prytany. This building was called the Prytaneion (*πρυτανεῖον*), and was used for a variety of purposes. (Hermann, *Political Antiquities of Greece*, § 127.)

PRZEMYSL is a circle in the Austrian kingdom of Galicia, about 2000 square miles in extent, with a population of 240,000 inhabitants, of whom about 14,000 are Jews. The surface is level: the country contains extensive forests, and is watered by the Save, or Sau, and some smaller rivers: the soil is fertile, and produces corn, hemp, flax, and potatoes; the breeding of cattle is carried on to a great extent. Next to agriculture, the chief employment of the inhabitants is linen-weaving.

PRZEMYSL, the capital of the circle, situated in 49° 46′ N. lat. and 23° E. long., is an old and tolerably well built town on the right bank of the Save, over which there is a handsome bridge 500 feet long. It is surrounded with a rampart, and on a neighbouring eminence are the remains of an antient castle. There are in the town two cathedrals, 14 Roman Catholic and Greek United churches, a convent of Benedictine nuns, a gymnasium, and several schools. Both a Greek United bishop and a Roman Catholic bishop reside here, the latter being under the archbishop of Limberg. The inhabitants, in number 7800, manufacture leather, linen, and wooden-ware, in which they carry on a considerable trade.

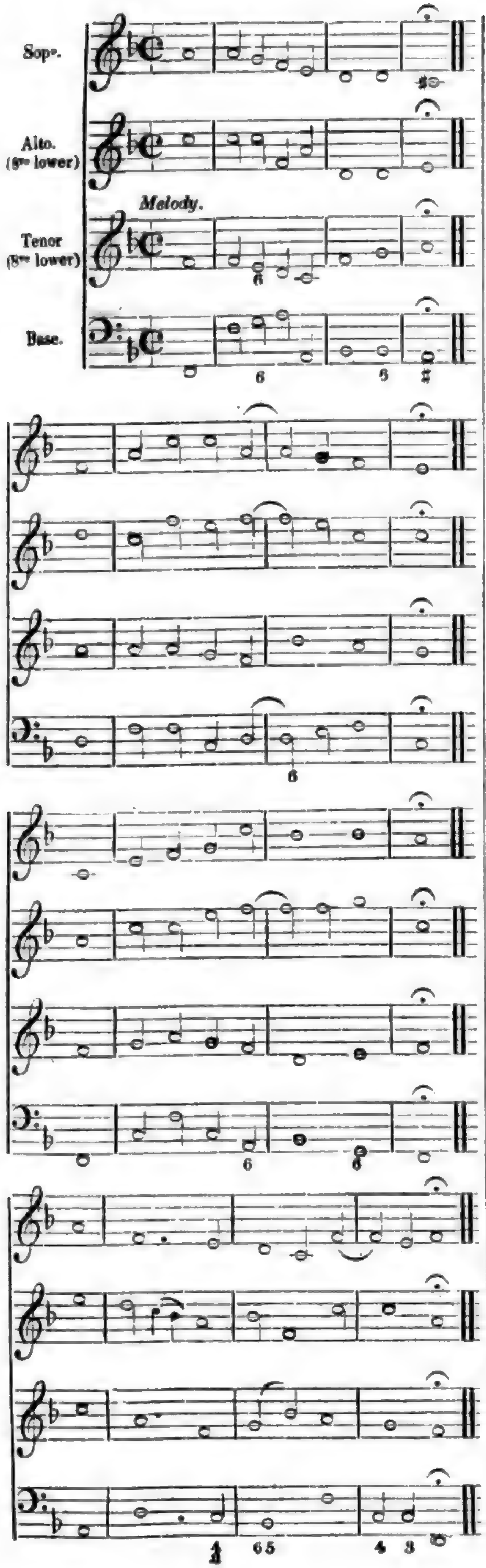
PSALMANAZAR, GEORGE, was born about 1679. All that we know of his early history is from his own memoirs, which were published after his death, but they do not tell us his true name nor that of his native country, though it is generally believed that he was a native of the south of France. (*Memoirs of ...., commonly known by the name of George Psalmanazar, a reputed native of Formosa, written by himself*, London, 1765.) He was in his youth a wandering adventurer. Sometimes he gave himself out for a Japanese, and at others for a native of the island of Formosa: at one time professing to be a convert to Christianity, and at others to be still a heathen. He travelled over several parts of Europe, France, Germany, and the Netherlands; was a soldier, a beggar, a menial, a preceptor, a man of all trades, and came at last to England, where he continued for several years to act the part of an impostor, and published a fabulous account of the island of Formosa, which imposed upon the credulity of the public. His natural abilities and a certain degree of information gained him several influential friends. At last, when about thirty-two years of age, a moral change took place in him; he grew ashamed of his dishonourable courses, became open to religious conviction, and determined to reform. He applied himself intensely to study, and after a time became engaged in literary pursuits, by which he earned an honest subsistence and considerable reputation during the rest of his life. He died in London, in 1753. He wrote, for the large work styled the 'Universal History,' most of the parts concerning antient history, except that of Rome, and his writings met with great success. He also wrote a volume of Essays on several scriptural subjects, a version of the Psalms, besides his own memoirs already mentioned. He also wrote, for the 'Complete System of Geography,' 1747, an article on the island of Formosa, founded upon authentic information, as a reparation for the stories which he had palmed upon the public in his former account. Psalmanazar is the name that he had assumed when he began his wandering life, and which he retained till his death.

PSALMODY, in its widest sense, signifies the Psalms of David set to music and sung. But from the early part of the sixteenth century the term has been applied only to metrical versions of the Psalms to which short grave airs are either set or adapted.

The practice of psalm-singing may be traced to a very remote date, but we need not refer to any period anterior to that of our Saviour. In St. Matthew's and St. Mark's gospels (xxvi. 30; xix. 26), we find that, after the last supper, Christ and his disciples 'Sung an hymn' ('*or psalm*,' says the marginal note), previously to their going 'out into the Mount of Olives.' St. Paul exhorts the Ephesians (v. 19) to sing 'psalms and spiritual songs;' and St. James (v. 13) recommends those who are 'merry' to do the like. The corroborative passage in the letter of the younger Pliny to Trajan (*Ep.*, x. 97) stating that the Christians sang hymns to their Christ before daybreak, is well known. The bishops Flavianus and Diodorus ordained that the Psalms of David should be sung by the choir, in the manner of the antiphons. [ANTIPHONY.] Among the inferior orders of clergy in the church of Rome were the Psalmistæ, whose first institution appears to have been at the commencement of the fourth century. It is believed that this order was established for the purpose of encouraging and regulating the antient psalmody; for, says Bingham, 'from the first and apostolical age, singing was always a part of divine service, in which the whole body of the church joined.' (i. 295 *et seq.*) The service of the antient church usually began with psalmody, according to St. Jerome. (Hieron., *Ep.* 22, 'Ad Eustach.') It was also the exercise and recreation of the Eastern churches in their nocturnal vigils; and, indeed, at all times in the church, St. Austin remarks, was psalmody used to fill up vacant intervals. (Aug., *Ep.* 119, 'Ad Januar.')

By degrees the greater part of the psalm-tune was surrendered to a single voice, the congregation joining only at the close. This led to a more scientific and perhaps a more refined mode of singing, requiring superior knowledge; and thus, the body of the people becoming incapable of taking a share of the performance, the service was left in the hands of professed musicians. This was encouraged by the church of Rome, during her long dominion, because it still farther divided the clergy and laity: but Huss, and afterwards Luther and Calvin, restored to the people their share in the divine service, furnishing them at the same time with the means of performing it in a manner agreeable to themselves, and conformably to what they conceived to be the true principles of public worship. With this view the Psalms were turned into metre, tunes were composed or adapted, and the practice of psalmody soon became a marked distinction of those who departed from the church of Rome. Luther however was friendly to harmony, or music in parts; the severe Calvin, on the contrary, sternly refused to admit anything but simple unaccompanied melody. The design of the reformers was seconded by Clement Marot, who translated the first fifty Psalms into French verse. [MAROT.] These, adapted to popular airs, became exceedingly fashionable, and the length to which the new amusement of singing sacred songs was carried by the monarch of France and his courtiers, is fully described by Bayle (in a note on MAROT), and after him by Warton (*Hist. of Poet.*, sect. xlv.), as well as others. Theodore Beza, by his version of those Psalms which Marot left untouched, completed the hundred and fifty. [BEZA.] Most of the melodies to these, as used by the first Calvinists, are commonly attributed to Claude Goudimel and Claude Le Jeune, distinguished French composers; but Bayle, on apparently good authority, ascribes them to one Guillaume Franc; while some think that they were chiefly German. It seems almost certain that a few owe their birth to the great reformer himself, of whose musical knowledge undoubted proofs remain; and it is equally clear, for the reason before mentioned, that the *harmonized* tunes of Goudimel and Le Jeune were not admitted into Calvin's places of worship, though probably their melodies were.

At nearly the time that Marot's translation of the Psalms appeared, Sternhold and Hopkins, with several coadjutors, produced an English version, to which were adapted many of the best German and French tunes; and Strype says, 'it is certain that Sternhold composed several at first for his own solace. For he set and sung them to his organ, which music King Edward VI. sometime hearing (for he was a gentleman of the Privy Chamber), was much delighted with them.' (*Historical Memorials*, bk. i., chap. 11.) But if this versifier possessed as little musical as poetical taste, it is fortunate for him that his compositions do not remain to demonstrate that he was no less unskilful in one art than in the other. It is however to be presumed that there having been many very able musicians in the service of the youthful Edward, they contributed something in aid of Sternhold's design. But it is now generally supposed that for the majectic melody to which our 100th Psalm is adapted, we are indebted to the genius of Claude Le Jeune. This forms the *taille*, or tenor part, of his 134th Psalm, as printed in the Leyden edition of 1635; and it is necessary to remark that he, as well as others in his time, made a practice of giving the subject, or air, as a kind of *cantus firmus*, to the tenor voice. As an interesting and not commonly known relic, we insert this, substituting the treble for the c clefs. The musical critic will not fail to observe that the rhythm of Le Jeune's melody does not exactly correspond to that adopted in England: and he may perhaps concur in our opinion, that the subject has been better treated by the unknown harmonist in this country than by the French composer.



The first complete collection of psalm tunes for four voices deserving notice was published in 1621, by Thomas Ravenscroft, Mus. Bac., to which Tallis, Morley, Dowland, and all the great masters of the day contributed; the name of John Milton, the father of the poet, also appears there, as the composer of *York* and *Norwich* tunes. The editor supplied many, some of which are still in use; and to his collection all the numerous works of the kind since printed have been much indebted. About the year 1671, John Playford, a good musician and a most useful industrious editor, printed, in 8vo., 'The Whole Book of Psalms in three parts,' in which he has judiciously given the melody to the soprano voice, to which it naturally belongs, and it ever since has retained its place. A few of the tunes in that collection are supposed to have been composed by Playford himself, whom Sir John Hawkins considers as 'the father of modern psalmody.' Subsequently to the last edition of his work, valuable additions were made to the stock of genuine English psalmody, by Dr. Croft, Courteville, Carey, &c., and Handel is the reputed composer of the sweet music to the 104th Psalm, which still continues in our chimes, and as the dirge at the soldier's funeral. Dr. Miller, of Doncaster, about fifty years ago, effected a considerable improvement in psalmody by his 'Psalms of David for the use of Parish Churches,' in which the version of Tate and Brady was employed, and drove Sternhold and Hopkins from many of their strongest positions. The extraordinary success of that work, which made its way into the remotest parts of Great Britain, raised up a host of rivals, and the number of publications and of new tunes has since increased beyond calculation. The popular works of all foreign composers have been made contributory to that love of novelty which carries its influence even into the temples of religion, and every tenth organist has fancied himself qualified and privileged to print a collection for the use of the church or chapel in which he officiated. Hence the music which had become almost a part of our Liturgy is falling into desuetude, and modern hymns—not always the most appropriate or the best in point of composition—threaten finally to banish the fine characteristic harmony of our antient psalmody. (Bingham's *Antiq.*; Bayle; Strype; Warton's *Hist. of Poet.*; Mason's *Essay*; Hawkins; Burney; Dr. Vincent *On Psalmody*.)

PSALMS (*ψαλμοί*, from *ψάλλω*, *to strike gently*, and so, to play on a stringed instrument) denote generally the poems which form one of the canonical books of the Old Testament. This book is called in Hebrew סֵפֶר תְּהִלִּים (*sepher tehillim*), 'the book of praises.' Many of the Psalms have titles, which, though they are no part of the original, are of great antiquity, and in these titles a Psalm is called מִזְמוֹר (*mizmor*), something pruned, trimmed, or finished off, from זָמַר, *to prune*.

The book of Psalms is often called the 'Psalms of David,' though many of them were not written by him. Ps. xc. for example was written by Moses, and Ps. lxxxv. and cxxxvii. were composed long after the time of David by persons unknown. The authors of the Psalms named in the titles are Moses, David, Solomon, Asaph, Heman, Ethan, Jeduthun, and the sons of Korah. Between the earliest and latest of the Psalms, a period of about one thousand years seems to have intervened.

According to the Masorites, the Psalms are divided into five books, of which the first ends with Ps. xli., the second with Ps. lxxii., the third with Ps. lxxix., the fourth with Ps. cvi., and the fifth with Ps. cl. The first three books end with 'Amen and Amen;' the last two with 'Hallelujah.' This division existed in the time of Jerome, but how long before is uncertain. It is thought to have been made for the purpose of rendering the Psalms in this respect like the Pentateuch. The collecting of the Psalms into one book is generally attributed to Ezra.

The Psalms afford an exemplification of every variety of Hebrew metre, and they are pervaded by the highest poetic feeling. They were designed to be rehearsed in the worship of God with the aid of instrumental music. David appointed the singing of the Psalms by a company of persons, trained for this purpose, in the worship of the tabernacle. (1 *Chron.*, vi. 31; xvi. 4-8.) This practice was continued by Solomon in his Temple (2 *Chron.*, v. 11-13), and, after the interruption occasioned by the Captivity, it was renewed by Ezra. (*Ezra*, iii. 10, 11.) The New Testament furnishes evidence that Psalmody formed, in the time of Christ and his Apostles, a part of the worship of God, and the Christian church has in all ages followed this example. The book of Psalms obtained extraordinary attention among the early Christians. Theodoret, who wrote in the first half of the fifth century, says (*Preface to the Psalms*), that while most men paid little or no attention to the rest of the Scriptures, they were so familiar with the Psalms, that in their houses, in the streets, and in the high ways, they enjoyed profit and delight by the singing of these divine odes. The following passage is part of a beautiful eulogy pronounced upon the Psalms by Hooker; 'What is there necessary for man to know which the Psalms are not able to teach? They are to beginners an easy and familiar introduction, a mighty augmentation of all virtue and knowledge in such as are entered before, a strong confirmation to the most perfect amongst others. Heroical magnanimity, exquisite justice, grave moderation, exact wisdom, repentance unfeigned, unwearied patience, the mysteries of God, the sufferings of Christ, the terrors of wrath, the comforts of grace, the works of Providence over this world, and the promised joys of that world which is to come, all good necessarily to be either known or done or had, this one celestial fountain yieldeth.' (*Ecclesiastical Polity*, v. 37.)

The canonical authority of the book of Psalms has never been disputed.

(Patrick's *Paraphrase*; Rosenmüller's *Prolegomena* and *Scholia to the Psalms*; Horne's *Introduction*.)

PSALTERY, an antient musical instrument of the harp kind, in use among the Jews, and supposed by Blanchinus to have been the נבל, *nebel* (whence *ναβλα* and *nablum*), mentioned in several of the Psalms. Whether this instrument was square or triangular, and played on by the finger, or struck by a plectrum, seems doubtful; the probability is that it took many forms, and was acted on both ways. Blanchinus makes it square, Luscinius triangular. According to Mersenne, and after him Kircher, the Psalterion, as they denominate this instrument, adopting the Greek term, was in shape a trapezium, and similar to that which is still in use under the name of dulcimer. [Dulcimer.]

PSAMMO'BIA. [Psammocola.]

PSAMMO'COLA, M. de Blainville's name for a genus of conchifers (*Psammobia* and *Psammotæa*, Lam.) belonging to Lamarck's family *Nymphacea*. *Animal?*

Shell oval, elongated, regular, gaping but little, equivalve, subinequilateral; umbones well indicated and a little inclined forwards; often a well marked angle on the posterior or longest side; hinge somewhat incomplete; one or two small cardinal teeth in each valve; ligament external, very convex; two very distinct muscular impressions, united by a narrow pallial impression deeply excavated backwards and prolonged rather strongly beyond.

M. de Blainville proposes the following divisions of this group:—

1. Capsoïds.

Shell hardly gaping, striated from the summit to the base, with two intrant, oblique, divergent teeth in each valve, but largest on the left valve.

Example, *Psammocola rugosa*.

2. Psammobiæ.

Shell more gaping, striated longitudinally; teeth of the hinge much more effaced.

Example, *Psammobia virgata*.

3. Psammotææ.

Shell of the same form; a single cardinal tooth in each valve or in one only.

Example, *Psammotæa violacea*.

Psammobiæ have been found in most seas and on sandy bottoms at depths varying from 0 to 13 fathoms. [Pyloridea.]

PSAMMO'DROMUS, a genus of Saurians belonging to the *Pristidactyl Cœlodonts* of MM. Duméril and Bibron. [Pristidactyls.] Type, *Psammodromus Hispanicus*, Fitzing.

PSAMMOSAURUS. [Scink.]

PSARIS. [Muscicapidæ, vol. xvi., p. 12.]

PSARISO'MUS. [Muscicapidæ, vol. xvi., p. 12.]

PSE'LAPHUS, according to Herbst, a genus of Coleopterous insects, but now regarded as a family, to which the name *Pselaphidæ* is applied. The *Pselaphi* are very minute insects and most remarkable in their structure. By some entomologists they are arranged with the *Brachelytra*, owing to their having the wing-cases short and truncated; and by others they are placed in the section *Trimera*, their tarsi having but three joints: in the classification of Latreille they constitute the last family of Coleopterous insects, being placed at the end of the Trimera.

Scarcely any of the known *Pselaphi* exceed one-twelfth of an inch in length, and the greater portion of them are under that size: they prey upon other insects still smaller than themselves, and are found under stones, and amongst herbage, especially in damp situations: some species are found under the bark of trees, and in putrid wood, and the species of one of the genera are found in ants' nests (the genus *Claviger*). They are often collected during the winter months by shaking the moss from the roots of trees, or from old walls, over a piece of white paper or cloth. They are probably found in all parts of the world. The principal characters of the group are as follows:—

Head moderately large, exserted, and most commonly of a triangular form, being broad at the base and attenuated in front: the eyes moderately prominent, sometimes wanting; palpi usually large and generally four-jointed: antennæ usually eleven-jointed, sometimes with six joints, and in one genus apparently having but one large joint, generally equal to about half the length of the insect, and increasing in thickness from the base to the apex. Thorax usually not much broader than the head, sometimes nearly cylindrical, but most commonly dilated in the middle: elytra broad, much shorter than the abdomen, and truncated behind, destitute of striæ, if we except one on each elytron near the suture, and an abbreviated stria at the base about midway between the suture and the outer margin—these are almost constant. Abdomen broad, obtusely terminated, and without appendages as observed in the Brachelytra; usually four or five joints are visible beyond the elytra: legs rather long; tibiæ curved; tarsi three-jointed, the basal joint small, and the terminal joint furnished either with one or two simple claws.

The *Pselaphidæ* are composed of the following thirteen genera, which may be most briefly characterised by throwing them into a tabular form, as in M. Aubé's Monograph, published in Guerin's 'Magasin de Zoologie' for the year 1834.

Section 1. Antennæ two-jointed.

Division 1. Tarsi with two claws.

1. A. with the claws unequal.

1. *Metopias.*—Thorax cordiform; antennæ with the basal joint almost as long as the others taken together.

1. B. with the claws equal.

2. *Tyrus.*—Palpi with the three basal joints obconical; thorax nearly spherical; antennæ with the three terminal joints very slightly incrassated.

3. *Chennium.*—Palpi with the second joint broader than the others, and of a spherical form; antennæ moniliform; thorax broad behind.

4. *Ctenistes.*—Palpi with the joints large and produced posteriorly into a spinous process.

Division 2. Tarsi with a single claw.

5. *Pselaphus.*—Body slightly elongated, elytra and abdomen somewhat depressed; the terminal joint of the palpi much elongated and clavate.

6. *Bryaxis.*—Body short, slightly convex; terminal joint of the palpi conical and somewhat dilated externally; thorax dilated in the middle and having three foveæ.

7. *Tychus.*—Body short and convex; the terminal joint of the palpi hatchet-shaped; basal joint of the antennæ large, the fifth joint dilated in the male; thorax without foveæ.

8. *Bythinus.*—Body very convex; the terminal joint of the palpi securiform; two basal joints of the antennæ large, the second often dilated in the males.

Those species in which the second joint of the antennæ is not dilated in the male sex, and does not exceed the basal joint in size, form the genus *Arcopagus* of Leach.

9. *Trimium.*—Body comparatively narrow and elongated; terminal joint of the palpi conical (or nearly so) and dilated on the inner side at the base; and terminated with one very large joint.

10. *Batrisus.*—Body elongated; antennæ inserted in a lateral groove; palpi with the terminal joint acute; thorax with three longitudinal furrows; antennæ rather long and gradually thickened from the base to the apex.

11. *Euplectus.*—Body elongated and subdepressed; terminal joint of the palpi ovate; antennæ short, inserted be-

neath the edge of the forehead and terminating in a large knob.

Section 2. Antennæ six-jointed.

12. *Claviger.*—Head elongated, obtuse in front, and not distinctly separated from the thorax; eyes none; thorax with the sides slightly rounded; body ovate: no furrows or foveæ on either the thorax or the elytra.

Section 3. Antennæ with but one large and elongated joint.

13. *Articerus.*—Head broad and notched in front, attenuated behind; eyes prominent; thorax broadest behind; body ovate.

Examples of most of these genera are found in this country. Of the genus *Metopias* only one species is known; it inhabits Cayenne. The genus *Tyrus* is found in Sweden and Germany, and perhaps in England. Of the genus *Chennium* but one species is known: it is found in the South of France. The curious genus *Claviger* has but recently been discovered in England by Mr. Westwood: it is found in the nest of a species of ant (*Formica flava*). On the Continent it has been long known.

Owing to their remarkable appearance, and the curious forms displayed by the various species, the *Pselephidæ* have been more carefully studied perhaps than any other group of minute insects, and have given rise to several monographs—see the 'Monographia Pselaphidorum et Seydmænidarum Britanniæ,' by H. Denny, Norwich, 1825, 1 vol. 8vo.; 'Monographia Pselaphorum,' H. F. L. Reichenbach, Lipsiæ, 1816, 1 vol. 8vo. P. W. J. Müller has published a monograph on the Pselaphi in the third volume of the 'Magazin der Entomologie, von E. F. Germar.' M. C. Aubé has likewise published an excellent monograph on the same group, which has been quoted in the former part of this article.

PSEUDO-AMEIVA, Fitzinger's name for a genus of the *Pleodontes Strongylures* of MM. Duméril and Bibron, genus *Trachygaster*, Wagl., *Centropyx*, Spix. [Pleodonts.]

PSEUDO-BOA, Schneider's name for a genus of serpents (*Scytale*, Merr.) arranged by Cuvier as a subgenus of *Boa*, and described as having plates not only on the muzzle, but on the cranium, like the *Colubri*; no fossets, a round body, and the head 'd'une venue avec le tronc,' as in *Tortrix*.

Mr. Swainson makes *Pseudo-boa*, Oppel., the last genus of the family *Hydrophidæ*, or *Water Snakes*, with the following description:—

Head short, enlarged behind, and covered with large plates; back carinated with a longitudinal range of scales, wider than those of the sides.

PSEUDOBDELLA, M. de Blainville's name for a genus of *Hirudinidæ*, or *Leeches*. [Leeches, vol. xiii., p. 383.]

PSEUDOCA'RCINUS, M. Milne Edwards's name for a genus of *Cancerians*.

General form that of many Xanthi [Xanthus]; *carapace* slightly convex, and a little embossed near the front, which is nearly horizontal: latero-anterior borders moderately curved, and armed with more or less projecting teeth; posterior portion of the carapace nearly of the same extent as the anterior, with its lateral borders straight, and directed very obliquely backwards. The basilary joint of the *external antennæ* is very small, the second hardly reaches the front, and the third, which is lodged in the orbital gap, does not fill it, so that the antennary fosset is not completely separated from the orbit; the terminal stem of these appendages, instead of being very short, is more than twice as long as its peduncle. The prelabial space is not canaliculated, as in *Ozia*, the genus which immediately precedes it in the arrangement of M. Milne Edwards, and the external jaw-feet present nothing particular. The first pair of *feet* are remarkable for their size, especially in the male, and have nearly the same form as in *Carpilius*, but are still stronger; the pincers are equally rounded and obtuse at the end; they are unequal and armed with large rounded tubercles, which, on one side (the right generally), are few in number, but of remarkable volume. The succeeding feet are of a fair length, and much resemble those of the first division of *Xanthus*, except that they are narrower, and that their last joint is longer. The abdomen of the male is divided into seven very distinct articulations. (M. E.)

Geographical Distribution of the Genus.—The Indian and Southern Oceans.

M. Milne Edwards divides the genus thus:—

A. Species having the lateral borders of the carapace armed with four or five teeth.

a. Upper surface of the carapace embossed anteriorly.

Example, *Pseudocarcinus Rumphii*, *Cancer Rumphii*, Fabr. (Herbst, t. iii., pl. 49, f. 2) Length from two to three inches.

Locality.—The Indian Sea.

aa. Carapace smooth, without remarkable embossments on its anterior part.

Example, *Pseudocarcinus ocellatus*. Length about three inches. Colour of the carapace yellowish, with a multitude of circular red spots; pincers black; four last pair of feet banded with red and yellow.

Locality.—Unknown.

B. Species having the latero-anterior borders of the carapace armed with nine or ten spiniform teeth.

Example, *Pseudocarcinus Gigas*, *Cancer Gigas*, Lam. Length about seven inches. Colour yellowish marbled with red; pincers black.

Locality.—The seas of New Holland.

PSEUDOCORYSTES, M. Milne Edwards's name for a genus of brachyurous crustaceans belonging to his tribe of *Corystians*, and bearing much analogy to *Corystes* [Corystes], and especially to *Nautilocorystes*.

General form approximating to *Corystes*, but the feet natatory, as in *Nautilocorystes*; *jaw-feet* differing from those of both.

Carapace nearly oval and fairly convex. *Front* narrow, advanced, and horizontal. Ocular peduncles of moderate size, and the moderate-sized orbits entirely open externally. *Internal antennæ* small, and completely covered above by the front, their stem bent back longitudinally, as in *Corystes*. Disposition of the *external antennæ* essentially the same as in those crustaceans, but the auditory frame placed at their base is very large. *Epistome* not distinguished from the prelabial space, and the *buccal frame*, which is entirely open anteriorly, prolonging itself laterally before the base of the external antennæ, where it terminates by a stout conical tooth, which with that appendage forms the lower wall of the orbit. *External jaw-feet* very wide, second joint very large, but the third small, triangular, and nearly as long as it is wide; their terminal stemlet is extremely short, and is inserted near the summit of the third joint. The *sternal plastron* is nearly of the same form as in *Corystes*. The anterior feet are stout, compressed, and of moderate length. The four succeeding feet are nearly all of the same length and very much compressed; their tarsus is lamellar, wide, and of lanceolate form, especially in the second and fifth pair. The *abdomen* is very narrow, and has only five distinct segments in the male; the third, fourth, and fifth rings are soldered together. (M. E.)

Example, *Pseudocorystes armatus*. Length two inches.

Locality.—Valparaiso.

M. Milne Edwards observes that the crustacean figured by Browne ('Jamaica,' pl. 48, f. 2) under the name of the *Grass-crab* belongs to this genus, and may not differ specifically from *Ps. armatus*.

PSEUDOGRAPSUS. [Grapsus, vol. xi., p. 361.]

PSE'UDOPUS. [Scheltopusik.]

PSEUDO'STOMA. [Muridæ, vol. xv., p. 513.]

PSEUDOZOA'RIA. From the earliest times when systematic views of nature were sought, clouds have overhung the obscure confines of the animal and vegetable kingdoms. We find Aristotle perplexed regarding the animal or vegetable nature of sponge, Trembley and Ellis removing errors regarding the hydræ and celluliferous polypiaria, Lamarck classing Corallina with animals, and Blainville deciding that it is a plant. Much of this difficulty arises from the various definitions which are employed to characterise animal existence. To show irritability of parts, to have the faculty of self-movement, to exhibit sensibility—such or other characters being assumed for animals, we shall always find in some part of the vast series of life some particular beings in which these characters become unrecognisable (though they may exist), or equivocal, even if they do not conduct to erroneous results.

One of the modes by which systematists have eluded a difficulty, which nothing but strict and patient scrutiny can conquer, is by constituting an intermediate order of life, so vaguely characterised as to embrace the doubtful conterminous tribes of the animal and vegetable races. Hence the terms Phytozoa, Zoophyta, Nematozoa, and, according to the same analogy, Lithophyta, Ceratophyta, Calciphyta, to express the stony or horny nature of the animal or vegetable structures, or even to convey some hint of their analogy to mineral aggregations.

Pseudozoaria is a term of the same order proposed by Blainville to include vegetables, many of which have been ranked with the Polypiaria. It is subdivided into two classes: Calciphyta, which are principally composed of the genus Corallina, Linn.; and Nematophyta (also called Namatozoaria), which include Conferva, Oscillatoria, Byssus, &c.

Class I. Calciphyta.

Plantlike, mostly solid, attached, but not by real or penetrating roots. Composed of two substances, the interior more or less fibrous, the exterior cretaceous and porous, and generally subject to discontinuity, whence the whole appears articulated.

Lamouroux calls the group Polypiaria calcifera.

Fam. 1. Corallinæa.

Stem and branches encrusted with a thick porous calcareous substance, discontinuous at intervals, whence the whole is articulated. (This is the genus Corallina, Linn., which Lamarck and Lamouroux have greatly divided.)

Genera.

Cymopolia, Lamouroux.

Articulations moniliform, perforated by distinct circular pores.

Example, Cymopolia barbata. Ellis, 'Corallines,' pl. 25, fig. *c* C. The few species are chiefly West Indian.

Corallina.

Flabelliform, trichotomous, articulations distinct, the upper ones compressed or dilated; pores obscure.

Example, Corallina officinalis. Ellis, 'Corallines,' pl. 24, fig. *a* A. The species occur in various parts of the ocean and of the British coasts.

Jania, Lamouroux.

Divided, like moss, into slender round capillary articulated dichotomous branches.

Example, Jania corniculata. Ellis, 'Corallines,' pl. 24, fig. *d*.

European seas.

Flabellaria, Lamarck. (Halimedea, Lam.)

Flabelliform; branches trichotomous; articulations distinct, flattened

Example, Flabellaria incrassata. Ellis and Solander, pl. 20, fig. *d*. West Indies.

Amphiroa, Lamouroux.

Articulations very distinct, the intervals fibro-cartilaginous. (Some species have verticillate branches, the others are much like Corallina.)

Example, Amphiroa fragilissima. Ellis and Solander, pl 21, fig *d*.

Many of the species are Australasian.

Penicillus, Lamarck. (Nesæa, Lamouroux.)

Composed of capillary radical fibres, a simple stem, and a crown of cylindrical dichotomous articulated branches.

Example, Penicillus phœnix. Ellis and Solander, pl. 25, fig. 2.

Most of the species are Australasian.

Galaxaura, Lamouroux.

Articulations tubuliform, cylindrical, soft and cellular within, ramifying dichotomously so as to form a conical tuft, originating in a single membranoso-calcareous articulation. (Included by Lamarck in his genus Dichotomaria.)

Example, Galaxaura rugosa. Ellis and Solander, pl. 22, fig. 3.

The species are chiefly West Indian.

Acetabulum, Lamarck. (Acetabularia, Lamarck.)

Stem simple, filiform, articulated, fixed, supporting an orbicular terminal lamina, which is radiated above and below, and formed of little radiating tubes open at their ends.

Example, Acetabulum mediterraneum, Blainv.; Tubularia acetabulum, Linn. Blainville, 'Actinol.,' tab. 66, fig. 3.

Polyphysa, Lamarck.

Adherent, fixed, composed of a vertical filiform, fistulous, articulated stem, supporting a capitulum of eight or ten oval foliaceous membranous bodies arranged in a radiating manner.

Example, Polyphysa australis, Lam. 'Polyp. flex.,' pl. 8, fig. 2.

Fam. 2. Fucoidæa.

Stem and branches internally fibrous or membranous, encrusted by a thin calcareous continuous layer, *without articulations* or pores. Substance more gelatinous than in the Corallinæa.

Genera.

Udotea, Lamouroux.

Fibro-cretaceous, flabelliform; stem short, spreading rapidly into a large expansion, lobed or cut at the circumference, and marked on both faces with concentric lines. (Corallina of Linnæus.)

Example, Udotea flabelliformis, Sol. and Ellis, tab. 24. The species are American.

Dichotomaria, Lamarck.

Membrano-cretaceous, lichenoidal, originating in a short simple stem, and terminating in compressed dichotomous ramifications, rounded at the extremity.

Example, Dichotomaria fruticosa. Ellis and Solander, pl. 22, f. 5. The species are chiefly West Indian.

Liagora, Lamouroux.

Subcretaceous, branching. Ramifications ending in soft swollen parts like buds. (Analogous to Fucus, with which one species has been ranked by Gmelin.)

Example, Liagora versicolor, Lamarck. The species are chiefly from the Mediterranean.

Neomeris, Lamouroux.

Elongated, tumid in the middle, attenuated towards and enlarged at the ends, by one of which it is attached. The central axis is membranaceous and fistulous; it is surrounded by a crust composed of crowded small tubular cylinders, and in the upper part small globular tubercles. The whole is enveloped in another thin calcareous crust marked by many small pits in quincunx.

Example, Neomeris dumetosa, Lamouroux, Zooph.,' tab. 68, f. 10, 11. South America.

Class 2. Nematophyta, Blainville.

(Syn. Nemazoaria, Gaillon.)

Generally filamentous, gelatinous, green, unattached aquatic bodies.

Concerning these singular objects three opinions have been maintained:—

1. They have been (not all, but most of them) ranked as genuine plants by Linnæus, Lamarck, &c.

2. They have been considered as of a mixed or alternating nature, so that, growing and appearing like plants, they yield seminal parts which are endowed with locomotion (as the ova of sponges) for a short period, and thus appear as animals. Agardh, Fries, and Bory de St. Vincent support views of this nature.

3. They have been described as plant-like agglomerations of animals, originally free and individualised. M. Gaillon, 'Annales des Sciences Naturelles,' &c., has maintained this opinion after exact and curious researches, and many eminent persons have admitted this remarkable doctrine.

M. Gaillon has proposed a classification in conformity with his views, which includes two grand divisions, viz. Monadulées (resembling Monas or polygastric animalcule) and Naviculées (resembling Bacillaria or Navicula). In the former are two families, viz. Endocystées (reproductive globules formed internally) and Ectocystées (reproductive globules formed externally). In the second division are the Diarthrosées (animalcula associated by junction) and Eleuteriées (animalcula associated without junction). The first family includes ordinary Confervæ, &c.; the second, Mucor and Charæ, &c.; the third, Diatomæ, &c.; the fourth, Girodella. This whole subject appears still to need new researches. [ALGÆ; CHARACEÆ.]

PSI'DIUM, one of the Greek names of the pomegranate, which has been applied to a South American genus of plants belonging to the natural family of Myrtaceæ. The genus is characterised by having a calyx with an obovate tube and a 5-fid limb. Petals 5. Stamens numerous. Style filiform. Stigma capitate. Ovary 5-20-celled. Ovules numerous, horizontal, attached to the margin of the placenta. Fruit baccate, covered with the tube of the calyx, and crowned by its lobes, many-seeded. Seeds in the ripe fruit nestling within a pulp. Testa bony. Embryo curved. Cotyledons leafy, very small. Radicle very large. The species are about forty in number, either trees or shrubs. Leaves opposite, quite entire, feather-nerved, not dotted. Peduncles axillary, 1-3-flowered, bibracteated. Flowers white.

Two species are alone much known. These are, P. pomiferum and P. pyriferum, which yield the fruits so well known under the name of Guava. These two natives of South America and of the West Indies have been transferred to the Old World, and are as extensively cultivated in the Indian Archipelago and in India as in the countries where they are indigenous. P. Cattleianum is a species remarkable for the purple colour of its fruit. The Guava, of which the name is derived from the American word Guyaba, is much esteemed in hot countries as a fruit, and comes nearest to the pear, though its odour is not thought agreeable by many. It is also preserved and made into a jelly. The roots, buds, and leaves are astringent, and used as such medicinally. Some of the species are cultivated in hot-houses, but do not ripen their fruits well.

PSILOPO'GON, Boie's name for a genus of *Picidæ* (Wood-peckers).

PSILOSO'MATA, M. de Blainville's name for his third family of his order *Aporobranchiata*, and placed by him at the end of that order and immediately before the order *Polybranchiata*, which contains the genus *Cavolina*. [POLYBRANCHIATA.]

The only genus of *Psilosomata* recorded by M. de Blainville is *Phylliröe*.

Generic Character.—Body free, naked, very much compressed, or much higher than it is thick, terminated behind by a sort of vertical fin; cephalo-thorax small, and provided with a pair of natatory appendages, which are triangular, compressed, and simulate a kind of long tentacles or branchiæ; mouth subterminal, of a horse-shoe shape, with a short retractile proboscis; anus on the right side of the body; orifice of the organs of generation unique, on the same side, and more anterior than the anus. Organs of respiration?

Example, *Phyllirhöe Bucephalum*.

Locality.—Discovered in the Mediterranean Sea, by Péron and Lesueur.

PSI'THYRUS (Saint-Fargeau), a genus of Hymenopterous insects belonging to the section *Anthophila* (Latreille) and family *Apidæ*. The insects of this genus so closely resemble the Humble-bees (*Bombus*), that till recently they were by all authors confounded with them. The Psithyri however differ widely from the Humble-bees, inasmuch as they make no nests of their own, neither do they collect food for their young, but, like the cuckoo among birds, they deposit their eggs in the nests of others, and leave their young to be hatched and reared by them. It is the nests of the Humble-bees that they select for this purpose. Mr. Newman considered these facts relating to their economy so important, that he established an order among Hymenopterous insects, to which he gave the name *Apathites* (from *α*, without, and πάθος, affection), for the reception of the present insects, which, according to him, constitute the genus *Apathus*, and some other genera of bees. The characters of the order *Apathites*, given by the author, are as follows:—larva hatched from an egg, deposited by its parent in the nest of other *Apidæ* at the time when their own eggs are laid; when it hatches, being stronger and larger than the rightful possessor of the cell, it consumes the food provided for its companion, and starves it to death; and in those instances in which fresh supplies of food are daily provided, it continues to receive and appropriate them as its own. Pupa changes in the same situation, in a silken cocoon, spun by the larva. Imago has no apparatus either on the body or legs for collecting honey; in other respects it resembles in structure each of the other orders of *Apidæ*; it enters their nest with perfect familiarity, and seems to be quite unsuspected of intrusion; it collects no pollen or honey, never builds a nest of any kind, nor takes any care of its young, but spends its time among flowers, or hovering about sand-banks in which other bees have fixed their habitations. The genera included in this order are:—Apathus (or *Psithyrus*[*]), *Cælioxys*, *Melecta*, *Stelis?*, *Epeolus*, *Nomada*, *Hylæus?* (*Entomological Magazine*, vol. ii., p. 404.) The order *Apathites* however is very objectionable in many points of view; it is founded upon the habits of the species; whilst in fact the habits of the individuals composing the very genera placed by the author in his order are in many cases but partially known; the order moreover comprises genera agreeing in no positive points of structure.

The species of the genus *Psithyrus* may be distinguished from those of *Bombus* by the structure of their hinder legs. In *Bombus* the hinder tibia is compressed, smooth, and somewhat concave on the outer side, and is furnished on its edges with a fringe of stiff curved hairs, which serve to retain on the outer side of the shank the pollen collected by the insect to feed its young. The *Psithyri* have the tibia narrower and covered throughout with hair; they have no basket for the purpose of carrying pollen.

Four or five species of *Psithyrus* are found in England, and these are well described by Kirby in his 'Monographia Apum Angliæ.' They are arranged by that author in his genus Apis, section * *, c. 2, which section also includes the true *Bombi*.

Psithyrus rupestris very closely resembles the Red-tailed Humble-bee (*Bombus lapidarius*), but may be distinguished by the dark (almost black) colour of its wings. The *Apis Albinella* of Kirby is no doubt the male of this species.

Ps. campestris is black, has a yellow band on the fore part of the thorax, yellow hair on the scutellum, and a patch of yellow on either side of the abdomen at the apex. *A. Rossiellus* of Kirby is no doubt the male of this species.

P. Barbastellus is black, has the fore and hinder portion, the thorax, and the base of the abdomen yellow; the apex of the abdomen is white.

A. subterraneus and *A. vestalis* of Kirby's monograph also belong to this group.

PSITTA'CIDÆ, PARROTS, an extensive and highly interesting family of birds, remarkable for their beautiful colours, their powerful bill, their fleshy tongue, and their power of imitating the human voice. The articulation of some of the species is so perfect, that when the bird is unseen it is difficult to suppose that the words pronounced do not proceed from the mouth of man.

That several of these birds were known to the antients, both Greek and Roman, we have abundant evidence. Not to weary the reader with quotations, we shall here only refer to Ctesias (*Indic.*, 3; *Phot. Bibl.*, lxxii.); to Aristotle (*Hist. Anim.*, viii., xii.), where he notices the anthropoglott, ψιττάκη, as the Indian bird, and refers to its powers of mimicry; to Arrian, who speaks of the σιττακος, and its imitation of the human voice (*Hist. Ind.*, c. xv.); to Plutarch, who alludes to the same quality in his treatise, *De Solertia Animalium* (vol. x., p. 51, ed. Reiske; vol. iv., p. 972, Lut. Paris, 1724); to Ovid (*Amor.* ii. 6); Persius in the Prologue to his *Satires* (line 8), and Martial's delicate flattery (xiv. ep. 73),

> 'Psittacus à vobis aliorum nomina discam:
> Hoc didici per me dicere; Cæsar ave.'

These, with the exception of the passage in Ctesias, and many more examples, will be found in the learned treatise by Mr. Vigors, 'On a Group of Psittacidæ known to the Antients' (*Zool. Journ.*, vol. ii.), where he reminds us that the antient writers are unanimous in informing us that the parrots known to their times came exclusively from India. 'We are informed by Ælian,'[*] continues Mr. Vigors, 'that they were the favourite inmates of the palaces of the princes; and were looked up to as objects of sacred reverence by the religious feelings of the people. From thence they were introduced into Europe at the time of the Macedonian conquest; and the specific name of *Alexandri*, applied by modern science to the type of the group, in honour of the first European discoverer of it,[†] serves to perpetuate the name of a warrior who is said to have valued the conquests that extended the boundaries of his empire chiefly as they served to extend the boundaries of science. It was not until the times of Nero that the *parrots* of Africa became known to the Romans. (Pliny, *Hist. Nat.*, vi. 29.) Some of these birds were among the discoveries made in the course of an expedition sent out by that prince. They came apparently from the neighbourhood of the Red Sea; and it is probable that as that country became more known, numbers of the same race were imported from it into Rome, and formed the chief part of those victims of the parrot tribes, which in after-times are said to have supplied the inordinate luxury and wantonness of Heliogabalus. The Indian group thus familiar to the antients may be identified with those beautiful birds, equally the favourites of our modern times, which are brought to us from the same country, and which are distinguished by the rose-coloured collar round their neck, the brilliant emerald of their body, and the deep ruby of their bill. Pliny (*Hist. Nat.*, x. 42) points out distinctly the former character. Solinus, in general the servile copier of Pliny, confirms this description, though with a slight variation as to colour (*Polyhist.*, c. 23). Apuleius again alludes to the same characters, but more immediately and forcibly distinguishes the varying tints of the collar round the neck (*Florid.*, lib. ii.). Oppian gives the bird an epithet (*ποιοίχροον ὄρνιν** *De Venat.*, vii. 488); while Ovid, in like manner, particularises both the emerald plumage and the deep-red bill' (*Amor.*, ii., vi.). To this group Mr. Vigors has assigned the name of *Palæornis*.

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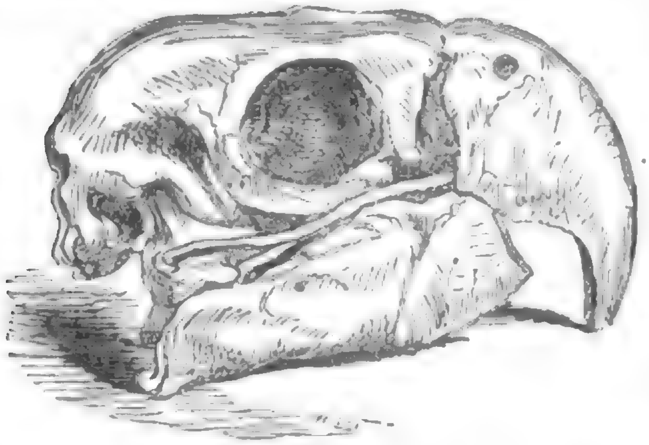
[*] The name *Psithyrus* has been used for another group of insects; the term *Apathus* therefore should be adopted to prevent confusion.

[*] *De Nat. Anim.*, xiii. 18. See also Strabo (*Geog.*, xv., p. 718, ed. Casaubon).

[†] But see Ctesias, who, in the place above quoted, notices the bird called *bittaces* as having the voice and the tongue of a man, alluding to its size as being about that of a hawk (ἱέραξ), and to its red bill (πορφύρεον πρόσωπον) &c. We are further told (loc. cit.) that the bird speaks like a man in the Indian language, but that it speaks Greek also, if it is taught.

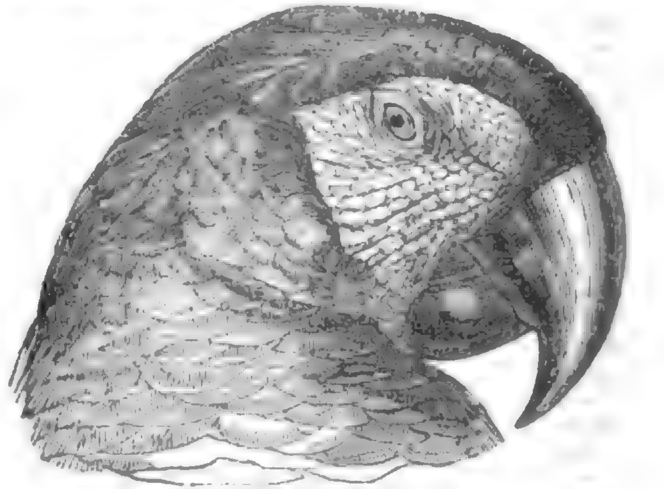
Organization.

The upper mandible, which is immoveable in mammals, has more or less motion in birds, as we have seen. [Birds, vol. iv. p. 423.] Some birds indeed, for instance the capercailzie and rhinoceros birds, are not gifted with this motion; but mobility of the upper mandible is the rule in this class, and the want of it the exception. In the *Psittacidæ* this power is highly developed; for the upper mandible is not connected into one piece with the skull, by yielding and elastic bony plates, as is the case with birds in general, but constitutes a particular bone, distinct from the rest of the cranium, and articulated to it.

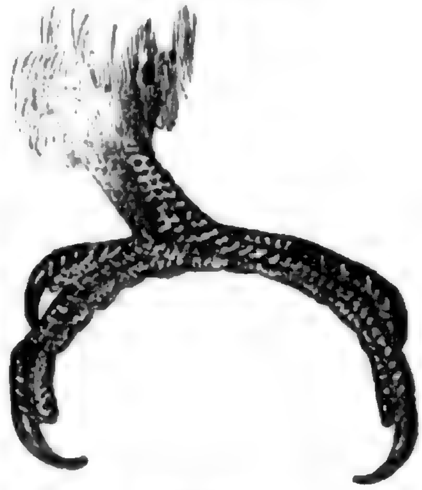


Skull of Maccaw.

The advantages derived to the animal from this conformation are obvious to any one who watches a parrot taking its food or using the bill as a third extremity to assist it in climbing about its cage. In most birds there is a progressive increase in the number of the phalanges of the toes: thus the great toe has two, the next three, the middle toe four, and the outer toe five. The parrots possess a peculiar cross-bone belonging to the great toe. In common with the pigeon and some other birds, they are destitute of a gall-bladder. Their intestines are very long, and are without cæca. The soft thick tongue so characteristic of this tribe must be a highly sensitive organ of taste. It is covered with papillæ, and moistened with a salivary secretion, so that they are able to taste and select different articles of food. In some of the forms, the *Trichoglossi* for instance, which feed on the nectar of flowers, the brush-like tongue is fringed with tubular processes, in conformity with the suctorial mode of feeding adopted by these birds. One of them kept by Mr. Caley, on seeing the coloured drawing of a plant, made an attempt to suck the flowers, and evinced the same disposition towards a piece of printed cotton furniture. (Post, p. 90.) The accurate observer last mentioned supplied the *Psittacus pusillus*, Lath., a species of the same genus, with honey and moistened sugar, which it sucked with ease and apparent pleasure by means of its brush-like tongue. In the museum of the College of Surgeons there is (No. 1479 c, *Physiological series*) one of these tubular tongues described as the tongue of a Lory (*Lorius Domicella*, Vigors). The tongue is short, thick, and fleshy, as in most of the parrot tribe; but it is further distinguished by terminating in a number of very delicate and close-set filaments, which can be protruded and expanded like a brush. (*Cat.*, vol. iii., part 1.) The plumage of this extensive family is of the most rich and varied description, embracing almost every colour and gradation of tint. The Zoological Society of London possesses one of the finest, if not the finest, living collections of these splendid birds in the world. The quantity of mealy dust discharged from the skin by the cockatoos, and other species of parrots, particularly at pairing time, is remarkable; though the separation of this peculiar matter from the skin is not confined to this family, but is effected in many birds of different orders, eagles and herons for instance. The characters of the powerful bill, and the grasping scansorial foot, which last is so constructed as also to convey the food to the mouth, will be seen below.



Head of Maccaw.



Foot of Maccaw.

This large, hard, and solid bill, rounded throughout, and surrounded at its base with a membrane wherein the nostrils are pierced, together with the thick fleshy and rounded tongue, gives the *Psittacidæ*, as Cuvier observes, the greatest facility in imitating the human voice, a facility to which their complicated lower larynx, with its three peculiar muscles on each side, contributes. Their strong mandibles, formed for shelling and cracking the hardest fruits, are worked by more numerous muscles than those of other birds.

Geographical Distribution and Habits.—The Parrot-tribe are found in great numbers in warm climates, and principally in the torrid zone. They are however abundant in the southern hemisphere, and occur even in high latitudes, whilst in the north they do not appear to be represented beyond the tropics by any species, except perhaps in India by *Palæornis*. Parrots occur in the southern extremity of America, throughout New Holland, in Van Diemen's Land, New Zealand, and even in Macquarrie Island, in the 52nd degree of south latitude. They are monogamous, and make their nests in the holes of trees, which they climb with their feet and bill. The shortness of their wings not permitting them to pass wide seas, the old and new continents, and even some of the large islands, have their particular species. Their food consists of fruits of almost every kind, and their natural voice is loud, harsh, and grating almost beyond endurance.

Arrangement and Natural History.

Brisson places the Parrots in his thirteenth order of birds, consisting of those with two anterior and two posterior toes. This order he divides into four sections, the first, *with a straight bill*, includes the Wryneck, Woodpecker, and Jacamar as generic forms; the second, *with the bill rather*

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* Grass-coloured bird

curved, the Barbets and Cuckoos; the third, *with the bill short and hooked*, the Trogons, Crotophaga, and the *Parrots*; and the fourth, with the bill long, and of the size of the head, the Toucans.

Linnæus placed the genus *Psittacus* at the head of his order *Picæ*, with the following definition:—

Bill hooked; upper mandible moveable, furnished with a cere. *Nostrils* situated in the base of the bill. *Tongue* fleshy, obtuse, entire. *Feet* scansorial.

He divided the genus, which is preceded by *Lanius* (the Shrikes), and immediately followed by *Ramphastos* (the Toucans), into the following sections:

*

Macrouri cauda cuneiformi.

This division contained the Maccaws.

* *

Macrouri minores.

This division contained *Psittacus Alexandri* and the Parrakeets generally; but both in this and the former division we find Parrots that can hardly be called 'long-tailed.' Thus in the first division we have *Psittacus nobilis* with the synonyms of 'Psittacus viridis alarum costa superne rubente of Aldrovandi (vol. i., t. 669), Sloane, *Jam.*, 2, p. 297,' '*Psittacus Amazonicus*, Briss., and *Psittacus mediæ magnitudinis Will.*, t. 16:' whilst in the second we find the *Psittacus agilis*, *Psittacus minor viridis* of Edwards.

* * *

Brachyuri cauda æquali.

This contained the Cockatoos, Lories, and True Parrots.

Latham's second order, *Picæ*, consisted of three sections, the second of which, *with scansorial feet*, included the *Parrots*, Toucans, Hornbills, Crotophaga, Trogon, Barbets, Cuckoos, Wryneck, Woodpeckers, and Jacamars.

M. de Lacépède makes the *Grimpeurs* the first subdivision of the first division (two anterior and two posterior toes) of the first subclass of birds. The first order of this subdivision (toes large and strong) is distinguished by a *hooked bill*, and the genera comprehended under it are *Ara* (Maccaws) and *Psittacus*, the latter consisting of all the Parrots and Parrakeets without denuded cheeks. The second order consists of the Toucans, the Trogons, the Touracos, and the *Musophagæ* or Plantain-eaters.

M. Duméril's *Grimpeurs* form his third order, the second family of which (*Levirostres* or *Cênoramphes*) consists of the Toucans, Plantain-eaters, Trogons, Touracos, Barbets *Maccaws*, *Cockatoos*, and *Parrots*.

The *Psittacini* form the first family of Illiger's *Scansores*, and include the genera *Psittacus* and *Pezoporus*. His second family, *Serrati*, consists of the Toucans (*Ramphastos* and *Pteroglossus*), *Pogonias*, the Touracos, the Trogons, and the Plantain-eaters.

Cuvier places the *Psittacidæ* between the Toucans and the Touracos: they consist of the *Aras* (*Ara*, Kuhl): *Perruches* (*Conurus*, Kuhl, divided by Le Vaillant into Perruches-Aras, which have naked cheeks (*Psittacus Guyanensis*, &c.); Perruches à queue en flèche (*Palæornis*); and Perruches à queue élargie vers le bout (*Platycercus*). *Cockatoos* (*Plyctolophus*): *True Parrots*: *Lories*: *Short-tailed Parrots* (*Psittacula*, Kuhl): and *Parroquets à Trompe*, Le Vaill. (*Microglossus*, Vieill.), of which last Cuvier thinks that the *Perruches Ingambes* (*Pezoporus*, Ill.) may be made a subgenus.

M. Vieillot's first tribe of his second order, *Sylvicolæ*, consists of the *Zygodactyli*; and the *Psittacins*, or *Psittacidæ*, form the first family of that tribe. The second family comprehends the *Macroglosses*, including the Woodpeckers and the Wryneck.

M. Temminck arranges all the Parrots at the end of his first family of *Zygodactyles*; the second family consists of the Woodpeckers, the Jacamars, and the Wryneck.

M. de Blainville (1815-1822) makes the Parrots his first order of birds (*Prehensores*), belonging to the anomalous subclass.

Mr. Vigors arranges the *Psittacidæ* in the normal group of the Scansores, or climbing-birds, and he observes that the immediate connection of the *Ramphastidæ* (Toucans) with *Psittacidæ*, which immediately follow them in his method, is not very evident. These families, he remarks, are placed next to each other by all systematic writers; and he decidedly concurs in the general views which bring them into neighbouring groups. But he states that he is unacquainted with any forms which intimately connect the *Ramphastidæ* and *Psittacidæ*, and soften down the important difference observable in the bills and tongues of those birds. Mr. Vigors indeed, though he hazards a suggestion as to *Trogon*, declares his opinion to be that the *Psittacidæ* afford more difficulties to the inquirer into affinities than any other known group in the whole class. He remarks that in manners and general structure, as well as in the mode of using their feet and bill, the Parrots hold nearly an insulated situation among birds; and that they may perhaps be pronounced to be the only group among them which is completely *sui generis*. In the formation of his opinion that their station in nature accords with the place assigned them in his series, and that they come next to the *Picidæ* in affinity, Mr. Vigors at first felt some doubt in consequence of their bills and tongues here equally apparent, as in the case of the *Ramphastidæ*. But he was decided in his opinion by observing that while there was no other group with which they accord more closely in such characters, they possess an affinity to no birds but the *Picidæ* in the structure of the foot and the use to which they apply it. He reminds us that the leading characteristic of the *Scansores* is the faculty of climbing; and that the greater portion of the families contained in it possess what are technically called *zygodactyle* feet, or feet in which the toes are disposed in pairs, and which are generally considered as conducive to that faculty. But he remarks that the *Picidæ* and the *Psittacidæ* are the only families thus distinguished whose toes are strictly and constantly disposed in pairs; and that they are consequently the only groups which constantly benefit by that construction in climbing. The external hind toe of the other *Scansores* is, he observes, retractile: and these birds are never seen to climb, at least to that extent which is common to the two families in question. 'We may thus venture, I think,' continues Mr. Vigors, 'to separate the Parrots and Woodpeckers from the other families, and to associate them together, in consequence of the affinity in these essential characteristics of the tribe. In this point of view they will compose its normal groups as climbers *par excellence*, differing however as to the mode in which they climb; the *Parrots* using the foot chiefly in grasping the object which assists them in their ascent, and in conjunction with the bill; while the *Picidæ* rely upon the strength and straightness of the hind toes in supporting them in a perpendicular position on the sides of trees; in which posture they are also assisted by the strong shafts of the tail-feathers. While I was influenced by these general points of coincidence in placing the *Psittacidæ* and *Picidæ* together, I recognised a group which appeared to intervene between them, and to diminish the apparent distance that exists even in the form of their bill. That important group which comprises the Linnean *Barbets* evidently exhibited the expected gradation in the structure of that member; the bill of *Pogonias*, Ill., approaching most nearly that of the *Parrots* by its short strong and hooked conformation, while the straighter and more lengthened bill of the true *Bucco* united itself to that of *Picus*. Many other particulars in form, and also in extraordinary conformity in colouring, still further pointed out the affinity; and I was at length confirmed in my conjectures respecting the situation of these birds, by arriving at a knowledge of their habits being actually those of the true *Woodpeckers*, and of their chief affinity being to that group. The regular gradation by which these two families, united in their general characters, and those the characters, it must be remembered, most prominent and typical in their own tribe, are also united in their minuter points of formation, appears to me now eminently conspicuous.' With regard to these minuter points, Mr. Vigors observes that some of the *Psittacidæ*, among which he particularises *Psittacus Alexandri*, Linn. (*Palæornis*), and its congeners, partially employ the tail in supporting themselves as they climb, in a corresponding manner with the Woodpeckers. The tongue, also peculiar to the *Psittacidæ*, he remarks, becomes slenderer, and, as is said, more extensible in that group of which *Ps. aterrimus*, Gmel., is the representative, thus evincing an approximation, slight indeed, but still an approximation to the bill of the *Woodpeckers*. (*Linn. Trans.*, vol. xiv.)

M. Latreille makes the *Psittacins* the first family of the order *Grimpeurs*. He divides the family into two tribes: the first consisting of the genera *Ara*, *Perruche*, *Pezopore*, and *Kakatoës*; and the second of the genus *Eurhynque*.

In the method of M. de Blainville developed by M Lberminier in 1827, the family of Parrots appears in the Normal subclass between the Touracos and the Humming-Birds.

In M. Lesson's *Projet de Classification*, the '*Psittacées*' appear as the first tribe (*Zygodactyles*) of the '*Insessores* or *Grimpeurs* (*Hèterodactyles*):' they are immediately succeeded by the '*Pogonićes*.'

Mr. Swainson is of opinion that the Parrots constitute the subtypical division of the *Scansores*, wherein the powers of climbing are less developed. 'If,' says Mr. Swainson, any group in nature be isolated, it is this. Possessing in themselves the strongest characteristics, there is no bird yet discovered which presents any point of connection to them: approximations indeed are certainly made towards them by the tooth-billed Barbuts (Barbets, *Pogonias*); but there is still a gap, which no genus yet discovered is calculated to fill up. On considering the relative difference between the barbuts and the parrots, we should say, theoretically, that of all the five groups among the latter, one only remains to give the typical structure.' As the Parrots appear to Mr. Swainson to form a group precisely equivalent to the true Woodpeckers, he arranges them under five genera: the Maccaws, the Parrots, the Cockatoos, the Lories, and the Ground Lories (*Platycercus*, Vig.). In the synopsis at the end of the work (*Classification of Birds*) we find the following arrangement:—

Psittacidæ.

Bill very short: the upper mandible greatly curved over the lower, which is considerably shorter.

Subfamily Maccrocercinæ. *Maccaws.*

Upper mandible greatly hooked; lower mandible much higher than broad. Tail very long, cuneated.

Genera: *Macrocercus*, Vieill.; *Conurus*, Kuhl; *Leptorhynchus*, Sw.; *Palæornis*, Vig.

Subfamily Psittacinæ. *Parrots.*

Upper mandible very distinctly toothed; lower mandible longer than it is high. Tail short, even, or rounded.

Genera: *Erythrostomus*, Sw.; *Chrysotis*, Sw. (Amazonian Parrots); *Psittacus* (Parrot of the Old World—most typical of this subfamily); *Agapornis*, Selby; *Poicephalus*, Sw.

Subfamily Plyctolophinæ. *Cockatoos.*

Head large, ornamented with a folding or procumbent crest. Bill short, very broad; the culmen remarkably curved. Tail rounded, lengthened, broad; the feathers not narrowed.

Genera: *Plyctolophus*, Vieill. (subtypical); *Licmetis*, Wagl.; *Microglassus*, Geoff.; *Centrourus*, Sw.

Subfamily Lorianæ. *Lories.*

Bill but slightly curved; the margin of the upper mandible sinuated; the notch obsolete; lower mandible slender, conic, much longer than high; the gonys (typically) straight.

Genera: *Brotogeris*, Vig.; *Psittaculus*, Kuhl; *Trichoglossus*, Vig.; *Lorius*, Brisson; *Pyrrhodes*, Sw.

Subfamily Platycercinæ. *Loriets.*

Tail long, very broad, considerably cuneated. Bill strong, thick, toothed: the culmen very convex. Under mandible deep, but very short: the gonys curved. Feet and toes slender. Tarsus longer than the hallux.

Genera: *Vigorsia*, Sw.; *Platycercus*, Horsf. and Vig.; *Nanodes*, Horsf. and Vig.; *Leptolophus*, Sw.; *Pezoporus*, Ill. (Swainson).

The family is placed by Mr. Swainson between the *Ramphastidæ* and the *Picidæ*.

Mr. G. R. Gray (*List of the Genera of Birds*) also arranges the *Psittacidæ* between the *Ramphastidæ* and the *Picidæ*, in the following method:—

Subfamily I. Platycercinæ.

Genera: *Coracopsis*, Wagl. (*Psittacus*, Linn.; *Muscarinus*, Less.; *Vigorsia*, Sw.).

Prioniturus, Wagl. (*Psittacus*, Vieill.).

Platycercus, Vig. (*Psittacus*, Lath.).

Nymphicus, Wagl. (*Psittacus*, Lath.; *Calopsitta*, Lath.; *Leptolophus*, Sw.).

Subfamily II. Araïnæ.

Genera: *Ara*, Briss. (*Psittacus*, Linn., *Macrocercus*, Vieill., *Sittace*, Wagl., *Arara*, Spix); *Anodorhynchus*, Spix (*Psittacus*, Lath., *Macrocercus*, Vieill.—Ex. *Hyacinthine Maccaw*); *Conurus*, Kuhl (*Psittacus*, Shaw, *Aratinga*, Spix, *Psittacara*, Vig., *Sittace*, Wagl., *Macrocercus*, 2nd div. Vieill.); *Enicognathus*, G. R. Gray (*Psittacara*, King, *Sittace*, Wagl., *Leptorhynchus*, Sw., *Psittacaria*, Meyen).

Subfamily III. Palæorninæ.

Genera: *Trichoglossus*, Vig. and Horsf. (*Psittacus*, Linn. *Australasia*, Less.); *Palæornis*, Vig. (*Psittacus*, Linn. *Psittaca*, Br., *Conurus*, Less.); *Pezoporus*, Ill. (*Psittacus* Shaw); *Polytelis*, Wagl. (*Psittacus*, Sw., *Palæornis*, Vig and Horsf.); *Centrourus*, Sw. (*Psittacus*, Lath., *Trichoglossus*, Vig. and Horsf.); *Euphema*, Wagl. (*Psittacus*, Lath., *Lathamus*, Less., *Nanodes*, Vig. and Horsf.).

Subfamily IV. Lorinæ.

Genera: *Charmosyna*, Wagl. (*Psittacus*, Gm., *Psittapous*, Less., *Pyrrhodes*, Sw., *Palæornis*, Vig.); *Brotogeris*, Vig. (*Psittacus*, Lath., *Trichoglossus?* Steph., *Coriphilus*, Wagl., *Lorius* and *Lathamus*, Less.); *Lorius*, Briss. (*Psittacus*, Linn., *Domicella*, Wagl.); *Eos*, Wagl. (*Psittacus*, Gm.); *Electus*, Wagl. (*Psittacus*, Gm.); *Psittacodis*, Wagl. (*Psittacus*, Linn., *Muscarinus*, Wagl.).

Subfamily V. Psittacinæ.

Genera: *Tanygnathus*, Wagl. (*Psittacus*, Linn., *Muscarinus*, Less., *Erythrostomus*, Sw.); *Triclaria*, Wagl. (*Psittacus*, Spix, *Erythrostomus*, Sw., *Maximilicus*, Less.); *Psittacus*, Linn. (*Jaco*, Less.); *Chrysotis*, Sw. (*Psittacus*, Linn., *Androglossus*, Vig.?); *Pionus*, Wagl. (*Psittacus*, Linn.); *Poicephalus*, Sw. (*Psittacus*, Linn., *Pionus* β., Wagl.); *Agapornis*, Selby (*Psittacus*, Kuhl, *Psittacula*, Wagl., *Poicephalus*, Sw.); *Psittacula*, Kuhl (*Psittacus*, Lath., *Psittaculus*, Sw.); *Nasiterna*, Wagl. (*Psittacus*, Quoy and Gaim., *Micropsitta*, Less.).

Subfamily VI. Cacatuinæ.

Genera: *Cacatua*, Briss. (*Psittacus*, Linn., *Plyctolophus*, Vieill., *Kakadoe*, Kuhl); *Calyptorhynchus*, Vig. and Horsf. (*Psittacus*, Lath., *Cacatua*, Vieill., *Banksianus*, Less., *Plyctolophus*, Sw.); *Corydon*, Wagl. (*Psittacus*, Lath., *Plyctolophus*, Sw., *Calyptorhynchus*, Vig. and Horsf.); *Licmetis*, Wagl. (*Psittacus*, Kuhl, *Cacatua*, Less.); *Microglossum*, Geoffr. (*Psittacus*, Gm., *Cacatua*, Vieill., *Probosciger*, Kuhl, *Solenoglossus*, Rantz., *Eurhynchus*, Latr.); *Nestor*, Wagl. (*Psittacus*, Forst., *Plyctolophus*, Gould); *Dasyptilus*, Wagl. (*Psittacus*, Less., *Psittrichas*, Less., *Centrourus*, Sw.).

Of the genera here stated, *Leptorhynchus* is noted as having been previously employed; and *Nanodes* and *Polytelis* as being similar to a word used in entomology. Other forms are marked in the subfamily *Psittacinæ*, viz. *P. Feildii*, Sw., *P. pileatus*, Scop., and *P. mitratus*, Pr. Max., with a query as to whether they are not entitled to rank as genera.

It is impossible to read this elaborate catalogue without being struck with the labyrinth of names in which the unfortunate student must find himself involved. In too many instances the genera thus coined bear the impress of crude theory, and those who promulgate them would find it very difficult to define the characters on which they ought to rest.

We proceed to lay before the reader some of these forms.

Macrocercus.—The *Maccaws* are all natives of America, and principally of its southern portion. The *Carolina Arara* (*Psittacus Carolinensis*, Linn.) has been recorded as occurring in the United States as high as lat. 42°, though, according to Audubon, few are now to be found higher than Cincinnati; but the true Maccaws are natives of much warmer latitudes. Though the tongue is thick, fleshy, and soft, their powers of imitation fall far short of those of the true Parrots and Parrakeets, and the harsh tones with which, after much teaching, they not very perfectly articulate a few words, contrast strongly with the assumed musical voice and ready docility of the latter. They are however capable of great attachment when domesticated. Their natural notes are screams of the most discordant and piercing kind. The hollows of trees are the places selected for their nests, and the number of eggs laid amounts to two, which are said to undergo the incubation of the male as well as the female.

The Great Green Maccaw (*Psittacus militaris*, Auct.), inhabiting the warmer districts of the chain of the Andes, where it is found as high as about 3000 feet, in Mexico and Peru; the *Hyacinthine Maccaw* (*Macrocercus Hyacinthinus*; the *Red and Blue Maccaw* (*Macrocercus Aracanga*; and the *Blue and Yellow Maccaw* (*Macrocercus Ararauna*), are known to most admirers of this gay race; though the *Hyacinthine Maccaw* is rarely seen alive in this country, and is not common even in museums.

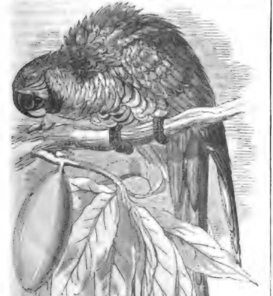
Generic Character.—Size large. *Orbits* and sometimes the face destitute of feathers. Nostrils concealed. Notch in the upper mandible obsolete; the under remarkably short, but very deep. (Sw.)

We select as an example *Macrocercus Ararauna*.

Description.—Bill black, largely and strongly developed. The upper mandible, which not unfrequently measures from the forehead to the tip 3½ inches, is much deflected: the under mandible is short, deep, and very stout. Cheeks white, naked, with three fine narrow lines of black plumelets under the eyes, the irides of which are yellowish. Beneath the under mandible a broad black band extending upwards to the ears behind a great part of the white naked patch. Plumage rich blue above, blending into green on the forehead, crown, some of the smaller wing-coverts, and rump. Greater quills and tail nearly violet. Wings and tail, beneath, yellow. The rest of the under parts rich saffron. Legs and feet blackish-grey. Total length about 39 inches, of which the tail measures some 24 inches.

Geographical Distribution.—Tropical America. The Brazils, banks of the Marañon, or Amazon river, Guiana, Surinam, &c.

Habits.—Though generally living in pairs, the Blue and Yellow Maccaws sometimes assemble in large flocks, their favourite haunts being swampy woods where a species of palm on whose fruit they principally feed is abundant. They fly well and often very high, showing a great command of wing, especially before they alight on the top of the lofty trees which they select for their resting-place. The two eggs, which are laid in the hollows of decayed trees, as well as the young, are said to receive the parental care of the male as well as of the female, which have two broods a year generally. Mr. Selby (*Naturalist's Library—Parrots*) notices a very fine individual completely domesticated at Dr. Neill's, Cannonmills (near Edinburgh), which is allowed the freedom of several apartments; and he tells us that when the bird is desirous of being noticed, it calls out 'Robert,' the name of its earliest master, very distinctly, but that it has not acquired more than one other conventional sound.



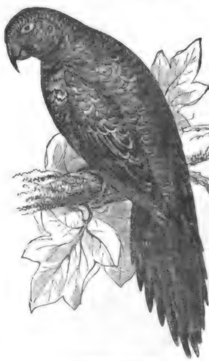
Macrocercus Ararauna.

Psittacara.—Between the *Maccaws* and *Parrakeets* (*Palæornis*) comes the genus *Psittacara* (Vig.). 'These birds,' says Mr. Vigors, 'although their cheeks are covered with feathers, and they are thus brought within the circle of the *Parrakeets*, have yet the bill of the *Maccaws*; and by a greater or less nakedness of the orbits round the eyes they still further assert their affinity to them. From their osculant situation between the two groups, thus strikingly apparent, the species that exhibit these characters have received the familiar name of *Parrakeet-Maccaws* in our language and of *Perruche-Aras* among the French ornithologists. Like the true Maccaws, they are exclusively natives of the New World.' (*Zool. Journ.*, vol. ii.) Mr. Vigors adds in a note, that a species nearly allied to both these groups had then lately been brought to this country.

Generic Character.—*Head* feathered, space round the eye naked. *Bill* thick, rather short; upper mandible compressed at the apex, the lower mandible very short inclining inwards, deeply emarginate. *Wings* moderate; first and fourth quills equal, third rather longer, second longest; internal web of the first slightly notched near the middle, external webs of the second to the fifth inclusive gradually broader in the middle. *Feet* rather strong, *tarsi* short. (Vig.)

Example, *Psittacara leptorhyncha.*

Description.—Green; space round the eye white; inter ocular band and frontal fillet red; tail cinnamon red.



Psittacara Leptorhyncha.

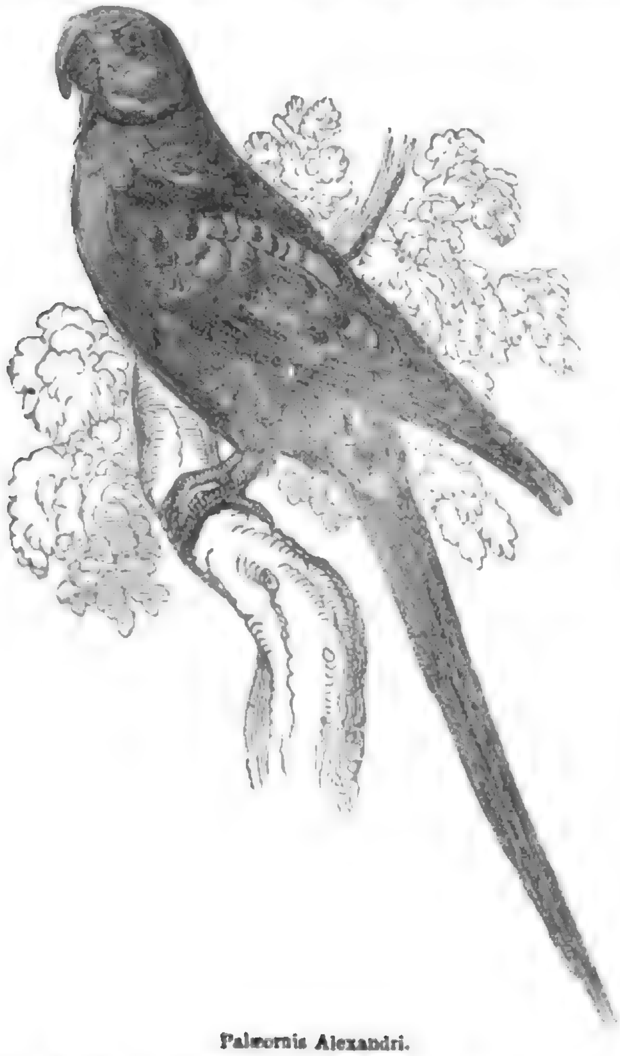
The subfamily *Palæornina*, as it appears in Mr. Vigors and Dr. Horsfield's *Description of the Australian Birds in the Collection of the Linnæan Society* (*Linn. Trans.*, vol. xv.), consists of the genera *Nanodes*, *Platycercus*, *Pezoporus*, *Palæornis*, and *Trichoglossus*.

Palæornis.—The Parrakeets forming this group belong to Continental India and some of the neighbouring islands in the Indian Ocean and Africa, with the exception of *Palæornis Barrabandi* (*Polytelis* of Wagler), which is a native of New Holland. India and its islands must however be considered as the principal locality of the species, which, according to Wagler's monograph, amounts to eleven, including *Palæornis inornatus* (*Psittacus incarnatus* of authors), which he adds to the group with doubt.

These *Ring Parrakeets*, as they are generally termed, are justly held in high estimation for the symmetry of their form, the grace and elegance of their movements, the beauty of their colours, their great docility and powers of imitation, and their fond attachment to those with whom they are domesticated and who treat them with kindness. They were not less prized, as we have seen, by the antients; and it becomes a not uninteresting inquiry to endeavour to ascertain what were the species known to them. Some suppose that *Palæornis Alexandri* was the only one: but though that species may have been and was probably the first introduced into Europe, we think that it will appear that those who confine the Parrakeets known to the antients to that bird have taken too narrow a view of the subject.

Mr. Vigors, in the paper above alluded to, says—

'It is not easy to decide, although we may form a probable conjecture on the subject, how many and which of the species of *Palæornis* were known to the antients. Ælian (*De Nat. Anim.*, xvi. 2) tells us that they were acquainted with three species. But as some of the more common species approach each other most closely in their specific characters, it is not improbable that the differences between them might have been passed over by observers who were so little accustomed and had so little occasion to pay attention to minute distinctions, and that four or five species at least were familiar to antiquity. The birds that come from the remoter Indian islands, *P. Papuensis*, *Malaccensis*, and *Xanthosomus*, in particular, are in all likelihood among the number of those which have been only known in recent times. To these may of course be added the newly-characterised species from New Holland, the *P. Barrabandi*. The beautiful blossom-headed species also, *P. erythrocephalus* and *Bengalensis*, which are even now more rarely met with than the neighbouring species, most probably did not come under the observations of the antients; for it is impossible that they should have passed over without notice the lovely and changeable roseate colour of the head, which casts into the shade even the collar round the neck so frequently alluded to by them, if either of these birds had been before them. The poets at least would have seized upon a character which involved so truly poetic an image, and Ovid or Statius would have woven it up among the most conspicuous wreaths of their beautiful elegiac garlands. *P. bitorquatus*, the locality of which is unknown, is at present of rare occurrence; but it formerly might have been more generally distributed. The species which we can imagine to have been best known to former times are the *P. Pondicerianus* and *flavitorquis*, which are diffused over the whole of the Indian continent, the former species more particularly, which is now also found dispersed over a great extent of the Eastern Archipelago. *P. Alexandri* appears to have been the bird sent from Ceylon to the Macedonian warrior from whom it derives its specific name; Ceylon, or the antient Tabrobana, being the principal resort, even down to the present moment, of that species. And it is probable also that the Romans, particularly in later times, received a great number of the same species from that island.—If to these birds we add the *P. torquatus*, which is the species that agrees most intimately with the descriptions of Pliny, and, after him, of Apuleius, and which is generally scattered over the Indian as well as the African continent on the eastern side, we shall probably have before us all the species known to the antients of this classical group.'



Palæornis Alexandri.

Generic Character.—*Bill* rather thick; the upper mandible dilated, the culmen round, the lower mandible broad, short, and emarginate. *Wings* moderate; three last quills (extimis) nearly equal, longest; external webs of the second, third, and fourth gradually broader in the middle. *Tail* graduated; the two middle very slender feathers much exceeding the rest in length. *Feet* with short and weak tarsi; the claws moderate, rather slender, and falcate. *Body* slender and neat. (Vig.)

Mr. Vigors divides the genus into the following sections:—

* Lower mandible short.

P. Alexandri, *P. torquatus*, *P. flavitorquis*, *P. bitorquatus*, *P. Xanthosomus*, *P. Malaccensis*, *P. erythrocephalus* *P. Bengalensis*, *P. Pondicerianus*, *P. Barrabandi*.

** Lower mandible elongated.

P. Papuensis.

We select as an example the generic type, *P. Alexandri*.

Description.—Green, with a vermillion collar; throat and band between the eyes black; spot on the wings purple-red. Differs from *P. torquatus* by the greater size of the bill and the dark red spot on the shoulders. (Vig.)

Locality.—Ceylon and parts of the continent of India.

Platycercus (*Loriets*).

Generic Character.—*Bill* rather short, the upper mandible rounded and dilated, the lower one short, deeply emarginate, with the apex squared. *Wings* rounded; the first quill shorter than the second and equal to the fifth; second and third longest; the external webs of all except the first abruptly notched towards the middle. *Tail* broad, depressed, rather rounded or sub-graduated; the tail-feathers rounded at the apex. *Feet* with elevated tarsi; the toes slender and elongated, and the claws long and but little falcated.

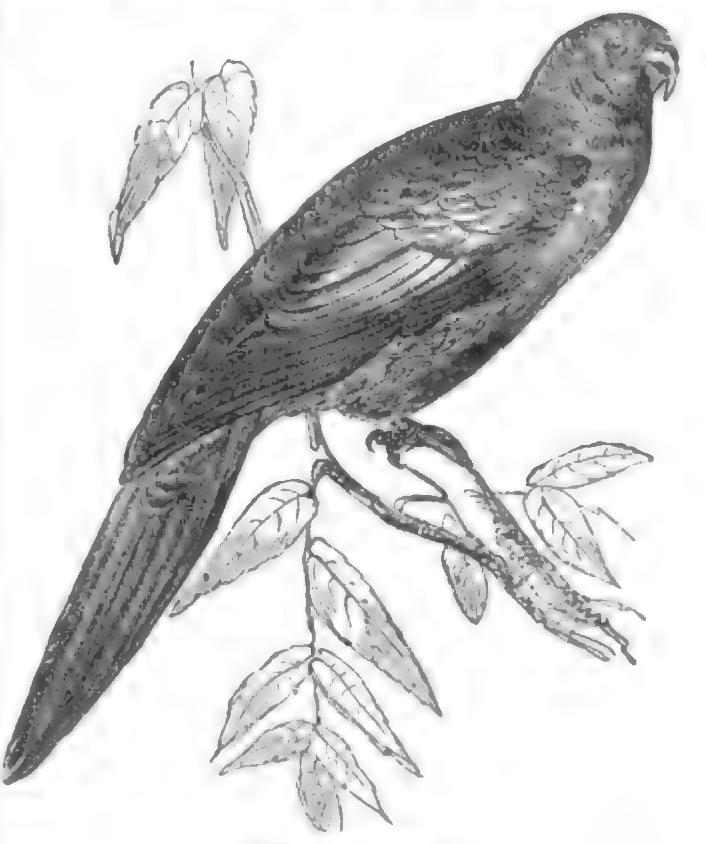
Example, *Platycercus scapulatus*, *Tabuan Parrot*, or *King's Parrot*.

Description.—*Male.*—Green; the head, neck, and body beneath scarlet; nuchal lunula and rump lazuline; longitudinal scapular line pale green-cerulean; tail-feathers black, with brilliant green reflections.

Female.—Head and neck green.

Locality.—New Holland.

Habits, &c.—Mr. Caley seldom noticed a full-coloured specimen, that is, red. He states that, when the Indian



Platycercus scapulatus.

corn is ripe, they may be seen in large flocks on the farms, clinging on the stalks and occasioning much mischief to the corn. He apprehends that the greater part of these flocks are young birds, as it is rare to see a bright red one among them. The natives told him that this species breeds chiefly in a white gum-tree (a species of *Eucalyptus*), making its nest of a little grass, and lining it with feathers. It has, he adds, as many as twelve young ones, and the eggs are of a dirty white with black specks: the nest is found by its enlarging the hole at which it creeps in; this process gives the surrounding part a reddish appearance, which, forming a contrast with the whiteness of the other parts, renders it conspicuous.

Mr. Swainson had one of these beautiful birds alive in his possession for many years. Its manners were gentle and timid. Like many of its congeners, it delighted to wash itself in a basin of water. In the day and during winter it was generally silent; but on a mild evening it would go on for two or three hours with a somewhat whistling note, sometimes shrill, but generally soft and pleasing. Its ordinary diet was moistened bread, with a little hemp and canary seed; but during summer and autumn the small garden fruits appeared to be highly welcome to it. (*Zool. Ill.*, 2nd series.)

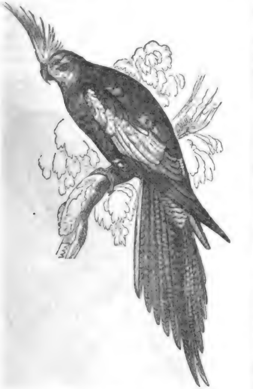
Nymphicus.

Generic Character.—*Bill* distinctly toothed, culmen slightly carinated; *nostrils* thick, tumid, naked; *head* crested; wings very long, outer web of the quills not sinuated; *tail* very broad, cuneated, the two middle tail-feathers conspicuously longest and pointed. (Sw.)

(Mr. Swainson considers this to be the rasorial type.)

Example, *Nymphicus Novæ Hollandiæ.*

Description.—*Male.*—Forehead, crest, and cheeks lemon-yellow; ear-coverts rich reddish-orange; back of the neck, two centre tail-feathers, and the external margins of the primaries brownish-grey; back, shoulders, and all the under surface and outer tail-feathers greyish chocolate-brown, the shoulders and flanks being the darkest; a white mark extends from the shoulders lengthwise down the centre of the wing; bill and bare space round the eye brownish-grey; feet blackish-brown.



Nymphicus Novæ Hollandiæ

Female.—Differs from the male in the colour of the face and crest being of a dull olive-yellow, the latter becoming still darker at its extremity; in having the throat greyish-brown and the back lighter than in the male; the lower part of the abdomen, upper tail-coverts, and tail-feathers yellow, except the four middle ones, which are grey; the whole transversely and irregularly barred with lines of brown. Total length twelve inches.

Locality.—New Holland.

Habits, &c.—Mr. Gould, whose accurate description we have given from his grand work on the *Birds of Australia*, now in the course of publication, states that this species has many of the actions of the *Platycerci*, being extremely active and running round its cage with surprising agility, in which particular it is only equalled by the most terrestrial members of the family. To give some idea of the immense flocks of this beautiful bird which inhabit the interior of Australia, the same author informs us that his brother-in-law, Stephen Coxen, Esq., procured more than two hundred examples during a single excursion into the interior.

Euphemia, Wagl. (*Nanodes*, Vig.).

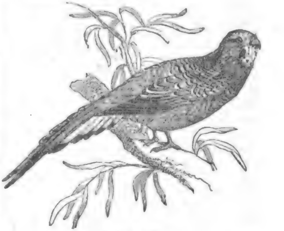
Generic Character.—*Bill* short, the culmen rounded, higher than it is long, being very like that of *Macrocercus*, the lower mandible very short, inclining inwards, and emarginate. *Wings* moderate, subacuminate; first and second quills, which are nearly equal, longest; the external webs of the second and third slightly emarginate towards the apex. *Feet* moderate; *tarsi* and *toes* rather slender. *Tail* graduated, cuneated; tail-feathers slender towards the apex. (Vig.)

Example, *Euphemia undulata.*

Description.—*Male.*—Crown of the head and throat pale yellow, the latter ornamented on each side with several rich blue spots, a row of which, but of a darker tint, crosses the throat in the form of a crescent; sides and back of the head, back of the neck, upper part of the back, scapulars and wing-coverts olive brown, each feather having a crescent shaped mark of black near its extremity, and margined with yellow; primaries green on their outer edges, the tip and internal web brown; secondaries crossed by a broad band of yellow, which is continued, but much narrower, across some of the primaries; breast, all the under surface, lower part of the back, and the tail-coverts fine pale green; two centre tail-feathers deep blue at the base, passing into deep green at the tip; the remainder of the tail-feathers bright yellow, tipped with dark green; bill horn-colour at the base, passing into pale yellow at the tip; feet flesh-colour.

Female.—Differs in being less brilliant in all her markings, and in having the blue spots on the throat less defined and irregular in form. Total length seven inches and a half (Gould, *Birds of Australia.*)

Locality.—Interior of New South Wales.



Euphemia undulata.

Habits, &c.—Captain Sturt discovered this species in great abundance in the interior of New South Wales. He informed Mr. Gould that on the extensive plains bordering the Morumbidgee he met with it in immense flocks, feeding upon the seeds and berries of the low stunted bushes called scrubs. Mr. Gould also received several from Mr. Coxen, which the latter had procured to the north of Hunter's River. Mr. Gould adds that they are quick and active, and run on the ground with great facility, much after the manner of the true *Platycerci*, or Ground Parrakeets, to which he is of opinion they are closely allied in affinity.

Trichoglossus (*Lorikeets*).

Generic Character.—Bill somewhat elongated, rather compressed; lower mandible nearly straight, the margin entire, longer than it is high. *Tongue* furnished below with many marginal bristles at the apex. *Wings* moderate; first *quill* longest, second and third a little shorter, webs entire. *Feet* rather short; *tarsi* somewhat covered with the femoral feathers; *acrotarsi* a little feathered below the knee: toes rather strong, depressed; *claws* strong, falcate. *Tail* graduated; the tail-feathers rather narrower at the apex. (Vig.)

Locality.—New Holland.

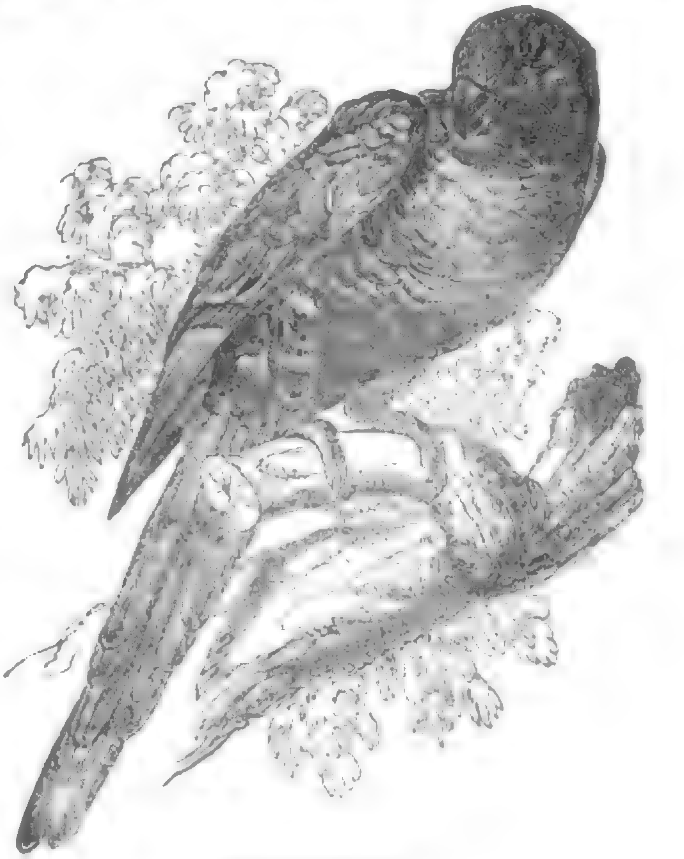
Mr. Vigors (*Linn. Trans.*, vol. xv.) remarks, that besides the external characters specified above, which separate this genus from the rest of the subfamily *Palæornina*, a decided ground of distinction is exhibited in the formation of the tongue; the under part of this member being furnished at the apex with numerous strong hairs or bristles, of a brush-like structure, and which seem to serve the bird for the purposes of suction. (Ante, p. 84.) He remarks that the tendency of a considerable portion of the birds of New Holland to feed by suction upon vegetable juices, for which a sufficient provision is made by nature in the luxuriant vegetation and the constant succession of flowers in that country, renders this singular deviation from the general form of the *Parrot's* tongue less surprising; and he further observes that it is to be remarked that although the *Parrots* are in general a long-lived race, and of all birds perhaps the most easily reared, and although the birds of the present group are most numerous in New Holland, few of them have been kept alive for any length of time in a state of confinement. He accounts for this from the probable ignorance of their natural mode of feeding.

The natural and acquired habits of the species of this genus require some notice. Mr. Caley informs us that the *Blue-mountain Parrot*, *War'rin* of the natives (*Trichoglossus hæmatodus*), is remarkable for its docility and attachment to some people, whilst it is a perfect scold to others who may have teazed or offended it. 'Flocks of these birds,' says this accurate observer, 'may be seen in the *Eucalypti* trees when in flower, in different parts of the country, but in the greatest number near their breeding-places. It does not eat any kind of grain, even when in a domesticated state. It is much subject to fits, which generally prove fatal; and it is rare to find an individual kept alive above a couple of years. One that I kept, on being shown a figure of a coloured plant, used to put its tongue to the flowers, as if with the intent of sucking them; and I have seen it make the same attempt with a piece of cotton furniture. The flesh of this bird is very good eating.' Again, speaking of the *Crimson-fronted Parrakeet*, *Coolich* of the natives (*Trichoglossus concinnus*), Mr. Caley states that it may be observed in large flocks sucking the *Eucalypti* flowers. He adds that, like the *Blue-mountain Parrot*, it is subject to fits, which generally prove fatal, that it is seldom kept alive, and that its breath or some part about its head emits a very sweet odour. The natives told him that this species breeds in the hollow boughs of trees, scraping out the decayed mould, and making its nest of it. The eggs, he informs us, are green, without spots, and the number of young two. Of the *Small Parrakeet*, *Jerryang* of the natives (*Trichoglossus pusillus*), he observes that this, like the *Coolich*, is seen in very large flocks in the *Eucalypti* trees when in blossom. 'The natives,' says he, 'now and then bring in the young ones, but they seldom live long. I had three young ones for some time, which used to huddle together and give out a very pleasing note. They all died, strongly convulsed, and nearly at the same time; the limbs were as stiff the moment life was extinct as if the body had become cold. The natives tell me that it builds in the hollow limbs of trees, making no other nest than of the decayed wood. It has four young ones. The eggs are white, and without spot.'

Mr. Caley also learned from the natives that the nest of this species, of the *Ground Parrot* (*N. pulchellus*), of the *Dulang* (*Pl. Pennantii*), and of the *Coolich* (*Tri. concinnus*), smell very strong and offensive of dung.

Example, *Trichoglossus hæmatodus* (Vig., *Trichoglossus Swainsonii*, Jardine and Selby).

Description.—Green; head, middle of the body, and bands on the sides azure-blue; throat, breast, and flanks orange crimson. (Sw.)

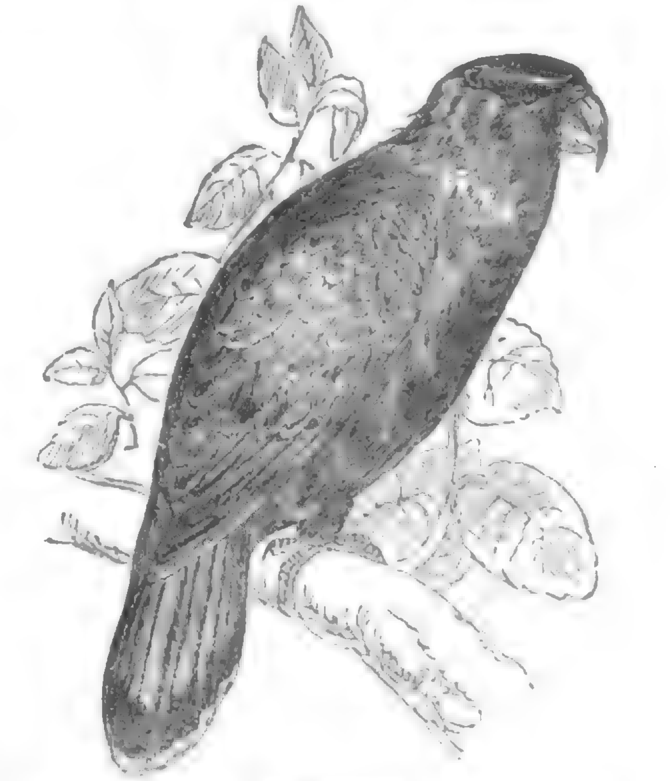


Blue-bellied Parrakeet.

Lorius.—The true Lories are remarkable for the elongated and weak form of the bill, and also for a formation of the tongue, similar to that in *Trichoglossus*. (Ante, p. 84.) They are inhabitants of the islands of the East, and are considered by Mr. Vigors to be the aberrant group of the family. Their colours are of the most rich and mellow description, and the birds are highly prized, not only for their beautiful plumage, but for their lively, active, and affectionate disposition, and their great docility in the articulation of words and even sentences.

Generic Character.—Bill elongated, weak. *Wings* pointed, two first quills longest. *Tail* moderate, rounded or graduated; the feathers broad, and hardly narrow at their tips.

Example, *Lorius Domicella.*



Lorius Domicella.

Description.—Rich scarlet; upon the upper part of the breast a yellow collar; crown of the head blackish purple in front, passing into violet-purple behind, upper surface of the wings green, violet-blue at the bend and margins, as are the under wing-coverts; thighs externally azure, greenish at the base; bill orange-yellow; length between 11 and 12 inches.

Locality.—The Moluccas and other Eastern Islands.

The *Plyctolophinæ*, or *Cockatoos*, are natives of Australia and the Indian Islands, inhabiting the woods, and feeding upon seeds and soft and stony fruits, which last their powerful bill enables them to break with ease. Like others of their congeners, they make their nests in decayed trees, and are easily tamed when taken at an early age. They become familiar and even attached, but their imitative powers seldom go beyond a very few words added to their own cry of Cockatoo.'

Plyctolophus (*True Cockatoos*).

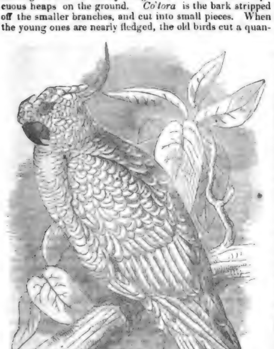
Generic Character.—*Bill* strong, short, very broad, culmen much curved. *Head* with a folding crest. Base of the under *mandible* frequently concealed by feathers. *Wings* long; secondaries, tertiaries, and the tail-feathers sometimes mucronate.

Example, *Plyctolophus galeritus* (*Crested Cockatoo*, White).

Description.—White, crest, and internal webs of the lateral tail-feathers yellow; under wing-coverts sulphureous.

Locality, New Holland.

Habits, &c.—Mr. Caley's notes contain the following observations on the Crested Cockatoo:—'This bird is called by the natives *Car'away*, and also *Curriang*. I have met with it in large flocks at the conflux of the Grose and Hawkesbury rivers, below Mulgo'ey on the former river, and in the long meadow near the Nepean river. They are shy, and not easily approached. The flesh of the young ones is accounted good eating. I have heard from the natives that it makes its nest in the rotten limbs of trees, of nothing more than the vegetable mould formed by the decayed parts of the bough; that it has no more than two young ones at a time, and that the eggs are white without spots. The natives first find where the nests are by the bird making *Co'tora* in an adjoining tree, which lies in conspicuous heaps on the ground. *Co'tora* is the bark stripped off the smaller branches, and cut into small pieces. When the young ones are nearly fledged, the old birds cut a quantity of small branches from the adjoining trees, but never from that in which the nest is situated. They are sometimes found to enter the hollow limb as far as two yards. The nests are generally formed in a *Black-butted* Gum-tree; and also in *Coroy'bo*, *Cajim'bbora*, and *Yarrowar'ry* trees (species of *Eucalyptus*). Their breeding-places appear to be local.'



Plyctolophus galeritus.

Mr. Vigors divides the genus into the following sections

Cristâ plicatili, acuminata, antrorsum tortâ.

Of this division he gives *Plyctolophus galeritus* above described as the example.

* *

Cristâ rotundatâ, retrorsum incumbente.

Of this section he gives the *Rosalbin Cockatoo*, *Plyctolophus Eos*, *Psittacus Eos* (Kuhl) as the example.

The *Tricolour-crested Cockatoo*, *Plyctolophus Leadbeateri*, Vig., *Cacatua Leadbeateri*, Wagl., also a native of New Holland, is the most splendid species yet discovered. Nothing appears to be known of its habits. In Mitchell's interesting Journal, where a coloured figure of the bird is given, it is called the Cockatoo of the Darling, and the enterprising author states that a flight of them flew over the heads of his party from the north-west when he was endeavouring to ascertain the final course of the Lachlan. The species is beautifully figured in Lear's 'Parrots,' and in the volume on Parrots by Sir W. Jardine and Mr. Selby. (*Naturalist's Library*, 'Ornithology,' vol. vi.)

In the same family of *Plyctolophinæ* Mr. Vigors places his genus *Calyptorhynchus*, the chief difference between which and *Plyctolophus* consists in the greater elevation and comparative shortness of the bill. The species appear to be confined to Australia. Of *Calyptorhynchus Banksii*, *the Banksian Cockatoo*, Mr. Caley says, 'The native name of these birds is *Geringora*. I have met with them in various parts of the country. In the north rocks, a few miles to the northward of Paramatta, I have frequently seen them, but never many together. The natives tell me it breeds in winter in *Mun'ning-trees*, or *Blood-trees* of the colonists (a species of *Eucalyptus*), but makes no *Co'tora*. It has three young ones, but of the eggs I could obtain no information.'

Of the *Calyptorhynchus funereus*, *Funereal Cockatoo*, Mr. Caley says, 'Its native name is *Wy'la*, so called from the similitude of that word to the sound which it makes. I have never seen them together in any numbers, not more perhaps than half-a-dozen at a time; but I have met with them in many different places. Sometimes they come within half a mile of the centre of Paramatta, where I have shot them in the trees. The natives told me it made its nest in *Yar'ro-trees* (a species of *Eucalyptus*), using only the vegetable mould. It makes no *Co'tora*, but cuts off the small branches of *Apple-trees* (a species of *Angophora*). It has two young ones.'

Mr. Vigors and Dr. Horsfield have no doubt that the following observations in Mr. Caley's notes apply to *Calyptorhynchus Cookii*, *Cook's Cockatoo*. 'The natives,' says the last-mentioned traveller, 'tell me of another kind of Cockatoo (besides *Wyla* and *Geringora*, which they call *Curat*). It is very shy. It scrapes dirt out of the hollow boughs, and makes its nest as the others do. It lays two eggs, the colour of which I did not ascertain. The nest is found by watching the bird into the hole. It does not make *Co'tora*, nor cut off the branches of the trees; but it cuts off *May'rybor'ro* and *Mun'mow* (the fruit of two species of *Persoonia*), without however eating them, before they are ripe, to the great injury and vexation of the natives. Specimens of these three species of *Calyptorhynchus* and of *Cal. Solandri* will be found in the collection of Australian birds in the possession of the Linnean Society of London.

Here may be noticed the *Aratoo* (*Microglossus* of Wagler), of which the *Goliah Aratoo*, *Microglossus aterrimus*, Wagl., *Great Black Cockatoo* of Edwards, is an example. *Locality*, Papua, Wagiou, New Guinea, and other Eastern Australian Islands.

Psittacus (*True Parrots*).

Mr. Vigors is of opinion that the group of the *Psittacidæ*, to which the name of *Psittacus* should be applied, may perhaps be considered to be that which comprises the *Psittacus Amazonicus* of Brisson and some allied species. That at least, he observes, is the group best known under the old scientific term, and at the same time under the familiar names of *Parrot* in our language and *Perroquet* in the French, which correspond with it.

These *true Parrots* are for the most part inhabitants of tropical America, and their prevailing colour is green. The ash-coloured or grey parrot, *Psittacus erythacus*, Linn., is a native of Africa. This group excels all others in docility and power of imitation.

Mr. Swainson divides the *true Parrots* into two genera, viz.:—

1, *Chrysotis* (*Amazonian Parrots*), which he thus characterises:—

Face plumed. *Wings* rather short; the first and second quills graduated, and shorter than the third and fourth, which are the longest; all these have the inner web sinuated in the middle; tertials very long. Tail short, longer than the wings, broad, with the tips rounded.

The species of these *Green Parrots* are numerous: among them the *Festive Parrot* (*Psittacus festivus* of authors) and the *Amazon's Parrot* (*Psittacus Amazonicus* of authors) are perhaps the best known; the latter particularly, which is often brought to Europe on account of its superior mimic propensities. The former, which exceeds the *Amazon's Parrot* in size, inhabits Guiana and the Brazils, the banks of the Marañon, or river Amazon, particularly, living in the forests upon seeds and kernels of fruits. It articulates, with great clearness and precision, words, and even sentences. The smaller *Amazon's Parrot* is common in Guiana and Brazil, and more especially near the banks of the river from which it takes its name. Fruits form its food, particularly those of the *Rhizophora Mangle*, or *Mangrove-tree*, and in its decayed trunks the bird deposits its eggs. It is considered very destructive to orange plantations. In captivity it may be taught to repeat many words and short sentences, which it learns with great facility.

Sloane, in his account of the *Common Parrot of Jamaica*, says that it is lesser than those of the main, and has a reddish-coloured neck, being everywhere else of a green colour; that it has a short broad tail; speaks very articulately; and that it is eaten baked in pies, tasting like pigeons.

2. *Psittacus.*

Generic Character.—Wings lengthened, nearly as long as the tail. Face naked. Tail even; the feathers rounded. The Old World. (Sw.)

The *Common Grey Parrot*, *Psittacus erythacus*, is generally considered to be superior to all others in docility and mimicry: its imitation of the human voice, when well taught, is complete, and its articulation most clear. Very high prices have been given for clever and well-taught birds. The parrot for which the Roman cardinal gave a hundred gold pieces had, it is said, learned to repeat with clearness, and without hesitation, the whole of the apostles' creed, a wonderful instance of memory and imitation. This species is very long-lived. Le Vaillant mentions one that he saw which had been domesticated ninety-three years: it was indeed then in a state of decrepitude, and both sight and memory were gone.

Wagler's genera, *Electus*, *Pionus*, and *Psittacodis*, vary in some points from *Psittacus*; the former, *Electus grandis* (Moluccas and New Guinea), approaches the Lories.

The Australian genus *Nestor*, of the same author, is pointed out as forming a connecting link between the *Parrots* and the *Cockatoos*, and is thus characterised:—

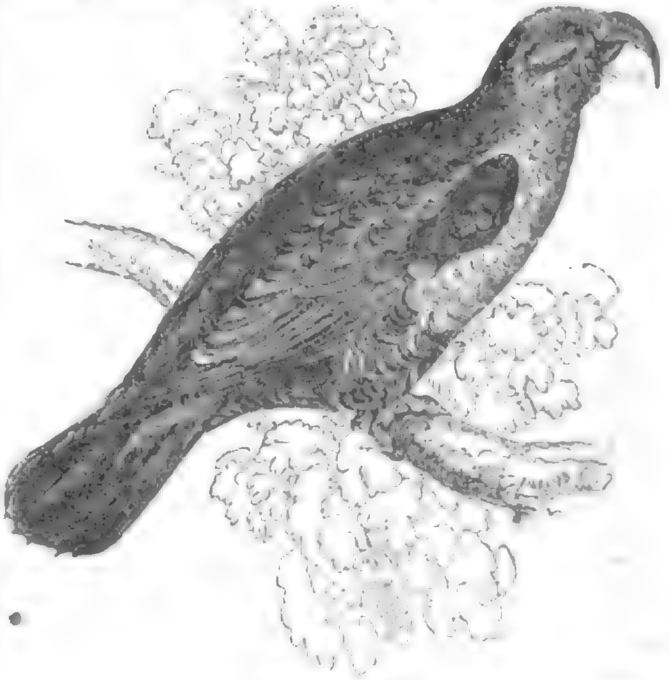
Bill elongated; upper mandible compressed, hooked; the tomia sinuated, but not distinctly toothed; the tip projecting, with its under surface sulcated and deeply excavated for the reception of the tip of the under mandible; under mandible narrow, compressed, slightly convex, or forming, when closed, an obtuse angle with the upper; wings rather long, ample; tail of moderate length, and even at the end; tips of the shafts bare, and slightly projecting beyond the feathered parts.

Example, *Nestor Productus* (*Long-billed Parrot*, Gould).

Description.—General colour of the upper surface brown; beak elongated; head and back of the neck tinged with grey; the feathers of these parts, as well as of the back, margined with a deeper tint; rump, belly, and under tail-coverts, deep red; cheeks, throat, and chest yellow, the former tinged with red; shoulders, on their inner surface, yellow tinged with rufous-olive; tail-feathers banded at the base with orange-yellow and brown, the inner webs of the quill-feathers at the base and beneath with dusky-red and brown; bill brown; feet blackish-brown. Total length fifteen inches. (Gould, *Birds of Australia.*)

Locality.—Norfolk Island and the most eastern portions of South Wales.

Habits, &c.—'Like all the other members of this extensive family,' says Mr. Gould, in his splendid work on the Birds of Australia, speaking of this species, 'it bears captivity remarkably well, readily becoming cheerful and contented; at least such is the case with an individual in the possession of Sir J. P. Millbank, Bart.; and, as might have been reasonably expected, the variation in the form of the mandibles, which renders these birds so conspicuous, is accompanied by a marked difference in the nature of their food, the powerful bills of the other members of the family enabling them to feed upon hard seeds and stony fruits, while, from the elongated form of this organ in the present birds, this power is denied to them, and we find that they give a decided preference to the leaves of succulent plants and the softer kinds of fruit. Sir J. P. Millbank informed me that the bird in his possession evinced a strong partiality to the leaves of the common lettuce and other soft vegetables, and that it was also very fond of the juice of fruits, of cream, and butter. Its voice was hoarse and inharmonious, frequently resembling the barking of a dog; and in Yates's "New Zealand" we are informed that the *Nestor hypopolius*, known there by the name of *Kaku*, is "capable of learning to imitate the human voice to a remarkable degree. . . . The cry of this bird, when ranging at large in the woods, is harsh and disagreeable in the extreme." Although I cannot assert it for a certainty, I have every reason to believe that both these birds frequently descend to the ground and grub up with their lengthened bills the bulbous and other roots which form a portion of their food, particularly as I have found earth still adhering to the mandibles of the specimens I have examined; besides which, I have been informed by Captain Sturt that a parrot inhabiting Australia, having a similar bill, but belonging to another group, is frequently in the habit of so doing.'



Nestor productus.

The genera *Psittacula* and *Agapornis* appear to be the most diminutive of this extensive and interesting tribe. The latter, a ready example of which occurs in the *Love-Birds*, so extensively petted, and remarkable for their sexual attachment, was separated from *Psittacula* by Sir W. Jardine and Mr. Selby.

The following cut will give some idea of the form of Psittacula (*Poicephalus* of Swainson).

The student should carefully consult the monograph of Kuhl, and that of Wagler*; and of illustrated works should direct his attention more particularly to *Le Vaillant's Perroquets*, with figures after the celebrated Barraband; Lear's *Parrots*; Swainson's *Zoological Illustrations*, 1st and 2nd series; and Selby's *Parrots*, containing many beautiful figures after Lear, though on a small scale, and forming the 6th volume of the *Ornithology* of the *Naturalists' Library*.

Those who keep birds belonging to this group would do well to study their natural habits, if they wish to keep them

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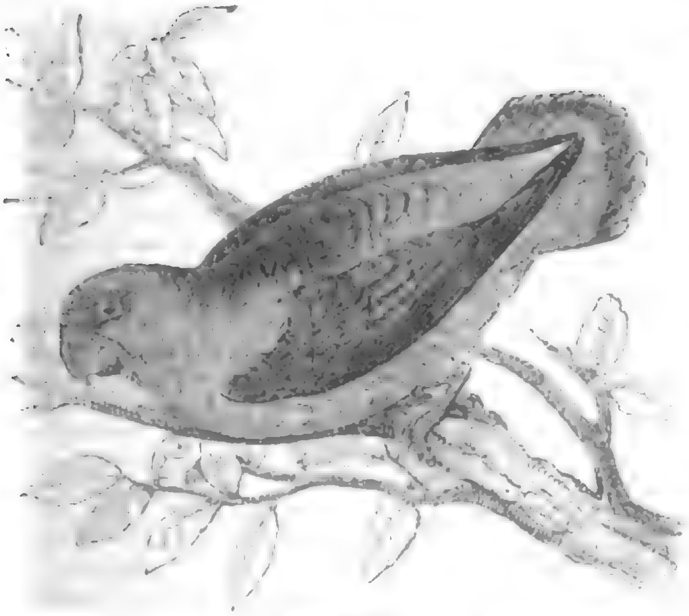
* 'Transactions of the Royal Academy of Munich.'



Psittacula Taranta.

in health. Some, as we have seen, live upon the nectar of flowers, others on soft fruits, and others again on hard fruits, for breaking which they are gifted with a powerful vice of a bill. We have known a case where the upper mandible of the bill of a parrot of this last description, which had been kept upon soft food, grew to such a length as to begin to penetrate its throat. To such a moderate proportion of hard food, such as almonds, and even harder food, should be presented. Some of the tribe have bred in captivity; and there is little doubt that if pairs were kept in good roomy cages, with a part of them so fitted up as to remind them of their favourite hollow trees, and furnished with dry rotten wood or vegetable earth, the instances would be comparatively frequent.

PSITTIROSTRA, M. Temminck's name for a genus of granivorous birds, which he places between the Crossbills (*Loxia*) and the Bullfinches (*Pyrrhula*).

Generic Character.—Bill short, very much hooked, a little convex at its base, upper mandible curved at the point over the lower one, which is very wide (evasée), rounded and obtuse at the point. *Nostrils* basal, lateral, half closed by a membrane covered with feathers. *Feet*, tarsi longer than the middle toe; all the toes divided, lateral, and equal. *Wings*, first quill null[*]; second rather shorter than the third. (Temminck.)

Example, *Psittirostra Psittacea* (*Loxia Psitticea*, Lath.; *Psittirostra icterocephala*, Temm.).

M. Temminck remarks that the above is the only species known to him, and that it is found in New Holland; but he adds that he possesses a portrait of a second species, which is green, with a grey beard.

Description of Psittirostra Psittacea.—Male.—Head and part of the neck yellow: body entirely green olive-brown, paler below; edge of the quills and tail-feathers yellowish; tail equal; legs pale brown.

Female.—Plumage nearly the same as that of the male, but without yellow on the head, which is green and yellowish-grey upon the temples.

M. Temminck observes that this genus has the bill formed nearly like that of the Parrots, and remarks that if its toes were disposed in pairs, and nothing were known of its habits, it might be classed with them.

Mr. Swainson places the form in his subfamily *Pyrrhulinæ*, family *Fringillidæ*, between *Spermophila* and *Corythus*.

PSKOW was formerly a part of the government of St. Petersburg, and afterwards of that of Novogorod, but it was erected into a separate government by the empress Catharine II. It is situated between 56° and 58° N. lat., and between 27° 20′ and 32° 5′ E. long. It is bounded on the north-west by lake Pskow, on the north by the government of St. Petersburg, on the north-east by Novogorod, on the east by Twer, on the south-east by Smolensk, on the south-west by Witepsk, and on the west by Livonia. The area, according to the survey of 1797, is 15,183 square miles, which M. Arunoff increases to 16,128 square miles, both which are undoubtedly below the truth; but Storch, who is followed by Hassel, Schubert, and lastly, in 1838, by Koppen, makes it 21,950 square miles, which Schmidtlin thinks is perhaps too much. The population, according to Koppen, is 705,300; but Hassel, in 1820, would make it 783,000; and Hörschelmann, in 1833, states it at 900,000. It must be observed that he makes the area only 16,800 square miles.

Face of the Country, Soil, Climate.—The surface is level, and in some places slightly undulating: there are no mountains, though the whole country is rather elevated. The soil is partly clayey, partly sandy, and in many parts covered with a tolerably thick layer of mould. The eminences and the banks of the rivers contain limestone and sandstone. Boulders of granite are not rare, and are most numerous where there is an extensive plain. The only large lake is Lake Pskow, which is, properly speaking, a bay of Lake Peipus, with which it is connected by a broad channel. The Polista, Podso, Khwat, and Woiskoe lakes are much smaller; there are also numerous meres and many marshes, principally in the south-east part of the government. There is no large river in the province. The Düna rises in it, but soon turns into Witepsk; the Loweth, which also rises in it, runs into Novogorod, is joined by the Polista and the Pola, and has below Velikie Luki several rocks and whirlpools, which are called cataracts Other rivers are the Welikaja, which runs to the north-east, and empties itself into Lake Pskow; the Szelon, which runs into Novogorod, and falls into Lake Ilmen; and the Toropez, which falls into the Düna. Most of these rivers, though not deep enough for large vessels, are however navigable by struses[*] and other barks, and therefore extremely useful to the government by giving it a communication with Petersburg, Narva, and Riga.

As the whole province is beyond the 56th parallel, the climate is cold.

Natural Productions.—Agriculture is the chief occupation of the inhabitants. The soil is in general tolerably fertile, but requires careful cultivation and manure; it produces however not only sufficient for the consumption of the inhabitants, but an annual surplus of about a million of chetwerts[†] for exportation. The grains chiefly cultivated are rye, barley, oats, and buckwheat; and of pulse, peas, beans, and lentils: very little wheat is grown. Culinary vegetables, such as cabbages, turnips, onions, garlic, and cucumbers, are cultivated. No fruit is to be seen, at least in the gardens of the peasants, who do not plant a cherry or an apple tree, but content themselves with the wild berries which grow in abundance in the woods and the marshes. On the estates of the nobility small orchards are here and there to be seen. Flax and hemp, both of excellent quality, are staple productions. The extensive forests furnish abundance of timber, chiefly pines, firs, birches, and alders: the oak, maple, and lime-tree are rare. The breeding of cattle is merely subservient to agriculture. The oxen are mostly of the Russian breed, and so are the horses, to which more attention is paid. Besides Russian sheep there are many of German breed. Swine are kept in great numbers, but only few goats and a little poultry. Birds and hares are scarce, and it is seldom that a stag or deer strays hither from the forests of Lithuania. But beasts of prey and fur-bearing animals abound, such as bears, wolves, lynxes, foxes, martens, squirrels, and badgers. Beavers and otters are nearly extinct. The lakes and rivers produce abundance of fish. The only mineral products are bog-iron, limestone, sandstone, and clay. There are salt-springs near the Szelon, but no use is made of them.

Manufactures and Trade.—The inhabitants excel in dressing skins and manufacturing leather; but, unlike the Russians in general, they have not a turn for mechanics, and do not willingly apply to any kind of handicraft. The countrywomen hardly spin wool and flax sufficient to manufacture linen, stockings, &c. for their own use. Some struses and barks are built, and there are many sawmills; the distilleries of brandy are few in number. There are three or four glass-furnaces. Some improvement has undoubtedly been made of late years, yet still, with the exception of Russian leather, the exportation of the government is confined to its own natural productions—rye, oats, barley, squared timber, masts, spars, planks, hemp, flax, hempseed and linseed, wool, hides, and a few other articles, which are sent to Pernau, St. Petersburg, and Narva, whence the inhabitants import colonial produce and other necessary articles.

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[*] Sic in orig.

[*] A very flat river boat, for the conveyance of timber, straw, &c. On the Wolga they are very large, have masts erected on them and have oars and a sail.

[†] The chetwert, according to Kelly (*Cambist*), is nearly 6 bushels (5·96)

Religion and Education.—The great majority of the inhabitants are Russians of the orthodox Greek religion. In the north-east part of the government there are a few Finns, in the western circles some Livonians, and near the chief town a colony of Esthonians, who, except that they retain their own dialect, are quite blended with the Russians, and have even embraced the Greek religion. There are also many Germans in the towns. The Greek church is under an archbishop, who has 450 churches, nine of which are cathedrals, and eight monks' and three nuns' convents in his diocese. In 1776 there were only 299 churches. Education is at an extremely low ebb in this government. According to Schmidtlin, in 1835, there were only 41 schools, with 47 masters, and 1248 scholars, besides seven schools belonging to the clergy, with 24 masters and 870 scholars; in all 2110 scholars—one to 300 of the population; and there was only one printing-office, which belonged to the crown. This statement however was given in 1832; and though we have no later detailed official statement, it is certain that considerable improvement has since been made.

The government is divided into eight circles, those of Pskow, Porkhow, Ostrow, Nowershew, Opotschka, Welikaja-Luki, Toropez, and Kholm.

Pskow, the capital of the government, is in 57° 40′ N. lat. and 28° 10′ E. long., on the left bank of the Welikaja, nearly five miles from its mouth in Lake Pskow. This town has acted a conspicuous part in the history of Russia. It is said to have been founded in the tenth century by the grand-duchess Olga. It appears to have been at first surrounded with a rampart of earth, and in the thirteenth century with a stone wall. At present the interior of the city has some resemblance to that of Moscow. In the centre of the town is the Kremlin, on the steep left bank of the river, which was erected by the brave Prince Dowmont, who reigned from 1266 to 1299, whose remains are deposited in the antient cathedral, where his sword is preserved, with the inscription, 'Honorem meum nemini dabo.' The middle town, extending in the form of a semicircle about the citadel, is also surrounded with a wall; a third very high and strong wall, five miles in extent, defends the great town, which envelopes the middle town. The fortifications, erected in 1701, by Peter the Great, have almost entirely disappeared. There is also a large suburb. Pskow must have been formerly a very populous city, if it is true that, in 1466, 48,000 inhabitants were carried off by the plague. It has sustained several memorable sieges, among others, in 1614, when it was attacked without success by Gustavus Adolphus, king of Sweden.

Pskow has sadly declined from its antient power and greatness, but is still a large town; it has one cathedral, richly adorned with gilding and carved-work, fifty-nine other Greek churches, in not more than half of which divine service is performed, a Lutheran church, three monasteries, an ecclesiastical seminary, a gymnasium, a district and other schools, an orphan asylum, and a handsome building for the government offices. It is the see of the Greek archbishop, and the residence of the military governor. The present population is 12,000, who manufacture Russia leather, linen, sail-cloth, and glass.

Toropetz, the chief town of the circle of the same name, has, according to Hassel, Hörschelmann, and others, a population of 12,000, but Schmidtlin says that it does not exceed 7500. It is an antient town, extremely well situated for carrying on an extensive trade, communicating with Riga by means of the river Toropa, on which it is situated, and which joins the Düna. There are thirteen churches and two convents in the town. Most of the houses are of wood.

The Germans call this government Pleskow or Pleskau, which is probably the right name, and the most antient that the town bore, for the historian Cedrenus calls it Pliscoba.

(Hassel; Stein; Hörschelmann; Schmidtlin, *La Russe et la Pologne*; and Russian official journals.)

PSO'PHIA. [Agami, in which article the scientific name of the bird is erroneously spelled *Trophia.*]

Mr. Swainson places the form in his family *Megapodinæ* (*Megapodiidæ*), between the *Dicholophus* and *Crax*. [Megapodiidæ.]

Mr. G. R. Gray arranges *Psophia* under his family *Ardeidæ*, in the subfamily *Psophinæ*, which consists of that genus and *Cariama* (*Dicholophus*, Ill.) only.

PSORA. [Itch.]

PSORA'LEA (so called from the Greek psoraleos (ψωραλέος), *warted*, on account of most of the species being covered with little tubercles), a genus of Papilionaceæ, of the natural family of Leguminosæ, characterised by the tube of the permanent calyx being sprinkled with callous points. Sepals five, united to the middle; stamens ten, usually diadelphous. Legume indehiscent, one-seeded, sometimes ending in a beak. Leaves of various forms. Flowers blue, white, or purple. The species, about sixty in number, and natives of different parts of the world, are either herbaceous plants or low shrubs, some of them ornamental, and all of easy culture. They may be propagated either by cuttings or seeds, which they produce abundantly. *P. esculenta*, the bread-root of North America, is cultivated along the banks of the Missouri and in other parts of that country. The roots, which abound in farinaceous matter, are, like the tubers of the potato, employed as food, especially during the winter months. In this climate it will grow in the open air, but requires the protection of a frame to produce abundant crops of roots. P. corylifolia is diffused over every part of India, especially in the vicinity of villages, during the rainy and cold seasons. It is employed as a stomachic and deobstruent. Other species are also used medicinally. P. glandulosa is called in Chili, coulen, culen, or cullen. Some of the native tribes make a very intoxicating kind of beer from a variety called yellow cullen.

PSORI'ASIS is a disease of the skin distinguished by slightly raised red patches of various extent and form, and generally covered with whitish scales. Several varieties of the disease have received different names, according to the form and severity of the eruption in each, and many others, according to the part chiefly or alone affected. The former varieties are Psoriasis guttata, P. diffusa, P. gyrata, and P. inveterata; among the latter are P. ophthalmica, P. palmaria, &c.

Psoriasis guttata is a mild form of the disease, consisting of small red patches two or three lines in diameter covered with very fine white scales. It occurs in various extent on all parts of the body, but most rarely on the face. At first small red spots appear, and soon after present white scales at their centres; then the spots gradually enlarge and the scales increase in number, till the redness begins to fade at the centre, and as the scales fall off, the skin slowly assumes its natural colour. The eruption is attended by a moderate itching, and by very slight symptoms of general disorder.

P. diffusa is in every respect a more severe form of the disease. The spots are large and irregular, and often confluent, and covered with thick scaly incrustations. It appears most frequently on the limbs and around the joints, often covering the whole of a limb with one scaly or raw-looking patch, and sometimes occurring at once and with equal severity on several parts of the body. The skin beneath the scales is very tender and irritable; it often cracks and discharges a thin ichor, which concretes about the fissures, and is attended by considerable pain and irritation, and some constitutional disturbance. The eruption often breaks out successively in different parts of the body, so that it is common for the disease to be protracted for several months and even for years.

P. inveterata is only (as its name implies) a yet less curable form of the same disease. The skin has its whole texture thickened and hard, its surface is covered by a furfuraceous deposit, and in the neighbourhood of the joints it is often very deeply and painfully cracked. The preceding forms are commonly met with in those who are otherwise in pretty good health; but this rarely occurs, except in those whose constitutions are enfeebled by long disease or want.

P. gyrata is a slight but very rare variety, distinguished by the patches occurring in stripes of a singularly tortuous or serpentine form.

Of the local varieties of Psoriasis, the most interesting is that which occurs on the palms of the hands, and which, being most frequent in those who work with light powders and other irritating substances, is commonly called bakers', or bricklayers', or washerwomen's itch.

Psoriasis, in all its forms, is difficult of cure. The general condition of the health being corrected by the means that in each case seem appropriate, the remedy which is most frequently successful in cases of long standing is arsenic, in the form of from three to five drops of the Fowler's solution, three times a day, for an adult. Active purging is also often useful, especially in recent cases and in young subjects. Another good remedy is tincture of cantharides, in doses of from three to five drops (for an adult) in water once or more in the day; but the effects of both this and the arsenic require to be carefully watched during their administration, and they must be discontinued as soon as they appear to produce any sickness or heat in the stomach. In addition to these, various other internal means have been recommended, and sometimes found useful, as decoctions of dulcamara, mezereon, and orchis, antimony, sulphur, &c. Indeed, in many cases it is found necessary to try one means after another without any rule, till one is found which produces benefit. External remedies are generally of less value than internal. The most approved are vapour and sulphur baths, and ointments or lotions containing very small quantities of nitrate of mercury, or white precipitate, or kreasote, or alkalis. These however can only be employed in the later stages of the disease: in the earlier, the mildest fomentations give relief, and all kinds of irritants must be carefully avoided.

PSYCHE (Ψυχή). Apuleius is the first writer who relates the loves of Cupid and Psyche (*Metamorph.*, lib. iv., v.). According to his account, Psyche was the most lovely creature that the world ever beheld. People flocked from all parts to see her, and neglected the worship of Venus, who became in consequence so incensed against her, that she commanded her son to inspire Psyche with love for some vile creature. Cupid however, instead of obeying the commands of his mother, became enamoured with Psyche, and made her his wife. She was however subsequently deserted by him for disobeying certain injunctions which he had given her. Inconsolable at her loss, she wandered through the world in search of him, and after enduring many trials and sorrows, was at length united to him. Jupiter conferred upon her immortality, and her union with Cupid took place with the approbation of Venus and the other deities. A child was soon afterwards born to them, who was called Pleasure.

Many writers consider the above tale an allegory, representing the union between the divine love and the human soul. The word Psyche signifies in Greek both 'soul' and a 'butterfly.' We frequently find in antient works of art Cupid pressing Psyche to his bosom in the form of a butterfly. It is thought by some modern writers that Psyche, or the soul, was personified in the form of a butterfly in the earlier representations of the allegory. When Psyche is represented with a human form, the wings of the butterfly are usually placed on her shoulders.

Though Apuleius is the first writer who mentions the loves of Cupid and Psyche, it is supposed the tale must have been current before his time, as there are many works of art representing this subject, which appear to have been executed before the second century of the Christian æra, which was the time in which Apuleius lived. (*Brit. Museum, Townley Gallery*, vol. i. pp. 147-148, Lond. 1836.)

PSYCHO'TRIA, a name variously derived, which is applied to a rather large tropical genus of the division of the great family of Rubiaceæ which is called Cinchonaceæ. It is characterised by having a calyx 5-parted, somewhat entire; corolla regular, funnel-shaped, five (rarely four) cleft; stamens five, rarely four, exserted or included within the throat of the corolla. Stigma bifid. Berry drupaceous, crowned with the limb of the calyx, usually marked with ten ribs, and containing two nuts. Nuts ribbed; single seeded. Trees or shrubs; rarely herbaceous plants. Some of the species are ornamental in foliage, and one, *P. parasitica*, as its name indicates, is found growing on trees in the West India Islands.

Several of the species are supposed to possess considerable medicinal properties. *P. emetica* is a small under-shrub, a native of New Granada on the banks of the Magdalena, and probably of other parts of South America; the *Cephælis emetica* of some other authors. The stem is erect, simple, hairy, and tomentose; leaves oblong, acuminate, narrow at the base, membranous, ciliate, rather hairy on the under surface; stipules very short, ovate, acuminate; peduncles few-flowered, axillary, sub-racemose. This species has long been celebrated as yielding the black or Peruvian or striated ipecacuanha, which, analysed by Pelletier, gave of emetine 6, fatty matter 2, and of starch and ligneous matter, the latter bearing but a small proportion, 92. P. herbacea is an Indian species used for the same purposes. The roots of *P. sulphurea* and of *P. tinctoria* are employed in dyeing.

PSYCHRISTUS, JACO'BUS (Ἰάκωβος Ψύχριστος), a celebrated physician of the fifth century. 'He was very eminent,' says Freind (*Hist. of Physic*), 'for his great insight into philosophy and physic, which he learned from his father Hesychius (who was also a physician), and who had travelled into a great many countries in the pursuit of knowledge. He was made count and archiater to Leo the Great, or the Thracian (who reigned from A.D. 457 to 474), and was so much beloved by this emperor and the people, that the senate set up a statue for him in the baths of Zeuxippus, built by Severus. (Malelas, *In Vitâ Leonis.*) Isidore of Gaza, called by others the Pelusiote, who flourished in the time of Justinian, saw another erected to him at Athens. (Photius, § 559.) And this author gives a further account of him, that he was an Alexandrian, though his family was originally derived from Damascus; that he had great experience in physic, and did many wonderful cures; that in his practice he frequently ordered clysters and suppositories; that in surgery he seldom made use of fire or the knife, and was no friend to bleeding. He was preferred to all the modern physicians by his scholar Asclepiodotus, who grew famous for reviving the use of white hellebore, which in that time had grown quite out of vogue, and was not so much as known to Jacobus himself. Suidas is still larger in his praise of this Jacobus, and says he attained to a perfect knowledge in physic, both in theory and practice: that he excelled all his contemporaries, that he might be compared to the antients, and was superior to many of them: that he was beloved and adored by his patients, who thought him inspired by heaven; that they had an implicit faith in him, because they never found his prognostic fail. Such an eagerness had he for improving his own art, that they thought the soul of Æsculapius was transfused into him. Kuster tells us he has retrieved his true name Ψύχριστος out of Malelas, whereas in the former editions of Suidas it was printed Ψυχόχριστος; however, in the translation of Aëtius (*Tetrab.*, iii., Serm. 4, cap. 43, col. 608), we read Psychristus. But I have reason to believe that both these readings are wrong; and if we consult Alexander Trallianus, we shall plainly discover that it ought to be read Ψυχόχρηστος or Ψυχρόχρηστος (for it may be either), as Φιλόχρηστος for he says in express terms that this name was applied to him, ὅτι ὑγραινούσῃ τροφῇ ἐκέχρητο (lib. v., cap. 4, p. 249, ed. Basil). Alexander gives him the epithet of θεοφιλέστατος, and Suidas, after him, calls him θεοφιλής: and therefore there must be an error in the text of Photius, where he and his father it is said ἀσεβεῖς ᾔσθην: and whoever attends to what follows in Photius, will perceive it ought to be read εὐσεβεῖς.' To this account by Freind, it should be added that (apparently to increase his influence over his patients) he pretended to be able to divine their thoughts as well as to distinguish their diseases. Some of his medical preparations are preserved by Alexander Trallianus (pp. 645, 649), but he does not appear to have left any works behind him. (See also Kühn, *Additam. ad Elench. Medicor. Veterum à J. A. Fabricio in Bibl. Gr. Exhibitum*, 4to., Lips., 1838, Fascic. xvii.)

PSYLLA (Geoffroy), a genus of insects belonging to the family *Aphidæ*, which, according to Latreille, forms the second family of the Homopterous *Hemiptera*.

The Psyllæ are minute insects, allied to those commonly called plant-lice, and live upon trees and plants, from which they derive their nutriment by suction, and in so doing they often produce excrescences somewhat resembling gall-nuts, particularly on their leaves and buds. They have two joints to the tarsi; the antennæ are composed of ten or eleven joints, the last of which have two bristles; both sexes have wings, and they possess the faculty of leaping. Their larvæ usually have a very flat body, broad head, and the abdomen rounded behind: the legs are terminated by a little membranous vesicle accompanied beneath with two hooks. Four wide and flat pieces, which are the sheaths of the wings, distinguish the pupa state; several of the species in this stage, as well as in the larva state, are covered with a white substance resembling cotton. The species are very numerous, and are often named after the plants which they infest. Mr. Stephens records twenty-six species as natives of this country.

PSY'LLIUM, a name of a plant which occurs in Dioscorides, &c., supposed to be so named from Psyllus (ψύλλος), a flea, from the resemblance of the seeds to that insect. The plant, Plantago Psyllium of botanists, is common in the south of France; its seeds are small, oblong and flattish, smooth, slippery, and shining, abounding in mucilaginous matter; whence their decoction is employed as a demulcent, and for many of the same purposes as linseed tea is in this country. They are also employed by the manufacturers of muslins, and hence form an article of commerce in the south of France. It is remarkable, according to Dr. Royle, that in the Eastern countries, where translations of Dioscorides continue to be employed for the description of medicinal plants and drugs, the seeds of another species of Plantago, the *P. Ispaghula* of Roxburgh (from the Persian Ispagool), should be employed for and considered identical with the *fuslioon*, that is, the psyllium of the Greeks.

PTARMIGAN. [Tetraonidæ.]

PTEROCARPUS (from *πτερὸν*, *a wing*, and *καρπός*, *fruit*, from its pod being winged), a genus of the natural order of Leguminosæ, containing many plants valuable for the nature of their products, and all of which are found indigenous in the tropical parts both of the Old and New World. The calyx is 5-cleft, corolla papilionaceous, stamens 10, ovary long-stalked. Legume indehiscent, irregular, somewhat orbicular, surrounded with a wing, often rugose, and 1-seeded. The species are about 20 in number, forming trees or shrubs. Leaves unequally pinnate, with the inflorescence in axillary racemes or forming terminal panicles. Many of the species, as P. dalbergioides, Marsupium, Indicum, and Santalinum, afford excellent timber; some, as the bark of P. flavus, are employed in dyeing; and others are thought to possess medicinal properties.

P. dalbergioides is a native of the Andaman Islands, where it grows to an immense size, and forms a valuable timber-tree, of which the wood is known as Andaman red wood, from its resemblance to mahogany; but it is redder, heavier, and coarser grained, though that of the root is finer than that of the stem. It was introduced by Col. Kyd into the Calcutta botanic garden in 1794, whence it has been spread into the country. *P. Santalinus*, or three-leaved Pterocarpus, is a native of India, which yields the Red Sandal or Red Saunder's wood of commerce, a substance long known for its employment in medicine, being described in the works of the Arabs under the name of *sundroos*. The tree is distinguished by having the three leaflets roundish, retuse, and glabrous. Racemes axillary, simple, or branched. Stamens triadelphus (5, 4, and 1). The wood from the centre of the tree is imported in large billets, which, when fresh, are of a brilliant red colour, but which gradually deepens by exposure to air, so that the outside becomes blackish-coloured. It is insipid, inodorous, and takes a fine polish, and may be distinguished from Brazil wood by the latter yielding its colour to water alone, whilst the red-sandal wood barely tinges it.

Many of these trees exude a reddish-coloured juice which hardens into a kind of astringent gum. The name of dragon's blood has been applied to that from *P. Draco*, a native of South America and the West India islands, as well as to the similar product of several other trees, while that of *P. erinaceus* has long been considered to be the real Kino of the west coast of Africa.

This substance seems to have been first mentioned by Moon, in his travels into the interior of Africa, as quoted by Murray, 'App. Med.,' vi., p. 202, as a red gum issuing from incisions in trees, which he mistook for dragon's blood. Dr. Fothergill introduced this into British practice in 1757, having been first indebted to Dr. Oldfield for information respecting its virtues. The red astringent gum, or Kino, as it was called, was said to have been procured out of a ship from the coast of Africa. Mungo Park discovered a tree, which he found called *pao de sangue* by the Portuguese, on the coast of Senegal, and which was afterwards ascertained to be P. erinaceus of Lamarck. Substitutes were early introduced for this substance, so that doubts may be entertained respecting what was originally employed, as the name Kino is so similar to the Sanscrit and Hindu names, *Kinsuka* and *Kuenee*, of the gum of Butea frondosa, which is, no doubt, one of the earliest substitutes for this substance. [Kino.]

P. Marsupium is another species, a native of the Circar Mountains of India, and grows to a large tree. It also exudes a red juice which hardens into a strong simply astringent gum of a dark red colour, so much resembling that of the Butea frondosa, that, according to Dr. Roxburgh, the same analysis might answer for both. [Kino.]

PTERO'CERAS. [Strombidæ.]

PTE'ROCLES. [Tetraonidæ.]

PTERODACTYLE (*Pterodactylus* of Cuvier; *Ornithocephalus* of Sömmering), a genus of fossil *Saurians*, whose type is entirely extinct

To Collini, the director of the elector-palatine at Mannheim. we are indebted for the first introduction of this Heteroclite. He described the skeleton of the long-billed species from a specimen, found at Aichstädt near Solenhofen, in that Museum, and figured it in the 'Memoirs of the Palatine Academy' (Part. Phys., v. 58, et seq.).

Collini had well made out the head, the neck, the retrograde direction of the trunk, the small tail, the left leg, and the two arms; but beyond this he seems to have been at a loss. He came to the conclusion that the animal was neither a bird nor a bat; inquired whether it might not be some amphibian; and finished by expressing his opinion that the type must be sought among the marine *vertebrata*.

Blumenbach took a widely different view of the subject, and referred this extraordinary form to the Palmipede or web-footed birds.

Professor Hermann of Strasburg, who drew upon his imagination for a restoration of the animal, and clothed it in a hairy skin, considered it to be a mammal, and assigned to it a situation between the mammiferous class and birds, still more intermediate than that occupied by the bats.

Sömmering also arranged the form among the mammals in the neighbourhood of the bats, not without an elaborate detail of the reasons which had conducted him to that conclusion.

It was reserved for the penetrating eye and acute but patient investigation of Cuvier effectually to destroy these theories, supported though they were by weighty authorities: the satisfactory reasoning by which he disposes of them one after the other, and proves conclusively from the organization of the animal that it was a Saurian (in which opinion he was supported by Oken) will be found at large in the fifth volume of the last edition of his *Ossémens Fossiles*. Our limits will not permit us to detail the links of the harmonious chain of his proofs; and we must here content ourselves with observing that the form of the *os quadratum* appears to have been the principal key by which the great French naturalist solved this intricate zoological puzzle, and detected its Saurian character. 'Behold,' says he, after having built, as it were, the animal before our eyes, 'an animal which, in its osteology, from its teeth to the end of its claws, offers all the characters of the Saurians; nor can we doubt that those characters existed in its integuments and soft parts—in its scales, its circulation, its generative organs. But it was at the same time an animal provided with the means of flight,—which, when stationary, could not have made much use of its anterior extremities, even if it did not keep them always folded as birds keep their wings,—which nevertheless might use its small anterior fingers to suspend itself from the branches of trees, but when at rest must have been ordinarily on its hind feet, like the birds again; and, also like them, must have carried its neck sub-erect and curved backwards, so that its enormous head should not interrupt its equilibrium.'

Well may Cuvier remark, that of all the beings whose antient existence is revealed to us in his great work above alluded to, these Pterodactyles are the most extraordinary; and that if we could see them alive, they would be the most at variance with living forms. Their flight was not performed by means of ribs as in the dragons [Dragon]; nor by means of a wing without distinct fingers, like that of a bird; nor by a wing leaving the thumb alone at liberty, as in the bats; but by a wing sustained principally on one very elongated finger, whilst the rest preserved their ordinary brevity and their claws. At the same time these flying reptiles—a denomination almost contradictory—have a long neck, the bill of a bird, everything in short that could conduce to give them a strange aspect. (*Oss. Foss.*)

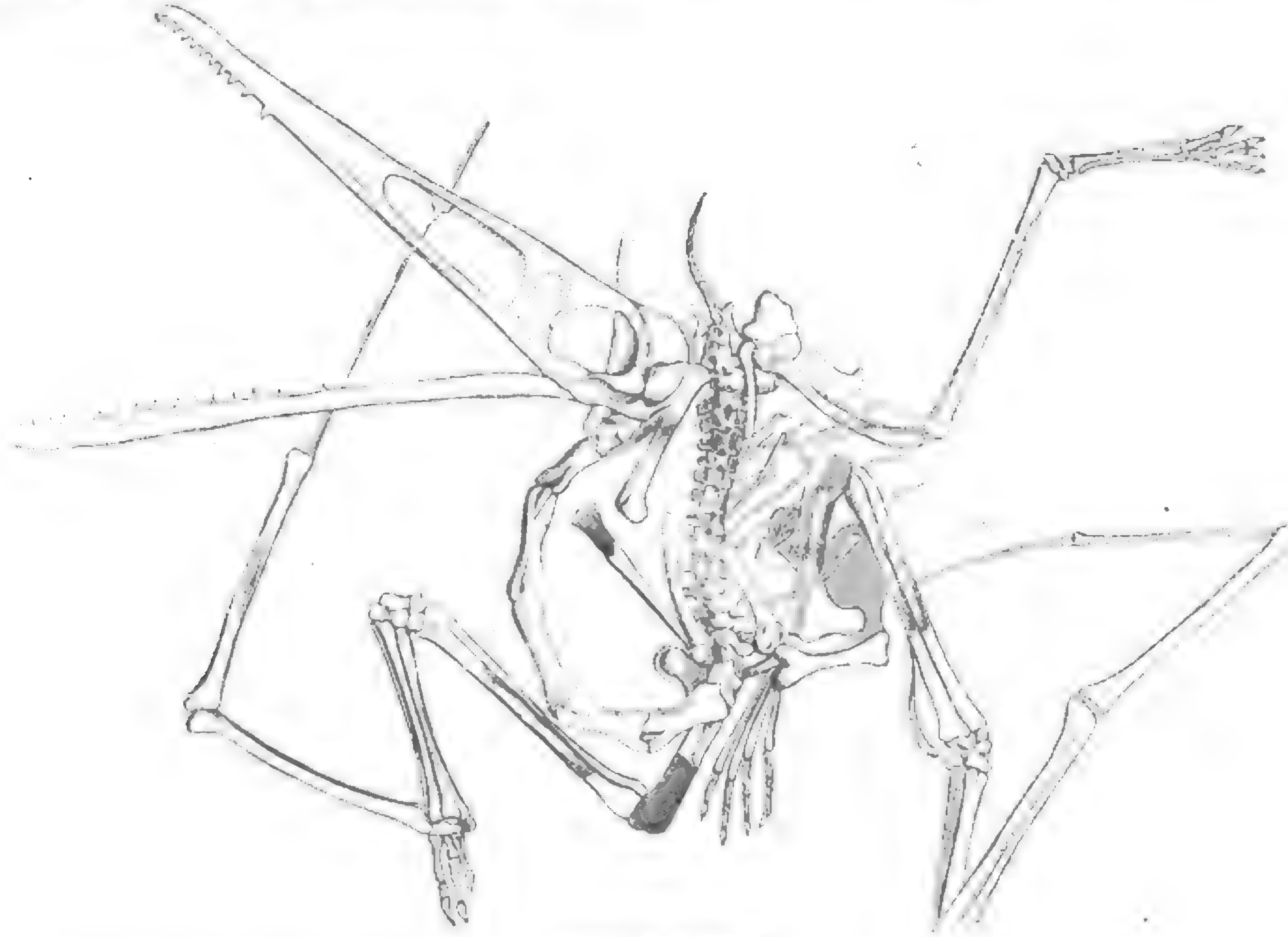
Dr. Buckland (*Bridgewater Treatise*) ranks these flying reptiles among the most remarkable disclosures made by geology, and considers them as presenting more singular combinations of form than we find in any other creatures yet discovered amid the ruins of the antient earth. He calls attention to the extraordinary discordance of opinion respecting a creature whose skeleton was almost entire, and observes that this discordance arose from the presence of characters apparently belonging to each of the three classes to which it was referred; the form of its head and length of the neck resembling that of birds, its wings approaching to the proportion and form of those of bats, and the body and tail approximating to that of ordinary mammalia. These characters, connected with a small skull, as is usual among reptiles, and a beak furnished with not less than sixty pointed teeth, presented, he remarks, a combination of apparent anomolies, which the genius of Cuvier reconciled. 'In his hands,' says the Professor, in continuation, 'this apparently monstrous production of the antient world has been converted into one of the most beautiful examples yet afforded by comparative anatomy, of the harmony that pervades all nature in the adaptation of the same parts of the animal frame to infinitely varied conditions of existence. In the case of the Pterodactyle, we have an extinct genus of the order Saurians, in the class of Reptiles (a class that now moves only on land or in the water), adapted by a peculiarity of structure to fly in the air. It will be interesting to see how the anterior extremity, which in the fore-leg of the modern lizard and crocodiles is an organ of locomotion on land, became converted into a membraniferous wing; and how far the other parts of the body are modified so as to fit the entire animal-machine for the functions of flight. The details of this inquiry will afford striking examples of numerical agreement, in the component bones of every limb, with those in the corresponding limbs of living lizards, and are at the same time illustrative of contrivances for the adjustment of the same organ to effect different ends.'

Dr. Buckland observes that we are already acquainted with eight species, varying from the size of a snipe to that of a cormorant.

Hermann von Meyer enumerates the following named species:—

1. *Pterodactylus longirostris*, Cuv. (*Ornithocephalus longirostris*, Sömm.; *Pterodactylus crocodilocephaloïdes*, Ritgen).

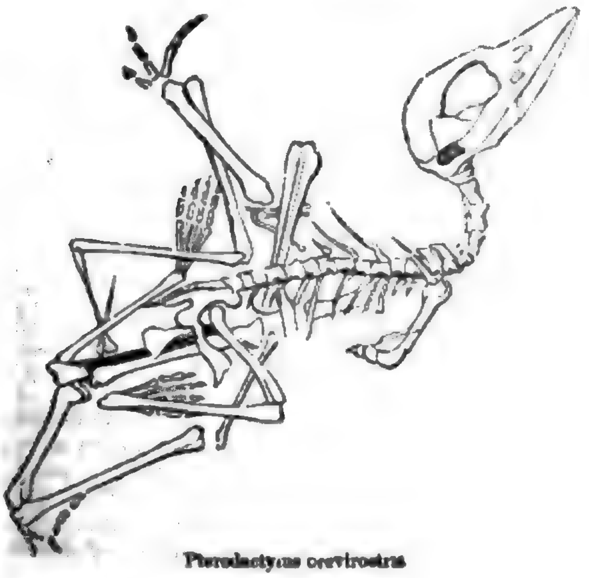
Locality, Solenhofen. (About the size of a woodcock.)



Pterodactylus longirostris.

2. *Pterodactylus brevirostris*, Cuv. (*Ornithocephalus brevirostris*, Sömm.; *Pterodactylus nettecephaloïdes*, Ritgen).

Locality, Solenhofen.



Pterodactylus brevirostris

3. *Pterodactylus crassirostris*, Goldf.

Locality, Solenhofen.

4. *Pterodactylus medius*, Münster.

Locality, Solenhofen.

5. *Pterodactylus Münsteri*, Goldf.

Locality, Solenhofen.

6. *Pterodactylus Macronyx*, Buckland (*Ornithocephalus Banthensis*, Theodori).

Localities, Lyme Regis, Buckl.; *Banz* (Germany), H. von Meyer. (Size about that of a raven; wings, when expanded, about four feet from tip to tip.)

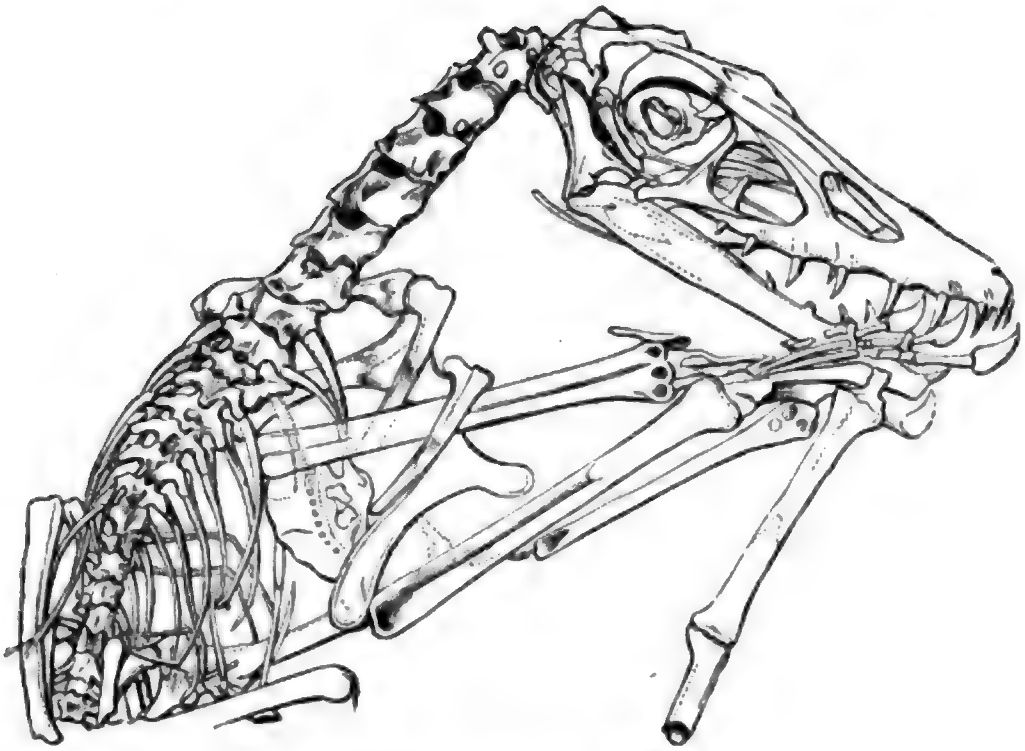
7. *Pterodactylus grandis*, Cuv. (*Ornithocephalus giganteus*, Sömm.).

Locality, Solenhofen? (About four times as large as *Pt. longirostris*.)

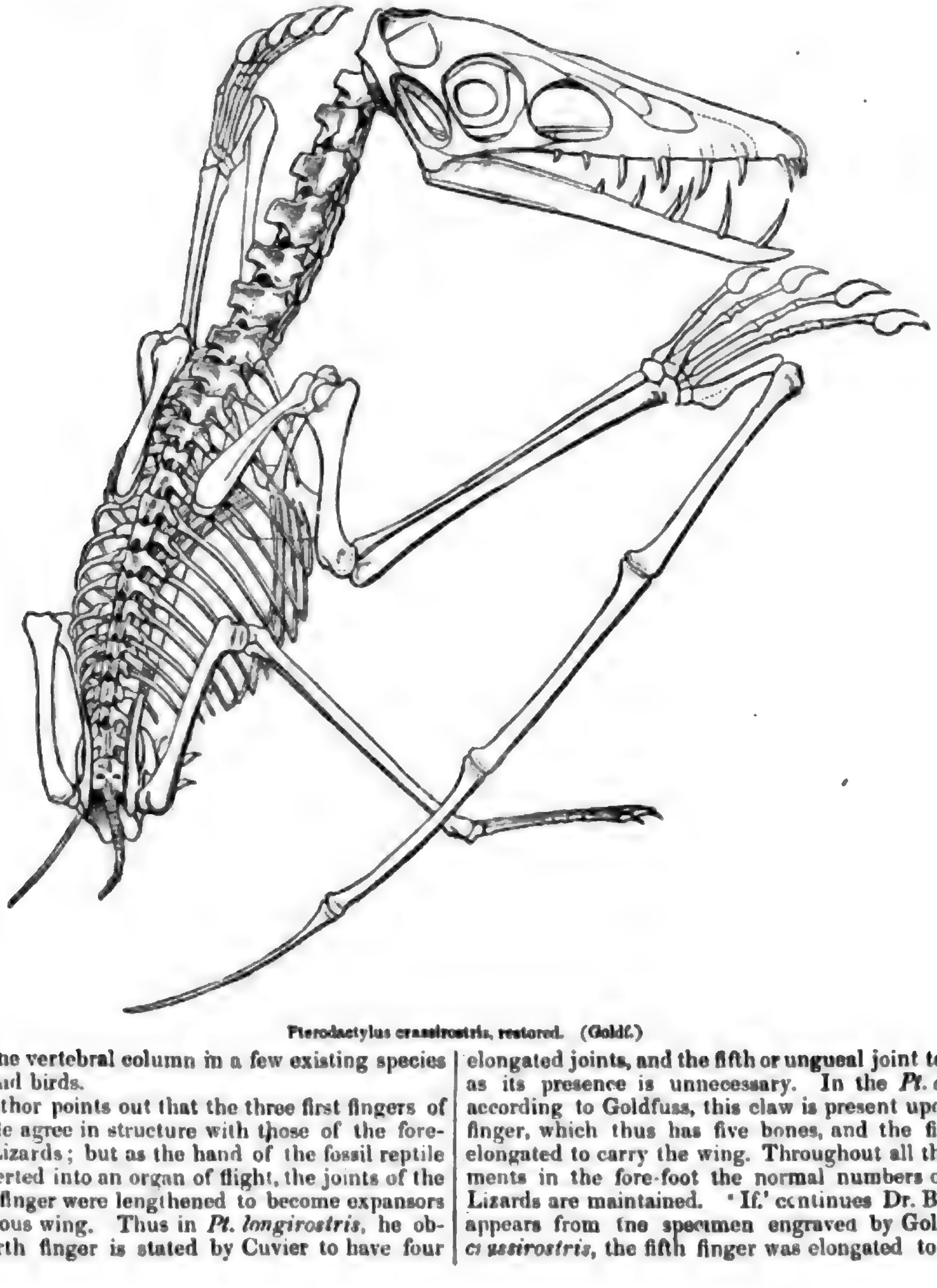
8. *Pterodactylus Bucklandi*, Goldf.

Locality, Stonesfield.

Dr. Buckland remarks that in *Pterodactylus Macronyx* (lias at Lyme Regis) there is an unusual provision for giving support and movement to a large head at the extremity of a long neck, by the occurrence of bony tendons running parallel to the cervical vertebræ, like the tendons that pass along the back of the Pigmy Musk (*Moschus pigmæus*) and of many birds. This provision, he observes, does not occur in any modern Lizards, whose necks are short, and require no such aid to support the head. In the compensation which these tendons afforded for the weakness arising from the elongation of the neck, Dr. Buckland sees an example of the same mechanism in an extinct order of the most antient reptiles, which is still applied to strengthen



[Pterodactylus crassirostris. (Goldf.)



Pterodactylus crassirostris, restored. (Goldf.)

other parts of the vertebral column in a few existing species of *Mammalia* and birds.

The same author points out that the three first fingers of the Pterodactyle agree in structure with those of the fore-foot of living Lizards; but as the hand of the fossil reptile was to be converted into an organ of flight, the joints of the fourth or fifth finger were lengthened to become expansors of a membranous wing. Thus in *Pt. longirostris*, he observes, the fourth finger is stated by Cuvier to have four elongated joints, and the fifth or ungueal joint to be omitted, as its presence is unnecessary. In the *Pt. crassirostris* according to Goldfuss, this claw is present upon the fourth finger, which thus has five bones, and the fifth finger is elongated to carry the wing. Throughout all these arrangements in the fore-foot the normal numbers of the type of Lizards are maintained. 'If,' continues Dr. Buckland, 'as appears from the specimen engraved by Goldfuss, of *Pt. crassirostris*, the fifth finger was elongated to expand the wing, we should infer, from the normal number of joints in the fifth finger of Lizards being only three, that this wing-finger had but three joints. In the fossil itself the two first joints only are preserved, so that his conjectural addition of a fourth joint to the fifth finger in the restored figure, seems inconsistent with the analogies that pervade the structure of this and of every other species of Pterodactyle, as described by Cuvier. According to Goldfuss, this species had one more toe than Cuvier assigns to the other species; in this respect it is so far from violating the analogies we are considering, that it adds another approximation to the character of the living Lizards.' After referring to the difference manifested in *Pt. crassirostris* from the other Pterodactyles, in having the fifth instead of the fourth finger elongated, as above noticed, for the purpose of expanding the wing, Dr. Buckland states that it is however probable that the fifth toe had only three joints, for the same reasons that are assigned respecting the number of joints in the fifth finger; and he observes that in *Pt. longirostris*, Cuvier considers the small bone in the foot to be a rudimentary form of a fifth toe.

Geological Position.—Lithographic limestone of the Jura formation at Aichstädt and Solenhofen, which abounds with remains of fish, and of brachyurous and macrurous crustaceans, and where *Xiphosuri* (*Limulus*) not unfrequently occur. The fish examined by Cuvier belonged, partially at least, to marine genera. He distinguished, for example, a well characterised species of anchovy, probably *Clupea sprattiformis*, Bl. *Libellulæ* and other insects have also been found in this Solenhofen slate. The other localities are Lyme Regis (lias), Bantz, and Stonesfield (oolite).

Habits, Food, &c.—Cuvier, speaking of the Solenhofen district, observes that there is no doubt that at the time of the deposit of the lithographic slate, there lived in that canton crocodiles, *Limuli*, and other beings whose geographical distribution is now confined to the torrid zone,[*] together with these flying Saurians, which flitted about by means of the membrane sustained by a single finger, suspended themselves and perhaps crept by the aid of the other three fingers, stood upon their hind legs only, and had their enormous gape armed with small pointed teeth, fit only for seizing insects and small animals.

Dr. Buckland thinks it probable that the Pterodactyle had the power of swimming so common in reptiles, and now possessed by the Vampire Bat[†] of the island of Bonin. (*Bridgewater Treatise.*) 'Thus,' says the Professor, 'like Milton's fiend, all qualified for all services and all elements, the creature was a fit companion for the kindred reptiles that swarmed in the seas or crawled on the shores of a turbulent planet:

> "The Fiend
> O'er bog, or steep, through strait, rough, dense, or rare,
> With head, hands, wings, or feet, pursues his way,
> And swims, or sinks, or wades, or creeps, or flies."

With flocks of such-like creatures flying in the air, and shoals of no less monstrous Ichthyosauri and Plesiosauri swarming in the ocean, and gigantic crocodiles and tortoises crawling on the shores of the primeval lakes and rivers, air, sea, and land must have been strangely tenanted in these early periods of our infant world.' (*Geol. Trans.*, *N. S.*, iii., part 1.)

In the 'Bridgewater Treatise' we find the size and form of the foot, and also of the leg and thigh, adduced as showing that the Pterodactyles had the power of standing firmly on the ground, where, with their wings folded, they possibly moved after the manner of birds; and an opinion that they could also perch on trees, and climb on rocks and cliffs, with their hind and fore feet conjointly, like Bats and Lizards.

Cuvier, as we have seen, conjectured that the food of these flying Saurians consisted of insects and other small animals, and he thought that, from the magnitude of their eyes, they may have been also noctivagous. Dr. Buckland refers to the presence of large fossil *Libellulæ*, or Dragonflies, together with many other insects in the same quarries with the Solenhofen Pterodactyles, and to the occurrence of the wings of coleopterous insects, mingled with the bones of those Saurians in the oolitic slate at Stonesfield, as proof that large insects existed at the same time with them, and that they may have contributed to their supply of food. He adds however that the head and teeth of two species of Pterodactyle are so much greater and stronger than is necessary for the capture of insects, that the larger species of them may possibly have fed on fishes, darting upon the latter from the air, after the manner of Sea-Swallows, or Terns, and Solan Geese. The enormous size and strength of *Pt. crassirostris*, he observes, would not only have enabled it to catch fish, but also to kill and devour the few small marsupial mammalia which then existed upon the land.

PTERODI'CTYUM. [POLYPIARIA.]

PTEROGLOSSUS. [RAMPHASTIDÆ.]

PTEROLO'BIUM, a small genus of plants of the natural family of Leguminosæ, so named from its pod ending in a membranous wing. The genus was first mentioned by Mr. Brown, in the appendix to Salt's 'Travels in Abyssinia,' and from a species, the Kantuffa, which is also named by Bruce, and described by him as being ordered to be cut away from the roads when the king was going to travel. The genus is found in India as well as in Africa, and even the species Kantuffa occurs there, as it is the Cæsalpinia lacerans of Roxburgh, but referred to Mimosa by De Candolle, and called *M. Kantuffa*; having been ascertained to be identical with the Indian plant, and belonging to this genus, it has been called Pterolobium lacerans. The genus contains only a few species of trees and climbing shrubs covered with strong sharp hooked prickles.

PTE'ROMYS. [SCIURIDÆ.]

PTEROPLEURA. [GECKO, vol. xi., p. 105.]

PTERO'PODA, Cuvier's tenth class of Mollusks, *Aporobranchianta* of M. De Blainville, who divides the order into the *Thecosomes* and *Gymnosomes*.

Cuvier defines his *Pteropoda* to be mollusks which swim like the cephalopods in the sea, but are unable to fix themselves, or creep there, from the want of feet. Their organs of motion consist only of fins, placed like wings at the two sides of the mouth, and they are stated to be all hermaphrodites.

The following genera compose Cuvier's *Pteropoda*:—

1. *Clio*. [CLIO.] 2. *Cymbulia*. [HYALÆIDÆ, xii., p. 371.] 3. *Pneumodermon*. [CLIO, vol. vii., p. 266.] 4. *Limacina*. [HYALÆIDÆ, vol. xii., p. 372.] 5. *Hyalæa*. [HYALÆIDÆ, vol. xii., p. 372.] 6. *Cleodora*. [HYALÆIDÆ, vol. xii., p. 373.] and 7. *Pyrgo*, described as a very small fossil shell, discovered by Defrance, globular, very delicate, and divided by a very narrow transversal slit. [THECOSOMATA.]

PTERO'PTOCHUS. [MERULIDÆ, vol. xv., p. 123.]

PTE'ROPUS. [CHEIROPTERA, vol. vii., p. 26.]

PTEROSOMA'TIDÆ. [NUDIBRANCHIATA, vol. xvi., p 360.]

PTEROSPERMUM (from the Greek word πτερόν, signifying a wing, and σπέρμα, a seed), a small genus of plants of the natural family of Byttneriaceæ, which is found in the Indian isles and the southern parts of India. The flowers being large and the foliage showy, have induced the cultivation of the species as ornamental trees all over India. The calyx is leathery, five-partite, tomentose outside, hairy within. Petals five, shorter than the calyx. Stamens twenty (five sterile), united at the base into a column with the stalk of the ovary. Style slender, club-shaped. Seeds winged. The genus is small, but all the species form handsome trees, and, like most of the plants of the nearly allied order of Malvaceæ, abound in mucilage.

PTEROTRA'CHEA. [GASTEROPODA, vol. xi., p. 92; NUCLEOBRANCHIATA; ATLANTA; CARINARIA.]

PTERU'THIUS. [LEIOTRICHANÆ.]

PTILOCHLO'RIS. [VIREONINÆ.]

PTILO'GONYS. [SHRIKES.]

PTILOLEPTUS. [INDICATORINÆ, vol. xii., p. 459.]

PTI'LONOPUS. [COLUMBIDÆ, vol. vii., p. 368.]

PTILONORHY'NCHUS. [STURNIDÆ.]

PTILO'PACHUS, Mr. Swainson's name for a subgenus of rasorial birds placed by him under the genus *Perdix* in the family *Tetraonidæ*.

Generic Character.—*Bill* small, slender. *Nostrils* naked, very large, occupying one half of the length of the bill. *Wings* rounded. *Tail* broad, rounded, larger and longer than in *Perdix*; the feathers very soft. Feathers of the back and rump with the shafts thickened and apparently spinous, as in *Ceblepyris*. *Tarsus* shorter than the middle toe. Lateral toes nearly equal, claws considerably compressed. (Sw.)

Geographical Distribution of the Genus.—Africa and India. (Sw.)

Example, *Ptilopachus erythrorhynchus*.

Description.—Size intermediate between the quail and the partridge. Ground-colour of the whole plumage earth-brown, just as dark on the body as on the back; this colour is varied by dusky white spots in the following manner:—the feathers upon the neck, throat, breast, interscapulars, and sides of the body have a row of white stripes down the middle of each web, bordering a stripe of rufous which occupies the middle of each feather; these spots (which are most distinct and defined on the interscapulars and sides of the body) are bordered above by a line of obscure black; the spots become indistinct and run into each other on the breast so as to form stripes. The chin and part of the throat is dirty white, each feather being nearly black in the middle. On the fore part of the body, immediately beneath the breast, is a large patch of pale fulvous or buff-yellow. All the rest of the plumage is dark brown, without any other variation than very minute and scarcely perceptible freckles of a paler colour; the quill and tail feathers are without any bands or spots, but there are a few white dots on the wing-covers, and obsolete undulations on the flanks; bill, orbits, and legs light, probably red in the live bird; tail very broad and rounded. Total length about ten inches. (Sw., *Birds of West Africa*, in 'Nat. Lib.') [PERDICIDÆ, vol. xvii., p. 443.]

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[*] A fine species of *Limulus* has been taken near Boston, in North America.

[†] Bonin Roussette (*Pteropus*).

PTILO'PHYRUS, Mr. Swainson's name for the genus *Lophyrus* [COLUMBIDÆ, vol. vii., p. 370], a change which he proposes because *Lophyrus* was preoccupied to designate a genus of insects.

PTI'LORIS, Mr. Swainson's name for a genus of birds which he arranges under the *Paradisiadæ*, or *Birds of Paradise*.

Generic Character.—Bill greatly curved. *Nostrils* basal, plumed; the aperture linear. *Wings* rounded. Tail short, even. *Tarsi* short. *Toes* as in *Meliphaga;* hallux very strong, equal to the tarsus and to the middle toe. Soles flat and broad. (Sw.)

Example, *Ptiloris Paradiseus* (*Rifle Bird*).

Locality.—New Holland.

PTILO'STOMUS, Mr. Swainson's name for a genus of birds which he places under the subfamily *Glaucopinæ* (Wattle-Crows) of the family *Corvidæ*.

Generic Character.—Bill shorter than the head, much compressed, the culmen considerably arched, and curved from the base. *Rictus* bristled. *Wings* moderate, slightly rounded; the third, fourth, and fifth quills longest. *Tail* long, cuneated; the feathers lanceolate. *Feet* very strong and robust. *Tarsus* lengthened, longer than the middle toe and claw; lateral toes short, and of equal length. (Sw.)

Geographical Distribution of the Genus.—Africa.

Example, *Ptilostomus Senegalensis* (Sw.), *Senegal Piapec.*

Description.—Size smaller and general form more slender than in the European magpie. Plumage of body above and below sooty black, feathers very soft and silky, and with a soft gloss upon them. On the tertials, and some of the secondaries, close transverse bands of darkly shaded lines, similar to those on the tail-feathers of *Lamprotornis longicauda*, &c. Primary quills and tail light sepia-brown, the former being almost white on their under surface, when held in some directions of light. Tail-feathers much narrowed towards their tips, and their shafts particularly strong. Total length 17½ inches. (Sw.)

Habits, &c.—Mr. Swainson remarks, that from the circumstance of Le Vaillant having found this species to be migratory in South Africa (where it is seen either singly or in small flocks), there can be no doubt that it quits Senegal at certain seasons along with the Grakles, and returns to West Africa to breed. Mr. Swainson infers the latter circumstance from having seen a young specimen from Senegal, before it had quite gained its full wing-feathers. He also remarks that the sharpness and curvature of its claws shows that the bird, although possessed of an ambulating foot, is yet more accustomed to perch upon trees than to walk upon the ground. (*Birds of West Africa.*)

PTILO'TIS. [MELIPHAGIDÆ, vol. xv., p. 82.]

Subgeneric character.—Bill short. Lateral *toes* almost equal. *Tail* slightly rounded, sometimes nearly even. (Sw.)

PTILOTU'RUS. [MELIPHAGIDÆ, vol. xv., p. 82.]

I. PTOLEMÆUS (Πτολεμᾶιος), surnamed SOTER, or 'preserver,' the founder of the dynasty of Greek kings in Egypt, frequently called the Lagidæ, was one of the ablest of the generals of Alexander the Great. He is commonly called the son of Lagus, but, according to the Macedonians, he was the son of Philip and grandson of Amyntas, but was called the son of Lagus, because his mother was given for wife to Lagus by Philip, though she was then with child. (Paus., i. 6, § 2.)

In the division of the provinces on the death of Alexander, B.C. 323, Egypt was assigned to Ptolemy, who soon took measures to erect it into an independent kingdom. He put to death Cleomenes, who had been appointed satrap of Egypt by Alexander, chiefly because he was well disposed to Perdiccas (Paus., i. 6, § 3), and obtained by his death an immense sum of money, which Cleomenes had collected during his administration. With this money, which amounted, according to Diodorus (xviii. 14), to 8000 talents, he collected a large army. In the first or second year of his rule he took the city of Cyrene and added the Cyrenaica to his dominions. He also obtained possession of the dead body of Alexander, which it had been resolved in the council at Babylon to transport to Ægæ in Macedonia. It was first carried to Memphis, and afterwards to Alexandria.

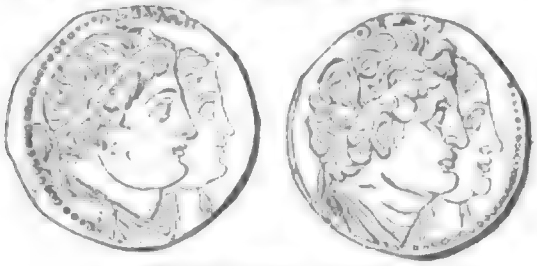
In the year B.C. 321 Perdiccas invaded Egypt; but he lost 2000 men in attempting to cross the Nile, and was subsequently murdered in his tent by his own troops. [PERDICCAS.] A few years afterwards Ptolemy had to encounter a more formidable rival in Antigonus, who was rapidly increasing in power; and in B.C. 316 he entered into an alliance with Seleucus, Cassander, and Lysimachus, to resist the ambitious projects of Antigonus. In the long war which followed, and of which an account is given in the article ANTIGONUS, Ptolemy took an active part. It was continued till B.C. 312, when a general treaty was made, by which Ptolemy obtained possession of Egypt and the adjacent districts. Ptolemy however was the first to break this treaty in the following year; and the war was again renewed, and carried on with various success, till the defeat and death of Antigonus, at the battle of Ipsus, B.C. 301, secured to Ptolemy the undisturbed possession of Egypt.

From this time to his death, Ptolemy devoted all his energies to develop the resources and promote the prosperity of his kingdom. Under his wise government and that of his successor, Alexandria became, as its great founder had anticipated, the first commercial city in the world, and the place from which Europe was supplied with the rich merchandise of the East. As his subjects consisted of two distinct nations, the Egyptians and Greeks, it was the policy of Ptolemy and his successors to amalgamate these races as much as possible. Ptolemy, being a Greek, introduced Greek habits and customs and also the Greek religion into Egypt; but, like his great master Alexander, he carefully avoided offending the prejudices of his new subjects, and adopted to a certain extent the Egyptian forms of worship. He and his successors conciliated the favour of their subjects, by the respect which they paid to the antient Egyptian priesthood, and also by contributing largely to the restoration of the antient monuments of the country. ('British Museum,' *Egyptian Antiquities*, vol. i., p. 35, Lond. 1832.) He also introduced the most complete religious toleration among all his subjects. The troubled state of Palestine and the growing commerce of Alexandria induced many Jews to settle in his dominions; and the same toleration was granted to the Jewish synagogue as to the temples of Isis and Jupiter. Ptolemy seems to have been desirous of uniting as much as possible the Egyptian and Greek religions; and his removal of the statue of Serapis from Pontus to Alexandria, which is mentioned by several antient writers (Tacit., *Hist.*, iv. 84, and commentators), and which was accompanied with great solemnity, seems to have been accomplished in order to establish the worship of a deity which might prove acceptable to both nations.

Ptolemy gave great encouragement to learning and science. He wrote himself a history of the wars of Alexander, which appears to have been a work of considerable merit, and which supplied Arrian, in conjunction with the narrative of Aristobulus, with the materials for his history. [ARRIAN, p. 395.] He invited many scholars and philosophers from Greece, of whom the most celebrated was Demetrius Phalereus [DEMETRIUS], who was received by him with the greatest distinction. He also invited Theophrastus (Diog. Laert., ii. 37), and received Stilpo (Diog. Laert., ii. 115), who had been banished from Athens for his religious opinions. In fact, Ptolemy extended his patronage to all persons of learning, independent of their religious and philosophical opinions. He laid the foundations of that school of learning for which Alexandria became afterwards so celebrated; and he probably commenced making collections for the public library which was regularly established by his son.

Ptolemy Soter was first married to Eurydice, the daughter of Antipater, by whom he had children; but he left his dominions to a younger son, Ptolemy Philadelphus, whom he had by Berenice (Paus., i. 6, § 8; Justin, xvi. 2; Plin., *Hist. Nat.*, xxxvii. 32). [Berenice.] His eldest son, Ptolemy Ceraunus, murdered Seleucus, B.C. 280, and obtained possession of the kingdom of Macedonia. He only reigned however for about a year, and fell in battle with the Gauls. (Paus., i. 16, § 2; x. 19, § 4; Strabo, xiii., p. 623; Justin, xxiv. 5.)

Ptolemy Soter assumed the title of king, B.C. 306 (Diod., xx. 53; Plutarch, *Demetr.*, c. 18); and died at the age of 84 (Lucian, *Macrob.*, c. 12), B.C. 283, forty years after the death of Alexander. All the antient writers agree in representing Ptolemy as a prince of the greatest wisdom, prudence, and generosity; and there is a saying of his reported by Ælian (*Var. Hist.*, xiii. 12), worthy of Alexander, 'that it was better to make rich than to be rich.'



Coin of Ptolemy and Berenice.

British Museum. Actual Size. Gold.

The two heads to the right are Ptolemy Soter and his wife Berenice. The two heads to the left are Ptolemy Philadelphus and his sister and wife Arsinoe. The words ΘΕΩΝ ΑΔΕΛΦΩΝ, 'the fraternal deities' occur in the Adule Inscription, and apply to Ptolemy Philadelphus and Arsinoe. [Adule.]

II. PTOLEMÆUS, surnamed **PHILADELPHUS**, or the 'brother-loving,' succeeded his father, B.C. 283, but was associated with him in the government two years previously. He followed the example of his father in the encouragement of learning; and he maintained with great liberality many distinguished philosophers and poets, of whom the most celebrated were Theocritus, Lycophron, and Callimachus. He established the public library, which was probably commenced by his father, and also founded a museum (*μουσεῖον*) for the promotion of learning and the support of learned men. Some modern writers attribute the foundation of this museum to Ptolemy Soter, but Athenæus (v., p. 203) distinctly ascribes it to Philadelphus. (Clinton, *Fasti Hell.*, iii., p. 380.) We learn from Strabo (xvii., p. 794) that the museum formed part of the palace, and that it contained cloisters or porticos (*περίπατον*), a public theatre or lecture-room (*ἐξέδρα*), and a large hall (*οἶκον μέγαν*), where the learned men who belonged to it dined together. The museum was supported by a common fund, supplied apparently from the public treasury; and the whole institution was under the superintendence of a priest, who was appointed by the king, and, after Egypt formed a province of the Roman empire, by the Cæsar. Attached to the museum there were botanical and zoological gardens. (Philostr., *Apollon.*, vi. 24; Athen., xiv., p. 654.) The institution was enlarged by the emperor Claudius. (Suet., *Claud.*, c. 42, with Casaubon's 'Note.')

Ptolemy Philadelphus showed the same favour to the Jews as his father had done; and it was under his auspices that the Hebrew Bible was translated into Greek. [Septuagint.] Josephus (*Antiq.*, xii., 2, § 12) has given us an account of the entertainment at which Ptolemy received the translators; and which is interesting, as it affords us some idea of the literary parties which the king appears to have frequently given. The king sat at the head of the table, and the guests on each side. The usual priests, heralds, &c. were sent away, and grace was said by one of the translators at the command of the king. This grace or prayer was received with loud applause by the whole company. After supper the king began to philosophise, and asked every one of his guests a philosophical question.

The treasures and resources of Philadelphus were very great. Much of the wealth which he possessed was, without doubt, owing to his possessing the trade with India and other parts of Eastern Asia. He also used every effort to extend the trade of Alexandria: he obtained possession of the maritime parts of Arabia and of the eastern coast of Africa, and his admiral Timosthenes appears to have gone as far south as Madagascar. (Vincent's *Commerce and Navigation of the Antients, &c.*, vol. i., p. 42.) Theocritus (*Adoniazusæ*) describes in glowing colours the wealth and power of his patron; and his account is confirmed by the less suspicious testimony of Appian, who was himself a native of Alexandria. The latter writer informs us (*Præfatio Histor.*, c. 10) that under the Ptolemies the army consisted of 200,000 foot soldiers, 40,000 horse, 300 elephants, and 2000 war-chariots, and the fleet of 2000 smaller vessels, 1500 triremes, and 800 ships magnificently adorned and equipped for royal use. The money in the treasury amounted to 740,000 Egyptian talents at the death of Ptolemy Philadelphus, who, according to Appian, amassed greater treasure and expended more upon public works than any of his successors. Athenæus also bears testimony (ii., p. 203) to the great power of Philadelphus, and states among other things that he surpassed all other kings in the number of his ships. The power and influence of the Egyptian kingdom under the three first Ptolemies is also attested by Polybius (v. 34), who says that they were masters of Cœle-Syria and Cyprus, and extended their influence over the neighbouring countries as far as Thrace and Macedonia. (Clinton's *Fast. Hellen.*, iii., p. 383.)

The political events of the reign of Ptolemy Philadelphus may be comprised in a few words. He put to death, at the commencement of his reign, two of his brothers, one of whom had endeavoured to excite the Cyprians to revolt. He was also engaged in war with Magas, the son of Berenice by a former husband, who had been appointed governor of Cyrene. Magas, who was married to Apama, the daughter of Antiochus and grand-daughter of Seleucus, prevailed upon his father-in-law to break the treaty which had been made between Seleucus and Ptolemy. Ptolemy however, by assuming the defensive, prevented Antiochus from invading his dominions (Paus., i. 7, § 3), and finally concluded a peace with his successor Antiochus II., by which the latter agreed to repudiate his wife Laodice, and to marry Berenice, the daughter of Ptolemy. [Antiochus II.]

In B.C. 274 Ptolemy sent an embassy to Rome and formed an alliance with the republic. (Liv., *Epit.*, 14; Eutrop., ii. 15.) We also read of a Roman embassy to Egypt. (Justin, xvii. 2.) Ptolemy sent a naval force to the assistance of the Athenians against Antigonus and the Macedonians (Paus., i. 7, § 3); and the Athenians in compliment to him called one of their tribes Ptolemais. (Paus., i. 6, § 8; i. 5, § 5.) Ptolemy also founded a gymnasium at Athens, not far from the market-place, which was called after his name, and which contained a bronze statue of him. (Paus., i. 17, § 2.) [Athens, p. 11.]

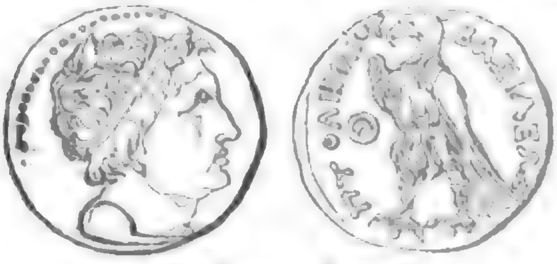
Ptolemy Philadelphus died, B.C. 247, after reigning two years with his father and thirty-six alone. He was married twice; to Arsinoe, the daughter of Lysimachus, and also to Arsinoe, his own sister. [Arsinoe.] Pausanias remarks (i. 7, § 1) upon his marriage with the latter, that in doing so he violated the laws of the Macedonians, but not of the Egyptians. By his sister he had no children, but by the daughter of Lysimachus he had three, Berenice, Ptolemy surnamed Euergetes, and Lysimachus. (Schol. Theocr., xvii. 128, quoted by Clinton.)

III. PTOLEMÆUS, surnamed **EUE'RGETES**, or the 'benefactor,' succeeded his father B.C. 247. He was engaged in war at the commencement of his reign with Seleucus Callinicus, to revenge the death of his sister Berenice. [Berenice II.] Great success attended his arms; he obtained possession of many of the provinces belonging to the Seleucidæ, and would probably have overthrown their empire, if he had not been obliged to return to Egypt in consequence of some civil commotions. (Justin, xxvii. 1.) Seleucus tried to strengthen his power by entering into an alliance with his brother Antigonus Gonatas; but they quickly became jealous of each other, and Ptolemy availed himself of their dissensions to extend his kingdom.

We possess hardly any particulars respecting the life and character of Ptolemy Euergetes. If inferior to his predecessors, he was superior to those that reigned after him; Strabo says (p. 796) that the kings of Egypt after the third Ptolemy governed worse than their predecessors. He followed his father's example in giving every encouragement to trade and commerce. It appears from an inscription, which was found at Adule by Cosmas [Adule], that Ptolemy had conquered Abyssinia, and that he maintained a powerful fleet in the Red Sea. A translation of this inscription, with many valuable remarks, is given in Dr. Vincent's 'Commerce and Navigation of the Antients in the Indian Ocean,' vol ii., p. 533, &c. If we can trust to this inscription, Ptolemy Euergetes must in his wars with Seleucus have subdued the greater part of Asia. It states that he had received from his father the kingdom of Egypt, Africa, Syria, Phœnicia, Cyprus, Lycia, Caria, and the Cyclades, and that he invaded Asia with his land and sea forces, and with elephants from the country of the Troglodytes and Ethiopians. The inscription then states that with these forces he reduced all the country on this side the Euphrates, as well as Cilicia, the Hellespont, Thrace, and all the forces in these provinces; and that he afterwards crossed the Euphrates, and entered Mesopotamia, Babylonia, Susiana, Persis, Media, and the whole country as far as Bactria, and brought the whole under his dominion.

During the reign of Euergetes, Cleomenes, king of Sparta, took refuge in Egypt, and was received by him with great distinction. (Plutarch, *Cleom.*, c. 32; Paus., ii. 9, § 3; Justin, xxviii. 4.)

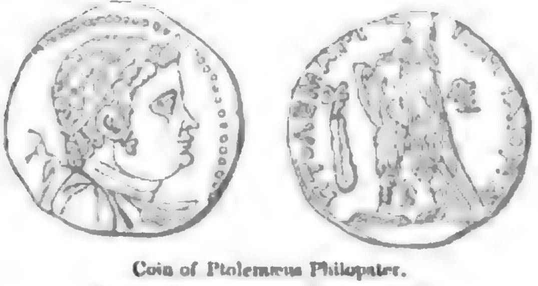
Ptolemy Euergetes married Berenice, the daughter of Magas, king of Cyrene. [Berenice III.] By her he had three children, Magas, Ptolemy Philopator, and Arsinoe. He was murdered by his own son Philopator, B.C. 222.



Coin of Ptolemæus Euergetes.
British Museum. Actual Size. Silver.

IV. PTOLEMÆUS, surnamed **PHILO'PATOR**, or 'father-loving,' succeeded Euergetes, B.C. 222. He was distinguished by his profligacy and cruelty, and is said to have been ironically called Philopator on account of having murdered his father. (Justin, xxix. 1.) His chief minister was Sosibius, at whose instigation he put to death his mother Berenice, his uncle Lysimachus, his brother Magas, his wife and sister Arsinoe, who is called Eurydice by Justin (xxx. 1), and Cleomenes the Spartan king. (Polyb., v. 34, 35; xv. 25; Plutarch, *Cleom.*, 33, 34, &c.) Philopator however appears to have been an able general. In B.C. 219 the province of Cœle-Syria, which had been conquered by his father, was attacked by Antiochus the Great, who at first obtained possession of the greater part of it through the treachery of Theodotus, the Egyptian governor. In the following year however the forces of Ptolemy were more successful. Antiochus was defeated in a great battle fought at Raphia, near Gaza, B.C. 217; and Cœle-Syria and Palestine were ceded to Ptolemy by a treaty made in the same year. (Polyb., iv. 37; v. 79-87.) [Antiochus III.]

Philopator died B.C 205, after a reign of seventeen years. (Clinton.)

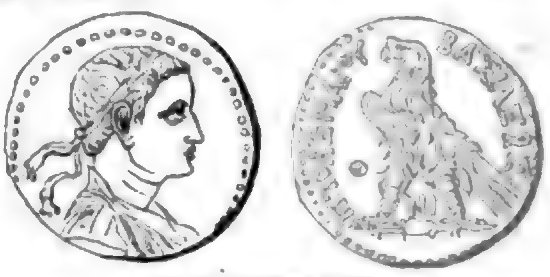


Coin of Ptolemæus Philopater.
British Museum. Actual Size. Silver.

V. PTOLEMÆUS, surnamed **EPI'PHANES**, or 'illustrious,' the son of P. Philopator and Arsinoe, was only five years old at the death of his father. (Justin, xxx. 2.) Antiochus the Great thought it a favourable opportunity not only to recover Cœle-Syria, but also to obtain the sovereignty of Egypt, and accordingly united with Philip, king of Macedon, to divide the Egyptian dominions between them. (Polyb., iii. 2; Liv., xxxi. 14.) The guardians of the young king took the precaution of placing him under the protection of the Romans, which the latter willingly undertook, as they were anxious to obtain a pretext for attacking Philip and Antiochus. (Justin, xxx. 2, 3.) Livy also mentions (xxxi. 9) an Egyptian embassy to Rome in B.C. 200.

When the Romans were engaged in their war with Philip, Antiochus attacked the dominions of Ptolemy, and reduced, in B.C. 198, all the cities in Cœle-Syria. He also conquered Scopas, who had in the preceding year brought 6000 auxiliaries to Ptolemy. (Liv., xxxiii. 19.) But as Antiochus was anxious to prosecute his conquest in Asia Minor, he proposed a treaty of marriage between his daughter and Ptolemy, to be consummated when both came of age, by which Cœle-Syria and Palestine were to be given with the princess as a dowry. (Polyb., xxviii. 17; Joseph., *Ant.*, xii. 4, § 1.) This marriage was afterwards celebrated in the year B.C. 192 or 193, when Ptolemy was about seventeen years of age.

Ptolemy died B.C. 181, and is said to have been poisoned. (Hieron., *Ad Dan.*, c. 11.) He left three children, P. Philometor, P. Physcon, and Cleopatra, who was successively married to her two brothers. (Joseph., *Antiq.*, xii. 4, § 11; Justin, xxxviii. 8.)



Coin of Ptolemæus Epiphanes.
British Museum. Actual Size. Gold.

VI. PTOLEMÆUS, surnamed **PHILOMETOR**, or 'mother-loving,' was a child when his father died; but the government was conducted by his mother Cleopatra. During the life-time of Cleopatra, the kingdom of Egypt enjoyed repose; but on her death, her brother Antiochus Epiphanes claimed Cœle-Syria and Palestine, which had been given to Ptolemy Epiphanes as his wife's dower. In B.C. 171 Antiochus invaded Egypt and defeated the army of Philometor at Pelusium; and in the following year he took most of the principal towns in Egypt, with the exception of Alexandria, and obtained possession of the person of Philometor. After the capture of Philometor, the Alexandrines raised his brother to the throne, who took the name of Euergetes II., but is more commonly known by that of Physcon.

In B.C. 169 Antiochus invaded Egypt for the third time, under pretence of restoring the kingdom to Philometor. He laid siege to Alexandria, and would probably have obtained possession of the city, had not ambassadors come from Rome, who commanded him to abandon the attempt. Afraid of provoking a war with the Romans, he retired from Egypt, leaving Philometor nominal king of the whole country with the exception of Alexandria. He appears to have hoped that the quarrels of the brothers would have still further weakened the country and rendered it an easier conquest to him; but they, seeing through his ambitious designs, agreed to divide the royal power between them, and turn their forces against him. Disappointed in his object, Antiochus again invaded Egypt in the following year (B.C. 168), and declared that he would not withdraw his forces unless Cyprus, and the strong city of Pelusium, with the surrounding country, were ceded to him. As the possession of the city of Pelusium would have enabled him at any time to overrun Egypt, his proposals were refused; and he accordingly marched towards Alexandria, but was again met within four miles of the city by the Roman ambassadors, who compelled him to depart from Egypt. (Liv., xlv. 11, 12.)

The two brothers however did not agree; and in the seventh year of their joint reign Philometor was driven from Egypt by Physcon, and obliged to take refuge in Rome. He was treated with great distinction by the senate, who restored him to his kingdom, and limited the dominions of Physcon to Cyrene. (Liv., *Epit.*, 46, 47; Valerius Max., v. 1, § 1.) In the following year Physcon went to Rome to complain of the unequal division of the Egyptian kingdom, and to beg that Cyprus might be given to him. The senate complied with his request, and commanded Philometor to surrender that island to his brother Philometor however refused to do so; and the Romans accordingly declared war against him, B.C. 159 (Diod. Sic., vol. ii., p. 626, ed. Wesseling), but did not prosecute it with much activity. They did not send any force to the assistance of Physcon, but gave permission to their allies in Greece and Asia to enlist under his standard. (Polyb., xxxiii. 5.) In the war which followed between the brothers, the Romans took no part. Physcon was defeated in Cyprus, and fell into the hands of Philometor, who however forgave him, and allowed him to retain the sovereignty of Cyrene. (Polyb., xl. 12; Diod. Sic., vol. ii., p. 588.)

About the year B.C. 151, Ptolemy Philometor marched into Syria to support Alexander Balas (Justin, xxxv. 1), who had been acknowledged king of Syria by the Romans, in opposition to Demetrius, the rightful heir. [ALEXANDER BALAS.] By the assistance of Philometor and the kings of Pergamus and Cappadocia, Alexander obtained possession of the throne, and married, in B.C. 150, Cleopatra, the daughter of Philometor. (1 *Macc.*, x. 57, 58; Joseph., *Antiq.*, xiii. 4, § 1.) Shortly afterwards however Philometor, accusing Alexander of an intention to murder him, took away his daughter, and gave her in marriage to Demetrius II. He then marched into Syria, and was crowned at Antioch as king of Asia and Egypt; but afraid of exciting the jealousy of the Romans, he relinquished Syria to his new son-in-law. During these transactions Alexander was in Cilicia; and as soon as he heard of what had taken place, he marched towards Antioch, near which he was defeated by Ptolemy and Demetrius. Philometor however died a few days afterwards of the wounds which he had received in battle. (1 *Macc.*, xi. 1-18; Joseph., *Antiq.*, xiii. 4, § 6-8; Justin, xxxix. 2.)

The character of Ptolemy Philometor is favourably drawn both by Polybius (xxix. 9, § 13; xl. 12) and Diodorus (vol. ii., p. 588). He was an active and enterprising prince, and did much during the latter years of his reign to repair the losses which his subjects had sustained by the conquests of Antiochus Epiphanes, and in the wars between himself and his brother. He was mild and merciful, and his conduct in that respect was a striking contrast to that of his father and brother. He died B.C. 146, after a reign of thirty-five years. (Clinton.) He left a son, who was only a child at his death, and two daughters of the name of Cleopatra, of whom one married successively Alexander Balas and Demetrius, as already stated, and the other afterwards reigned in Egypt jointly with her sons.

VII. PTOLEMÆUS, surnamed **EUERGETES II.**, or **PHYSCON** (big-belly), succeeded his brother B.C. 146, and commenced his reign by putting to death his brother's son. (Justin, xxxviii. 8.) Physcon is represented by the antient writers as a cruel and sensual tyrant. He derived his name of Physcon, or Big-Belly, from his unwieldy form; for he was, according to Justin (xxxviii. 8) and Diodorus (vol. ii., p. 597), ugly in face, short in stature, big-bellied, and more like a beast than a man. The portrait which Rosellini gives of Physcon, from the antient monuments of Egypt, is also that of a fat and sensual man. ('British Museum,' *Egyptian Antiquities*, vol. ii., p. 88, 89.) Posidonius the Stoic also described him (Athen., xii., p. 549) as a fat unwieldy man, who never went out without a stick.

He married Cleopatra, his own sister and his brother's widow, who bore him a son in the second year of his reign, while he was at Memphis for the purpose of being crowned. (Diod., vol. ii., p. 595.) He soon afterwards put away his sister, and married her younger daughter, his own niece, Cleopatra. He practised all kinds of cruelties upon his subjects, till at length Alexandria became almost deserted, and Physcon was obliged to solicit strangers to settle there. (Justin, xxxviii. 8.) He possessed an able minister in Hierax (Diod., vol. ii., p. 597), who compensated in some degree for the inactivity of the king, and restrained for a time the discontents of his subjects; but at length the people could bear his cruelty no longer, and in the sixteenth year of his reign compelled him to fly to Cyprus. The government was committed by the people to Cleopatra, his sister and divorced wife. Her son was with his father at Cyprus; and Physcon, fearing lest she might make use of her son's name to strengthen her on the throne, put him to death, and sent his hands, feet, and head to Cleopatra, with directions that they should be given her in the midst of an entertainment. (Diod., vol. ii., p. 602, 603; Justin, xxxviii. 8; Liv., *Epit.*, 59; Valer. Max., ix. 2, § 5.) In the war which followed, Physcon again obtained possession of the throne, which he held till his death, B.C. 117.

In the year B.C. 143, Scipio Africanus was sent at the head of a Roman embassy to Egypt, and was received with great pomp and respect by Physcon, who conducted him as far as Memphis. (Diod. Sic., vol. ii., p. 629, 630; Justin, xxxviii. 8.)

Physcon, though a sensualist and a tyrant, was a patron of learning and the fine arts. He was a disciple of Aristarchus, and wrote himself an historical work, which is frequently referred to by Athenæus (ii., p. 71; xiv., p. 654, &c.). Physcon had by his niece Cleopatra five children; two sons, Ptolemy Soter and Alexander, and three daughters, Tryphœna, Cleopatra, and Selene. He also left an illegitimate son, Ptolemy Apion, who reigned at Cyrene, and bequeathed his kingdom to the Romans at his death in B.C. 96. (Clinton, vol. iii., p. 389.)

VIII. PTOLEMÆUS, surnamed **SOTER II.**, but more frequently called **LATHY'RUS** (Λάθουρος, Strab., p. 795), succeeded his father Euergetes II., B.C. 117. He reigned together with his mother Cleopatra, who wished to have her younger son Alexander for her partner on the throne, but she was obliged by the people to select the elder. (Justin, xxix. 3.) She always showed the greatest hostility to her eldest son, who is sometimes in consequence called ironically Philometor. (Paus., i., ix. § 1.) During the lifetime of Physcon, Lathyrus was sent to Cyprus; and though compelled to make him king, she did everything in her power to weaken his authority. At the commencement of his reign she compelled him to put away his sister Cleopatra, to whom he was married, and marry his youngest sister Selene. (Justin, xxxix. 3.) She gave the island of Cyprus to her younger son, and after reigning ten years in conjunction with Lathyrus, at length raised an insurrection in Alexandria against him, which compelled him to leave Egypt. She permitted him however to retire to Cyprus, after taking away from him his wife Selene; and [illegible] recalled her younger son Alexander to Egypt, and associated him with her in the government, B.C. 107. (Justin, xxxix. 4; Paus., i. 9, § 2.)

Lathyrus subsequently took an active part in the affairs of Palestine. Gaza and some other cities of Palestine requested his assistance against Alexander Jannæus, and he accordingly landed in Palestine with an army of 30,000 men. (Joseph., *Antiq.*, xiii. 12.) He at first met with considerable success, but Cleopatra, fearing lest her son, after the conquest of Palestine, should march upon Egypt, sent an army to the assistance of Alexander, which compelled Lathyrus to give up the war and retire to Cyprus.

In the year B.C. 89, Cleopatra was put to death, after a reign of 28 years, by her favourite son Alexander, who wished to obtain the sole possession of the crown. The people however rose against him a few months after, and compelled him to flee from Egypt. His brother Lathyrus was then restored. (Paus., i. 9, § 2, 3; Justin, xxxix. 5.) The city of Thebes however refused to submit to his authority; but it was taken and plundered after a siege of three years. (Paus., i. 9, § 3.) He died B.C. 81, leaving a daughter, Berenice or Cleopatra, and two illegitimate sons, Ptolemy Auletes and Ptolemy who reigned in Cyprus. The latter is mentioned in several of Cicero's orations (*Pro Sextio*, 26; *Pro Domo*, 8, 20; *Pro Flacco*, 13).

There is some difficulty respecting the immediate successor of Lathyrus. It appears that there were two kings of the name of Alexander, who successively reigned between the death of Lathyrus and the accession of Auletes; but as Clemens of Alexandria (*Strom.*, i., p. 331) and Strabo (xvii., p. 796) both mention Auletes as the immediate successor of Lathyrus, the authority of the two Alexanders was probably not acknowledged in all parts of Egypt, or they must at least have reigned for a very short time. The subject is fully discussed by Mr. Clinton (vol. iii., p. 391, 392).

IX. PTOLEMÆUS, surnamed **NEOS DIONY'SUS**, 'the young Dionysus,' but more commonly **AULE'TES**, 'the piper,' was an illegitimate son of Lathyrus, and succeeded to the throne B.C. 81. His vices and low habits made him contemptible to his people (Strabo, xvii., p. 796; compare Cic., *De Leg. Agrar.*, ii. 16), who expelled him from Alexandria in B.C. 58. He came to Rome in the same year, and on his way thither met Cato at Rhodes. (Plut., *Cat. Min.*, c. 35.) The Alexandrians placed upon the throne Berenice, the daughter of Auletes, and sent ambassadors to Rome to plead their cause against the king. Auletes however found means to gain over a large party in the senate. Cicero made a speech in his favour, which was afterwards published, but of which only a few fragments have come down to us; and the creditors of Auletes, who were very numerous, used every exertion to obtain his restoration to his kingdom. In the following year, B.C. 57 the senate passed a decree for his restoration; but in B.C. 56 there was much dispute respecting the manner in which and the persons by whom he should be restored In consequence of the opposition which was made against him, nothing was done in that year; and we find that he retired in despair to Ephesus. (Dio., xxxix. 12-16; Cic., *Ep. ad Qu. Fr.*, ii. 2; *Ad Fam.*, i. 1, 2.) Auletes however possessed a powerful friend in Pompey, and in consequence of his support he prevailed upon Gabinius, in B.C. 55, to undertake his restoration. (Dio., xxxix. 55; Strabo, xvii., p. 796; Liv., *Epit.*, 105; Cic., *in Pison.*, 21.)

Berenice, whom the Alexandrians placed upon the throne, first married Seleucus, called Cybiosactes by Strabo, the pretended son of Antiochus Eusebes, and afterwards Archelaus, the son of the Archelaus who had carried on war against Sulla. Auletes, on his restoration in B.C. 55, put to death both Archelaus and his daughter. (Strabo, xvii., p. 796.) Auletes survived his restoration about three years and a half, and died in the beginning of May, B.C. 51. (Clinton, vol. iii., p. 395.) He left two sons, called Ptolemy, and two daughters, Cleopatra and Arsinoe. The history of his two sons is given under CLEOPATRA.

PTOLEMÆUS, CLAU'DIUS, a native of Egypt, but the place of his birth is not ascertained: the surname of Pelusiota, which is given to him in some editions of his works, appears to be a mistake of the copyists or translators. He lived at Alexandria in the first half of the second century of our æra, under the reigns of Hadrian and Antoninus Pius. Nothing more is known of his life, except his works. He was an astronomer, chronologist, and geographer. Ptolemy's Geography was for many centuries the text-book in that science for all the schools, and was superseded only in the fifteenth century, in consequence of new information derived from the discoveries of the Venetian, Portuguese, and other travellers and navigators.

Ptolemy and Strabo followed a different method in their respective works. Strabo's work is a descriptive geography; Ptolemy's is a mathematical geography. Strabo wrote mainly for the instruction of persons engaged in administration: he describes the physical character of each country, its extent, and its political divisions; he gives some historical account of the various peoples that had inhabited it; and he then proceeds to notice the subdivisions, the mountains, valleys, rivers, and towns, with their respective distances from each other, and the objects worthy of remark in them. He makes us acquainted with each place in a manner resembling that of modern books of travels, or guide-books. Ptolemy on the other hand applies himself to fix the astronomical position of each place; he gives a bare list of names of mountains, rivers, and towns, with their respective longitude and latitude, without any description, or at least only a few words. Strabo endeavours to ascertain the forms of the large masses of land and of the seas by a combination of itinerary distances between various points, referring only to a few positions which had been ascertained by actual observation: Ptolemy fixes the position of each place as if it were ascertained by astronomical observation. Ptolemy availed himself of the labours of Eratosthenes, Hipparchus, and the other mathematicians of the Alexandrian school [HIPPARCHUS]; but by adopting the method of Hipparchus in the projection of the map, in order to assimilate it to the spheroidal form of the earth, he committed a material error in his longitudes, all of which he places too far to the east. Beginning from Calpe, he places it 5° east of the Sacrum Promontorium of Iberia or Spain, an error of 1° 50′, and goes on increasing the excess of longitude as he advances to the eastward, making the length of the Mediterranean twenty degrees more than it is. He proceeds through Asia in the same way, till he places the mouths of the Ganges above forty-six degrees more to the eastward than the true position. Gosselin, at the end of his 'Géographie des Grecs analysée,' gives tables which show the difference between Ptolemy's positions and the true ones. Gosselin supposes that Ptolemy was led into this material error by estimating the degree of longitude at 500 stadia at the equator, and at 400 stadia in the parallel of Rhodes; while Eratosthenes had reckoned the first at 700 stadia, and the second at 555. But Ptolemy retained Eratosthenes's measure of 700 stadia for a degree of latitude, because he found that if he were to reckon the degree of latitude at 500, all his latitudes, several of which had been fixed by observation, would be too high; and that Alexandria, for instance, instead of being in 31°, would be in 43°, and Marseille in 60°. The different value given to the stadium by different geographers was a cause of much confusion. 'Eratosthenes,' says Gosselin, 'had fixed the distance between the Sacrum Promontorium of Spain and the eastern mouth of the Ganges at 70,000 stadia. These 70,000 stadia being reduced into degrees of 700 stadia each, give 100 degrees for the whole longitudinal distance, which is not far from the truth. But Ptolemy, by taking his degree of longitude too small, made 146 degrees between the two points. But again, if we reduce these 146 degrees at the rate of 500 stadia each, we shall have about 73,000 stadia.' See also on this subject both Mannert and Ukert, in their respective works, both entitled 'Geographie der Griechen und Römer.'

Dr. Brehmer, in his 'Entdeckungen im Alterthum,' 1822, pretends that Ptolemy consulted some Phœnician charts, and he lays great stress upon the geographical knowledge of the antient Phœnicians. Gosselin however, as well as Heeren (*Commentatio de Fontibus Geographicorum Ptolemæi, Tabularumque iis annexarum*, Göttingen, 1827), reject Brehmer's hypothesis: they reduce within very moderate dimensions the supposed geographical and astronomical knowledge of the Phœnicians, and trace the sources of Ptolemy's peculiar information to other quarters, and especially to the discoveries and conquests made by Roman commanders between the time of Augustus and the age of the Antonines, to the long peace which subsisted between the Romans and the Parthians under Hadrian and Antoninus Pius, and the flourishing commerce which was carried on during that period between the Roman empire and the remotest parts of India. Marinus of Tyre, who lived about the year 100 of our æra, had written a geography and constructed maps of which Ptolemy availed himself.

Ptolemy begins by stating in his first book the object of his work, and explains the elements of mathematical geography. He then, after mentioning with praise his predecessor Marinus of Tyre, notices, in chapters vi. to xviii., the errors into which that geographer had fallen, and corrects them. Marinus had read the geographical works and itineraries of most of those who had preceded him, and had constructed maps which he repeatedly corrected in successive editions; but Ptolemy, as he says, still found much to correct in the work of Marinus. Ptolemy mentions several travellers from whose itineraries Marinus had derived much of his information, such as a certain Diogenes who navigated the Indian seas; Dioscorus and Theophilus, who frequented the harbour of Azania, on the eastern coast of Africa; Alexander, a Macedonian, who had sailed from the Chersonesus Aurea to Cattigara; Philemon, who had visited Hibernia; and a certain Titianus, called Maës, whose agents used to trade as far as Serica, the modern Tibet or Chinese Tartary; but he adds (chap. 17) that some of the information collected by Marinus had been superseded by the testimony of more recent travellers and navigators, whom he, Ptolemy, had consulted, especially with regard to the remote regions of India. In the last three chapters of the first book, Ptolemy describes the method of drawing maps adapted to represent the spherical form of the globe.

With book ii. begins the description of the known world, which in the time of Ptolemy extended, from west to east, from the Fortunate or Canary Islands, where Ptolemy places his first meridian, to the vaguely defined regions of Serica and Sinæ, near the western and south-western borders of China, somewhere between 100° and 105° east of London, embracing altogether about 120 degrees of longitude, or one-third of the actual circumference of the globe, which extent however, through Ptolemy's error already noticed, was magnified by him to 180 degrees, or a full hemisphere. To the northward Ptolemy's known world extended to the sixty-third parallel of north latitude, in which he places the island of Thule north of Caledonia, near the site of the Shetland Islands. Some think that the Thule of Ptolemy was Norway. To the south, Ptolemy's known world extends nearly to the equator, but he places his latitudes about ten degrees too far south. He places the sources of the true Nile, or Abiad, in about 7° S. lat., and the emporium of Rhapta, on the eastern coast of Africa, and that of Cattigara, on the coast of the Sinæ, in about 8°. By comparing Ptolemy's world with that of Strabo, it may be seen how much the limits of the known world were extended during the century and a quarter which elapsed from the time of Augustus and Tiberius to that of the Antonines. Strabo's information did not extend northwards beyond the Elbe; of Britain he knew little, and of Hibernia nothing; to the eastward it only extended as far as Taprobana (Ceylón) and the mouth of the Ganges. Ptolemy added information, though it was vague, of India beyond the Ganges, the Chersonesus Aurea, and the countries of Serica and Sinæ east of the Chersonesus Aurea. Strabo had made the Hyrcanian or Caspian Sea a gulf of the Northern Ocean, though Herodotus (i., c. 203) had described it as a lake. Ptolemy also describes it as a lake, retaining however the error of his predecessor as to making its length from east to west, instead of from north to south. This mistake originated probably in some confused notion of the existence of the Aral Lake east of the Caspian. In one respect however Ptolemy's information was more remote from truth than that of Strabo, for he made the Indian Sea a gulf, without any communication with the Atlantic, and he supposed that the south-eastern coast of Africa turned to the east and joined that of Asia. This authority perpetuated for a long time the error of supposing that Africa could not be circumnavigated by the south. This error is the more curious, as there was an old tradition, preserved by Herodotus, of the circumnavigation of Africa. [AFRICA.] With regard to the interior of Africa, Ptolemy's information extended considerably further than that of his predecessors. [NIGER.]

Ptolemy proceeds in his description of the world from west to east. He begins with Hibernia, and Albion or Britain, stating the bearing of the great lines of coast, noticing the gulfs, æstuaries of rivers and capes, with the longitude and latitude of each, and he mentions the names of the various tribes and towns in succession, first those along the coasts, and afterwards those in the interior. His latitudes in Britain and Ireland are all too high by several degrees. He next describes Iberia, or Spain, with its divisions into provinces, stating the boundaries of each, and then, following the coast, he names the various towns, rivers, gulfs, and capes, fixing their respective positions. Few other particulars are given. We subjoin a specimen of the manner of his description:—'Iberia contains three provinces, Bætica, Lusitania, and Tarraconensis. The side of Bætica which looks to the west and north, is bounded partly by Lusitania and partly by the Tarraconensis province, and the description of this part is as follows:—

	Long.	Lat.
'The eastern mouth of the river Anas in	4⅓	37¼
Bend of the river to the eastward	6⅓	39
The part of the river nearest to Lusitania	9	39
And the boundary line between Bætica and Tarraconensis reaches the coast of the Balearic Sea in	12	37¼
The sources of the Anas are in	14	40

'The southern boundary of Bætica is formed by the external ocean and the Straits of Hercules, and to the eastward by the Iberian Sea, and the description of this part is as follows, beginning from the æstuary of the Anas, in the external ocean:—

Country of the Turdetani.

	Long.	Lat.
Onobalisturia	4½	37⅓
Mouth of the Bætis	5	37
Sources of the river	12	38⅙
Æstuary near Astau	6	36½¼

Country of the Turduli.

	Long.	Lat.
Menesthei portus	6	36⅓
Promontory at the entrance of the straits, on which is the temple of Juno	5½¼	36 1/12
Mouth of the river Bælon	6⅙	36⅙
Bælon town	6¼	36¾

Bastuli called Pini.

	Long.	Lat.
Menralia	6⅓	36⅓
Transdumenorum	6⅔	36⅓
Barbesola	7¼	36⅙
Carteia	7⅓	36⅙
Mount Calpe and pillar	7½	36⅙'

Ptolemy goes on describing after this manner the whole of Spain, and afterwards Celto-Galatia, or Gaul, and then Germany. Ptolemy notices the Chersonesus Cimbrica and the southern part of the Baltic as far eastward as the river Chesinus, the modern Duna. But Ptolemy does not seem to have known that the Baltic was an inland sea. East of the Chersonesus Cimbrica he places four islands, under the name of Scandiæ Islands. Scandinavia in his time was supposed to be an island. After Germany he describes Rhætia, Vindelicia, Noricum, Pannonia Upper and Lower, and Illyria, or Liburnia.

Book iii. contains a description of the eastern part of Europe, including Italy, with Sicily, Cyrnus or Corsica, Sardinia, European Sarmatia, Chersonesus Taurica, the country of the Iazyges Metanastæ, Dacia, Mœsia Upper and Lower Thracia, with the Chersonesus, Macedonia, Epirus, Achaia, the Peloponnesus, Eubœa, and Creta.

Book iv. contains the description of Libya (Africa), namely, the two Mauritaniæ, Numidia, Africa Proper, Cyrenaica, Marmarica, Egypt, Libya, Æthiopia south of Egypt, the island of Meroe, and Interior Æthiopia. Book v. relates to Western or Lesser Asia, with the Greater Armenia, Colchis, Iberia, Albania, Arabia (Petræa and Deserta), Syria and Palestine, Mesopotamia, Babylonia, and the island of Cyprus. Book vi. treats of Asia Major, including Assyria, Susiana, Media, Persis, Parthia, Hyrcania, Carmania, Arabia Felix, Margiana, Bactriana, Sogdiana, Aria, Paropamisus, Drangiana, Arachosia, Gedrosia, the country of the Sacæ, Scythia within and without Mount Imaus, and Serica, the metropolis of which is placed by Ptolemy in 38½ 1/12° N. lat., and 177¼° E. long., but which seems to have been somewhere near the actual western borders of China, or the eastern part of Tibet.

Book vii. contains India within the Ganges, Taprobana, India without the Ganges, with the Chersonesus Aurea, and farther still the country of the Sinæ, which Ptolemy describes as bounded on the north by Serica and on the east and south by 'unknown lands,' and on the west partly by India beyond the Ganges, and partly by a great gulf of the sea, which separates it from the Chersonesus Aurea, which forms the southern extremity of India beyond the Ganges. This position seems to indicate the countries of Siam and Cambodia, and the great gulf as the Gulf of Siam. Ptolemy then mentions another gulf farther to the east as the Gulf of Sinæ, perhaps from a confused notion of the sea of Cochinchina and Tonkin. Cattigara, a mercantile station on the coast of Sinæ, which he places in 8½° S. lat., has been looked for by some on the coast of Borneo. Gosselin however thinks that the great gulf is the Gulf of Martaban, that Cattigara is Mergui, and Thinæ the capital of the Sinæ, Tenasserim, and that the Sinæ of Ptolemy is the country of Siam, and that Ptolemy's information did not extend so far as the eastern coast of the peninsula of Malacca. The length of that peninsula, and its apparent continuation by the coast of Sumatra, gave rise to the notion of a continuous land enclosing the Indian Ocean on the east and south, and joining the eastern coast of Africa. (See Ptolemy's ch. 14 of book i. on the 'Navigation from the Chersonesus Aurea to Cattigara.')

The enormous size given to Taprobana (Ceylon) by Ptolemy and other antient geographers probably originated in their mistaking the peninsula of India for an island.

A good view of Ptolemy's known world, reduced to its real extent and position, is given by Gosselin in a map at the end of the fourth volume of his 'Recherches sur la Géographie systématique et positive des Anciens, pour servir de Base à l'Histoire de la Géographie ancienne,' 4 vols. 4to., Paris, 1813. The map is inscribed, 'Orbis Veteribus noti veris Limitibus circumscripti Specimen Geographicum.'

The latter part of book vii. and book viii. are a recapitulation of his system, with a description of the maps, twenty-six in number, which accompanied the work, namely, ten for Europe, four for Africa, and twelve for Asia. [AGATHODÆMON.]

Several editions of Ptolemy's Geography, translated into Latin, appeared in the fifteenth century. Among the best are those of Rome, 1478 and 1490. The Greek text was first printed at Basle in 1535, under the care of Erasmus. Servetus published a Latin edition at Lyon in 1541. Petrus Bertius published the work in Greek and Latin, Amsterdam, 1619. The Abbé Halma published at Paris, 1828, the first book of Ptolemy in the Greek text with a French translation accompanied by a Memoir 'On the Measures of the Antients.' Sickler published in 1833, at Hesse Cassel, Ptolemy's description of Germany, from an old Greek MS. in the king's library at Paris, as a specimen of an intended correct edition of the whole work, which he proposed to publish by subscription: 'Claudii Ptolemæi Germania è Codice MSpto. Græco antiquissimo nondum collato, qui Lutetiæ Parisiorum in Bibliotheca Manuscriptorum Regia sub titulo Cod. Req. Fontablandensis, No. 1401, asservantur, accurate descripta; edidit Dr. F. C. L. Sickler of Hildburghausen.' There are in the royal library at Paris ten MSS. of Ptolemy. It is well known that all the old editions of Ptolemy, both Greek and Latin, are incorrect, and that numerous errors were introduced into the text by ignorant transcribers and translators, especially during the fourteenth century. It appears also that as new discoveries took place, people took upon themselves to interpolate and correct Ptolemy's text without much discrimination. (*Commentatio critico-litteraria de Claudii Ptolemæi Geographia, ejusque codicibus, tam manuscriptis quam typis expressis, conscripta,* à G. M. Raidelio, Norimbergæ, 1737.)

There is in the Imperial library at Vienna a fine MS. copy on parchment of Ptolemy's geography in Greek, with twenty-seven maps, which are stated at the end to have been constructed by Agathodæmon of Alexandria. This statement is found also in another MS. in the library of St. Mark at Venice, as well as in others, and Raidelius read the same assertion in a fragment of an old MS. of the eleventh century. The maps which accompany the edition of Rome, 1478, and that of Ulm, 1482, appear to have been copied from the MS. maps. (Heeren, *De Fontibus*, &c.)

PTOLEMÆUS, son of Juba. [MAURITANIA.]

PTOLEMAIC SYSTEM. A few words of general explanation constitute all that can be given under this head, and we are not now speaking with particular reference to Ptolemy, of whose part in the matter we treat more particularly under SYNTAXIS, but of the astronomical part of that system which, founded on early metaphysical and physical doctrines adopted by Plato and Aristotle, reinforced by mathematical hypotheses drawn from Hipparchus and Ptolemy, received by the Mohammedans and by them imparted to the Christians of the middle ages, was the doctrine universally established in Europe till the seventeenth century. As a whole it combines the physics of the Aristotelian school, the geometry of Euclid and his successors, the sexagesimal arithmetic of the Greeks, and the astronomy of Hipparchus and Ptolemy, with some slight additions from later names. The geometry remains, the arithmetic has been supplanted by the decimal system of the Hindus; the physics and astronomy stood and fell together; and as under the words Ptolemaic System the astronomy is particularly meant, we only here notice the physical notions so far as they are connected with it.

The early separation of perceptible matter into the four elements of earth, water, air, and fire, with observation of the relative places they appear to assume, led to the formation of an elementary system. Earth (and solids generally) sink in water, while air rises in water, and flame in air. Hence the notion that the mass of the earth is the central body of the universe; above is a region of water, through which rises that portion of earth on which men and animals live. Above this is a region of air, and above this again a region of fire. Nothing is at rest until it arrives at its proper or natural place, and all the motions of a part separated from its whole are rectilinear; fire rises, and bodies fall, in straight lines. Gravity and levity are only the efforts of bodies separated from their natural places to return to them.

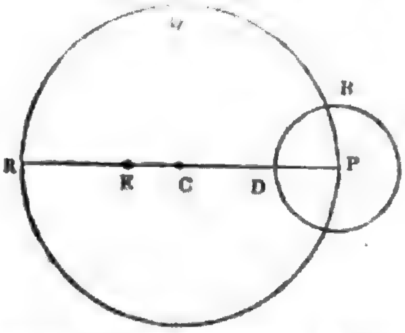
Above the earth and the elementary zones which encompass it, are other successive zones, called heavens. Each heaven contains an immense crystal spherical surface, to which one of the heavenly luminaries is attached, or would be attached, if it moved uniformly in a circle, as it would then do if the crystal sphere were made to revolve uniformly. But the varied motions of the heavenly bodies made it necessary that smaller orbs should be placed with their centres upon the larger ones, as hereafter noticed, and that the planets should move with the smaller ones. It is hardly to be believed (at least so many think) that Ptolemy and the mathematicians received these orbs, in the physical sense, or as anything but hypotheses for representing the actual motions of the planets; it is certain however that the actual solid orbs continued to be received till a late period; and even in the final scholium of the Principia, Newton thinks it worth while once more to overturn them, as Tycho Brahé had done before him, by showing that if they existed, the comets could not move as they were known to move.

The first heaven is that of the moon; the second that of Mercury; the third that of Venus; the fourth that of the Sun; the fifth that of Mars; the sixth that of Jupiter; the seventh that of Saturn; the eighth that of all the fixed stars. The heavens of Aristotle end here; later theorists add two more, a ninth, to make the precession of the equinoxes, and a tenth, or primum mobile, to make the diurnal revolution. All beyond this is the empyreal heaven.

The office of the *primum mobile* is to revolve from east to west in twenty-four hours, carrying with it (but how, we do not know) the whole of the subordinate heavens, and making all the phenomena of day and night. All the heavenly motions are to be circular and uniform; this doctrine of the Platonic school is the keystone of the whole system. The poles of the primum mobile are those of the equator; but the ninth heaven moves slowly round the poles of the ecliptic, carrying the whole system forward in longitude, so as to give the phenomena arising from the precession of the equinoxes. The heavens of the other heavenly bodies move round with the mean motions of the bodies depending upon them; and this completes the general view of the system.

The details of the heavenly motions were for the mathematicians only, who dropped the orbs, and only took such circles out of them as were necessary in the explanation of the motions.

Without entering into all the details connected with this explanation, which are rather complicated, and require besides some knowledge of the actual inequalities of the planetary motions, we shall take the two leading circumstances of those motions, namely, their not being uniform, and their being sometimes direct, or according to the order of the signs of the zodiac, and sometimes retrograde. One way of explaining the simple irregularity of motion was by supposing the orb of the planet to be a sphere, and revolving uniformly, but not concentric with the earth. Let the earth be at E, and let the circle PQR revolve uniformly round the centre C, or let the planet P revolve uniformly in that circle. Consequently, the nearer the planet is to E, the faster it will appear to move, and the contrary, that is, a spectator at E will see the planet moving most slowly when at P, from whence the apparent motion will be accelerated until it arrives at R, and retarded while it returns to P on the other side. The circle PQR is called an eccentric. This hypothesis was a tolerably good representation of the motion of the sun, when EC was taken in a certain specified proportion to the radius CR; and if the sun had been placed at E, it would have made a sufficient representation of the motions of the planets, at least for the earlier periods of observation. But it must be remembered that though an acceleration and retardation would thus be established, it would not be precisely that of the planets, though sufficiently near, as remarked, to represent the results of rough observation.



The mode of obtaining the alternate progressive and retrograde motion is as follows:—Let P be the centre of a circle called an epicycle, and let P revolve uniformly round the earth at C, while the epicycle revolves uniformly round its centre, carrying the planet on its circumference, or while the planet revolves uniformly round the epicycle. Let the epicycle itself move in the direction PQR, and let the planet on the epicycle move in the same direction, or ABD. If then the times of revolution of the planet in the epicycle be sufficiently great compared with that of the epicycle itself, its retrogradation at D will more than compensate for the progression of the epicycle itself; that is, the planet will appear to a spectator at C to move in a retrograde direction, when it is in the lower part of the epicycle. But in the higher part, at A, both motions conspire to make it appear to move directly. There must consequently be an intermediate point at which the direct motion ceases and the retrograde begins; and near this point the planet will appear stationary.

It is by a complicated use of these methods that Ptolemy succeeds in giving a tolerable account of the angular motions known in his time; but they fail in placing the planet at the right distance from the earth, though they may place it nearly in the right longitude. We imagine that in modern times very few persons have taken the trouble to make themselves acquainted with the details of this system.

These may be learnt, with some trouble, from Delambre's account of the Syntaxis (*Hist. Astron. Anc.*), but they are explained with much more clearness in Mr. Narrien's 'Origin and Progress of Astronomy.' London, 1833. Those who would have Ptolemy's own explanation at a less expense of time than is necessary to find it in the Syntaxis, should look at his short tract, *περὶ ὑποθέσεων τῶν πλανωμένων*, which was published with the Sphere of Proclus, by Dr. Bainbridge, in 1620. The physical views may be collected, as well as the mathematical ones, from the 'Philolaus,' the first work of Bouillaud, Amsterdam, 1639 [See also SYNTAXIS; TROCHOIDAL CURVES.]

PTOSIS is a dropping of the upper eyelid, which the patient cannot by any voluntary exertion raise from before the globe of the eye. In some cases this effect is produced by great inflammatory swelling of the eyelid with effusion of serum into its tissue; but in those cases to which the name of ptosis is more especially applied, it results from a paralysis of the third pair of nerves [BRAIN], or only of that branch of it which supplies the levator palpebræ muscle. [EYE.] These are in fact cases of local paralysis, and must be treated, without any particular reference to the eye, according to the principles on which paralytic affections in general are managed. [PARALYSIS.]

PTY'CHOGENS are those Endogenous plants whose leaves are occupied by veins running side by side from the base to the apex, without irregular division, as in grasses, lilies, &c. The name has been given in contradistinction to Dictyogens, which are those Endogens that, like Smilax, have the reticulated veins of Exogens. [SMILACEÆ.]

PTYCHOPLEURES, the name used by MM. Duméril and Bibron to designate a subfamily of the *Chalcidians* or *Cyclosaurs*, the seventh family of Saurians according to their arrangement. The other subfamily of the Chalcidians is named by them the *Glyptoderms*.

The *Ptychopleures* have the body covered with true scales, which are little or not at all imbricated, and distributed regularly in rings around the body, which is thus as it were circled. Most frequently there is a depression or furrow (sillon) throughout the length of the trunk, and which separates the sides of the abdominal region.

Only one genus is entirely without feet, and that (*Ophisaurus*) would be a true serpent if it had not eyelids, an auditory conduit, soldered jaws, and a tongue not sheathed. [OPHISAURUS.]

Pseudopus comes next, inasmuch as it has the rudiments only, or the indications, so to speak, of the existence of a pair of feet (posterior), with the longitudinal lateral furrow and the auditory aperture of the preceding genus. [SCHELTOPUSIK.]

All the other genera of the same group have two pairs of feet, or at least the rudiments of them, in which last case are the genera *Chalcides* and *Chamæsaura*. [CHALCIDES.]

The anterior appendages of the former corresponding to the anterior feet terminate by three or four scaly tubercles, whilst the posterior pair is often only represented by two slender stylets. Here there is neither trace of an auditory canal nor of femoral pores, and the lateral furrow is very little marked.

Chamæsaura has four appendages in lieu of feet, but they are not divided into toes at their extremity. The ear is apparent externally, and there are no folds along the lateral parts of the body.

Then come the species and consequently the genera which have the four feet terminated by toes well separated from each other. They may be divided into those which have only four toes and those which have five distinct toes.

Saurophis is the only genus with four toes only on the anterior and posterior feet. Their auditory canal or its tympanum is visible, as well as the longitudinal fold, and even the femoral pores. Among the genera with five toes on all the feet, and which thereby form an artificial division approximating to the true Lizards, there is one, *Heterodactylus*, which has been so named because the fifth toe of its anterior feet is so short that there was a belief that it did not exist: this genus moreover has neither tympanum nor abdominal furrow. The greater part have besides femoral pores, except the genus *Gerrhonotus*, whose tympanum is distinct and sunk in a canal, and in which the abdominal furrow is very apparent.

The other genera have femoral pores, but two are without that lateral fold which is found in the greater number of the species of this family. These are the genera *Ecpleopus* and *Pantodactylus*.

Among the other genera, there is one, *Gerrhosaurus*, the species of which have not strongly-spined scales round the tail, but they have all auditory apertures, a lateral furrow, and femoral pores. At first view they resemble the Scinks.

The two other genera have round their tails verticillations of rude solid scales, *Zonurus* or *Cordylus* and *Tribolonotus* which differ from each other by the papillæ with which their tongue is covered. They are in filaments and hairy in the first, whilst they are scales in the second, which besides wants the lateral folds, and has the back beset with strong spines, which seem to be adherent to the vertebræ.

The genera *Heterodactylus* and *Chalcides*, besides wanting the trace of external ears, have the eyelids very much attenuated. Their tongue, particularly that of *Chalcides*, very much resembles that of the *Amphisbænæ*, and they may be considered as almost insensibly leading the way to the *Glyptoderms*, to which we now draw the reader's attention.

MM. Duméril and Bibron characterise the *Glyptoderms* which correspond to the group of the *Amphisbænæ* by the quadrilled impressions observable all over their skin, which is besides annulated or marked with verticillations, with the trace of the lateral furrow (sillon). They allow the subfamily to contain only three principal genera, although they observe that authors have established a much greater number. They state that these genera are easily distinguished, first, because one only, *Chirotes*, is furnished with a pair of feet (anterior) the fingers of which are sufficiently distinct. In other respects it resembles the *Amphisbænæ*.

The other two genera have no feet, and have been generally arranged among the serpents. One of the most remarkable characters which distinguishes them however is the existence of the pores which are to be seen in front of the orifice of the cloaca in the *Amphisbænæ*, whilst there is not the slightest trace of it in the *Lepidosternon*, which has, as its name indicates, great scaly plates upon the lower and anterior part of the trunk near the neck.

The *Glyptoderms* are, further on in the work of MM. Duméril and Bibron, divided into *Acrodont Glyptoderms* and *Pleurodont Glyptoderms*.

The first section consists but of one genus, *Trogonophis*, Kaup.

The second comprises the genera *Chirotes* [CHIROTES], *Amphisbæna* [AMPHISBÆNA], and *Lepidosternon*. (*Erpétologie Générale.*)

PTYCHO'TIS, a small genus of Umbelliferous plants, of which the seeds of some of the species have formed articles of condiment and of medicine from very early times. The genus extends from the south of Europe, through the Oriental region, to all parts of India. The calyx is 5-toothed. Petals obovate, bifid, or emarginate, with a long inflexed point. Fruit compressed laterally, ovate or oblong. Seed roundish, or flat before and convex posteriorly. The species are annual or biennial plants. Stem leaves usually cut into numerous capillary segments. Flowers white, disposed in compound umbels, of which the involucels are many-leaved, and the involucre either wanting or few-leaved.

The European species are not remarkable for any useful properties, but *P. coptica* and *P. Ajowan* probably yielded the seeds which formed the *Ammi* of the antients. Botanists and inquirers into the plants, condiments, and medicines of the antients, have usually sought too exclusively in Europe for what was frequently derived from the East. Dioscorides states that the Æthiopic Ammi is called Cumin by some, and that it is thought to be distinct from the royal kind. The seeds of one kind were sent by Forskål to Linnæus, who named the plant Ammi copticum. This has now been removed to the present genus Ptychotis. Arabian authors give Nankhwah as the synonym of Ammi, and Persian authors consider Ajwain to be a synonym of the former. It is remarkable, according to Dr. Royle, that there is also an Indian plant which is everywhere called Ajwain, and celebrated for its aromatic smell, pungent taste, and for its employment both by natives and Europeans for culinary and medicinal purposes; so much so, that Dr. Roxburgh could not conceive that 'this famous Indian plant should be unknown to European botanists.' Dr Royle says, 'in Persian works in use in India the Arabic Nankhwah is given as a synonym of the Indian Ajwain, as it is also of the Greek Ammi.'

The Indian species has been referred by De Candolle to the genus Ptychotis, and called by him P. Ajowan, stating that it was very closely allied to *P. coptica*, which we have seen was considered to be one kind of Ammi—the two kinds described by Dioscorides being Cuminum Æthiopicum and regium. The latter name is translated by the Persians *Kumoon Mullooke*, or royal Cumin, and given as a synonym of the Nankhwah. The Indian and Egyptian kinds of Ptychotis, as ascertained by modern botanists, are therefore most probably the two kinds of Ammi of Dioscorides. These afford interesting instances of the results to be obtained by closely examining the products of nature possessed of any remarkable properties, in the countries where they are produced, and continue to be used, and whence they were probably first obtained by the antients.

PTYCHOZO'ON. [Gecko, vol. xi., p. 105.]

PTYODA'CTYLUS. [Gecko, vol. xi., p. 105.]

PUBERTY (*Pubertas*), the age at which the period of boyhood or girlhood ends, and that of adolescence begins. [Age.] The word is derived from *pubes*, which in its primary signification means the down or soft hair that generally begins to grow on young people about that time. Puberty appears at various ages, according to the climate, the circumstances connected with education, and the constitution of the individual. The usual period in this country is from the twelfth to the fourteenth year for females, and from the fourteenth to the sixteenth for males. In the northern parts of the island it is often a year or two later in both sexes. It is often observed earlier in boarding-schools both in respect of males and females. In the latter (in London or its vicinity) I have, says Dr. Copland (*Dict. of Pract. Med.*, art. 'Age') not unfrequently met with instances of puberty at ten and eleven years, especially in sanguine and plethoric constitutions; and where the apartments, particularly those for sleeping, have been crowded and close. Women in all countries reach the period of puberty one or two years before men; and the inhabitants of warm before those of cold climates. In the hottest regions of Africa, Asia, and America, girls arrive at puberty at ten, or even at nine years of age; in France not till thirteen, fourteen, or fifteen; whilst in Sweden, Russia, and Denmark this period is not attained till from two to three years later.

Occasionally however an extraordinary precocity exhibits itself in the development of sexual organization and power both in males and females. It is not necessary to dwell at any great length upon instances of exemplification, which may be traced in great numbers in the writings of physiologists who have been curious upon this subject. Those who are desirous of doing so may turn to the 'Journal des Sçavans' for 1688, and the 'Philosophical Transactions' for 1745. In the former Boisset gives an instance of this precocity in a boy of three years old; in the latter, the subject in the case recorded was two years and eleven months. A similar example at a similar age is well known, says Dr. Good (*Pract. of Med.*, 'Præcotia Masculina'), to have occurred only a few years since in a boy who was exhibited by his friends for money to medical practitioners in London; and may be found, together with various others, minutely described in the first volume of the 'Medico-Chirurgical Transactions.' Two, of late date, are also detailed in the eleventh and twelfth volumes of the same work, by Dr. Breschet and Mr. J. F. South. In the year 1741, Mr. Dawkes, a surgeon at St. Ives near Huntingdon, published a small tract, called 'Prodigium Willinghamense,' or an account of a surprising boy, who was buried at Willingham, near Cambridge, upon whom he wrote the following epitaph:—'Stop, traveller, and wondering know, here buried lie the remains of Thomas, son of Thomas and Margaret Hall, who, not one year old, had the signs of manhood; not three, was almost four feet high; endued with uncommon strength, a just proportion of parts, and a stupendous voice; before six he died, as it were, of an advanced age. He was born at this village, October 31, 1741, and in the same departed this life, September 3, 1747.' (See also 'Philos. Trans.,' 1744-5.) As Dr. Elliotson has observed (Blumenbach's *Physiology*, 4th ed., p. 535, note), this perfectly authentic case removes all doubts respecting the boy at Salamis, mentioned by Pliny (*Hist. Nat.*, lib. vii., cap. 17), as being four feet high, and as having reached puberty when only three years old; and respecting the person seen by Craterus, the brother of king Antigonus, who, within seven years, was an infant, a youth, an adult, a father, an old man, and a corpse. (Phlegon, *De Mirab.*, cap. 32.)

Females also may acquire a similar precocity to that of males; and we have numerous and well authenticated instances of pregnancy itself occuring at the early age of nine years. (See references in Dr. Good's *Pract. of Med.*)

At the time of puberty in the male, the larynx enlarges, the quality of the voice is changed, the beard grows, the chest and shoulders enlarge, and the power of procreation commences. In the female, the breasts and pelvis enlarge, the uterine organs are developed, and a peculiar periodic discharge from the uterus commences, which continues, subject to certain suspensions during pregnancy and lactation, as long as the organ is capable of impregnation, or, on the average, about thirty years The period which commences with puberty is, both as regards the mind and the body, one of the most important epochs of human existence; for, says Dr. Copland (*loc. cit.*), during it the natural development of the sexual organs imparts a health and tonic excitement throughout the economy, bringing to their state of full perfection all the organs of the body, and all the manifestations of mind, excepting those that are derived from experience. The organs of respiration and voice have acquired their full growth and tone, the muscles their due proportion, and the cerebro-spinal nervous system its beautiful organization; placing man, by the exercise of its admirable functions, at the head of all animated creation—the dread of all other animals, the wonder of himself. It is chiefly during this period of life that the mind becomes stored with ideas, derived both from the learning of the antients, the science of the moderns, and the arts and accomplishments of highly civilised life; and is more particularly and more ardently engaged in decomposing the information thus acquired, and recombining it in new and useful and attractive forms.

PUBLICA'NI. The publicani were a body of persons in the Roman state who farmed the public revenues (vectigalia), from which circumstance apparently their name is derived. ('Publicani autem dicuntur qui publica vectigalia habent conducta,' *Dig.*, 39, tit. 4, s. 12.) They were numerous as early as the sixth century of the republic, and they continued to exist under the emperors. The publicani formed various societies or partnerships, which had a corporate character. The persons who were members of these societies were chiefly of the equestrian order, and the whole body was so numerous and wealthy as almost to constitute a separate class in the state. Each societas had a magister, or chief manager, at Rome, and a deputy magister (promagistro), with numerous associates and assistants, in the provinces. [Provincia.] The revenues, which were chiefly leased to the publicani, were tolls, harbour duties, and the scriptura, or the tax that was paid for the use of the public pasture-lands. The publicani had their under-lessees (portitores, τελῶναι, *Luke*, v. 27, 29) and collectors. Numerous slaves were also employed by them in collecting the taxes; and this body of men was comprehended under the term of a 'familia publicanorum.' In the prætor's edict however (*Dig.*, 39, tit. 4, s. 1), which was specially directed against wrongful acts of the publicani, the term 'familia' was interpreted as comprehending all who aided them in collecting the vectigal, whether slaves of their own, of other people, or free men. In our translation of the New Testament these inferior officers are called 'publicans,' and are mentioned together with 'sinners,' a distinction to which they might be partly entitled for their occasional oppressive conduct, and partly to the general dislike of all the world to tax-collectors. It appears that Matthew, who was a Jew, was a publican (*Matth.*, ix. 9), from which circumstance, and from all reasonable probability, it may be concluded that natives of a province were employed as collectors, and probably farmed the revenues of small districts from the great Roman publicani. Indeed it is not easy to conceive how the services of natives could have been well dispensed with.

The publicani undertook to pay fixed sums for the taxes of a particular district or place. The contract was often made by a single person on behalf of himself and others. It was the business of the censors to let the taxes. The publicani gave security to the state for the due performance of their contract; and their property, as well as that of their sureties, was liable to the amount of their obligations.

Among the remedies which the publicani had against those who were bound to pay vectigal, was the 'pignoris captio,' which seems to have been a kind of distress (Gaius, iv. 28); but after the old forms of action were changed, it was not usual actually to seize the property, but a fiction was introduced into the formula, by virtue of which the person who owed the vectigal might be condemned in a sum of money equal in amount to what he must have paid in order to redeem his property if it had been seized.

PUBLI'COLA, PU'BLIUS VALE'RIUS. His original name was Publius Valerius, and the surname Publicola was given to him as a distinction for his republican virtues. He was of Sabine origin, and the son of Volesus. During the tyrannical government of Tarquinius Superbus, he is said to have been distinguished for his riches, wisdom, and affability. The first time that we find him taking an active part in the affairs of Rome was shortly before the expulsion of the Tarquins, when, with Sp. Lucretius, he went from Rome to Collatia to avenge the violence done to Lucretia. He strenuously assisted Brutus in effecting the banishment of the Tarquins (Plut., *Publ.*, i.; Liv., ii. 2); and when, after the establishment of the consulate, Tarquinius Collatinus had resigned his office, P. Valerius was appointed consul in his stead. In the ensuing war of the Tarquins, who were aided by the Veientines and Tarquinians, Valerius commanded the Roman infantry, and gained a great victory near the forest of Arsia (509 B.C.): Brutus, his colleague, fell in the battle. Valerius, with the spoils of the enemy, returned to Rome in triumph (Liv., ii. 7; Plut., *Publ.*, 9), where on the next day he solemnised the obsequies of his colleague. Valerius now had no colleague appointed in the place of Brutus, and he wished to remain sole consul, that he might not be thwarted in his plan of confining the consular power within proper limits. The election was thus delayed, and when, in addition to this, he built a stone house on the top of the hill Velia, which looked down upon the Forum, near S. Francesca Romana, he excited among his fellow-citizens a suspicion that he aimed at the kingly power. He himself in his innocence was unconscious of the feelings which he was exciting, and as soon as he was made aware of the rising suspicion, he appeared before the assembly of the people (populus), and, as a sign of respect, lowered before them his fasces, from which the rods had been previously taken out. He then addressed the people, and, to convince them of his innocence, he stopped the building, and ordered the part which was already finished to be pulled down. The people, thus ashamed of their unfounded suspicions, granted him a piece of ground at the foot of the Velia, where he might build his house, and at the same time the privilege of having the doors to open out into the street, while the doors of all other Roman houses, like our modern doors, opened into the house. The respect which he had shown to the populus, whom he had clearly acknowledged as the source of his power, procured him the name of *Publicola*. He still remained sole consul, and now began to carry out his plan. He first filled up the vacancies in the senate which had occurred during the late revolution by adding 164 senators (Niebuhr, *History of Rome*, i. 525, &c.), and then carried several laws to prevent the restoration of the kingly government; he also secured to the plebeians the right of appeal to a tribunal of their own order from a sentence pronounced by the consul which inflicted bodily punishment. (Plut., *Publ.*, 11; Liv., ii. 8; iii. 55; x. 9.) He is also said to have established a public treasury in the temple of Saturn, for the management of which two quæstors (treasurers) were appointed. (Comp. Niebuhr, *loc. cit.*) After he had introduced these beneficial and popular measures, he held the comitia for electing a successor to Brutus The curies appointed Sp. Lucretius, who, being at a very advanced age, died a few days after, and in his place was elected M. Horatius Pulvillus, who at the close of the year was re-elected to the consulship along with P. Valerius (508 B.C.). Respecting the difficulties connected with the first consulship of Valerius and his several colleagues, see Niebuhr 'Hist. of Rome,' i. 535, &c. In the war with the Etruscans [PORSENA] which broke out in this year, Publicola and his colleague were wounded, and the Romans retreated across the Tiber, within the city. But Publicola subsequently made great havoc among the Etruscans by a stratagem. The celebrated census of Publicola (Dionys., *Hal.*, v. 293, ed. Sylburg), at which 130,000 adult Romans were registered, is said to have taken place in the second consulship of Publicola. During the siege of Rome by Porsena (Plut. *Publ.* 17), or, according to Livy, after the battle of Aricia, Publicola was made consul a third time, with P. Lucretius (507 B.C.). It was in this year, according to the tradition followed by Plutarch, that Porsena attempted to negotiate for the restoration of the Tarquins, to which Publicola offered the most determined opposition. Among the hostages given to the Etruscan king was Valeria, the daughter of Publicola, and it was he who sent the maidens back, when, headed by Cloelia, they had made their escape.

Towards the end of this year the Sabines invaded the Roman territory, upon which M. Valerius, brother of Publicola, and P. Postumius, were appointed consuls. Marcus, aided by the advice and the presence of his brother, gained two victories, and in the last battle he slew 10,000 of the enemy without any loss on the Roman side. For this Marcus received great rewards, and was honoured with the same privilege as his brother, of having the doors of his house open into the street. (Plut., *Publ.*, 20.) But when the Sabines, after their defeat, united their forces with those of the Latins, and the danger thus became more threatening, Publicola was made consul a fourth time, together with T. Lucretius. The consuls set out against the enemy, who were already weakened by the desertion of some of their leaders, and, after ravaging the country, they gained a battle, in which the enemy was so much reduced that he ceased to be formidable, and the consuls, with rich spoils and numerous captives, returned to Rome in triumph. After this triumph, the new consuls for the following year were elected, and Publicola soon afterwards died, or, according to Plutarch, put an end to his own life. Niebuhr thinks that, according to the original legend, Publicola died in the battle of Regillus, 496 B.C. He was buried at the public expense, which must be considered as an honourable distinction, and not, as Livy thinks, as a proof of his poverty, and the Roman matrons mourned for him a whole year, as they had done for Brutus. The citizens decreed that the body should be interred within the city near the Velia, and that the whole house of the Valerii should enjoy this same privilege, for which however, in subsequent times, a symbolical ceremony was substituted.

The real history of Publicola is entirely disfigured, and has come down to us in the garb and with all the embellishments of poetry. The fact that Publicola is represented consul for three successive years, together with the fact that he pulled down his house on the hill Velia, and the extraordinary distinctions granted to him and other members of his house, have led Niebuhr to suppose that, after the banishment of the Tarquins, the Valerian house for a time possessed the right of exercising the kingly power, for and on behalf of the Tities, by one of its members; and he looks upon Publicola's taking up his residence at the foot of the Velia as a pledge of his intention to exercise his royal authority as befitted a citizen. (Niebuhr, *Hist. of Rome*, i., p. 538.)

PU'BLIUS, SYRUS, a native of Syria, was brought when a boy to Rome as a slave, but he met with a kind master who took care of his education, and eventually gave him his freedom. He excelled in writing mimi, which were in great vogue at Rome in the latter times of the republic. [MIMES.] Publius lived in the time of Julius Cæsar, who on a public occasion gave him the preference over Laberius and other contemporary mimographers. (Aulus Gellius, xvii. 14.) Publius appears to have been more correct and moral in his writings than authors of mimi generally were. St. Jerome (*Epistola ad Lætam*) says that the Romans used to read his works in their public schools. His works are lost, but several of his moral apophthegms, which have been preserved by Seneca, Gellius, and other antient writers, are remarkable for their laconic precision and justness of sense. They have been collected and printed at the end of several editions of Phædrus.

PUCCI'NIA, a genus of Fungi well known to farmers under the name of mildew. It is distinguished from other parasitical genera by its spore-cases being elevated upon long slender stalks and divided internally by one or two horizontal partitions into two or three separate cavities; the spore-cases arise from a spawn or matrix which is dispersed among the living tissue of the plant on which they grow. A considerable number of species have been distinguished by writers on fungi, and thirty-eight are enumerated as inhabitants of this country. They all grow upon the living leaves or stems of plants, and are generated in their interior, bursting through the epidermis when ready to scatter their seeds or spores; by what means the latter are introduced into the tissue has never been satisfactorily explained: some writers imagine the seeds to be introduced through the stomates from the atmosphere where they float; but it seems more probable that they are absorbed by the young roots, and carried upwards in the current of vegetation, a mode of introduction which their extremely small size renders quite possible. The mildew of corn is the *Puccinia graminis*, which makes its appearance on the straw and leaves in the form of dark grey or black lines and patches, broken in outline in consequence of their running irregularly together. Each line consists of numerous minute spore-cases, which are individually black when quite ripe. The plant appears in all corn-fields in all seasons, but its injurious effects are only observed in wet seasons, or in places where, from whatever cause, the straw becomes very rank; in the latter instance, the spore-cases, from their great abundance, attract from the straw the fluid food which was intended for the support of the grain, intercepting it in its passage upwards, and thus cause the ruin of the crop. In a disease of this kind there seems no hope of discovering a remedy, for the earth is undoubtedly well stored with the spores of Puccinia in all places and in all seasons.

PUCCOON. This name is given in the United States of America to a red vegetable pigment employed by the Indians, and hence has been transferred to the plant that produces it. By some it has been ascribed to Sanguisorba Canadensis; but Pursh asserts that it is obtained from the root of Batschia canescens, a Boraginaceous plant, while the American writers with one accord apply the name to Sanguinaria Canadensis, a Papaveraceous plant, whose roots yield, when wounded, a deep orange-red fluid.

PUDDING-STONE. [Conglomerate.]

PUEBLO. [Mexican States.]

PUERPERAL DISEASES. Under this term are included all those diseases which arise out of the state of pregnancy: they are not however, as the name would seem to imply, peculiar to this condition, but incidental only; and they are so far modified by it as to require some allusion to their character and mode of treatment. Among the most alarming of these diseases, and the earliest to make their appearance, are puerperal convulsions; they consist of epileptic seizures, and their character differs in no respect from the ordinary epileptic fits already described in the article Epilepsy: we therefore shall merely observe in the present place, that convulsions are liable to occur at any time after the sixth month of utero-gestation; but, for the reasons about to be stated, the majority of cases are met with during labour. When they occur after delivery, they are generally connected with a loaded state of the large intestine, or with a state of exhaustion from hæmorrhage. The cause of these attacks must be looked for in the state of the viscera and large blood-vessels at this period: during gestation, these parts are subjected to a constant and increasing degree of pressure from the gravid uterus, the natural tendency of which is to produce local congestion of the circulating fluid, and an undue accumulation of the excretions within the intestines. At the time of parturition this pressure is materially augmented by the contractile efforts which are made to expel the infant; and the mechanical obstacle thus offered to the flow of blood through the abdominal aorta, determines it in unnatural quantity to the brain. Hence this state of things, if not remedied, may not only produce the disease we have just been considering, but may even give rise to apoplexy. The treatment is obvious, and consists in relieving the vascular system by general and topical bleeding, and unloading the intestines by brisk cathartics.

But by far the most important and the most dangerous of puerperal diseases is puerperal peritonitis [Peritonitis], called also puerperal inflammation, puerperal fever. It usually attacks women a few days after delivery, and seems to have no connection with the duration or the severity of labour. This fatal disease varies so much in the type of the inflammation as to be scarcely recognised as the same affection in different individuals and at different periods, the accompanying fever being sometimes strictly inflammatory, and at other times typhoid. In its most dangerous form it is characterised by a remarkable prostration of the vital powers, and by a countenance expressive of extreme anxiety and distress. The pulse is frequent and feeble; the abdomen tympanitic, and unable to bear the slightest pressure; the bowels are constipated, and vomiting is not an unfrequent attendant. As the disease proceeds, the lochial discharge and the secretion of milk are suppressed; and towards its termination, a total cessation of pain sometimes occurs, and the patient dies, often in full possession of her consciousness to the last. This severe form of puerperal fever is most frequently epidemic, and many believe it to be highly contagious. The lesions met with in this disease are chiefly manifest in the peritoneum; but in the worst cases, the substance of the uterus itself, and the large veins in its vicinity, present evidences of inflammation. The treatment of puerperal fever is peculiarly difficult; 'every case,' observes one of our most celebrated accoucheurs, 'must be isolated and studied alone, and looked at by itself, and its management must depend upon its type and its stage.' Bleeding, general and topical; counter-irritation, by means of blisters or spirits of turpentine, applied to the abdomen; purging, by the exhibition of the last-named medicine, or by large doses of calomel; and the latter, given to excite ptyalism, have been the principal remedies used for combating this formidable malady. But the prostration of the vital powers is, in some cases, so extreme, as to afford us little chance of putting into requisition the only means which we possess of combating the inflammatory symptoms. A form of disease sometimes occurs after delivery, which, from its resemblance in some particulars to the one we have just alluded to, requires notice. It is due to stomachal and intestinal irritation; and is ushered in by rigors, followed by great heat of skin, a full and frequent pulse, and loaded tongue. The abdomen may be tumid and painful on pressure, and the head may be affected by symptoms of phrenitis, as intolerance of light, noise, wakefulness, and delirium. The affection of the head and that of the abdomen frequently coexist or alternate in the same case, and this conjunction of the two affections serves to assist in the diagnosis between peritonitis and the present complaint. As it is of the greatest importance in a therapeutic point of view to distinguish puerperal inflammation from intestinal irritation, much may be learnt by the exhibition of large injections of warm water, an examination of the evacuations, and an observation of the effects thus produced upon the disease. In intestinal disorders, the fæces will be found to be scybalous, or at least offensive and dark-coloured, and in large quantities; and the relief obtained will be found to depend upon the proper evacuation of the bowels. Another characteristic of intestinal irritation is the susceptibility to fainting upon blood-letting. The treatment of this disorder may be summed up in the words of Dr. Marshall Hall. 'In peritonitis,' he observes, 'the freest blood-letting must be aided by purgative medicines; whilst in intestinal irritation, the freest and fullest evacuation of the intestines must be aided by blood-letting; for although both blood-letting and purging are to be used in every case, yet the former is the remedy in inflammation, and the latter in intestinal irritation.' In describing the last-mentioned disease, we have alluded to the combination of cerebral symptoms, which so frequently are present. This disturbance of the intellectual functions is sometimes so great and so continued, as to lead to the supposition that the brain is the seat of some active inflammatory disease; and were we, acting upon this supposition, to have recourse to antiphlogistic remedies only, we should probably lose our patient. This alarming disorder has been termed puerperal insanity, or puerperal mania. It comes on rather insidiously: there is a little excitement during the day and sleeplessness at night; then delirium, and then actual mania; the pulse is somewhat accelerated, the tongue furred, the skin hot, the bowels costive, and the secretion of milk diminished. It seems to arise from a combination of causes acting upon an originally irritable temperament, but rendered still more so by intestinal disorder and hæmorrhage, or by the debility consequent upon suckling. Blood-letting in these cases is generally fatal; the treatment consists in regulating the bowels and preserving extreme quiet of mind and body, with a nutritious but not stimulating diet. When speaking of puerperal fever, it was observed that the large veins in the vicinity of the uterus frequently presented traces of inflammation. Uterine and crural phlebitis however occurs as a distinct disease, and has been described under the terms of phlegmasia dolens, œdema puerperarum, the white swelling of lying-in women, &c.; but it is only within a few years that the true nature of this disease has been fully understood, having been first pointed out to the profession by the late Dr. Robert Lee. It may appear as early as the fourth day after delivery; but, in the majority of cases, it is not till the second or third week that it makes its appearance; and, in many instances, attacks women who are recovering from puerperal fever. It is ushered in with rigors, and these are succeeded by heat, thirst, and other symptoms of pyrexia. There is a sense of pain, first experienced in the uterine region, and gradually descending in the course of the iliac and crural veins down one leg, accompanied by swelling, and great tenderness upon pressure along the course of the vessels, which are hard as a cord, and roll under the fingers. In some cases an erythematous redness of the integuments of the limb is met with; but in the majority they are smooth, shining, tense, and colourless. The power of moving the limb is completely lost, and it is greatly and uniformly swollen throughout its whole extent. Sometimes, after the inflammation has subsided in one limb, the other is attacked in a similar way. The pain and febrile symptoms usually diminish within a few days after the occurrence of the swelling; but sometimes the pain is excruciating throughout the whole period of the acute stage of the disease. The duration of the acute stage is various in different individuals; in the greater number of cases it terminates in two or three weeks; but the limb still remains powerless and œdematous. In some women the limb does not return to its natural state for many months, or years, or even during life. The appearances on dissection which are met with in this disease are similar to those which characterise inflammation of the veins generally. The causes of this affection are supposed to be owing to the orifices of the veins in the lining membrane of the uterus being left open after the separation of the placenta, by which a direct communication is established between the cavities of these veins and the atmospheric air. The treatment of phlegmasia dolens consists in the local abstraction of blood by leeches applied to the groin, and in the course of the large venous trunks of the limb; hot fomentations to the part, and the administration of diaphoretics and saline purgatives. After the inflammatory symptoms have subsided, the limb may be supported by a bandage, and slight frictions made use of. There is a disorder occasionally met with in the puerperal state, which, from not being mentioned in the article HÆMORRHAGE, must be alluded to in this place. The symptoms about to be detailed are owing to loss of blood, uterine hæmorrhage during and shortly after parturition being not an unfrequent occurrence. The more immediate effects of hæmorrhage are fainting; and where the loss of blood has been great, this symptom is sometimes so prolonged as to be not only dangerous, but fatal. It is the more remote consequences of loss of blood that we are to speak of in this place: we have seen already how a combination of this with intestinal disorder and other irritating causes gives rise to puerperal mania; we shall now view the effects of hæmorrhage as they are met with uncombined with the conditions previously alluded to. This condition of system has been called by the French pathologists a state of anæmia, and is characterised by a pallid condition of the skin; great nervous excitability; a throbbing of the temples; vertigo; tinnitus aurium; a frequent, jerking, compressible pulse; a great tendency to faint on the slightest exertion, or in the upright position; palpitation of the heart; halitant respiration; and, generally, great thirst. The treatment to be adopted in anæmia from loss of blood, consists in maintaining a perfect quiet of mind and body, in a free exposure of the patient to fresh air, a mild but nutritive diet, and a regular but not an over-active state of the bowels. The symptoms we have just enumerated as arising from loss of blood are sometimes met with, in a mitigated form, at a much later period of the puerperal state, and arise from the drain occasioned by super-lactation. The treatment of these cases is more simple, and consists generally in the weaning of the child, the adoption of a more nutritive diet, and change of air. With respect to what are called milk-abscesses, they arise from the inflammation consequent on over-distention of the lactiferous tubes, and require the same mode of treatment as is adopted in abscess when it occurs in other parts than the breast. [ABSCESS.] They are best prevented by permitting the infant to suck within a few hours after delivery, and by repeating this act frequently. When the secretion of milk is excessive, the bowels should be kept freely open by saline purgatives.

PUERTO BELLO. [PANAMA.]

PUERTO CABELLO is a town and port in the republic of Venezuela in South America, and in the department of the same name, in 10° 20′ N. lat. and 69° 10′ W. long. It is situated on the north coast of South America, and is considered the best port on the south coast of the Caribbean Sea. A narrow low island extends about two miles east and west. It is overgrown with mangrove-trees, and at its eastern extremity is united to the continent by a shoal. To the south of this island is the harbour, which is formed on the west by a peninsula projecting northward and terminating about 100 yards from the island. The space between the peninsula and island forms the entrance of the port, which is deep, but so narrow that only one vessel can pass through it at a time. The small bay, of which the northern part forms the harbour, extends southward, and at its extremity turns southwest. The southern portion of it contains several islands overgrown with mangrove-trees. The harbour itself is deep and spacious, and the largest vessels may lie there in safety; for though a heavy surf breaks along this coast of South America, its force is broken by the intervening island, and as the entrance of the harbour is from the west, the surf does not penetrate to the interior. Accordingly the water of the harbour is always as smooth as that of a lake. The town consists of the city and of the suburb. The city is situated on the northern part of the peninsula, through which a cut has been made, by which the site of the city is converted into an island. It is small, but contains several good houses, and is well fortified. Neither the church nor any of the public buildings require particular notice. There are some good warehouses, and an excellent wharf faced with stone, both erected by the Guipuzcoa Company, when it had obtained the right of exclusive commerce with this part of America. Vessels of large burden lie close to the wharf, and as they can be easily and securely fastened to the shore, anchors are seldom required. To this circumstance it is said the harbour owes its name, as implying that vessels may here be secured by a single hair (*cabello*); but Humboldt asserts that it acquired this name from one Antonio Cabello, who carried on an extensive illicit traffic with Curaçao before the Guipuzcoa Company built a town here. Over the cut which separates the city from the suburb is a bridge of wood, and a gate on it, which is shut every night. The suburb is much more extensive than the city, but built with less regularity. The houses are low, only a few of them having an upper story. It is the residence of the merchants and working people. Both places contained at the beginning of this century a population of 9000. Later accounts are wanting. The commerce of the town is considerable, and the produce of the fertile countries lying to the south of it, as the valley of Aragua and the plain of Valencia, is exported from it. The exports consist of cacao, coffee, sugar, and a great number of mules. Formerly 10,000 mules are said to have been annually shipped for Jamaica and other parts of the West Indies. The principal commercial relations of Puerto Cabello are with Jamaica and Curaçao, but as to this matter also more recent information is wanting.

(Humboldt's *Personal Narrative*; Depons, *Voyage à la Partie Orientale de la Terre Ferme*; Semple's *Sketch of the Present State of Caracas*.)

PUERTO DE SANTA MARIA, or St. Mary's Harbour, the 'Portus Menesthei' of the antients, is a large seaport of Spain, in the province of Cadiz, five miles north-east of that city, at the mouth of the river Guadalete. The town is well built, well paved, and kept very clean. The Calle Larga, or Long Street, which is about a mile in length, has a very handsome appearance, owing to the number of fine shops and elegant buildings. The public walk, called Paseo de la Victoria, is a very agreeable spot during the hot summer days, when it is very much frequented by the inhabitants. There is also a beautiful public garden on the banks of the Guadalete planted with all sorts of exotic trees. The quay is well contrived, but large ships cannot come up to it, on account of the numerous sand-banks by which the mouth of the river is obstructed. On the west side of the town there is a very fine prospect of the bay and town of Cadiz, which, seen from an eminence on the road to Xerez, looks as if it rose out of the waves of the ocean. The principal church, a building of tolerable antiquity, is chiefly remarkable for a profusion of gorgeous ornaments not in the best taste, as well as for a few pictures by the best masters of the Sevillian school. There are within the town six convents for men and three for women, but these have been shut for some time. This town is the capital of a considerable district, and is occasionally the place of residence of the civil and military authorities of the province of Cadiz. The climate is excellent, having little either of the severity of cold in winter or scorching heat in summer, for which reason the wealthy inhabitants of Cadiz make it their place of residence during the summer. The only manufacture of consequence at present in the town is soap, of which large quantities are yearly exported. There are also a few manufactories of hats and one or two brandy-distilleries. The land around the town is in a tolerable state of cultivation, and yields abundant crops of corn, oil, and wine, which last article is imported into England under the name of sherry. Puerto de Santa Maria is the birth-place of José Cordero, a Franciscan friar, who made the clock in the tower of the cathedral of Seville, and of Enziso Monzon, who translated the whole of Virgil into Spanish verse, Cadiz, 1698, 4to. Lat. 36° 31′ 8″ N.; long. 6° 18′ W.

PUERTO REAL, a town in the south-west of Spain, in the province of Cadiz, five miles east of that city, and on the bay of Cadiz. It was founded by Ferdinand and Isabella during the Moorish war, whence its name 'Royal Harbour.' The streets are airy, clean, and straight, and the houses well built, with flat roofs. The market-place, which is situated in the centre of the town, is a spacious square surrounded by stone arcades, under which all sorts of provisions are exposed for sale. There is also a very handsome stone pier and several commodious wharfs of the same material for the unlading of ships. Close to one of the latter is a large reservoir, from which water is daily conveyed to Cadiz for the supply of the town and the ships in the bay. During the Peninsular war, the French erected their batteries against Cadiz at Puerto Real. The population, which at the beginning of the last century amounted to nearly 7000, is now reduced, according to Miñano's estimate, to 3000. There is little or no trade, except in salt, this being the great depôt of all that which is collected between the island of Leon and the bay of Cadiz.

PUERTO RICO, an island of the West Indies, belonging to Spain, is the smallest of the Greater Antilles, and the most western of the Leeward Islands. The name of Leeward Islands is derived and corrupted from the old Spanish navigators, who divided the islands into two classes, Barlovento and Sotavento, the former comprising all the Caribbee Islands, and the latter Cuba, Jamaica, San Domingo, and Puerto Rico. The English have applied both names to the Caribbee Islands, the Windward Islands extending from Trinidad to Martinique, the Leeward Islands from Dominica to Puerto Rico.

This island is in the form of a parallelogram, 84 miles long and 35 broad, and it contains about 2940 square miles. It lies between 17° 50′ and 18° 30′ N. lat., and 65° 39′ and 67° 11′ W. longitude. The population, in 1836, was 357,086. Puerto Rico is bounded on the north by the Atlantic, on the west by the Mona Passage, which separates the island from San Domingo, with a width of about 75 miles, on the south by the Caribbean Sea, and to the east lie the Virgin Islands.

A range of mountains of considerable height runs through the centre of the island; the highest part is that of Luguilla in the north-east. The Yungue, the most elevated peak, is about 3700 feet high. From the central chain many inferior ridges run north and south, containing between them valleys of great fertility watered by rivers; these valleys widen as they approach the sea. The valleys of the north side produce the best pasturage; those of the south grow most sugar. The coast abounds with harbours: those on the north coast are generally unsafe during the prevalence of the northerly winds, in consequence of the heavy surf which then rolls in upon the shore. The same cause creates bars at the mouths of the rivers on the north coast. The port of San Juan is however perfectly sheltered by the narrow island on which the town and fortress stand. Aguadilla is an open roadstead at the north-west extremity of the island and much exposed, but from its position and the abundant supply of provisions and water which it affords, it is much visited. It was here that Columbus effected his first landing in Puerto Rico. The ports of Guanica and Jobos on the south coast are very large, afford excellent anchorage, and are easily defended. Few countries are so well watered by rivers as Puerto Rico. Seventeen rivers rising in the central chain run into the sea on the north coast, of which the rivers Manati, Loisa, Trabajo, and Arecibo are deep and broad: though there are bars at their mouths, small vessels with cargoes can safely cross them at high water. Nine rivers fall into the sea on the east coast, sixteen on the south, and three on the west, where also there are several fresh-water lakes that communicate with the sea. These rivers are well stocked with fish. During the last sixteen years many good roads have been constructed and bridges built. The principal roads are from San Juan to Aguadilla and Mayagues, from Ponce to Guayama, and from Faxardo to the capital; they are of solid construction, being of gravel or stone cemented. The greater number of bridges are of wood, but several are of stone.

The soil of Puerto Rico is of the richest and most varied description; there is the deep rich soil required for the cultivation of the sugar-cane, the cool mountain valley for the coffee plantation, the most luxuriant pasture, the moist spot favourable for the cocoa-nut and the irrigated rice-fields. The pasture-lands are principally on the north and east coasts; the cane-fields on the south and west. In 1830 there were 109,478 acres under cultivation, and 634,506 in pasturage. The quantity of sugar produced in 1830 was 414,663 quintals, which at the rate of 4 dollars a quintal will give 1,658,652 dollars. Capital is continually directed to this island, and fresh land is taken into cultivation yearly to a large amount. The proportion of sugar produced from an acre is very great compared with the produce of the other West India islands, the produce of Jamaica being about 10 quintals; Granada, 15 quintals; St. Vincent, 25 quintals; and Puerto Rico, 30 quintals to the acre. About 14,000 head of horned cattle are annually exported and 23,000 consumed in the island; the price is about 100 dollars for three full-grown bullocks.

The climate of Puerto Rico seems to be more favourable to Europeans than that of most of the other islands in the West Indies. According to a table given by Colonel Flinter from the observations of Don José Vertéz, on an average of five years, the maximum height of the thermometer is 92° Fahr., in the month of August, and the minimum 80°, in December, taken at noon. The salubrity may be partly ascribed to the very general cultivation and the absence of stagnant waters. There are two rainy seasons: the first commences in May and lasts about twenty days, when the sky clears up, the sun shines unobscured, and a perfect calm lasts till about 11 A.M., when the sea-breeze sets in. June and July offer little variation. August is the hottest month; the heat is then suffocating, the sea-breeze has died away into a calm, only occasionally broken by a faint breeze, and the night brings no relief, for there is no land-wind. This is the most sickly season for Europeans. This island suffered much from a hurricane on the 27th of August, 1825. About September the clouds have again gathered, and the rain pours down in torrents such as can scarcely be conceived by those who have not witnessed it. In a few hours from the commencement of the rain the rivers have overflowed, and the low lands are completely inundated. The quantity of rain which falls during the year in Puerto Rico has not been ascertained by actual measurement; in the island of Barbadoes, where it is much less, the quantity is about seventy inches. In October the weather becomes much cooler. In November the north and north-east winds set in, and blow till January, during which months the weather is occasionally cool.

Puerto Rico was discovered by Columbus in 1493. The natives, knowing that the Spaniards had subjugated S. Domingo, looked on them as beings of a superior order, and submitted to them for some time, when, having by experience discovered the fallacy of their opinion, they rose on the Spaniards and slaughtered many of them. On this the Spaniards exterminated the greater part of the natives, and the remainder have become so intermixed with the conquerors, that there is no mark of distinction between the races.

The island now contains fifty-eight towns and villages. San Juan, the capital, contained, in 1828, 800 houses of brick and stone: it is situated on the north side of the island, in 18° 29′ N. lat. and 66° 13′ W. long. San Juan is built on a narrow island connected at one end with the mainland by a bridge. The town is placed on the slope of a hill, and has regularly built streets, which cross each other at right angles. It is enclosed by strong fortifications, and contains about 30,000 inhabitants. The harbour lies between the town and the mainland. S. Juan is the seat of government. The chief public buildings are the cathedral, a large uninished building, a theatre, military hospital for 350 patients, another for females, a gaol, a house of correction, whose inmates labour at the public works, a town-house, which is a handsome building, an arsenal, and a custom-house. There are four churches and two chapels. A British force under Sir Ralph Abercromby made an unsuccessful attempt to carry this place in 1791.

Mayagues and Aguadilla on the west, Ponce on the south, Humacao on the east, and Pepino and Cayey in the interior, are considerable towns. The rest are very small, consisting generally of a large square with a church and a few straggling houses.

The government of Puerto Rico is administered by a captain-general, who has the supreme military command, but his civil authority is in some degree controlled by an officer who is called his legal adviser, and who is appointed to assist the governor and give decisions in those cases with which it is not supposed that a soldier can be conversant, and for the correctness of which the legal adviser is responsible. The governor must however sign the decision or sentence before it is valid, and he may act contrary to the opinion of the adviser, at his own risk. The court of royal audience is invested with the superintendance of all other authorities, and is consulted by the governor on all important occasions. The intendant is an officer ranking as a major-general, whose duty it is to watch over the revenue. There are two courts of cabildo in the island, which superintend the police and municipal affairs. The governor is president of it. The court is composed of two alcaldes, elected annually, a regidor, and a syndic. They decide all causes under 100 dollars. In each of the seven towns and villages which form the head of a department, a magistrate resides called the alcalde mayor. In the smaller towns there are inferior magistrates, who are annually appointed by the captain-general. They are responsible to the Court of Royal Audience for the discharge of their duty. The ecclesiastical tribunal is composed of the bishop and provisor, and takes cognizance of affairs connected with the church. The governor is vice-regal patron, an office which empowers him to check abuses. There is a naval tribunal presided over by the commandant of the marine. The consulado is established for the decision of all mercantile disputes.

Puerto Rico presents the singular appearance of white men working in the same fields and at the same labour as coloured men without being considered as degraded by it. This arises partly from the island having been a penal settlement, where the convicts were put to field labour, and partly from the price of labour being so low as not to afford remuneration for the risks of the slave-trade. The antipathy which exists in other colonies and in the United States of North America between the white and coloured races does not exist here.

The usual proportion between the white population and the slaves is reversed in Puerto Rico. The following table from the statistical returns made by the Board of Trade show the increase of the population of late years:—

	1802.	1812.	1820.	1827.	1830.	1836.
Whites .	79,281	85,662	102,432	150,311	162,311	188,869
Free Mulattoes	55,164	63,983	86,269	95,430	100,430	101,275
Free Blacks	16,414	15,833	20,191	25,057	26,857	26,124
Slaves .	13,333	17,536	21,730	31,874	34,240	41,818
	163,192	183,014	230,622	302,672	323,838	357,086

The inhabitants are classified by the census according to their nations, thus:—

Spaniards, Creole and Peninsular	300,600
French	1,474
English and North Americans .	327
Danes	212
Dutch	485
Italians	273
Germans	62
Africans	15,728
	319,161

And according to their professions and trades,—

Labourers	143,311
Carpenters	909
Shopkeepers	939
Merchants	880
Shoemakers	680
Dealers	544
Masons	282
Tailors	200
Coopers	151
Smiths	124
Not distinguished . . .	15,579
Having no trade or profession .	155,562
Total . .	319,161

The proportion which the different races bear to each other is as follows:—Whites 50¼, free people of colour and blacks 39¼, and slaves 10½ per cent.

The proportion of sexes is in favour of the females, excepting among the slaves:—Whites,—males 49¼, females 50¾; free coloured,—males 48½, females 51½; and slaves,—males 51½, females 48½. In the gross population, males 49, females 51.

The number of marriages in 1828,—

Whites.		Free coloured.		Slaves.		Total.
734	.	489	.	33	.	1256

In 1830 the number had increased to 2152, of which 150 were among slaves. Of births the total number is 4⅓ per cent. per annum of the population, thus distributed:—

Whites . .	3⅞ per cent.
Free coloured .	5⅝ „
Slaves . .	5⅝ „

Giving 1 birth to every 26½ whites.
„ „ 17⅛ free coloured.
„ „ 17⅝ slaves.

The deaths amount annually to 2⅝ per cent. of the whole population:—

	Total.		Males.		Females.
Whites .	2¼	.	2½	.	1⅞
Free coloured	3⅒	.	3	.	2⅞
Slaves .	3⅞	.	3⅛	.	3½

Giving 1 death to 40½ of the whites.
„ „ 31⅞ of the free coloured.
„ „ 27 of the slaves.
„ „ 37 of the entire population.

The number of the slave population is probably increasing with the demand for labour consequent on the additional cultivation. An extensive system of kidnapping negroes from other islands, chiefly from the British Leeward Islands, has prevailed of late years, many of whom have been discovered in Puerto Rico. The daily allowance to a slave is seven or eight plantains, or an equivalent in yams or other roots, 8 ozs. of salt-fish, 4 ozs. of rice or peas; also three suits by the year, each consisting of a cotton shirt, trowsers, handkerchief, hat, or cap, and a woollen shirt or jacket. They work nine hours a day, except during the harvest, when they must work thirteen hours. Marriage is promoted among the slaves, and the master of the male or female is obliged, on their marriage, to sell his slave, at a price fixed by arbitration, to the owner of the other.

The annexed table shows the quantity of produce exported from the island of Puerto Rico in the year 1836:—

Sugar . .	1,198,888½	quintals.
Coffee . .	52,772½	quintals.
Hides . .	8,686	quintals.
Molasses . .	1,724,661	gallons.
Raw Cotton . .	19,522½	quintals.
Unmanufactured:—		
Tobacco . .	49,542	quintals.
Cigars . .	8,000	quintals.
Rum . .	359½	bocoyes.
Cattle . .	4,911	head.

The quintal is equal to 100 lbs. avoirdupois.

The fanega is equal to one-fifth of a quarter.

The arroba is equal to 4¼ gallons, and contains 32 cuantillas.

Puerto Rico contains 14,435 houses in town and country, 29,696 huts and cottages, 1555 sugar estates, and 124 coffee estates.

Puerto Rico has no mines or manufactures, no indigenous quadrupeds, scarcely any birds except a few species of water-fowl and some parrots, and no monkeys. The cane-fields are infested by rats of a large size, which at times commit great ravages.

A royal decree was issued in the year 1815 for the promotion of the commerce and agriculture of Puerto Rico, from which time the commercial prosperity of the island has been rapidly advancing.

There are two classes of merchants: consignees of cargoes imported in European and American vessels, who receive a commission on the purchase and sale of merchandise; and those who with capital of their own purchase goods and retail them. There is scarcely such a person as a wholesale merchant in the island. No foreigner, unless naturalised, can make purchase or sale in his own name; five years' residence in the dominions of Spain entitles him to naturalization.

There is an ad valorem duty of 17 per cent. on the importation of foreign goods; the consequence of which is a contraband trade with St. Thomas's and other islands, of so great extent as to falsify considerably the tables of imports. The trade with America consists in salt-fish, flour, butter, grain, and lumber; with France, in linens, cambrics, ornaments, toys, and jewellery; with England, cotton goods, hardware, and earthenware: England takes a great quantity of cattle for the supply of her colonies; with Spain, olives and brandies, wines, dried fruits, anchovies, &c.; with the German States, in glass, sword-blades, linens, hams, &c.

The following is a statement of the total value of imports and exports, and amount of customs duties received in the island of Puerto Rico in each of the years 1835 and 1836:—

Years.	Value of Imports. Dollars.	Value of Exports. Dollars.	Total. Dollars.	Customs Duties, includ Tonnge.
1835	3,914,116	3,949,534	7,863,651	746,285
1836	4,005,944	4,099,576	8,105,521	800,025

The government returns state the rural and urban wealth of Puerto Rico to be 22,719,213 dollars, and the value of its agricultural produce 5,259,769 dollars, in the year 1834.

Statement of the number of vessels, distinguishing Spanish from foreign, which entered the ports of the island of Puerto Rico in 1835 and 1836:

Years.	Spanish.	Foreign.	Total.	Tonnage.
1835	750	504	1254	88,268
1836	707	521	1228	93,447

Statement of the number and tonnage of vessels, distinguishing the countries to which they belong, that entered and cleared at the island of Puerto Rico in the year 1836:

	Inwards.		Outwards	
Countries.	Ships.	Tons.	Ships.	Tons.
Spanish	707	29,161	659	27,695
American	302	45,654	319	45,934
Danish .	49	4,273	49	4,174
Dutch .	13	701	13	701
Sardinian	8	1,058	8	1,058
Bremen .	11	1,048	11	2,100
French .	91	7,052	94	7,208
English .	37	2,772	35	2,658
Swedish .	7	216	7	216
Hamburg	3	541	3	541
Total .	1228	93,446	1198	92,285

Statement of the value of merchandise imported into and exported from the island of Puerto Rico, distinguishing the trade with each country:

Countries.	Imports Value. Dollars.	Exports. Value. Dollars.
Spain .	485,823	1,150,536
Spanish Colonies	1,848,405	413,252
United States .	1,121,900	1,876,720
Denmark .	339,394	164,556
Holland .	75,342	9,156
Sardinia .	50,245	79,204
Bremen .	43,577	107,521
France .	31,116	145,687
Great Britain .	5,084	65,353
Sweden .	4,208	3,568
Hamburg .	814	84,019
	4,005,908	4,099,572

(Flinter's *Present State of Puerto Rico*; Turnbull's *Travels in the West*; *Statistical Returns of the Board of Trade*. 1837.)

PUFF-BALL. [LYCOPERDON.]

PUFF-BIRDS. [BARBETS, vol. iii., p. 434; KINGFISHERS, vol. xiii., p. 227.]

PUFFENDORF, SAMUEL, an eminent historical and juridical writer, was born in the year 1632, at the small town of Chemnitz in Saxony, in the neighbourhood of which place his father was settled as a Lutheran clergyman. He received the earliest rudiments of his education at Grimma, one of the three schools called Prince's Schools, founded by the elector of Saxony, in 1550. Being designed by his father for the Protestant ministry, he was removed from Grimma to the university of Leipzig, where he studied theology for several years. Accident and the tendency of his mind led him while at Leipzig to change his course of study, and about the year 1656 he went to the university of Jena, where he devoted himself to the study of mathematics, under the tuition of Erhard Weigel, whose improvements in the method of teaching natural philosophy had at that time excited great attention in Germany. About the same time Puffendorf appears to have first applied himself to the law of nature, on which subject he afterwards became a distinguished writer.

About the time that he quitted Jena, his brother, who had been employed by the chancellor Oxenstiern in lucrative and confidential offices under the Swedish government, advised him to seek his fortune in foreign diplomacy, and with a view to this ultimate object he obtained a situation as tutor to the son of the Swedish ambassador at Copenhagen. He had scarcely joined the legation when a rupture ensued between Denmark and Sweden, and the whole family and attendants of the ambassador were detained as prisoners during eight months at the Danish capital. Puffendorf employed the leisure which this captivity afforded him in investigating and arranging the principles of general law contained in the works of Grotius, Hobbes, and some other political writers. These he reduced to writing, adding to them such reflections and arguments as had occurred to his own mind. At the time of its composition this work was not intended for publication; but on visiting Holland shortly after his enlargement, he was induced by the advice of a friend to publish it; and it accordingly appeared at the Hague, in 1660, under the title of 'Elementa Jurisprudentiæ Universalis.' This work, though crabbed in style and greatly inferior in general merit to the treatise 'De Jure Naturæ et Gentium,' exhibited much closeness of thought, and contained some enlarged and original views upon the subject of jurisprudence; and the circumstance of its dedication to the elector-palatine Charles Louis, perhaps more than its substantial merits, made it the foundation of the subsequent fortunes of the author. The elector-palatine was desirous of attracting attention to the university of Heidelberg, which had fallen into decay; and as one of the means to this object, he founded a professorship of the law of nature and nations, and placed Puffendorf in the chair, entrusting him also in particular with the education of his son the electoral prince. Puffendorf commenced his occupation as professor at Heidelberg, in 1661, and the numerous auditory attracted by his lectures supplied him with pecuniary independence as well as encouragement to persevere in his juridical studies. Soon after his establishment at Heidelberg he directed his attention to the constitution of the body termed the Germanic empire; and struck with the absurdities and incongruities of this strange compound of princes, small republics, prelates, and knights, each of whom exercised within their respective territories a degree of sovereign authority, he composed a treatise exhibiting in rather strong colours the usurpations and defects of the system, and pointing out practical remedies for the grievous abuses which it had occasioned. As the existing order of things in Germany was criticised in this work with considerable freedom and severity, Puffendorf did not venture to publish it in his native country, or with his own name, but sent it to his brother Isaiah Puffendorf, who was at that time the Swedish ambassador in France, who, after showing it to Mezeray, directed it to be published at Geneva, under the title of 'Severini de Mozambano, De Statu Imperii Germanici.' This work excited very general attention in Europe, being translated into German, English, and French, and not only involved Puffendorf for several years in an active controversy with German civilians, but exposed him to the indignation of some of the more powerful constituents of the Germanic body, and especially of the Austrian government. To avoid the possible consequences of the commotion his work had occasioned, he gladly accepted, in 1670, an invitation from Charles XI. of Sweden to become professor of the law of nations at the university of Lunden, then recently founded. About two years after his removal to Lunden, he published the great work upon which his reputation at the present day is principally founded, entitled 'De Jure Naturæ et

Gentium.' It is a very careful and accurate digest of the law of nature, and being arranged on a much more scientific principle than the work of Grotius, 'De Jure Belli et Pacis,' is more useful to the student.

Grotius has inverted the natural order of treating the subject by considering at once the artificial states of peace and war and the law of nations, without first tracing the original principles of the science as they are found in human nature. Puffendorf, on the other hand, commences with the law of nature, then considers the subject as applied to the conduct of individuals, and lastly investigates the difficult and complicated questions which arise in the intercourse of nations. 'Without the genius of his master,' says Sir James Mackintosh, 'and with very inferior learning, Puffendorf has yet treated the subject with sound sense, with clear method, with extensive and accurate knowledge, and with a copiousness of detail, sometimes indeed tedious, but always instructive and satisfactory.' (*Discourse on the Study of the Law of Nature and Nations.*)

In consequence of some of the new views contained in this work, it was virulently assailed by contemporaries, and involved the author a second time in angry controversy; but, at the same time, it raised the reputation of Puffendorf to a great height throughout Europe; and a few years after its appearance, the king of Sweden removed him to Stockholm, making him his historiographer, and giving him the title of counsellor of state. In his official character he composed and published in Latin a 'History of Sweden, from the expedition of Gustavus Adolphus into Germany, until the death of Queen Christine;' but although a promising theme for an historian, Puffendorf has not availed himself of the rich materials which were placed at his disposal in the archives of the Swedish government in such a manner as to render his narrative attractive or complete. In 1688 the elector of Brandenburg, Frederic William, invited him to Berlin, with the consent of the king of Sweden, and employed him in writing the history of his life and reign. The elector also bestowed upon him the title of counsellor of state, with an annual pension of 2000 crowns. In obedience to this engagement, he wrote and published, in nineteen books, 'Commentarii de Rebus Gestis Frederici Willielmi Magni, Electoris Brandenburgici,' a work which neither experienced nor deserved greater success than his previous historical performances. His employment in Berlin was considered to be merely temporary, and he intended to return to Stockholm as soon as he had completed his engagement with the elector of Brandenburg; indeed the king of Sweden always continued his esteem for him, and a few years only before his death, and during his residence at Berlin, raised him to the dignity of a baron. He died however in Berlin, in October, 1694. A complete catalogue of the voluminous writings of Puffendorf, and an account of the various editions of each, will be found in a note to the article under his name in the 'General Dictionary,' and also in the 'Biographie Universelle.'

PUFFIN. [Auk, vol. iii., p. 99; Petrels, vol. xviii., p. 41.]

PUG, a dwarf variety of the dog, somewhat resembling a mastiff or bull-dog in miniature. The Dutch Pugs have more the aspect of the large varieties last named than the French Pugs, some of which latter are very small. Both are snappish and noisy, but capable of strong attachment to their masters or mistresses. The French Pugs are docile, and may be easily taught many amusing tricks.

PUGET, PIERRE, who has been called the Michael Angelo of France, from his ability in painting and architecture, as well as in sculpture, and perhaps also on account of a kindred enthusiasm and decision of character, was born, in 1622, at Marseille, where his father practised as an architect and sculptor. It was from him that he received his first instructions in art, after which he was placed under a shipwright, or builder of galleys, to learn to carve the ornaments used in such vessels. Disgusted with the drudgery of such workmanship, he set out for Italy, and passed a considerable time at Florence, where he pursued his studies as a sculptor with great success. He next repaired to Rome, whither he was attracted by the fame of Pietro de Cortona; and not only did he become the pupil of that artist, but made such progress under him, that he accompanied him to Florence as his assistant in painting the ceilings of the Pitti palace. Instead however of remaining there, he suddenly resolved upon returning to France, and he was then only twenty-one. On his arrival at Marseille he was very well received, and was shortly afterwards commissioned to design a vessel of extraordinary magnificence, named La Reine, in honour of Anne of Austria. That princess being desirous of obtaining accurate drawings of all the antient monuments at Rome, the person commissioned by her to procure them thought that he could not do better than take Puget with him for the purpose of executing them. Puget accordingly proceeded a second time to Rome, and there spent between five and six years; but what afterwards became of that valuable collection of drawings is not known.

On his second return from Italy he executed several works in painting; but his excessive application to that art so seriously affected his health, that he renounced the practice of it, and confined himself thenceforth to architecture and sculpture. His talents met with employment at Toulon and Marseille, for which latter city he projected many embellishments, which established his reputation as an architect; and he further gave proof of his skill in engineering by different ingenious machines and inventions which he introduced into the marine at Toulon.

He was sent by Fouquet to Genoa for the purpose of selecting marble for some of the works proposed to be executed at Marseille; but that minister being shortly afterwards disgraced, instead of returning home, Puget preferred remaining at Genoa, where he produced some of his most noted pieces of sculpture, the two statues of St. Sebastian and St. Ambrosius, and the grand bas-relief of the Assumption, in the chapel of the Albergo de' Poveri, besides various architectural ornaments. At length he was recalled by Colbert, who obtained for him a pension of twelve hundred crowns, in consequence, it is said, of the earnest recommendation of Bernini. That the patronage of the one and the recommendation of the other were not discredited, is proved by his two celebrated performances at Versailles, the Milo of Crotona, and the group of Perseus and Andromeda, the former of which is generally reckoned the chef-d'œuvre of his chisel, and a work that will bear comparison with the antique. He was not however to be attached to a court, even by the flattering compliments of Louis XIV. himself, but he retired to Marseille, where he built himself a small residence, which he occupied until his death, December 2nd, 1694, at the age of seventy-two.

Puget undoubtedly merited the applause that he received from his countrymen and contemporaries, but dispassionate criticism will not exactly confirm previous opinion. The historian of modern sculpture, Cicognara, speaks of Puget in rather a disparaging manner, insisting that though they manifest genius, his productions almost invariably betray inaccuracy as to proportions, want of refinement in taste, and show more of the painter than of the sculptor in their treatment, seldom producing a pleasing effect except from a single point of view. Neither the Milo nor the Perseus escapes reprehension from him; and he says that as a composition, the former has been frequently surpassed by young artists who have tried their powers on the same subject.

As an architect, he must at the present day be held even lower, if, as a sample of his taste in that art, we refer to the court-yard and old building of the British Museum, designed and erected by him, and in which it is easier to perceive a kind of dull stateliness than to detect the slightest element of beauty.

PU'GLIA, the antient *Apulia*, is the general name given to a large division of the kingdom of Naples, which lies east of the Apennines, and extends to the Adriatic Sea. It comprises the three administrative provinces of Capitanata, Terra di Bari, and Terra d'Otranto. In former times the kingdom of Naples was divided by geographers into four great divisions, called Abruzzi, Puglia, Calabria, and Terra di Lavoro, each of which was subdivided into three administrative provinces. Puglia is naturally divided into two regions, namely, the great plain of Capitanata, called Puglia Piana, or 'Flat Apulia,' and the hilly region of Bari and Otranto, called Puglia Pietrosa, or 'Stony Apulia.' A description of these two regions is given under Capitanata, Bari (Terra di), and Otranto (Terra di). The whole of Puglia is one of the most productive countries of the kingdom; its chief wealth consists in corn, oil, wool, and cattle. In antient times this tract of country was inhabited by the Dauni, the Appuli, the Peucetii, the Calabri or Messapians, and the Salentini. [Apulia.] The Calabri occupied the northern and the Salentini the southern coast of the Iapygian peninsula. The first Norman conquerors of Naples styled themselves dukes of Apulia and Calabria, before Naples had become the capital of the whole kingdom.

PU'LCI, LUI'GI, born at Florence, in 1431, of a respectable though poor family, became early in life acquainted with the wealthy family of Medici, through which he seems to have obtained an inferior office under the Florentine republic. He travelled about Italy, and even beyond its limits, according to his own statement. Few particulars of his life are known. He married Lucrezia Albizzi, by whom he had two sons, who survived him. He was a welcome guest at the table of Lorenzo de' Medici, who relished his wit and his extempore poetical effusions. Lucrezia Tornabuoni, Lorenzo's mother, urged Pulci to write an epic poem. Pulci undertook the task, and he looked for his theme among the traditional legends of Charlemagne and his Paladins, as recorded by Turpin, which had already become familiar in Italy through the Italian romance 'I Reali di Francia,' written in the thirteenth century, and had become a popular theme for the extempore effusion of strolling story-tellers. Pulci took for the subject of his poem the treachery of Gano of Maganza, one of Charlemagne's vassals, who is reported in the old legends to have conspired with the Saracens of Spain against his master, and to have brought about the fatal defeat of the French at Roncesvalles in the Pyrenees. Pulci was well acquainted not only with Turpin's 'Chronicle,' but with the old French and Provençal romances which related to the fabulous history of Charlemagne's Spanish wars. An abstract of these singular traditions, in which the confused records of the wars of Charles Martel and his son Pepin against the Saracens in France were mixed up with the short campaign of Charlemagne himself beyond the Pyrenees, is given (by Foscolo) in No. 42 of the 'Quarterly Review,' and also in an article on the early poetry of Spain, in No. 78 of the 'Edinburgh Review.' Pulci moulded those rude materials into a living form, and breathed into it his own poetical inspiration. His predecessors had dealt out the old traditional fables in a sober serious strain. Pulci was the first to seize the ludicrous side of the stories, and to derive from it a fresh subject for poetry and a source of amusement for his readers. Still his poem is not, as it has been by many supposed to be, a burlesque poem, but a combination of the serious with the facetious; it is a romance accompanied by its own parody. The poet is often evidently in earnest, being carried along by the lofty or pathetic events which he describes; but he now and then relaxes to enjoy a laugh with his hearers at the expense of his heroes, and of the popular story-tellers, who formed a numerous tribe in his age, and who, by their pompous diction and their exaggerations and anachronisms, enhanced the absurdity of their wondrous tales. One character however, that of Orlando, the French and Spanish Roland, Pulci preserved in its original simple grandeur, as handed down by old tradition. It was reserved for Bojardo to lower the original character of the Roland of old traditional legend, the chaste and unspotted champion of religion, loyalty, and chivalry, and to reduce it to that of a brave but frail warrior. Pulci brought also on the scene another worthy competitor for fame, Rinaldo of Montalbano, the Reynault of the French romances, whose character and adventures he took chiefly from 'Les Quatre Fils d'Aymon' of Adenès, an old romance writer of the thirteenth century.

The title of 'Morgante Maggiore,' which Pulci chose to give to his poem, is a capricious one, for the giant whom he introduces by the name of Morgante is only a subordinate character, and acts as squire to Orlando. The reason of the adjunct 'Maggiore' is not perceived, unless it was given to him on account of his great strength.

Orlando is the hero of the poem, but Gano may be considered as the principal actor; like Satan in Milton, he is the author of all mischief, and his punishment is properly the end of the action. 'The Treasons of Gano' would have been a more appropriate title to the poem. Another giant, called Margutte, is the Thersites of the poem. He is an open scoffer at religion, and boasts of his numerous sins; he is, in short, an impudent but humorous villain. He accompanies Morgante, who is a pious personage, and dies at last of an immoderate fit of laughter at some ludicrous sight. This character of Margutte, which is merely episodical, and which seems to have been introduced by Pulci in fit of unrestrained mirth, has been adduced by Voltaire and others as a proof of Pulci's unbelief. But the poet, from the beginning, proclaims Margutte to be what he is, a profligate despicable fellow, and by so doing shows no intention of recommending his opinions or example.

In canto xxv. there is a curious dialogue between Rinaldo and a familiar dæmon named Astaroth concerning the then so-called Pillars of Hercules. The dæmon says: 'An old and hallowed error has long prevailed, that no one can venture westward of this point without incurring certain death. Know then that this is a vain supposition, for it is possible to navigate far beyond, as the sea is level everywhere, although our world has a round form, as everything above is attracted to the centre, and the earth itself stands suspended among the stars. And ships shall proceed far beyond the boundaries which Hercules fixed here in times of ignorance, and they will discover another hemisphere, where are towns, nations, and empires. Those are the antipodes, and they adore the Sun and Jupiter and Mars, they have trees and cattle as you have, and often wage war against one another.' (Canto xxv., st. 228, et seq.) Pulci wrote this fifteen years at least before Columbus sailed on his memorable expedition. Rinaldo asks whether the antipodes are of Adam's race, and are capable of obtaining salvation. To this delicate question the dæmon answers, that all men may be saved by the Cross, and that the day will come when, after many errors and wanderings, all will acknowledge the truth and find acceptance. The whole passage is curious as illustrative of the state of mind among men of information in Italy in that age. Roland's last fight and dying scene at Roncesvalles are beautifully described by the poet. The farewell of Roland to his faithful steed, his trusty companion in many a battle, his confession and last prayer, and the angelic melody which is heard above, as he expired—all this part is equal in pathos and loftiness to any passage in either Dante or Tasso. The poet felt evidently interested in his subject and wrote in earnest. But even here he occasionally breaks out, in the midst of his most serious narrative, into a fit of comic humour, as if by way of relaxation. While the fearful conflict is raging in the glen of Roncesvalles, the poet descries two dæmons keeping watch in a deserted chapel on the outskirts of the defile, intent upon seizing and securing the souls of the Saracens who fell in the battle, as their lawful prey. The eagerness of these satanic sentries is described with much drollery.

It is a curious fact that the first edition of the poem of Pulci, with all its freedom of thought and expression, came out in 1481, from the press of the convent of Ripoli at Florence, and that some of the nuns, and one Marietta among them, acted as compositors, and were paid accordingly. (*Notizie Istoriche sopra la Stamperia di Ripoli*, by Father Vincenzo Fineschi, Domenicano, Florence, 1781.) There was a much greater degree of freedom in speaking and writing in Italy during the fourteenth and fifteenth centuries than there has been at any time since; the change took place about the middle of the sixteenth century, when the alarm about the spreading of the doctrines of the Reformation induced Pope Paul III. to establish permanently, with the consent of Charles V., the court of the Inquisition, which effectually silenced both tongues and pens.

The 'Morgante Maggiore' is less read and noticed now even in Italy than it deserves; the poem has many beauties, and great fluency and vivacity of diction, owing to the author being a Florentine and writing in his own vernacular language. Pulci may be considered both as the last of the old romancers and as the first of the Italian epic writers. His poem retains much of the simplicity and antique cast of the traditions of the dark ages, enriched with the information of a more enlightened period. By reading the 'Morgante' attentively, one is less surprised at some old Florentine critics giving it the preference over Ariosto's splendid and elaborate poem. But the two works are the representatives of two different ages, and there is the same difference between them as there was between Pulci's jovial and free-spoken friend, Lorenzo de' Medici, and the princes of the House of Este, the courtly patrons of Ariosto. The edition of the 'Morgante,' Naples, 1782, contains a good biography of the author.

Pulci wrote also a number of satirical and some licentious sonnets, and other light poetry, including his 'Confession,' the copies of which are rather scarce. Pulci died at Florence in 1487.

PULEX, the name given by Linnæus to a group of insects of which the common flea may be regarded as the type.

The fleas are considered by Latreille, Kirby, and many other entomologists, as constituting an order of insects. They form the group *Suctoria* of De Geer; the order *Siphonaptera* of Latreille, and *Aphaniptera* of Kirby and Spence, by whom they are placed between the orders *Diptera* and *Aptera*. In the 'Règne Animal' they are arranged between the orders *Parasita* or *Anaplura* of Leach, and the *Coleoptera*. It is highly probable however that when this group is better known—when the numerous insects allied to the fleas are more common in our cabinets—it will be found that they do not constitute an order by themselves, but are aberrant forms of the other *well established* orders; in these there is a certain degree of uniformity, as regards numbers, variety of habits, &c., which can but lead us to doubt the validity of the so-called orders containing only one or two genera, and but few species, such as the present order, and the orders *Aptera*, *Homaloptera*, and *Strepsiptera*. It is moreover worthy of observation that each of these so-called orders is composed of *parasitic insects*, which necessarily involves a structure very unlike the more typical species of the groups to which we may suppose they belong. Upon these grounds, the orders just mentioned, being regarded as not sufficiently worked out, are omitted in the article **Insecta**.

The *Suctoria* have the mouth composed of three pieces, enclosed by two articulated laminæ, which, when united, form a cylindrical or conical proboscis, the base of which is protected by two scales. They undergo a complete metamorphosis: the larva is of an elongated cylindrical form, and when about to change into the pupa state, encloses itself in a silken cocoon, and at the end of a few days assumes the imago or perfect state.

In the genus *Pulex* the body is compressed, of an oval form, and protected by a tough coriaceous covering. The head is small and much compressed, and furnished on each side with a small round eye; behind this is a concavity in which the antennæ (which are three-pointed) are situated.

On the anterior part of the head are two four-jointed organs, supposed by Latreille to be the antennæ, but which must be palpi, the organs situated behind the eyes being now supposed to be the antennæ. The legs are large and strong, particularly the hinder pair, by which the insect jumps, and covered with spines; the tarsi are five-jointed, and the terminal joint is furnished with two elongated claws; the anterior pair of legs are inserted almost under the head, and the rostrum lies between them.

The female flea is said to lay about a dozen eggs, which are of a whitish colour and somewhat viscid: the larvæ are long and slender, and have no legs; the head is scaly and has no eyes, but is furnished with two very small antennæ: each of the segments of the body is provided with little tufts of hair, and the terminal segment has moreover two hooked appendages at its apex.

The common flea (*Pulex irritans*) is but too well known. It is said to attack dogs, cats, and other animals, as well as man; but there are other species which appear to be peculiar to certain birds and quadrupeds, and these have received in most cases the names of the species they attack, such as the dog flea (*Pulex Canis*), the mole flea (*P. Talpa*), that of the martins (*P. hirundinis*), and of the mouse (*P. musculi*), &c.

The Chigoe of the West Indies and South America also belongs to this group, being the *Pulex penetrans* of authors. 'It is described,' say Messrs. Kirby and Spence (vol. i., p. 102), 'as generally attacking the feet and legs, getting, without being felt, between the skin and the flesh, usually under the nails of the toes, where it nidificates and lays its eggs; and if timely attention be not paid to it, which, as it occasions no other uneasiness than itching (the sensation at first, I am assured, is rather pleasing than otherwise), is sometimes neglected, it multiplies to such a degree as to be attended by the most fatal consequences, often rendering amputation necessary, and sometimes causing death. The female slaves in the West Indies are frequently employed to extract these pests, which they do with uncommon dexterity.' Besides the name Chigoe, they are sometimes called *Jiggers*, *Nigua*, *Tungua*, *Pique*, &c.

For further information respecting this group of insects the reader is referred to M. Duge's 'Recherches sur les Caractères Zoologiques du genre Pulex,' published in the *Annales des Sciences Naturelles* for October, 1832. Mr. Westwood has also published a paper 'On the Structure of the Antennæ of the order *Aphaniptera*,' &c., in the *Entomological Magazine*, vol. i., p. 359.

PULGAR, HERNANDO DEL, a celebrated Spanish historian, was probably born at Pulgar, a village close to Toledo, about 1436. When still young he entered the household of John II., king of Castile, and was educated as one of his pages. After the death of that monarch, Pulgar was appointed secretary to Henry IV., his son and successor, by whom he was entrusted with various confidential affairs. He retained his place on the accession of Isabella, who, in 1482, named him to the vacant office of national historiographer. From this period Pulgar remained near the royal person, accompanying the queen in her various progresses through the kingdom, as well as in her military expeditions into the Moorish territory. He was consequently an eye-witness of many of the warlike scenes which he describes, and from his situation at the court must have had access to the most ample and accredited sources of information. That portion of his Chronicle containing a retrospective survey of events previous to 1482, may be charged with gross inaccuracy: but this cannot be said of the remaining part, which may be received as perfectly authentic, and has all the character of impartiality. Pulgar's style of narration, though rather too prolix, is sufficiently perspicuous, and may be favourably contrasted with that of contemporary writers. His Chronicle was first printed at Valladolid, in 1565, when it appeared under the name of Antonio de Lebrixa, among whose papers it was found by his grandson the editor. Two years later (1567), another edition was published at Saragossa, with the real name of the author. The last and most elegant edition of Pulgar's Chronicle was printed at Valencia, in 1780, by Benito Montfort, in large folio.

Pulgar left some other works, of which his Commentary on the 'Coplas de Mingo Revulgo,' an antient satire, in the form of a dialogue between two shepherds, describing the court of John II., his 'Letters,' and his 'Claros Varones,' or sketches of illustrious men, have alone been published. The last contains forty-six biographical articles of the most distinguished individuals of the court of Henry IV., which, although too indiscriminately encomiastic, contain much valuable information on the principal actors of that period. Fourteen of the Letters were first printed at Seville, towards the close of the fifteenth century; the whole number—thirty-two—were afterwards printed at the same city, together with the 'Claros Varones,' 1500, 4to. Several editions of the same two works were subsequently published, Alcalá, 1524 and 1528; Zamora, 1543; Valladolid, 1545; Antwerp, 1632; all in 4to. The Letters only were afterwards translated into Latin by Julian Magon, and published with the Spanish text, at the end of Peter Martyr's 'Epistles,' Amstelodami, apud Elz., 1670. There are also three modern editions, Mad., 1747, 1775, and 1789, 4to. The two last are valuable on account of some excellent notes and their having a biographical account of Pulgar prefixed to them

Nicolas Antonio (*Bib. Nov.*, vol. ii., p. 388), attributes to him a Chronicle of Henry IV., and a history of the Moorish kings of Granada. Other bibliographers have confounded this Pulgar with Hernan Perez del Pulgar, a distinguished officer, who gained great renown in the war of Granada, and who is supposed to be the author of a Chronicle of Gonzalo de Cordova, Alcalá, 1584, fol., as well as of a translation of a French historical work, entitled 'La Mer des Histoires,' which appeared at Valladolid, in 1512, fol., under the title of 'Mar de Historias.'

The year of Pulgar's death has not been ascertained: it is probable that he did not survive the capture of Granada by Ferdinand and Isabella, as his history falls somewhat short of that event, and we cannot suppose that he would have failed to commemorate the most important occurrence in the reign of his royal masters. Besides, from some remarks in his Letters, all of which were written after 1482, it would appear that he was already at that time much advanced in years. It is however quite clear that Pulgar was still living some years after 1486, the epoch which the 'Biographie Universelle' has erroneously assigned for his death. (Nicolas Antonio, *Bib. Nov.*, vol. ii., p. 387.)

PULLEY. The pulley is one of the simple machines or mechanical powers employed in the construction of machinery and in the transmission and modification of force. The kinds of pulley in use are very numerous; but they all consist of combinations of a grooved wheel, moveable on an axis, and a rope lying in the groove: and the manner in which this rope passes over and under a system of these wheels, so as to connect the force with the resistance, or the power with the weight, determines the species or kind of pulley. But whatever the mechanical arrangement of the wheels and of the rope, the principle of all pulleys is the same, namely, the transmission of the tension of a rope, without sensible diminution, so as to obviate the loss of force consequent on rigidity. If a rope possessed perfect flexibility, any system of fixed points, as a series of nails, over which the rope might be bent, would answer the same end mechanically as a system of pulleys; but it is known that if a rope be bent over a sharp edge, little force will be transmitted beyond that point, as the daily experience of sustaining a very heavy weight attached to one end of a rope by a very small power at the other end, provided the rope be bent over several small edges, shows.

The principle of pulleys is the application of the theoretical principle of the transmission of the force of tension, and the following are the mechanical combinations by which it is usually put in practice:—

The single fixed pulley is a wheel with a groove on its circumference, and fixed in a case or *sheave* (as it is technically termed) to prevent the rope slipping from off its surface as it is moved round by the friction of the rope. The force is not modified in amount by this machine, but only in direction; that is, the power and the weight equal each other.

The single moveable pulley consists of one wheel fixed and the other moveable; the power acts at one end of the rope, and the other end is fixed to an immoveable obstacle; the weight or resistance is attached to the sheave of the moveable wheel. In this the power is one half the resistance when there is equilibrium. The pulley is sometimes called a *runner* by practical men.

The Spanish barton consists of two moveable wheels and one fixed wheel; and there are other arrangements, by which two fixed wheels and one moveable wheel are employed.

The first system of pulleys consists of an upper and lower set of wheels, called the upper and lower block; the upper being fixed, and the lower, to which the resistance or weight is attached, being moveable. The power is to the weight or resistance as unity to the number of wheels in the lower block.

Smeaton's tack, so called after the celebrated engineer of that name, contains two tiers of wheels, one above the other, in each block. The course of the rope is so arranged that the power and the weight act over the centre of the upper and lower block, and there is consequently no tendency in the system to twist, but the upper and lower block each preserves its horizontal position. This highly ingenious arrangement is open however to other serious objections, as great friction and unequal wear for the different velocities with which the wheels move. These practical difficulties are in a great measure obviated in the following system.

White's Pulley. The wheels in each block, the upper and lower block, turn on the same axis, and have different diameters, and are so proportioned that the circumferences have a velocity equal to that of the rope which passes over them. It is found on calculation that the several wheels in the upper block will revolve in the same time, if their circumferences are as the numbers 1, 3, 5, &c., and that the several wheels in the lower block will revolve in the same time, if their circumferences are as 2, 4, 6, &c. The diameters of the wheels consequently have this proportion. The lateral friction, however, of a number of independent wheels is great; and this is obviated by having the upper and lower block cut in grooves according to the above rule, so that all the friction is reduced to that of the pivots and the lateral friction of one wheel.

Second system. In the combinations previously described only one rope is employed, and the upper block is fixed and the lower block moveable. But in this system there are several ropes; the upper block consists of a single wheel, which is fixed, and the lower block of several moveable pulleys; the string of each being attached to the sheave of the moveable pulley above it, and to an immoveable obstacle. Each additional rope or moveable pulley in this system doubles the effect of the power, but it is not a system of any practical use.

Third system. In this the wheels of the upper block are moveable pulleys, with the exception of the upper wheel, which is fixed, and there are several strings, each attached to the weight. This is the most powerful system in respect of the ratio of the power and weight, but useless in practice.

The various systems of pulleys present the best practical illustration of the great mechanical principle of virtual velocities [VIRTUAL VELOCITY], or, as it is expressed by practical men, that whatever is gained in force is lost in velocity. The power of a weight or of an agent in practical mechanics is estimated by the product of the force exerted and of the space through which it is exerted: in all the preceding systems it will be found that the product of the power and of the space through which it has moved is equal to the product of the weight and of the space through which it has moved; and the principle of virtual velocities may be easily verified.

PULMOBRANCHIA'TA, M. de Blainville's name for his first order of his second subclass (*Paracephalophora Monoica*) of his *Malacozoa*, and thus defined by him:—

Organs of respiration retiform or aërian, carpeting the *plafond* of the cavity situated obliquely from left to right upon the origin of the back of the animal, and communicating with the ambient fluid by a rounded orifice, pierced on the right side of the swollen border of the mantle. All these animals, according to M. de Blainville, are more or less disposed to breathe air. The greater part are terrestrial, some live on the banks of fresh waters and sometimes on the sea-banks. None of them bury themselves in the mud or sand of the bottom, excepting the *Limnacea*, during the rigorous season. All are phytiphagous, and are known in almost all parts of the earth.

The following families and genera are arranged by M. de Blainville under this order:—

Fam. 1. Limnacea.
Genera:—*Limnæa, Physa, Planorbis.*
Fam. 2. Auriculacea.
Genera:—*Pedipes, Auricula, Pyramidella.*
Fam. 6. Limacinea.

Genera:—*Succinea, Bulimus, Achatina, Clausilia, Pupa, Tomogeres, Helix, Helicolimax, Testacella, Parmacella, Limacella, Limax, Onchidium.*

Cuvier had previously named his first order of Gastropods *Pulmonés*, describing them as distinguished from other mollusks by their breathing the elastic air through a hole under the border of their mantle, and which they dilate or contract at their pleasure. They have, he adds, no branchiæ, but only a network of pulmonary vessels which creep upon the walls, and principally upon the *plafond* of their respiratory cavity.

Some, he observes, are terrestrial. Others live in the water, but are obliged to come from time to time to the surface, in order to open their pectoral cavity for respiration. He divides them into the following sections:—

1. Pulmonés Terrestres.
(Almost all four tentacles.)

Genera:—*Limax, Vaginulus, Testacella Parmacella, Helix, Vitrina* (*Helicolimax*, Fér.), *Bulimus, Pupa, Chondrus, Succinea, Clausilia, Achatina.*

2. Pulmonés Aquatiques.
(Two tentacles only.)

These, according to Cuvier, always come to the surface of the water to respire, so that they cannot inhabit deep waters: they live for the most part in fresh waters or salt lakes, or at least near the coasts and mouths of rivers.

Genera:—*Onchidium* (without a shell), *Planorbis, Limnæa, Physa, Scarabus, Auricula, Melampus* (*Conovulus*, Lam.).

Most of these forms have been treated of in this work.

PULMO'GRADA. The genus *Medusa* of Linnæus was placed by him in the second section of his *Vermes*, viz. *Mollusca*. The *Mollusca* were divided into six sections in the 'Systema Naturæ;' and in the last of these, consisting of those molluscous forms which had a central mouth below *Medusa* stood as the first genus, followed by *Asterias* and *Echinus*. The third section of *Vermes* (*Testacea*), with *Chiton* at its head, immediately followed. In this arrangement *Medusa* came between *Nereis* and *Asterias*; but in the body of the work it stands between *Sepia* and *Asterias*.

The following is the Linnean definition of the genus *Medusa*:—

Body gelatinous, orbiculate, depressed. *Mouth* beneath, central.

The genus contained twelve species, and these consisted not only of true *Medusæ*, but of *Cirrhigrada*, as *Porpita* and *Velella*. [CIRRHIGRADA.]

The *Acalephæ* of Cuvier (his third class of *Zoophytes*) comprehend, to use his own terms, Zoophytes which swim in the sea, and in whose organization may be perceived vessels which in truth are most frequently nothing but productions of the intestines hollowed in the parenchyma of the body.

Cuvier's first order of these *Acalephans*, or *Sea-nettles*, consists of the *Simple Acalephans*, which he characterises as floating and swimming in the sea by means of the contractions and dilatations of their body, their substance being gelatinous, without apparent fibres. The sort of vessels which are seen in some are hollowed in the gelatinous substance; they often visibly come from the stomach, and do not give place to a true circulation.

The genera contained in this order are the great genus *Medusa*, Linn., with its subgenera *Porpita* and *Velella*.

The great genus *Medusa* is characterised as having a disk more or less convex above, similar to that of a mushroom, and called the *umbrella*. Its contractions and dilatations concur to the motility of the animal. The edges of this umbrella, as well as the mouth, or the suckers, more or less prolonged into pedicles which take its place, in the middle of the lower surface, are furnished with tentacles of very different form and size. These different degrees of complication have given rise to very numerous divisions. For these we refer the reader to the 'Règne Animal.'

The *Arachnodermata* form the second class of M. de Blainville's *Actinozoaria*. He observes that this class corresponds exactly to the genus *Medusa* of Linnæus.

The following is M. de Blainville's definition of this genus:—

Body free, regularly oval or circular, subgelatinous, covered with an extremely fine skin, which is but little or not at all distinct, sustained or not by a solid subcartilaginous part, and provided with very diversiform radiated appendages.

Intestinal canal limited to the stomach and provided with a single orifice.

Ovaries multiplied, radiated, and opening in the interior of the stomach.

M. de Blainville goes on to state that their form, which is regular, is nearly always circular (the *Velellæ* alone being oval), sometimes discoid or spheroidal, but most frequently hemispherical, which causes them to resemble our umbrellas, and has given rise to the distinction of their body by that name. This body is sometimes furnished in addition in its circumference with more or less long cirrhi, to which the name of tentacles, or better, of tentaculiform cirrhi, has been given.

The lower surface of the umbrella, he observes, is sometimes entirely naked, but in other cases is provided with numerous and dispersed tentaculiform suckers, as in the *Porpitæ* and *Velellæ*, or else with very diversiform appendages, capillaceous at least at their extremity, which zoologists have termed arms, whence the denomination of *Brachideous* which they have given to some species. These appendages or arms are sometimes free from their base, but in other cases are united, which unity produces a sort of peduncle, which has originated the designation of *Pedunculated* for those species that are so provided. In the middle of the lower surface of the umbrella of these *Medusæ* is sometimes a species of peduncle, formed by a proboscidiform prolongation of the buccal orifice, and they are then called *Proboscideous*; but in the greater number of cases, the middle of the lower part of the umbrella is occupied by a more or less considerable mass, attaching itself to the body by four roots, in the form of a cross, so as to divide the buccal orifice into four semilunar parts. This peduncle, terminated by more or less numerous capillaceous divisions, has caused the name of *Pedunculated* or *Polystomatous* to be applied to those *Medusæ* which are provided with it.

The *Arachnodermata*, according to the same author, are all marine animals. They are found in all seas, often in considerable masses, but especially in the seas of warm climates, sometimes, it is said, in sufficient quantity to stop the progress of vessels which traverse the enormous shoals which they form. Although they are all free in the fluid, where they live at various depths, they are constantly in a reversed position, like the *Echini*. Their locomotive power is far from being sufficient to resist the currents of the medium which they inhabit; it consists of an isochronous movement of systole and diastole, which is continued, without suspension, to the termination of life, and in a more voluntary contraction of the borders of the umbrella.

M. de Blainville further states that he would willingly suppose that these animals are not born with the same degree of development which they afterwards attain, but he adds that he has no positive fact which supports this hypothesis. Pallas however, he observes, says that *Rhizostoma Cuvieri*, so common on our coasts, has much less complicated appendages in its youth. (See p. 121.)

M. de Blainville acknowledges that he knows nothing positive of the duration of life of these animals; he only knows that certain *Rhizostomata* acquire a considerable development, so as to reach nearly a foot and a half in diameter, and a total length of two feet at least; but, he adds, it would seem that the number of species which are nearly microscopic is infinitely the greatest; and he refers to Scoresby, who in his observations on the zoology of the arctic regions has furnished curious details on this subject.

The first subdivision of the *Arachnodermata* established by M. de Blainville depends on the existence or absence of a solid piece for the support of the umbrella or body of the animal, and consists of the *Cirrhigrada*, which are provided with that support, and of the *Pulmograda*, which are without any such support. These orders, observes M. de Blainville, are further distinguished by the very different nature of the appendages with which the umbrella is furnished on the buccal surface.

Of the *Cirrhigrada* we have already treated [CIRRHIGRADA]; we now have to turn our attention to the much more considerable order of the *Pulmograda*, or *Medusarians*.

ORGANIZATION.

The difficulty of examining the *Pulmograda* is, from the very nature of their texture, considerable, and that of preserving them in spirit great. It is not then to be wondered at that a great portion of their organization remained for a long time in obscurity, and that much relating to it still remains to be cleared up. To observe them with anything like a satisfactory result, they must be studied on the spot, and while they are alive; and thus it is that several points relative to their organization and habits, and their generation especially, have lately been cleared up. The possibility of fairly preserving them in spirit is shown in the museum of the Royal College of Surgeons in London, where, in the department comprehending the first division of the Preparations of Nat. Hist., in spirit, several of the Acalephans (No. 64 to 73 A, both inclusive) are to be seen so preserved. Of the *Pulmograda*, or *Medusarians*, there are eight specimens (No. 68 to No. 73 A, both inclusive).

The disk presents a uniform cellular appearance internally, and the cellular substance is very soft. In its mass no fibre has hitherto, we believe, been traced, and indeed the quantity of solid matter in the whole animal must be very small. Those who have taken *Medusæ* out of the sea and laid them upon a dry board or dry stone must have observed how soon they sink into a sort of deliquescence. Spallanzani came to the conclusion that the sea-water penetrating the organic texture constitutes the greater part of the volume in the *Medusæ*, some of which when newly taken out of the sea weighed 50 ounces, though their dried remains gave a weight of little more than 5 or 6 grains. A fine muscular membrane appearing, when examined with a magnifying glass, to be composed of numerous fleshy fibres disposed in small bundles radiating as regards the axis of the *Medusa*, and adhering closely to the gelatinous substance of the disk, may be seen in some species stretching over a given extent of the lower surface of the umbrella a little within its outer margin. Portions of the disk, or umbrella, have been cut from these animals whilst they were alive: those portions which had no part of this muscular membrane attached to them exhibited no signs of motion; in those, on the other hand, whose connection with the muscular membrane was preserved, the reciprocal contraction and dilatation were continued for some time. Those *Pulmograda* which have cilia around their margins have also circular vessels running along their bases, and most of the projectile and extensile tentacles and filaments have sacs and canals with contained fluids at their roots. If these cilia may be regarded, and they doubtless may be, as one of the causes, and a principal one, of locomotion, the pensile tentacles of the *Medusæ* may be viewed as ancillary at least to that faculty, though they probably are principally employed as nutrient organs. They are hollow and simple, and appear to increase in their extensibility in proportion to their connection with the appendages of the digestive cavities, or when furnished with a vesicle at their base. Suckers are found at the extremities and along the sides of these tentacles in several of the genera, so as to enable them more securely to catch the floating destined prey, or to assist in anchoring the Medusa when it would rest, as we have reason to believe it occasionally does. Eschscholtz was convinced that what Péron took for internal air-bladders were only appendages to the gastric cavities, into which air had been introduced by accident upon removing the animals from the sea.

Nervous System and Senses.—We are not aware of any quite satisfactory demonstration of a nervous system in the Acalephans. Dr. Grant indeed (*Zool. Trans.*, vol. i.) notices a structure in *Cydippe* which in his opinion can only belong to that system; but Eschscholtz, whose labours in investigating the organization of this class were not small, failed to discover nerves in the largest which he examined. That they enjoy *sight* has been a question. Ehrenberg has endeavoured to show that *Medusa aurita* possesses eyes in the form of small red points visible on the surface of the eight brown masses which are round the circumference of the umbrella; and he has compared these so-called eyes to those of certain *Rotifera* and *Entomostraca*. He considers the glandular body at the base of the pedicle to be an optic ganglion, and notices its connection with two filaments that decussate about the middle of their course; and he views these as constituting part of a nervous circle situated, for the greater part of its extent, directly along the bases of the row of tentacles surrounding the umbrella, and so forming a sort of outer wall of the circular vessel or appendage of the intestinal cavity which runs round the margin of the umbrella. He also describes another nervous circle, formed of four ganglion-like masses. These he states to be disposed round the mouth, and to be each connected with a corresponding group of tentacles.

But the general opinion seems to be that *touch* is the only sense possessed by the Acalephans, as far as proof has hitherto gone. That they are sensible to light, though the evidence in favour of their possessing sight properly so called may not be deemed conclusive, will be generally admitted. It is said that some of the smaller tribes have been known to shun a bright light, and to sink into deep water to avoid it. We remember to have seen off Seaton in a calm a shoal of the great Rhizostoma of our coasts swimming high with the tides as they neared our boat, over whose side we were looking, they gradually sank in the clear glassy sea; and it required some dexterity to catch even one or two of the great numbers that passed with the boat-hook, the only engine we had for their capture. The least motion seemed to alarm them. We have observed a similar care in avoiding strange objects, when watching the shoals of a smaller species of *Medusæ* coming up with the tide in the river Hamble in Hampshire, which is also very clear on the flood-tide when the rains have not been heavy.

The chief seat of the touch appears to be in the tentacula and cirrhi with which the majority of Pulmograda are furnished. Many of them, as we have ourselves observed, make no sign when wounded extensively in the umbrella or disk. That their irritability is not small, is however shown by the experiments of Spallanzani, who, by friction of the muscular membrane of the umbrella and pricking it, excited the contracting and dilating motions in *Medusæ* which had been deposited in a dry place for four and twenty hours, had entirely ceased to exert their ordinary movements, and had lost two-thirds of their bulk or nearly so by the draining out of their contained fluids.

Food and Digestion.—The food, small fishes and marine animals, both living and dead, is probably conveyed to the mouth not only by the tentacles and cirrhi with which the greater part of the *Medusæ* are furnished, but also by contractions in the umbrella or disk itself. This must, one should think, be the case in those genera, *Eudora* for instance, which are without tentacles. The mode of taking the prey does not however seem to be accurately known. Botta's observations were confined to the digestion of a small fish by a *Medusa*, but he did not see the *Medusa* catch it. Fishes of some size have been found dead and entangled in the tentacles of *Medusæ*, killed most probably by that benumbing or stinging quality which has obtained for them the name of *Sea-Nettles*.

By the investigations of M. Milne Edwards principally, we now know that all the *Pulmograda* have gastric cavities, but all have not mouths in the ordinary acceptation of the word. In *Rhizostoma*, for instance, the only communication between the stomach and the outer surface is carried on through numerous branching canals in the pensile arms. The orifices by which these open externally are very minute; so small indeed, even where the species is large, as barely to admit *Entomostraca* of a very small size. In *Charybdæa*, which was believed to be agastric, M. Milne Edwards has shown that a mouth and an internal cavity with which that mouth is connected actually exist. The projection of extremely delicate tissues hanging from the roof, so to speak, of the funnel-shaped cavity of *Charybdæa* surrounded a central mouth and a stomach, from which proceeded four long canals leading to the tapering filaments pendent from the margin of the animal's body, and these canals he believes to bear analogy to the radiating vessels in Rhizostoma. There is a group of small cylindrical sacs at the beginning of each canal and opening into it, which, he thinks, may be regarded as biliary organs. The experiments of Spallanzani, which were principally made on *Aurelia phosphorea*, Lam. (*Pelagia*, Esch.), showed him four groups of convoluted membranous tubes, which resembled in structure the intestines of the *Vertebrata*, and though he did not trace their connections, he seems to have viewed them as true parts of the alimentary canal. They exhibited a peristaltic motion both when in the water and out of it, and this motion could be increased by stimulus. Professor Owen suggests that these must have been the ciliated and plicated tube-like *testes*, or *ovaria*, according to the sex of the individuals examined.

A good deal of obscurity still hangs over the *Respiration* and *Circulation* of the *Pulmograda*; but we cannot forbear to call attention to two most striking and beautiful examples of the anatomical skill of John Hunter, which may help the observer in his inquiry as to how these animals breathe. In the *Physiological Series of Comparative Anatomy* in the museum, the foundation of which was laid by him, will be found the following preparations (*Series I. Aeration of the blood by means of gills*):—No. 982. A Medusa (*Rhizostoma cærulea*, Cuv.) injected, with a portion of the disk removed so as to expose the central cavity or stomach, and the common orifice by which the numerous nutritive canals of the ramified processes pour their contents into that cavity. The vessels which proceed from it to ramify and subdivide, so as to form the respiratory network in the margin of the disk, are successfully injected. No. 983 shows a portion of the margin of the same specimen. The colour of the vermilion, which some chemical change has destroyed in the preceding preparation, is here preserved. The vascular network is seen to be formed by the lateral ramifications of straight vessels diverging to the circumference of the disk, and placed about an inch apart from each other. The vessels at the central margin of the network are the largest, and encroach in a semicircular form upon the intervals of the straight vessels, before these begin to distribute their lateral branches. The peripheral or terminal vessel of the network is very minute, and follows the scolloped contour of the margin of the disk. The whole of this vascular network is placed on the surface of the disk, which, in the natural position of the animal, rests upon the water; and thus this simple but beautiful respiratory apparatus is most effectually brought in contact with that element, through the medium of which the circulating fluids of the Medusa are submitted to the influence of the atmosphere. (*Cat. Mus. Coll. Chir.*, vol. ii.)

Till lately nothing comparatively was known of the *Generation* of this curious tribe. Gaede, Müller, Eschscholtz, Milne Edwards, Ehrenberg, Jæger, Siebold, and Wagner have all thrown light upon the subject, but the last has satisfactorily proved that some of the *Pulmograda* at least are diœcious; that they are in fact male and female; and that the organs of the male are in August crowded with *spermatozoa* aggregated in minute spiriform groups. No copulation has been observed, and the probability is that the male influence is conveyed by dispersion through the ambient medium. The *ova* are excluded by compression of the sac, and Siebold has traced their stages with as great exactness as has been employed in tracing those of any other animal. Not the least curious part of the generative system and economy of the Pulmogrades is the marsupial apparatus in certain species, as the *Medusa* (*Cyanæa*) *aurita*. This consists of a series of small flask-shaped processes developed from each side of the oral tentacles, where the ovaria are crowded with the impregnated ova, and by a transition, of which the nature is as yet as problematical as the passage of the embryo into the pouch of the Marsupialia, the ciliated ova, or gemmules, of the Medusa are transferred from the ovaria to the brachial marsupial sacs, and there undergo their development. The young Medusæ quit the marsupial pouches in the form of certain ciliated Infusoria, and afterwards assume the form of an eight-armed Polype, before their final metamorphosis, which would seem to take place in the month of February or early in March. The marsupial sacs are deciduous, and disappear soon after the escape of the young.

In the preparation No. 2235, in the Museum of the Royal College of Surgeons, is shown a Medusa (*Cyanæa aurita*, Cuv.). The four circular opaque white bodies in the substance of the disk, and seen in the interspaces of the oral tentacula, are the *gemmaria*, or organs in which the reproductive ciliated gemmules are developed: each gemmary opens by a separate ciliated orifice in the ventral or inferior surface of the body. (*Cat. Mus. Coll. Chir.*, vol. iv.)

Some idea of the swarms of *Medusæ* which are occasionally met with may be formed from the note appended to the account of the small luminous *Medusæ* brought from the Red Sea, and preserved in the Museum of the College of Surgeons (*Preparations of Nat. Hist. in Spirit*), No. 73 A. Henry Salt, Esq., was the donor, in 1811, and the note states that they were in such profusion, that the proportion of *Medusæ* to the water was fully one-third, perhaps nearly one-half. They were luminous only when alive.

ARRANGEMENT.

From the causes above noticed, when observing on the difficulty of satisfactorily examining and preserving the *Pulmograda*, the distinction of species becomes no easy task; and there is yet another reason, namely, the probability that in most of them the young after its exclusion from the ovarial sac undergoes a series of metamorphoses before it attains its full development, as it certainly does in some.

The names of Péron and Lesueur stand prominent as those of zoologists who have grappled with this obscure branch of natural history; but, as Cuvier observes, in their 'Prodromus' genera often occur which they have established on the authority of the bad figures of inaccurate authors, such as Baster and Borlase, and without having themselves seen the subjects; and from the same cause they have beyond measure multiplied the species. Still their arrangement should be that principally consulted by the student.

The method of Eschscholtz, who paid attention to a consideration hitherto comparatively disregarded, namely, the ramifications of the digestive canal, contains several new genera, which are disposed in a manner entirely different from the arrangement of Péron and Lesueur. The following table will exhibit his systematic distribution of the *Medusæ*:—

DISCOPHORÆ.

Section I.

Phanerocarpæ.

(Ovaries visible.)

Family 1.

Rhizostomidæ.

Genera: *Cassiopea, Rhizostoma, Cephæa.*

Family 2.

Medusidæ.

Genera: *Sthenonia, Medusa, Cyanæa Pelagia, Chrysaora, Ephyra.*

Section II.

Cryptocarpæ.

(Ovaries concealed.)

Family 3.

Geryonidæ.

Genera: *Geryonia, Dianæa, Linuche, Saphenia, Eirene, Lymnorea.*

Family 4.

Oceanidæ.

Genera: *Oceania, Callirhöe, Thaumantias, Tima, Cytacis, Melicertu, Phorcynia.*

Family 5.

Æquoridæ.

Genera: *Æquorea, Mesonema, Ægina, Cunina, Eurybia, Polixena.*

Family 6.

Berenicidæ.

Genera: *Eudora, Berenice*

From these two systems, or at least by intercalating among the genera of Péron and Lesueur, the existence of which he is far from guaranteeing, those of Eschscholtz M. de Blainville presents the following synoptic table —

PULMOGRADA, OR MEDUSARIA

Section I.

Simple.

Genera: *Eudora, Ephyra, Phorcynia, Eulymene, Charybdæa.*

Section II.

Tentaculated.

Genera: *Berenice, Æquorea, Mesonema, Polixena, Ægina, Cunina, Foveolia, Eurybia, Pegasia, Obelia.*

Section III.

Subproboscidean

Genera: *Oceania, Aglaura, Melicertie, Cytacis, Thaumantias, Tima, Campanella.*

Section IV.

Proboscidean.

Genera: *Orithyia, Geryonia, Saphenia, Dianæa, Linuche, Favonia, Lymnorea, Sthenonia.*

Section V.

Brachideous and *Pedunculated.*

Genera: *Ocyröe, Cassiopea, Aurelia, Melitæa, Evagora, Cephæa, Rhizostoma, Chrysaora, Pelagia.*

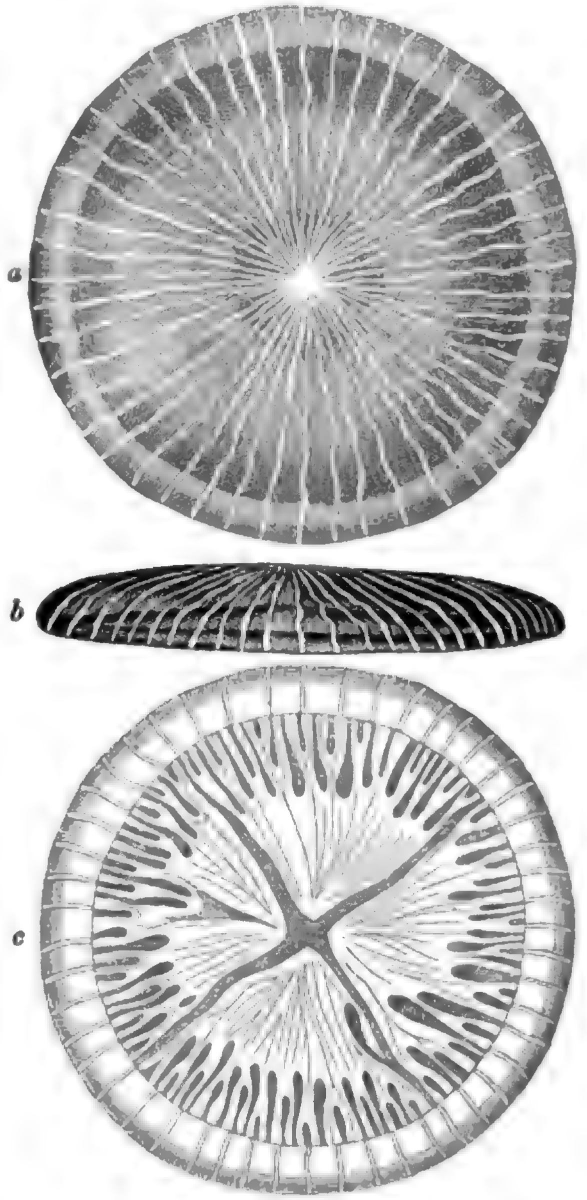
We now proceed to lay before the reader examples of these several sections.

Section I.

Eudora.

Generic Character.—Body very much depressed, discoïd, simple, without tentacular cirrhi, without either peduncles or appendages, and offering within only ramified canals opening (s'abouchant) by four large trunks, in the form of a cross, into a small central cavity without external aperture.

Example, *Eudora undulosa* (Pér. and Les.).



Eudora undulosa.

a, view of the upper side; b, in profile, or with the edge of its disk toward the spectator; c, view of the lower side.

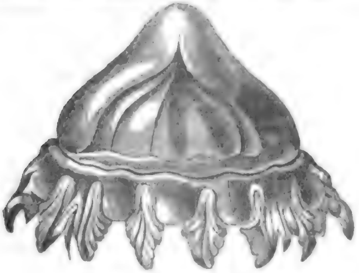
M. de Blainville remarks that he only knows this genus from the characteristic and short description given by Peron and Lesueur. He doubts whether this *Medusa* has not a mouth; for he thinks that the centre of the reunion of the four large trunks of the canals ought to be regarded as a stomach. He further inquires whether the individual figured was complete. He says that M. Lesueur informed him that there was a membrane on the lower surface, and he inquires whether this was not perhaps some remains of the stomachal cavity.

Cuvier united this genus with the *Geryoniæ*. Eschscholtz places it, as we have seen, in his family *Berenicidæ*, and unites *Euryale* with it.

Charybdæa.

Generic Character.—Body hemispherical, subconical, or even semi-elliptical, furnished on its circumference with foliaceous subtentacular lobes, hollowed below by a great stomachal excavation with an aperture as large as itself.

Example, *Charybdæa periphylla* (Pér. and Les.).



Charybdæa periphylla.

Section II.

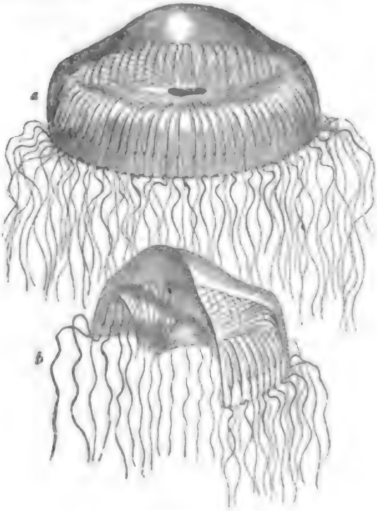
Æquorea.

Generic Character.—*Body* slightly diversiform, furnished at its circumference with a circle of filamentous tentacular cirrhi, often very long, and more or less numerous, a good deal excavated below, with a median orifice often at the extremity of a sort of circular lip, which is more or less projecting or provided with tentacular fringes.

Stomachal appendages linear, numerous, or sacciform and not numerous.

Example, *Æquorea cyanea* (Pér. and Les.).

Habitat.—South Seas.



Æquorea cyanea.

a, the animal complete; *b*, a portion thereof.

M. de Blainville divides this genus into the following sections:—

*

Marginal cirrhi very numerous; stomachal appendages equally numerous and linear.

A. Lip simple.

Genus Æquorea.

B.

Lip fringed.

Genus Mesonema. (Esch.)

**

Marginal cirrhi as well as the stomachal appendages sufficiently numerous, or not numerous.

C.

Cirrhi sufficiently numerous, originating opposite to the triangular stomachal appendages.

Genus Polyxena. (Esch.)

D.

Cirrhi and sacciform stomachal appendages few.

Genus Ægina. (Esch.)

We have selected a genus of the first subdivision for illustration.

Section III.

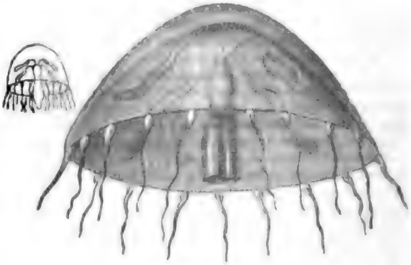
Thaumantias.

Generic Character.—*Body* hemispherical, provided at its circumference with tentaculiform cirrhi which are bulbous at the root; very much excavated beneath, and having in its middle a free pedunculiform stomachal cavity dividing itself into claviform canals and terminated by a simple buccal orifice.

Example, *Thaumantias cymbaloïdea* (*Med. cym.*, Slabber.; *Dianæa cymb.*, Lam.).

Placed by Péron among his *Oceaniæ*.

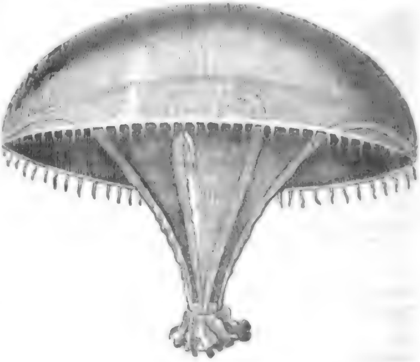
Habitat.—Coasts of Europe; Holland.



Thaumantias cymbaloides.

Tima.

Generic Character.—*Body* hemispherical, depressed, furnished on its circumference with a circle of tentaculiform cirrhi, which are short and numerous; not much excavated beneath, and prolonged into a very thick conic peduncle, which is entirely exserted, and terminated by a plicated enlargement; buccal orifice at the centre of four labial appen-



Tima flavilabris.

dages; stomachal cavity in the enlargement of the peduncle, and giving origin to four ascending canals and communicating with a marginal canal.

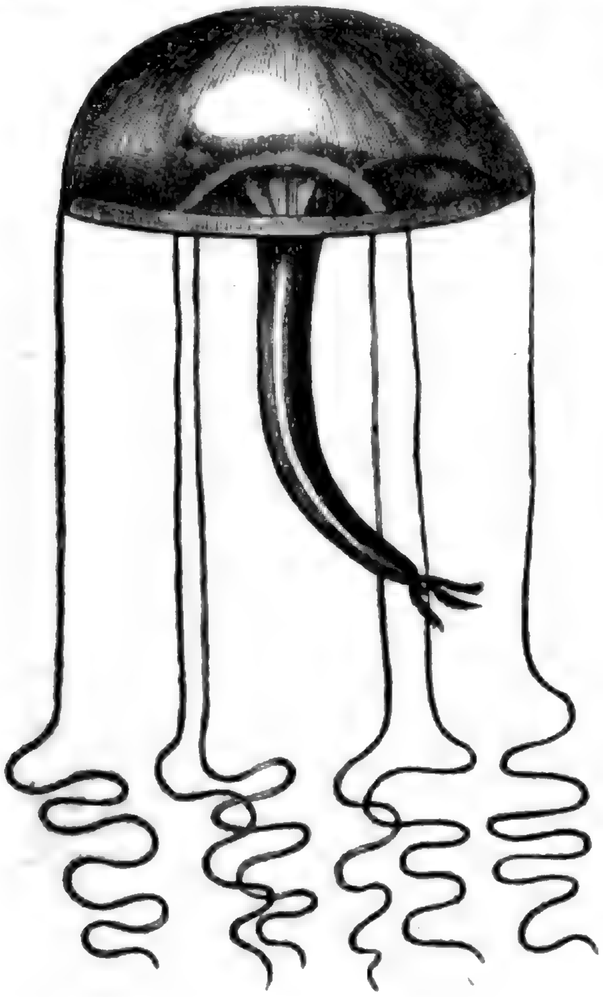
Example, *Tima flavilabris.*

Habitat.—The Azores.

Section IV.

Dianæa. (Quoy and Gaim.)

Generic Character.—Body hemispherical, furnished on its circumference with a small number of tentaculiform cirrhi; excavated beneath, and provided at its middle with a strong exserted proboscidiform appendage, with four brachideous appendages at its extremity.



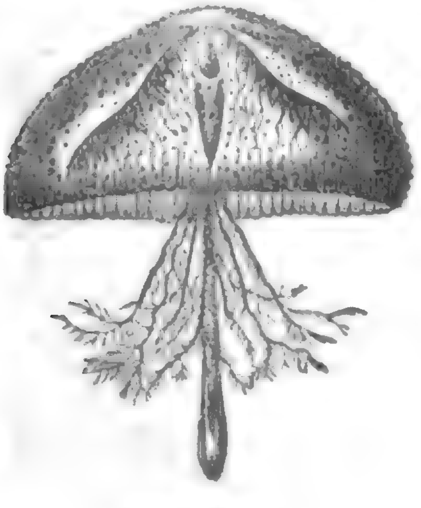
Dianæa.

Favonia.

Generic Character.—Body subhemispherical, with neither cirrhi nor tentaculiform marginal cilia; rather deeply excavated beneath, with a long, median, proboscidiform prolongation, having at its root six or eight brachideous appendages, furnished with radiciform suckers. Four ovaries.

Example, *Favonia Octonema* (*Orithyia Octonema*, Lam.).

Habitat.—South Seas.



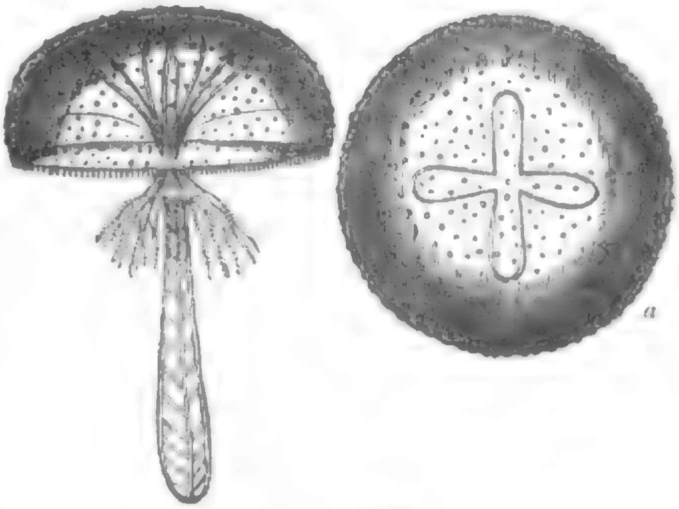
Favonia Octonema.

Lymnorea.

Generic Character.—Body subhemispherical, furnished on its circumference with very fine, short, and numerous tentacular cilia; rather deeply excavated beneath, and provided with a long proboscidiform prolongation, having at its base eight bifid and finely divided appendages. Four ovaries, in the form of a cross.

Example, *Lymnorea triedra* (*Dianæa triedra*, Lam.).

Habitat.—South Seas.



Lymnorea triedra.

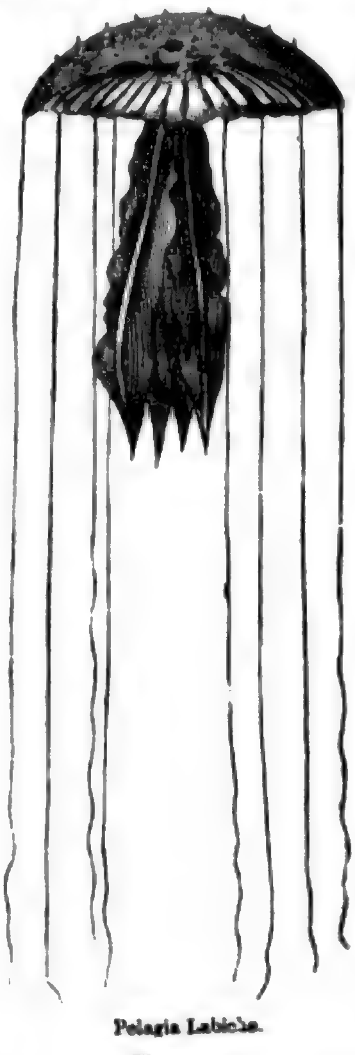
a, the disk seen from above.

Section V

Pelagia.

Generic Character.—Body subhemispherical, lobated, auriculated, furnished on its circumference with a few tentaculiform cirrhi; eight inferior apertures at the extremity of a fistulous? peduncle provided with four very strong and foliaceous arms. Four ovaries. Stomach with cæciform appendages.

Example, *Pelagia Labiche*, Esch. (*Cyan. Labiche*, Quoy and Gaim.).

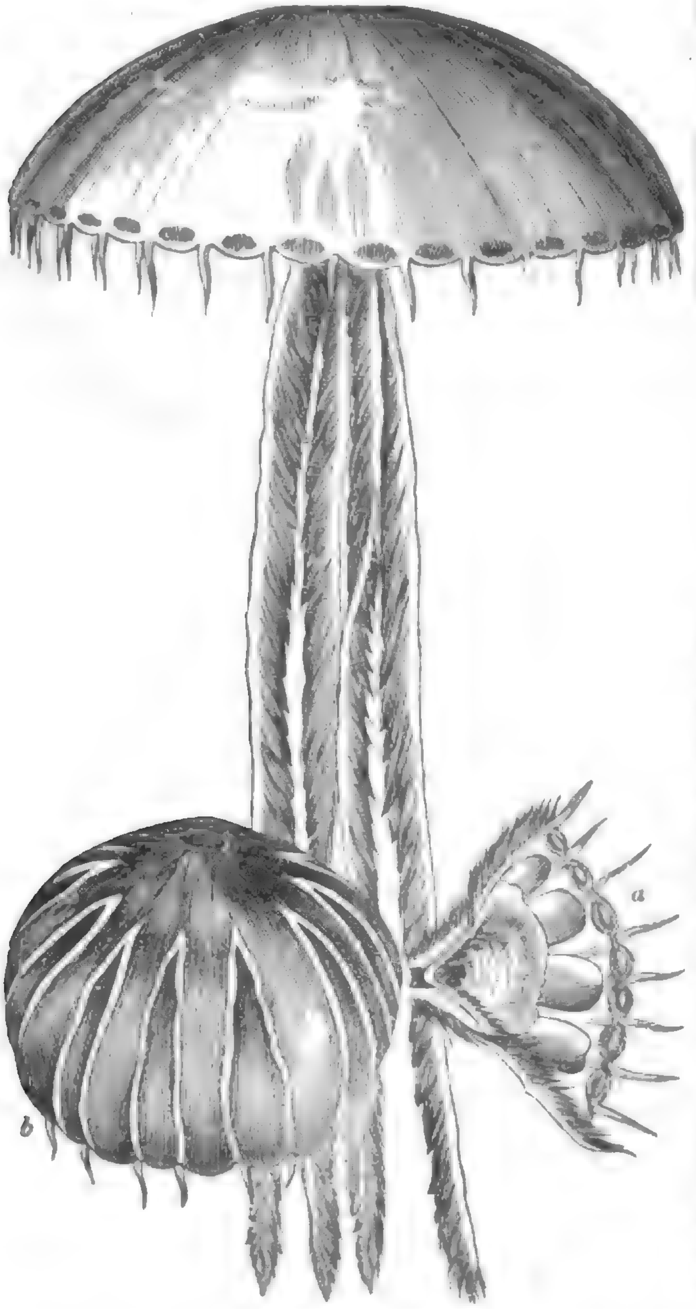


Pelagia Labiche.

Chrysaora.

Generic Character.—Body circular, hemispherical, festooned and provided with at least twenty-four tentaculiform cirrhi on its circumference; excavated internally into a considerable cavity with sacciform appendages; communicating externally by a single orifice, pierced in the centre of a median peduncle, provided with distinct brachideous appendages. Four ovaries.

Example, *Chrysaora lutea.*



Chrysaora lutea.

a, fourth of the disk or umbrella seen from below; *b*, disk without its appendages.

Rhizostoma.

Generic Character.—*Body* circular, hemispherical, provided on its circumference with lobes or festoons intermingled with auricles, largely excavated below, with four semilunar orifices, produced by four roots of insertion of a considerable pedunculated mass, afterwards divided into eight very complex brachideous appendages furnished with fibrillary suckers, without a median prolongation. Four ovaries, in the shape of a cross. Stomachal cavity very large and vascular at its circumference.

Example, *Rhizostoma Cuvieri.*

Habitat.—European Seas.

M. de Blainville separates the genus into two divisions.

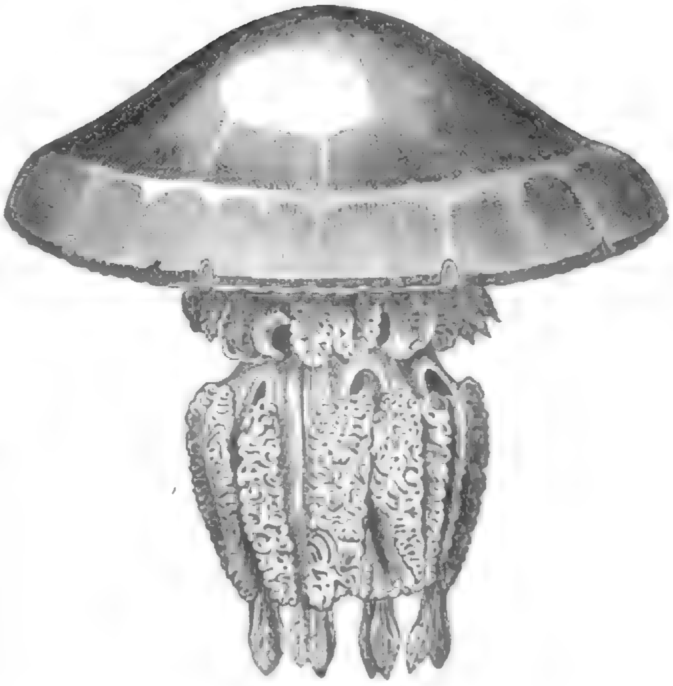
A

Species having a peduncle of insertion for the root, with radical appendages, besides those of the arms.

B.

Species having a very short peduncle of insertion, without radical appendages, besides the four bifid arms. (*Evagora*, Pér.)

We have given an illustration of the first. The species grows to a very large size.



Rhizostoma Cuvieri.

Fossil Impressions of Medusæ?

Mr. Babbage, in his paper 'On Impressions in Sandstone resembling those of Horses' Feet,' December, 1836, in which he noticed those in the channel of a stream on the extensive moor called Pwll-y-Duon, about seven miles from Merthyr Tydvil, to which his attention was drawn by Mr. Guest of Dowlais, and the analogous casts in the old red-sandstone of Forfarshire, there called *Kelpies' feet*, described some observations recently made by Mr. Lyell, on impressions left by *Medusæ* on the rippled sand near Dundee. On removing the gelatinous body of the animal, a circular space was exposed, not rippled, but having around half the border a depression of a horse-shoe form. These marks however were not considered by Mr. Lyell as identical with those called *Kelpies' feet*, but merely so far analogous as to invite further observations, and to make it desirable to possess drawings of the impressions which different species of *Medusæ* leave when thrown by the tide upon a beach of soft mud or sand. (*Geol. Proc.*, vol. ii.)

PULMONELLA. [Synoicum.]

PULMONELLUM. [Zoophytaria.]

PULP is a name given in vegetable physiology and botany to such parts of plants as are semifluid. This substance appears to the naked eye as a mucilaginous unorganised mass of the nature of a secretion; but it is in reality composed of very thin-sided cells which have little power of cohesion, and secrete in their interior a greater abundance of fluid than is usual. Pulp may therefore be regarded as young and imperfectly formed tissue filled with the secretions peculiar to the species. It is also in some cases, perhaps in all cases, mixed with an abundance of cinenchyma, or laticiferous tissue, which passes through it in all directions in the form of the most delicate ramifications. The pulp of the grape affords a good example of this. To the naked eye it appears to be nothing more than a fleshy homogeneous mass that may be compared to half-consolidated gum; but under the microscope it is found to be a congeries of oval transparent bags turgid with fluid and very easily ruptured; treated with iodine, they lose their transparency in some measure, and acquire a brown colour, when their limits become very distinct. The same re-agent stains still browner the vessels of the latex, whose course and position are thus brought clearly into view. In a few minutes however the colouring fades away in the latter, till they become as indistinct as they were before the iodine was applied: it is therefore necessary that the observation should be made as soon as the iodine has seized upon the latex or its tubes.

PULPIT. This term affords a striking instance of the great change of meaning and application which words frequently undergo, for, exclusively of the Latin termination, it is identical with *Pulpitum*, which signified that part of the Roman stage (distinguished from the orchestra) on which the actors recited and performed their parts. The French *Pupitre* and the English *Pulpit* both come from the same source, but are dissimilar in signification; the former meaning merely a reading-desk, and *Chaire* (*Cathedra*) being the term that corresponds with our English one. The *Ambo* of the early Christians appears to have been different both in form and purpose from pulpits afterwards used for preaching, it being rather a low platform on which parts of the service were sung or recited. The most antient pulpits now existing are supposed to be those in S. Lorenzo fuor delle Mura and S. Clemente at Rome; and these and other early pulpits of the same kind are of marble, with inlaid or mosaic compartments. In the church of S. Lorenzo at Florence, and several other modern basilicas, there are two pulpits, one on each side of the nave. Great cost both of material and workmanship was frequently bestowed on pulpits; and some of them rank among the most celebrated monuments of art of their period. Niccola and Giovanni Pisano [PISANO], Donatello, Benedetto da Majano, and other eminent sculptors, employed their talents upon such works. The pulpit in the baptistery of Pisa, by Niccola, is hexagonal, and supported on seven columns, one at each angle and a central one. Giovanni Pisano executed that in the nave of the Duomo at Pisa, besides which there are two others in the same church, on the opposite sides of the choir. The *Pergamo* of Santa Croce at Florence, by B. da Majano, is greatly extolled by Vasari for the beauty of its reliefs and sculptures. The two *pergami* in S. Lorenzo at Florence, similarly placed opposite each other, are the work of Donatello; and of the mastery of composition displayed in their reliefs some idea may be formed from the specimen given of them in Cicognara's 'Storia della Scultura.' Notwithstanding the richness of such pulpits, and their elaborate execution, their general forms are not always the most pleasing or appropriate.

For a long time the pulpit appears to have been treated as an architectural feature of the interior, being constructed, if not of marble, of the same material as the rest. Among numerous other examples of Gothic stone-pulpits may be mentioned that in the nave of Strasburg cathedral, which is spoken of by Dr. Dibdin in terms of unqualified admiration, yet it is too much of a jumbled mass of ornament, and the whole of the canopy is in exceedingly bad taste, though not quite so vicious as that afterwards displayed in many Roman Catholic pulpits whose canopies are made in the form of clouds, curtains, palm-branches, and similar extravagancies. One of the most celebrated as a performance of art is the magnificent oak pulpit in the nave of St. Gudule, at Brussels; the whole is elaborately carved, and the pulpit itself is supported by figures representing Adam and Eve expelled from Paradise by the Angel.

Of stone-pulpits we have few remaining in this country; but there is one in Bristol cathedral, and another in Worcester, drawings and details of which latter are given in Pugin's 'Gothic Specimens.' It was originally erected in the nave, near the west end, but has been removed to the north side of the choir, and has been greatly disfigured by modern 'beautifying,' a flat sounding-board having been added to it in the shape of a bed-tester 'with paltry little scalloped festoons.' Even the pulpit itself is not remarkable for the elegance of its details, although its general form is good. This and another subject represented in the same work are instances of what may be termed *oriel pulpits*, being made to project after the fashion of an oriel [ORIEL] from a pier or wall, and similarly corbelled below, instead of being supported from the ground. The second of the above-mentioned examples is in fact a small oriel in an angle of the outer court of Magdalen College, Oxford; and another, still more antient and curious—and we may add, more beautiful—is that at Beaulieu, Hants, which projects from an elegant open Gothic arch, and is supported, not on a corbelled and moulded oriel-stool, but on a short reversed spire, whose angles are decorated with small pillar-shafts, and the sides between them with foliage: a representation is given in the plates to the 'Glossary of Architecture.' Besides pulpits of this kind in the courts and cloisters of religious houses, there were others called *Preaching-Crosses*, from which sermons were delivered in the open air: Paul's Cross is a celebrated and well-known instance.

At the present day very few of the pulpits in our English churches have any beauty of form or character, but are frequently tasteless excrescences, encumbered with steps, reader's-desk, &c., and with respect to design, they are mere carpenter and joiner's work. Of late years the practice has been introduced of having two distinct pulpits, one for the reader, the other for the preacher placed on opposite sides of the chancel; whereby architectural symmetry at least is kept up; yet this has been objected to as a reprehensible departure from strict usage, and likewise an absurdity, though if there be absurdity in having two pulpits when only one is required at a time, the absurdity is the same whether they be united together, one above the other, or placed singly. The two might very properly be combined, were the pulpit to be made a central object in a church, by being so placed at the altar-end of the chancel; but though it has occasionally been adopted, such mode is still more strongly objected to as being offensively indecorous, because in such case the pulpit must be before the altar. It might however be at such distance from it as not to obtrude upon it; and as to indecorum, when no irreverence is intended, but merely convenience is consulted, the impropriety becomes excusable, such situation being certainly the most advantageous of any, because the preacher is then both heard and seen more distinctly by the whole congregation than when he is stationed on one side of the church.

PULSE. [HEART.]

PULTAWA. [POLTAWA.]

PULTENEY, WILLIAM, Earl of Bath, was born in 1682. He was the eldest son of a father of the same names, whose father, Sir William, had represented the city of Westminster in parliament with some distinction. The surname is supposed to have been taken from Pulteney in Leicestershire, where the family had been antiently established.

Young Pulteney, having been sent first to Westminster school and then to Christ Church, Oxford, afterwards travelled on the Continent, and on his return home was brought into parliament for the borough of Hedon in Yorkshire. This appears to have been in 1705. He was indebted for his seat to his guardian, Henry Guy, Esq., formerly secretary to the treasury, who afterwards left him a legacy of 40,000*l.* and landed property to the value of 500*l.* a year. Pulteney besides derived a considerable estate from his father, and he also received a large portion with his wife, Anna Maria, daughter of John Gumley, Esq., of Isleworth. All this wealth he increased by the practice throughout his life of a very rigid economy, 'which,' says Coxe, in his 'Memoirs of Walpole,' 'his enemies called avarice, but which did not prevent him from performing many acts of charity and beneficence.'

From his entry into the House of Commons, Pulteney attached himself to the Whig party, which was that of his family. He continued to sit for Hedon throughout the reign of Anne; but his name does not appear in the reported parliamentary debates during that reign. Coxe however states that he spoke for the first time on 'the Place Bill, which he warmly supported. Place Bills, or proposals for excluding placemen from parliament, were brought forward in the House of Commons almost every session in this reign. Coxe also tells us that he distinguished himself on the question of the prosecution of Sacheverell; that he had made himself so obnoxious to the Tories, that when they came into power, in 1710, they revenged themselves upon the young orator by removing his uncle, John Pulteney, Esq., from the board of trade; that during the last four years of Queen Anne he not only took a principal share in the debates, but was admitted to the most important secrets of his party; and that on the prosecution of Walpole, in 1712, Pulteney defended his friend in a very elegant speech. He certainly was looked upon by this time as one of the leading men of his party.

On the accession of George I. Pulteney was appointed secretary-at-war; but when Walpole resigned in 1717, Pulteney also gave up his office. Soon after this however a coolness took place between the two friends, which was not removed by the appointment of Pulteney to the valuable sinecure of cofferer of the household on Walpole's resumption of office in 1720; but it was not till 1725 that Pulteney openly threw himself into the ranks of opposition, and began that course of bitter and incessant attack upon the minister, which did not cease till he had driven Walpole from power in 1742. Nor did he confine his exertions to his place in parliament; out of doors he entered into a close union with the party of which Bolingbroke was the head, and became the principal assistant of that writer in his paper called the 'Craftsman.' By his shining powers as a debater also, and the flaming patriotism with which he filled his harangues as leader of the opposition, he raised himself to the height of public favour, and was for some years the most popular man in the kingdom. When the administration of Walpole was at last overthrown, all the authority of the state seemed for a moment to lie at the feet of Pulteney; and he actually named the new ministry, taking to himself a seat in the cabinet without any office. But the arrangements that were made had in fact been all, it may be said, dictated by Walpole, who still retained his influence with the king, and secretly arranged with his majesty the course into which Pulteney was to be seduced with the view of destroying the popularity which was his chief strength. The composition of the new cabinet disappointed the expectations both of partisans and of the public; everything wore the appearance of its apparent maker having in fact made a compact and a compromise with Walpole; one considerable section of his late supporters (that headed by the Pitts and the Grenvilles) was wholly overlooked in the distribution of places; and the suspicion and sense of injury awakened by all this burst into a universal storm of indignation when, after the lapse of a few months, Pulteney walked into the House of Lords as earl of Bath. From this moment the late popular idol became quite insignificant. However he lived till 1764, chiefly occupied in nursing his private fortune, but still sometimes taking part in the debates and in public affairs. In the year 1760 he published 'A Letter to Two Great Men' (Mr. Pitt and the Duke of Newcastle), in which Horace Walpole, perhaps from no better authority than his own suspicion and spite, says he was assisted by his chaplain Douglas (the same who afterwards became successively bishop of Carlisle and of Salisbury). Walpole adds, 'It contained a plan of the terms which his lordship thought we ought to demand if we concluded a peace; it was as little regarded by the persons it addressed as a work of Mr. Pitt's would have been, if, outliving his patriotism, power, and character, he should twenty years after have emerged in a pamphlet.' ('Mems. of George II.,' ii. 412.) However the caustic annalist allows that 'it pleased in coffee-houses more than it deserved.' Pulteney left no family, and his peerage became extinct on his death; but the title of baroness Bath was conferred in 1792, and afterwards that of countess of Bath in 1803, on Henrietta Laura Pulteney, daughter of Frances Pulteney, and Sir William Johnson, Bart. (who took the name of Pulteney), and great-granddaughter through her mother of a younger brother of the first earl's father, according to Coxe (who had his information from Bishop Douglas), or (according to other authorities) daughter of the earl's own younger brother Henry. This lady, who inherited the earl's fortune, died also without issue in 1808, and the title is now again extinct.

PULVINITES. [MALLEACEA, vol. xiv., p. 336; MARGARITACEA.]

PUMICE. [LAVA; VOLCANO.]

PUMP. [AIR-PUMP; HYDRAULICS.]

PUMPKIN is the vulgar name of the fruit of the *Cucurbita maxima*, a plant whose native country is not certainly known, but which is probably a variety of *C. Pepo*, a species inhabiting the Levant. It is, as is well known, an annual plant, sending forth many long succulent angular rough shoots, bearing leaves and flowers something like those of the cucumber. Its fruit is often of enormous size, specimens having been produced in this country weighing 220 lbs., and in hotter countries they are still larger. This kind of fruit is however only furnished by the variety called the yellow Potiron; in other varieties it is much smaller. The seed of the pumpkin should be raised in a frame, in a garden pot, after the same manner as the cucumber, and planted out upon a dunghill, or in any well-manured soil, as soon as the frosts are gone. Its young tender leaves and shoots constitute the best of all spinach; and the fruit, when ripe, is used for soup, or is baked with pears as an ingredient in tarts: when young, it may also be boiled and brought to table like vegetable marrow.

PUN. A pun has been defined by Addison (*Spectator*, No. 61) to be 'a conceit arising from the use of two words that agree in the sound but differ in the sense.' Sometimes however the pun is effected by the employment of only one word, which is susceptible of a double application; as when one who had undertaken to pun upon any subject that should be given him, on being desired to make a pun on the king, answered that the king was no subject. Sometimes too the sound that is thus made to convey two ideas at once is not an entire word, but only a syllable. The definition moreover to be complete ought to have explained in what the effect of the conceit consists. It appears to be, as we have just hinted, in the novelty and unexpectedness of the signification or application presented by the pun—a novelty which always at least produces surprise, and often the livelier titillation of a grotesque or otherwise ludicrous image. Sometimes, though rarely, a pun has risen into a far higher region than the ludicrous; as for instance when Burke (or whoever else it was) exclaimed, 'What is (m)ajest(y) when deprived of its externals but a jest?' So, in his account of his ramble through London, in the 'Spectator,' No. 454, Steele tells us that when he looked down from one of the windows on the first floor of the Exchange upon the area below, 'where all the several voices lost their distinction and rose up in a confused humming,' a reflection occurred to him that could not have come into the mind of any but of one a little too studious; 'for,' he adds, 'I said to myself, *with a kind of pun in thought*, what nonsense is all the hurry of this world to those who are above it?' It may be observed that both these last-mentioned puns arise not out of the similar sound of two words, but out of the double application of one—*externals* in the former, *above* in the latter.

A sketch of the history of puns has been given by Addison in a well known paper in the 'Spectator' (No. 61), in which he traces the existence of the practice from the time of Aristotle downward. The figures of speech or turns of expression known among the Greeks by the names of the paragramma (παράγραμμα), and the paronomasia (παρωνομασία), the antanaclasis (ἀντανάκλασις), and the plóke (πλοκή), were often merely what we should now call puns. Addison observes that Aristotle, in the eleventh chapter of his 'Rhetoric,' describes different kinds of puns or paragrams, among the beauties of good writing, and produces instances of them out of some of the greatest authors in the Greek tongue. 'Cicero,' he adds, 'has sprinkled several of his works with puns, and in his book, where he lays down the rules of oratory, quotes abundance of sayings as pieces of wit, which also upon examination prove arrant puns.' 'I do not find,' he afterwards says, 'that there was a proper separation made between puns and true wit by any of the antient authors except Quintilian and Longinus.' We may also refer to another very clever paper in the 'Guardian' (No. 36), attributed to a writer of the name of Birch, which contains what is called 'A Modest Apology for Punning.' In the introduction to this paper the distinction is happily enough drawn between the extemporaneous puns of conversation and the punning in deliberate and grave compositions, which in this country, in the early part of the seventeenth century, used to be reckoned eloquence and fine writing. 'I look,' says the author, 'upon premeditated quibbles and puns committed to the press, as unpardonable crimes. There is as much difference betwixt these and the starts in common discourse, as betwixt casual rencontres and murder with malice prepense.'

The philosophy of the pun, and its relation to alliteration, rhyme, and other forms of speech, the effect of which is derived partly from the sound, might afford matter for some speculation.

PUNCH, the name of the principal character in a well known puppet-show which is exhibited about the streets, and which appears to have originated in Italy; the name is a corruption of Policinella, the Neapolitan clown, who is generally the leading character in puppet-show performances. But the show itself, or rather the puppets, are styled by the Italians 'fantoccini.' Galiani, in his 'Vocabolario del Dialetto Napoletano,' gives the following account of the origin of Policinella, or rather Polecenella, as it is pronounced by the Neapolitans. A company of strolling comedians once arrived at the town of Acerra near Naples, in the season of the vintage. The vintagers are, by traditional custom, licensed jesters. The comedians fell in with a band of vintagers, who assailed them with jokes and vociferations, which the comedians retorted. One of the vintagers, called Puccio d'Aniello, or Puccio the son of Aniello, remarkable for a very large nose and grotesque appearance, was the most forward and witty of all his band, and at last the comedians were fairly beaten out of the field. Reflecting on this occurrence, the comedians thought that a character like that of their antagonist Puccio d'Aniello might prove very attractive on the stage, and they proposed an engagement to him, which he accepted. The engagement proved profitable to both parties; and the comedians had crowded houses wherever they went. After some years, Puccio d'Aniello died, but his place was filled by a well-taught adept in his art, who assumed his name, softened into Polecenella, and also his manner and costume, with a mask which perpetuated the features of the facetious vintager. By degrees, personifications of the original Polecenella were multiplied all over the country, and the name and character have thus become immortal. It is remarkable that the district in which Acerra is situated was remarkable in antient times for that kind of dramatic wit and farcical humour which has made the reputation of the modern Polecenella. [ATELLANÆ FABULÆ.]

PUNCTUATION is the art of dividing written or printed composition into sentences and clauses, by points or stops, so as to indicate the closer or more remote connection of the several parts. It serves to elucidate the sense, and thus also assists the delivery, since the latter must have reference to the grammatical construction.

The elements of a system of punctuation are discoverable in antient times. Aristotle mentions the subject in his 'Rhetoric' (iii. 5); Jerome, in the fourth century, attended to the punctuation of the sacred books which he revised; about the middle of the fifth century Euthalius published an edition of the four Gospels, and afterwards of the Acts, and of all the apostolical Epistles, in which he divided the New Testament into *stichoi* (στιχοι), or lines, regulated by the sense, so that each terminated where some pause was made in the reading; and in the Alexandrine manuscript, which may be referred to the fourth or fifth century, we find not only a break at the end of each paragraph, but stops, similar to the higher part of our colon, inserted, though sparingly, in the body of the sentences.

The invention of the modern system of punctuation has been attributed to Aristophanes, a grammarian of Alexandria; but the subject was very imperfectly understood till the close of the fifteenth century, when the learned Venetian printers, the Manutii, increased the number of the signs, and established some fixed rules, which have been so generally adopted, that we may regard them as the inventors of the present system.

The points used in English composition are

The comma, marked thus	,	The period or full stop	.
The semicolon	;	The interrogation	?
The colon	:	The admiration	!

to which may be added the dash —, the apostrophe ', and the parenthesis ( ).

It is considered that the proper length of the pause at a comma is while we may count *one;* at a semicolon *two;* at a colon *three;* and at a period *four*. But it will be easy to show that there is frequently a much greater separation of the sense, and that there ought therefore to be a longer pause at some commas than at others. Thus in the following sentence there should evidently be a longer pause after *instance*, than after *candour*, *fortitude*, *charity*, and *generosity*, though these words are all followed by the same mark of grammatical punctuation, namely the comma: 'The qualities of candour, fortitude, charity, and generosity, for instance, are not in their own nature virtues; and if ever they deserve the title, it is owing only to justice, which impels and directs them.'

The form and structure of sentences are so various, that it would be difficult, if not impossible, to lay down rules for punctuation which shall meet every case which can occur. The following may serve as a general guide:

I. The *comma* is used,—

1. To throw together such similar parts of speech as are joined in pairs by the conjunction *and*.

2. To separate the several members of a series, *i.e.* a succession of similar words or members.

3. To separate from the rest of the sentence such clauses as are added by way of explication or illustration, or such as are really parenthetical, though they may not be so marked.

4. To separate from the rest of the sentence words in the vocative case.

5. In many cases to separate the relative and the antecedent.

6. To separate from the rest of the sentence such clauses as are introduced by a connective, conditional, or exceptive particle, or by an adverb of time or place; and to separate antithetical clauses, and such comparative clauses as are introduced by the adjectives *like*, *better*, by the conjunctions *as*, *so*, *than*, by the adverbs *how much*, *more*, *oftener*, *rather* unless the comparative member at the end be short.

II. The *semicolon* is used when a longer pause is required than at a comma, but when the sense is imperfect, and needs some other member to render it complete. Or it is used for dividing a compound sentence into two or more parts, which are not so closely connected as those which are separated by commas only, nor yet so independent and perfect as those which admit a colon: thus—

'Life, with a swift though insensible course, glides away; and like a river which undermines its banks, gradually impairs our state.'

'As there is a worldly happiness which God perceives to be only disguised misery; as there are worldly honours which in his estimation are a reproach; so there is a worldly wisdom which in his sight is foolishness.'

III. The *colon* may be inserted—

1. When a member of a sentence is complete in itself, but is followed by some additional remark or illustration of the subject: thus—

'Do not flatter yourself with the idea of enjoying perfect happiness: there is no such thing in the world.'

'Keep close to thy business: it will keep thee from wickedness, poverty, and shame.'

2. When several semicolons have preceded, and when a longer pause is necessary in order to mark the connecting or concluding sentiment: thus—

'A divine legislator uttering his voice from heaven; an almighty governor stretching forth his arm to punish or reward; informing us of perpetual rest prepared hereafter for the righteous, and of indignation and wrath awaiting the wicked: these are the considerations which overawe the world, which support integrity, and which check guilt.'

3. A colon is generally placed at the close of the words which introduce an example, a quotation, a saying, a speech, or a narrative: thus—

'The earl of Chatham made an excellent speech, from which the following is a brief extract: "I know that the conquest of British America is an impossibility."'

IV. The *period* or full stop is placed at the end of a sentence, *i.e.* at the end of such an assemblage of words as present a complete and independent sense: thus—

'Truth is the basis of every virtue.'

'The Latin tongue is now called a dead language, because it is not spoken as the mother tongue of any nation.'

In some sentences an additional clause is included, which does not modify the preceding: thus—

'The law of the Lord is perfect, converting the soul.'

These are called *loose sentences*.

The *note of interrogation*, as its name implies, is placed at the end of every question.

The Spaniards place this mark also *at the beginning* of interrogative sentences; and it must be acknowledged that in some cases this is an advantage, as it suggests to the reader from the first the tones of voice which are suitable.

The *note of exclamation* or *admiration* is placed at the end of such words or clauses as express any strong passion or emotion of the mind.

The *dash* should be used sparingly: it is introduced with propriety where a sentence or dialogue breaks off abruptly; where the sense is suspended, and continued after a short interruption; where a significant pause is required; where there is an unexpected turn in the sentiment, or a sort of epigrammatic point; when a sentence consists of several clauses which form the nominative to a verb following, or lead to a conclusion or inference, and it is desirable to assist the eye more readily than by semicolons; and in some cases to indicate an ellipsis.

The *apostrophe* shows the omission of a letter, as in *form'd*, *e'en*, *e'er*, used chiefly in poetry; and in the genitive case, as *man's*, *boys'*, both in prose and poetry.

The *parenthesis* marks a clause, which should contain some necessary information, or a useful remark, introduced into the body of a sentence *indirectly*, but which might be omitted without doing injury to the sense or the construction.

(For more ample illustrations of this subject, see Steel's *Elements of Punctuation*, 12mo., London, 1786; *Principles of Punctuation*, by the Rev. C. Hartley, 18mo., London, 1818; and *The Principles of English Punctuation*, by G. Smallfield, 18mo., London, 1838.)

It has been remarked above, that one use of the pauses is as a guide to reading; but it must not be supposed that those which are usually inserted even in well punctuated books are sufficient for this purpose. Thus in the following sentence we find only one pause, namely after *fine*:—

'The descriptive part of this allegory is likewise very fine, and full of sublime ideas.'

But were it merely for the purpose of taking breath, it would be necessary to pause in the first clause, and the most suitable place for doing this is after *allegory*. The words *the descriptive part of this allegory* stand in the relation of a compound nominative case to the verb; and it may be laid down as a rule that there should always be a pause in good reading after such a combination of words as this. There should be a pause in reading between the object and the modifying words in the inverted order; as after *man*, in the following sentence: 'He was a man patient, sober, honest, and industrious;' and after *love* in the following: 'To love wisely, rationally, and prudently, is, in the opinion of lovers, not to love at all.' There should also generally be a pause after prepositions. In accordance with these remarks, we should place a pause in reading after *passion, admiration, effects,* and *behaviour,* in the following sentence, though the printer would insert none at all; and bishop Lowth lays it down as a rule, that a simple sentence, *i.e.* one consisting of one subject and one finite verb, does not admit of a pause between any of its parts:

'A violent passion for universal admiration produces the most ridiculous effects in the general behaviour of women of little sense.'

When it is also considered, as has been before remarked, that the points are not sufficiently discriminative, it will be perceived that they are, as at present placed, a very imperfect guide to the pauses which good reading requires.

(See this subject treated at length in Walker's *Elements of Elocution*, and Wood's *Grammar of Elocution.*)

PUNIC WARS (*Punica bella*), the three great wars between the Carthaginians (*Pœni*) and the Romans.

I. The *First Punic War*, which lasted nearly twenty-three years (A.U.C. 490-513, or B.C. 264-41), arose out of the application of the Mamertines of Messana to Rome (B.C. 264) for aid against the Carthaginians, and Hiero, king of Syracuse. [CARTHAGE, vol. vi., p. 327.] The senate of Rome, who had only six years before severely punished in the Campanians of Rhegium a similar act of piracy to that by which the Mamertines had established themselves at Messana, refused to take part with the latter against their own allies, Hiero and the Carthaginians. Upon this the consuls, Appius Claudius Caudex and Marcus Fulvius Flaccus, brought the subject before the people in the comitia, and, by appealing to their jealousy of the Carthaginian power, and by representing the gain to be made by a contest with so wealthy a state on the fertile plains of Sicily, they prevailed upon them to espouse the cause of the Mamertines.

At the beginning of the war the Carthaginians were masters of the sea, and possessed a well furnished treasury, which enabled them to enlist a large number of mercenaries. These hired forces however were no match for the citizen-soldiers of Rome, whose native vigour more than compensated for her limited resources.

While preparations were being made to commence the war, Caius Claudius crossed over to Messana, and treacherously seized Hanno, the Carthaginian governor of that city, who surrendered the citadel to purchase his freedom, and for this act of weakness was crucified on his return to Carthage. Hiero and the Carthaginians now blockaded Messana; but the consul Appius Claudius succeeded in eluding the Carthaginian fleet and carrying over his army from Rhegium to Messana, where he defeated first the Syracusans and then the Carthaginians, and, after raising the siege of Messana, pursued Hiero to the walls of Syracuse. This city however and that of Egesta resisted his attempts to take them, and, after overrunning the open country, he returned to Rome. In the next spring (B.C. 263) two consular armies were sent to Sicily, and Hiero, after severe losses, made a peace with the Romans, and remained their firm ally for the rest of his life. In the next year (B.C. 262), the Romans took Agrigentum, after a siege of about seven months; but they now began to feel their operations greatly embarrassed by the naval supremacy of the Carthaginians. They resolved therefore (B.C. 261) to have a fleet. Hitherto their only vessels had been triremes and penteconters; the quinqueremes (which Dr. Arnold happily terms 'the line-of-battle ships of that period') they did not even know how to build. They found a model in a Carthaginian vessel which had accidentally fallen into their hands, and in two months they built a fleet of a hundred ships, the crews having in the mean time been trained to row. With this fleet the consul Caius Duilius defeated the Carthaginian fleet under Hannibal off Mylæ (*Melazzo*), on the northern coast of Sicily, taking or destroying about fifty ships and 10,000 men. This naval victory, the first which the Romans ever gained, appears to have been chiefly owing to their use of a peculiar machine for grappling with and boarding the enemy's ships. Its moral effect was of the greatest consequence, and the people showed their sense of its importance by the extraordinary honours which they conferred upon Duilius. After three years of indecisive warfare, the Romans gained another naval victory off the Liparæan Islands (B.C. 257), which emboldened them to carry the war into Africa. They prepared during the winter a fleet of 330 ships, the crews of which, exclusive of fighting men, amounted to nearly 100,000 men, and in the spring of the year 256 B.C., the two consuls, L. Manlius Vulso and M. Atilius Regulus, crossed over to Africa, after defeating a Carthaginian fleet of 350 ships off Ecnomus, on the southern coast of Sicily. They landed at the fortress of Aspis or Clypea, and proceeded to ravage the fertile country around. After some weeks, Manlius was called back to Rome, and Regulus was left in Africa with 15,000 foot and 500 horse. He overran the country, which was destitute of fortified places, without opposition, and established his head-quarters at Tunes, about fifteen miles from Carthage. The Carthaginians now sued for peace, but Regulus treated their envoys with the utmost arrogance, and offered them terms so intolerable, that they rejected them indignantly. At this period there arrived at Carthage a Spartan officer named Xanthippus, who had already acquired considerable military fame. The Carthaginians put their armies under his command, and soon completely defeated the Romans, taking Regulus prisoner (B.C. 255). The fortress of Clypea was now all that remained to Rome of her African conquests, and this was immediately evacuated. The fleet which carried away the remains of the Roman army suffered a disastrous shipwreck on the southern coast of Sicily. The Carthaginians now renewed their efforts in Sicily: Agrigentum was recovered by Carthalo, and Hasdrubal was entrusted with the chief command in the island, while Panormus was taken by the Romans. The loss of another fleet by shipwreck (B.C. 253) put a stop for a time to the naval exertions of the Romans. During the next two years the Romans gained no ground, and their armies fell into a bad state of discipline; but in the year 250 B.C., L. Cæcilius Metellus gained a great victory over Hasdrubal at Panormus. In this battle thirteen noble Carthaginians had been taken prisoners, and, in order to recover them, the Carthaginians sent an embassy to Rome to propose an exchange of prisoners. Regulus accompanied the embassy, having promised to return if it failed. He met the senate, advised them to refuse the exchange, and, upon his counsel being followed, he returned to Carthage, where he soon after died. In the autumn of this year the Romans laid siege to Lilybæum, the only place, except Drepanum, which the Carthaginians retained in Sicily; but though two consular armies were engaged in the siege, the town resisted all their attacks, and they were compelled to turn the siege into a blockade, but even then they were unable to prevent the introduction of supplies and reinforcements by sea. In the year 249 B.C., the Carthaginian general Adherbal gained a great naval victory over P. Claudius, the consul, off Drepanum, and in the same year two Roman fleets, consisting of corn-ships and ships of war, were totally wrecked off Cape Pachynus, and the war continued for some time in favour of the Carthaginians. In the year 247 B.C., the great Hamilcar Barcas was appointed to command the Punic forces in Sicily. He conceived the plan of forming a body of infantry able to cope with that of the Romans, and for this purpose he avoided pitched battles, and kept up an incessant war of posts, fixing his head-quarters first on the summit of an almost impregnable table-mountain near Panormus (now Monte Pellegrino), and afterwards on Mount Eryx, and thus for six years he baffled all the Roman armies. At length the Romans, by an extraordinary effort, sent another powerful armament to sea, under the command of the consul Caius Lutatius Catulus (B.C. 242). The Carthaginians hastily equipped a fleet, and sent it out under the command of Hanno. The fleets met at the Aegates, a group of islands off the western point of Sicily, and Lutatius was completely victorious. This battle put an end to the war. Both parties were exhausted by the struggle, and though victory had declared in favour of the Romans, they could not hope to reduce Lilybæum, Drepanum, and Eryx, especially when defended by so firm and able a man as Hamilcar, without very great trouble, while the Carthaginians could look for nothing better than merely to retain these places. A peace was therefore concluded on the following terms:—that the Carthaginians should evacuate Sicily and the adjacent small islands; that they should pay 3200 talents to Rome within ten years; that they should release all Roman prisoners without ransom; and that they should make no war on Hiero or his allies.

Thus ended the first Punic war, which was a contest for the possession of Sicily and the sovereignty of the sea, by the loss of which, Heeren remarks, the fate of all the other external possessions of Carthage was already predetermined; while the Romans, by the expulsion of the Carthaginians from Sicily, were delivered from a danger which threatened the security of their Italian empire. The next and fiercest struggle of the rival republics was for the complete supremacy of the one over the other; the third and last was, on the part of Carthage, for existence.

II. The causes of the *Second Punic War* are to be found in the position in which the two parties were left by the first; the Romans still dreading the power of Carthage, and the Carthaginians burning to avenge their losses. This was especially the feeling of Hamilcar Barcas and his party, and it is not improbable that the war would have been renewed in his life-time, but for the insurrection of the mercenaries. [CARTHAGE; HAMILCAR.] After concluding the mercenary war, Hamilcar prepared for the contest by bringing Spain under the Carthaginian rule, and forming there a veteran army; and above all, by training up his son Hannibal to be the uncompromising enemy of the Romans. In the meantime, Rome committed an act of wanton aggression by seizing upon the island of Sardinia (B.C. 237). At length, in the year 218 B.C., Hannibal commenced the war by taking Saguntum, a town on the eastern coast of Spain, some distance south of the Ebro, which was under Roman protection, and by crossing the Ebro, which had been fixed by a treaty (B.C. 226) as the boundary between the Roman and Carthaginian possessions. By a master-stroke of warlike policy, he resolved to make Italy itself the theatre of war. The details of his march into Italy, his victories at the Ticinus, the Trebia, and the Trasimene lake, his complete overthrow of the Romans at Cannæ, the indecisive progress of the war in the following years, during which Fabius Maximus and Marcellus kept Hannibal in check, and the complete turn of the scale in favour of the Romans by the destruction of Hasdrubal's army (B.C. 207), are given under HANNIBAL. The exploits of Scipio Africanus in Spain, his invasion of Africa, and his defeat of Hannibal at Zama (B.C. 202), are related in the article SCIPIO. The battle of Zama concluded the war. Peace was granted to the Carthaginians on the following terms: they were to retain only their territory in Africa; they were to give up all their ships, except ten triremes, and all their elephants; they were to pay the Romans 10,000 talents, at the rate of 200 a year; they were to commence no war without the consent of Rome; and to restore to Massinissa all his hereditary possessions. Thus Carthage became little more than a vassal of Rome. But this was not enough. It was deemed necessary by a powerful party at Rome that Carthage should be destroyed, and for this end, to which they were also urged by personal motives, they induced the people to engage in a third war, for which a pretext was easily found. [CARTHAGE, vol. vi., p. 327-328.]

III. The *Third Punic War* began in the year 149 B.C., and lasted only three years. Its unprovoked commencement, its treacherous conduct, and its cruel consummation reflect disgrace upon Rome. When the Carthaginians found that the Romans were resolved on their destruction [CARTHAGE, p. 328], they made the most vigorous preparations for a resolute defence. The consuls Censorinus and Manilius attacked the city on opposite sides, but were repulsed. Other reverses followed. The consuls of the following year (148, B.C.) were equally unsuccessful. But in the next year (147 B.C.) Scipio Æmilianus finished the war by the capture of Carthage. [SCIPIO.] By a decree of the senate, the city was razed to the ground, and Africa was made a Roman province.

(Polybius; Livy; Appian's *Punica* and *Hannibalian War*: Plutarch, *Marcellus, Fabius Maximus;* Zonaras; Niebuhr and Arnold's *Histories of Rome* (for the first Punic War), Heeren's *Manual of Antient History;* Clinton's *Fasti Hellenici.*)

PU'NICA, a genus of plants of the natural family of Myrtaceæ, sometimes distinguished, in consequence of its having two verticels of capsules developed instead of one, from Myrtaceæ under the name of Granateæ. The genus consists of only a single species, the celebrated Pomegranate, with a dwarf variety, which is sometimes considered a distinct species. The pomegranate has from the earliest periods formed an object of attraction in the countries from Syria to the north of India, where it grows in perfection, as well as in the north of Africa; and this, as well from its shining dark-green foliage, as from its conspicuous flowers, of which the flower-cup and petals are both of a crimson colour, while its large red-coloured fruit, filled with juicy pleasant-flavoured pulp, which covers its numerous seeds, makes it an object of desire in hot countries. Thus we find it mentioned in the Bible under the name Rimmon (*Numbers*, ch. xiii.), and we hence learn that it was cultivated in Egypt and also in Palestine; by the Arab authors it is called *rooman*, and by the Persians *anar*, and it is probably indigenous all along the mountains from the Caucasus to the Himalayas, where it is described by Dr. Royle as being found in a wild state. Forster describes the pomegranate as being delicious in most parts of Persia; and Burnes states that the famous pomegranates without seeds are grown in gardens under the snowy hills near the Caubul river.

The pomegranate was well known to the Greeks, being the Roa of Theophrastus and the Roia of Dioscorides. Hippocrates mentions it by what is supposed to be its Phœnician name, *side*. By the Romans it was called Punica, and Punicum malum, from having been introduced from Carthage. Besides the fruit, the parts employed by the antients were the double flowers, which were called *balaustion;* the pericarp, from its leathery consistence, called *malicorium*, was used for its astringent properties; while the bark of the root was considered an efficient anthelmintic. In the East, where so much has remained stationary, the different parts continue to be employed for the same purposes; and Dr. Royle mentions that in India *buloositon* is given as the Greek name of the double flower. The rind of the wild fruit is much preferred for astringent purposes, and forms in the present day an article of commerce from the Himalayas to the plains of India. The bark of the root, being also still employed in India for the expulsion of intestinal worms, was made known as a recent discovery in India, in consequence of a Mohammedan practitioner having cured a European gentleman there of tape-worm with great ease. He had no doubt learned this property of the bark of pomegranate from the translations of Dioscorides, which are incorporated in most of the Mohammedan works on Materia Medica, affording a striking instance of facts once well known being forgotten until they are rediscovered. It is remarkable that the African slaves in the West Indies are also acquainted with this property of the root of the pomegranate, which they must have learned in their own country, probably from the prevalence there of Mohammedan works on medicine, or of the practice which is inculcated in them.

PUNISHMENT. The verb *to punish* (whence the noun substantive *punishment*) is formed from the French *punir*, according to the same analogy as *furnish* is formed from *fournir, tarnish* from *ternir, finish* from *finir*, &c. The French *punir* is derived from the Latin *punire*, antiently *poenire*, which is connected with *poena* and the Greek *poinè* (ποίνη). Poinè signified a pecuniary satisfaction for an offence, similar to the *wergeld* of the German codes: *poena* had doubtless originally a similar sense; but in the Latin classical writers its meaning is equivalent to that of our word *punishment*.

Punishment may be inflicted on men by a supernatural being or by men; and it may be inflicted on them either in the present life, or in the existence which commences after death. Punishment may likewise be inflicted by men on the more intelligent and useful species of animals, such as horses and dogs. In the following remarks, we confine ourselves to punishment inflicted by man on man in the present life.

The original idea of punishment was, pain inflicted on or endured by a person as a satisfaction or atonement by him for some offence which he had committed. (Grimm, *Deutsche Rechtsalterthümer*, p. 646.) According to this conception of punishment, it appeared to be just that a person should suffer the same amount of pain which he had inflicted on others by his offence; and hence the origin of the retaliatory principle of punishment, or the *lex talionis*. This principle is of great antiquity, and is probably the earliest idea which all nations have formed concerning the nature of punishment. It occurs among the early Greeks, and was attributed by them to their mythical prince and judge of Hades, Rhadamanthys. They embodied it in the following proverbial verse:—

εἰ κε πάθοι τά κ' ἔρεξε, δίκη κ' ἰθεῖα γένοιτο.

(Aristot., *Eth. Nic.*, v. 8.)

The *talio* was also recognised in the Twelve Tables of Rome (*Inst.*, iv. 4, § 7), and upon it was founded the well-known provision of the Mosaic law, 'an eye for an eye, and a tooth for a tooth:' a maxim which is condemned by the Christian morality. (*Matth.*, v. 38-40; and Michaelis, *Commentaries on the Laws of Moses*, vol. iii., art. 240-2.)

The infliction of pain for the purpose of exacting a satisfaction for an offence committed is *vengeance*, and punishment inflicted for this purpose is *vindictive*. [ANGER.]

By degrees it was perceived that the infliction of pain for a vindictive purpose is not consistent with justice and utility, or with the spirit of the Christian ethics; and that the proper end of punishment is not to avenge past, but to prevent future offences. (Blackstone's *Commentaries*, vol. iv., p. 11.)

This end can only be attained by inflicting pain on persons who have committed the offences; and as this effect is also produced by vindictive punishment, vindictive punishment incidentally tends to deter from the commission of offences. Hence Lord Bacon justly calls revenge a sort of wild justice. [ANGER.]

But inasmuch as the proper end of punishment is to deter from the commission of offences, punishment inflicted on the vindictive principle often fails to produce the desired purpose, and moreover often involves the infliction of an unnecessary amount of pain. Thus when an offence is expunged from the criminal code, all persons suffering punishment for it ought at once to be pardoned; inasmuch as their punishment cannot produce any preventive effect. Again, the degree of the punishment will often be placed too high, if regard is had merely to the suffering produced by the offence in the individual case, or to the moral turpitude implied by it, and not to the facility or difficulty of prevention, or the mischievousness of the class of offences. All punishment is an evil, though a necessary one. The pain produced by the offence is one evil; the pain produced by the punishment is an additional evil; though the latter is necessary, in order to prevent the recurrence of the offence. Consequently a penal system ought to aim at economising pain, by diffusing the largest amount of salutary terror, and thereby deterring as much as possible from crimes, at the smallest expense of punishments actually inflicted; or (as the idea is concisely expressed by Cicero), 'ut metus ad omnes, pœna ad paucos, perveniret' (*Pro Cluentio*, c. 46).

It follows from what has been said, that it is essential to a punishment to be *painful*. Accordingly, all the known punishments have involved the infliction of pain by different means, as death, mutilation of the body, flogging or beating, privation of bodily liberty by confinement of various sorts, banishment, forced labour, privation of civil rights, pecuniary fine. The punishment of death is called *capital* punishment: other punishments are sometimes known by the name of *secondary* punishments. Moreover, the pain ought to be sufficiently great to deter persons from committing the offence, and not greater than is necessary for this purpose.

A punishment ought further to be, as far as the necessary defects of police and judicial procedure will permit, *certain*; and also, as far as the differences of human natures and circumstances will permit, *equal*.

If a punishment be painful, and the pain be of the proper amount, and if it be likewise tolerably equal and certain, it will be a good punishment.

The qualities just enumerated are those which it is most important that a punishment should possess. But it is sometimes thought desirable that a punishment should possess other qualities than those which we have enumerated.

1. Since the time when it has been generally understood that punishment ought not to be inflicted on a vindictive principle, the deterring principle of punishment (which necessarily involves an infliction of pain) has been sometimes overlooked, and it has been thought that the end of punishment is the reformation of the person punished. This view of the nature of punishment is erroneous in excluding the exemplary character of punishment, and thus limiting its effects to the persons who have committed the offence, instead of comprehending the much larger number of persons who may commit it. The reformation of convicts who are suffering their punishment is an object which ought to enter into a good penal system; but it is of subordinate importance as compared with the effect of the punishment in deterring unconvicted persons from committing similar offences.

2. It is likewise sometimes thought that punishment is inflicted for the purpose of getting rid of offenders, or of rendering them physically incapable of repeating their offence. Death has often been inflicted for this purpose; and bodily disablements of different sorts have been inflicted for the same end; transportation has likewise been often recommended on the ground of its getting rid of convicts. This view of punishment errs in the same manner as that just examined; inasmuch as it is confined to the persons who have actually committed offences. If all offenders were removed to a place of reward, they would be got rid off, but not punished. The principle of getting rid, or confinement, for the purpose of protecting society against the known dangerous tendencies of a person, is properly applicable in the case of madmen. It may also be rarely employed with advantage in the case of mischievous political adventurers and conquerors; as *e.g.* Napoleon Bonaparte.

A detailed account of the punishments which have been used in different nations may be found in different works on antiquities and law books. See, for the Greeks, Wachsmuth's *Greek Antiquities*, vol. ii., part 1, p. 181; Hermann's *Greek Antiquities*, § 139; for the Romans, Haubold's *Lineamenta*, § 147; for the antient Germans and for Europe generally in the middle ages, Grimm's *Deutsche Rechtsalterthümer*, b. v., ch. 3; for modern France, *Le Code Pénal*, liv. 1; and for England, Blackstone's *Commentaries*, vol. iv.

The subject of *Secondary Punishments* (the principal of which are in this country transportation and imprisonment), is treated under TRANSPORTATION. We will here make a few remarks on the subject of *Capital Punishments*.

An idle question is sometimes raised as to the right of a government to inflict death as a punishment for crimes, or, as it is also stated, as to the lawfulness of capital punishment. That a government has the power of inflicting capital punishment cannot be doubted; and in order to determine whether that power is rightfully exercised, it is necessary to consider whether its infliction is, on the whole, beneficial to the community. The following considerations may serve to determine this question respecting any given class of crimes. Death is unquestionably the most formidable of all punishments; the common sense of mankind and the experience of all ages and countries bear evidence to the truth of this remark. Moreover, capital punishment effectually gets rid of the convict. It may be added, as subordinate considerations, that death is the cheapest of all punishments, and that it effectually solves all the difficult practical questions which arise as to the disposal and treatment of convicted criminals. On the other hand, capital punishment, from its severity and consequent formidableness, is likely to become unpopular; and hence, from the unwillingness of judges and juries to convict for capital offences, and of governments to carry capital sentences into effect, uncertain. Whenever the infliction of capital punishments becomes uncertain, their efficacy ceases, and they ought to be mitigated. An uncertain punishment is not feared, and consequently the pain caused by its actual infliction is wasted. Capital punishments ought therefore to be denounced only for crimes which could not be effectually prevented by a secondary punishment, and for which they are actually inflicted with as much constancy as the necessary defects of judicial procedure will allow.

The writings on the subject of punishment, and particularly of capital punishment, are numerous. Beccaria's well known treatise first, with Voltaire's assistance, diffused more rational views on the subject throughout Europe; but it cannot be read with much profit at the present time. The best work on the subject is Bentham's *Théorie des Peines*, edited by Dumont. Some valuable remarks on the subject of punishment may likewise be found in the recent writings of Archbishop Whately and others respecting transportation.

PUPA. In entomology, this term is applied to the third stage of existence of an insect, the egg being the first stage, and the larva or caterpillar, the second. A caterpillar, from the time that it leaves the egg until it is full-grown, frequently casts its skin; and the necessity for this change arises from the circumstance that the soft skin of the animal rather stretches than grows between the times of casting; and as the horny parts, such as the head, parts of the mouth, legs, &c., cannot stretch, they become out of proportion; and, unless they were changed for large parts, the insect could never attain its proper size.

There are certain times in which a caterpillar is comparatively torpid; cannot eat, and with difficulty moves. During this time a new set of parts are rapidly forming beneath the old ones (which prevents their being used); and when these are perfected, the old covering, or skin, including that of the head, legs—in fact, of all the external parts, and even the lining of the intestinal canal and of the breathing openings—is cast off. Previous to this shedding of the skin, as before stated, all the hard parts are proportionately small, and the soft skin is stretched to its utmost; but after the moult, the new skin is loose, and the horny parts are proportionately large. When the caterpillar has thus, by a series of moults, attained its full size, it again casts its skin; but instead of keeping the caterpillar form, we find the animal much changed in appearance: it has in fact assumed the pupa state. In this pupa we can trace most of the parts of the caterpillar with an addition of other parts (in a more or less rudimentary state) which are peculiar to the perfect insect. The pupa is at first soft (and is filled with a watery fluid); but, in many instances, the skin soon becomes hardened, as in the pupa, or chrysalis, state of the Lepidopterous insects.

'From the swathed appearance of most insects in this state' (say Messrs. Kirby and Spence), 'in which they do not badly resemble in miniature a child trussed up like a mummy in swaddling-clothes, according to the barbarous fashion once prevalent here, and still retained in many parts of the Continent, Linné has called it the pupa state, and an insect when under this form, a *pupa*. In this state most insects eat no food; are incapable of locomotion; but there are differences in the various orders which are worthy of attention. The most perfect transformation, perhaps, takes place in the Hymenopterous insects; that is to say, there is more difference between the larva and perfect or imago state of these insects, than in other tribes; and as one of the peculiar characteristics of the insect tribe consists in their transformation, this fact, in conjunction with others, would lead one to place that order at the head of the insect tribe. The larva of an Hymenopterous insect is a legless maggot, and has consequently very little power of locomotion: in the pupa state, all the parts are enclosed in a thin membrane; and although they are applied closely to each other, they are not glued, as it were, as in the case of the pupæ of Lepidopterous insects; neither does the thin skin which covers the Hymenopterous pupæ harden to that degree as we observe it in the insects just mentioned, owing probably to their being for the most part better protected from the inclemencies of the weather, partly by the situations in which they are placed, and partly by being enclosed in a silken cocoon spun by the larva immediately previous to its transformation. The pupæ of the Coleopterous insects resemble those just described: they constitute what Aristotle called *Nymphæ*, and are now most frequently termed *incomplete* pupæ.'

'Butterflies, moths, and some of the two-winged tribe,' say the authors before quoted, 'are, in their pupa state, also enclosed in a similar membranous envelope; but their legs, antennæ, and wings are closely folded over the breast and sides, and the whole body enclosed in a common case or covering of a more horny consistence, which admits a much less distinct view of the organs beneath it. As these pupæ are often tinged of a golden colour, they were called from this circumstance *chrysalides* by the Greeks, and *aureliæ* by the Romans, both of which terms are in some measure become Anglicized; and although not strictly applicable to ungilded pupæ, are now often given to those of all Lepidopterous insects. These by Linné are denominated *obtected* pupæ.'

The differences however between the *obtected* pupæ and the *incomplete* pupæ are not so great as would appear from the passage just quoted; they are only differences of degree. We have reason to believe the parts are not all enclosed in one common integument, but that the legs, antennæ, and wings each have a sheath: that side which is not exposed differing only in being thinner. In the orders *Hemiptera*, *Orthoptera*, and many of the *Neuroptera*, the pupæ are active, and differ only from the larvæ in possessing rudimentary wings. In some cases the perfect insects of these orders have no wings, and it is difficult, if not impossible, to distinguish the stages:—Here there is an approach made towards the *Crustacea*, but in the true insects the skins are never shed after they have attained maturity, whereas in the *Crustacea* the integument is cast even after the species have the power of propagation. The necessity for moults is the same in both cases; the shell of the crab, like the integument of an insect, having no power of growth after its first formation.

It has been stated that insects immediately previous to their moult are inactive; but there is much difference in the duration of this state, and this difference appears in a measure proportionate to that which exists between the insect before and after the moult. The caterpillar of the butterfly or moth is a considerable time inactive before it changes into the pupa state, whereas when the change is not so great, the time in effecting that change is less.

To the various kinds of pupæ already mentioned may be added one other, termed by Linné the *coarctate* pupæ. These are peculiar to the insects belonging to the order Diptera. These pupæ are not, as in other instances, excluded from the skin of the larva, but remain concealed under it: the skin of the larva in fact forms a kind of protecting cocoon. Where the pupæ resemble the larva and perfect insect, except in possessing rudiments of wings, as in most of the *Orthoptera* and *Hemiptera*, they are termed by Linnæus *semi-complete* pupæ; and lastly, where the pupæ do not differ from the perfect insect, as in the lice tribe, they are called *complete* pupæ. These terms are however of but little use; there are in fact only two essential differences in the pupæ of insects, and they may be expressed by the terms *active* and *inactive*; the active pupæ being those which walk about. The terms given by Linnæus, and applied by Messrs. Kirby and Spence and other authors, to all the trifling modifications of pupæ, we think have a tendency to prevent generalisations by creating a prejudiced idea of differences greater than those which in reality exist. Besides this, the science is already overburthened with technicalities.

PUPA. (Conchology.) [HELIX, vol. xii., p. 106, 107, 110.]

PUPIE'NUS. CLODIUS PUPIENUS MAXIMUS, an officer of rank in the Roman army, was elected emperor by the senate conjointly with Balbinus, after the death of the two Gordians, in opposition to the usurper Maximinus, A.D. 240. After a reign of about a twelvemonth, he was killed, together with his colleague, in an insurrection of the Prætorians at Rome. Further details concerning these events are given under BALBINUS.

IMP CAES M CLOD PVPIENVS AVG
VICTORIA AVGG

Coin of Pupienus.
British Museum. Actual Size.

PUPIL. [EYE.]

PUPIL, ARTIFICIAL. The operation of forming an artificial aperture in the iris is required in a variety of cases in which the passage of light through the natural pupil to the deeper seated parts of the eye is obstructed; and to meet the different exigencies of these several cases a variety of operations have been suggested, each of which in its turn deserves to be preferred. The chief of these are—1, the tearing away a portion of the iris from its attachment to the ciliary ligament [EYE], a method which is however now very rarely employed; 2, the making a simple incision through some part of the iris, by the retraction of whose edges an elliptical or circular aperture is produced; 3, the making a portion of the iris protrude through an aperture in the cornea, and cutting it off. In whatever way the operation be performed, it is necessary to make the aperture in the iris as large as possible, that when it contracts in the process of cicatrization, it may not be too small to permit the passage of a sufficient quantity of light for useful vision.

PUPI'VORA. In entomology this term is applied by Latreille to his second great section of hymenopterous insects—a section the species of which are distinguished by their having the abdomen attached to the thorax, in most cases, by a slender stalk, and not, as in the first section (*Securifera*), forming as it were a continuation of the thorax. The females are furnished with a slender bristle-like ovipositor, and in this respect they also differ from the greater portion of the *Securifera*.

The larvæ of the *Pupivora* have no feet, and most of them are parasitical. Latreille divides this section into two groups, the *Evaniales* and the *Ichneumonides*, distinguished chiefly by the insertion of the stalk or basal portion of the abdomen. In the *Evaniales* the stalk is attached to the thorax, and in most cases immediately under the scutellum: they have distinct nervures to the wings, and those of the upper pair form cellules; the antennæ are filiform, or setaceous, and composed either of thirteen or fourteen joints; the mandibles are toothed on the inner side; the maxillary palpi have six joints, and the labial four; the ovipositor is generally exserted, and composed of three slender pieces.

Dr. Leach regarded the present group as constituting a family, and applied to it the name *Evanidæ;* compared with the next section of the *Pupivora*, the present one is very limited in species. Mr. Stephens, in his 'Systematic Catalogue of British Insects,' only enumerates five species, and these constitute three genera, *Evania*, *Brachygaster*, and *Fœnus*.

In the *Ichneumonides* the abdomen has its origin between the two posterior legs; the nervures of the upper wings form cellules; the antennæ are generally filiform or setaceous, and composed of many joints (sixteen at least); the mandibles are in most cases destitute of denticulations on the inner side, and are bifid at the apex; the maxillary palpi are always distinct, and seldom have more than six joints. Of this group the species are exceedingly numerous. Mr. Stephens states that he possesses 800 British species of this family. The *Pupivora* appear to be destined to prevent other tribes of insects (particularly the *Lepidoptera*) from becoming numerous

The *Ichneumonidæ* may be seen during the summer months in great numbers flying from plant to plant in search of the caterpillars which are suited to furnish the proper food and to rear their larvæ, each caterpillar apparently having its own peculiar parasite, or parasites, for sometimes several species of ichneumon attack the same larvæ. The female ichneumon, by means of her long bristle-like ovipositor, inserts her eggs into the body of the caterpillar in such a manner, and in such parts, that it does not destroy the life of the victim. In most cases these eggs are not hatched until the caterpillar has changed into a chrysalis; they then hatch, and the ichneumon larvæ feed upon the contents of the pupa case, enclose themselves in silken cocoons, and undergo their final transformations, to come forth in proper season, eating their way through the chrysalis case. Instances are not uncommon in which the eggs of the ichneumon hatch in the body of the living caterpillar, and, what is most remarkable, they do not destroy its life. It is not until the larvæ have quitted their abode in the caterpillar that it dies, having the cocoons of the ichneumon larvæ attached to its skin. The caterpillar so abundant on cabbages, and which is that of the common white butterfly, affords a familiar example of this nature. At certain times of the year numbers of those caterpillars may be seen on walls adjoining gardens: on these they usually attach themselves (in some sheltered situation) to undergo the transformation into the pupa state. One of these caterpillars will appear healthy, select a convenient situation, attach itself (as usual before the change into the pupa state) by means of a silken thread around its body, but instead of undergoing the transformation, we shall find it after a short time covered with an immense number of small yellowish silken cocoons spun by the larvæ of the ichneumons as they crawl from its body. These cocoons, which are about one-eighth of an inch in length, are attached to each other, and to the skin of the caterpillar, which then dies. The larvæ of some of the *Ichneumonidæ* themselves are infected with parasites.

For the characters of the various subdivisions of this extensive group of insects, and for descriptions of the species, the reader is referred to the 'Conspectus Generum et Familiarum Ichneumonum,' by J. L. C. Gravenhorst.

PURANAS. [SANSCRIT LITERATURE.]

PURBACH, GEORGE, so called from the name of his birth-place, Peurbach, a village on the confines of Bavaria and Austria, and about twenty-four miles west from Linz, was born in the year 1423. His family name appears to be unknown. Montucla informs us that he became a pupil of Gmunden, who taught astronomy in the university of Vienna; that he afterwards visited the principal seats of learning in Europe, in order to acquaint himself with those who cultivated astronomy; and that on his return he succeeded his master Gmunden, notwithstanding very strong solicitations to fix his residence at Bologna and Padua. He constructed many astronomical instruments, among which is an application of the plumb-line to a graduated circle; and he computed several trigonometrical tables, including a table of sines for every ten minutes of the quadrant, which his pupil Muller afterwards extended to each minute: but he is now chiefly remembered on account of the part he took in the translation and elucidation of the 'Almagest' of Ptolemy.

Printing, observes Delambre, had not then been applied to the diffusion of mathematical knowledge. The Greek manuscript of Ptolemy was then unknown in Europe, and the only works whence a knowledge of astronomy could be derived were two Latin versions of the 'Almagest' (translated from the Arabic), both of which were in many places incorrect, and more frequently altogether unintelligible; an imperfect Latin version of Albategnius; one of Alfragan; and a treatise on the sphere, by Sacrobosco, which last contained a few elementary notions relating to the phenomena of the diurnal motion and eclipses. Manuscripts were scarce, and those who could procure them were, for the most part, soon discouraged by the difficulties they encountered in their perusal of Ptolemy, and still more by the prolixity of his interminable calculations. It cannot therefore be a matter of surprise that those whose perseverance had in some measure surmounted these obstacles should enjoy a high reputation, and that their assistance should be eagerly sought after by others. Such was the case with Purbach. His ignorance of the Greek language would have precluded his reading the 'Almagest' in the original, had it been in his possession; but he had read the Latin translations of it, and after relieving them of their geometrical reasoning and tedious calculations, he endeavoured to explain the Ptolemaic system, not to those who wished to become astronomers, but to those who would be contented with a general notion of the mechanism of the phenomena and the arrangement of the heavenly bodies. The most difficult part was the theory of the planets, concerning which Sacrobosco was silent. Purbach made it the subject of a book, which was not published till 1488, twenty-seven years after his death, when it appeared at Venice appended to a quarto edition of Sacrobosco's treatise on the sphere, under the title of 'Theoriæ Novæ Planetarum.' This work, which may be looked upon as an introduction to Ptolemy, passed through many editions, accompanied by as many different commentaries; from which we may infer, says Delambre, that the work itself was not what it ought to have been, but that it served as the text-book to most of the professors of the day.

A faithful translation of the 'Almagest' was still a desideratum among astronomers. Bessarion, who first introduced into Europe the text of Ptolemy and that of his commentator Theon, had himself commenced a new version, but unable to proceed with it, in consequence of his numerous political missions, he addressed himself to Purbach, whom he persuaded to undertake the task. Our authority (Delambre), who does not say how Purbach qualified himself to translate from the Greek, adds, that when he had completed the earlier books, he died, confiding the revision and further prosecution of the work to his friend and pupil Muller. According to Montucla, Purbach was advised by Bessarion to acquaint himself with the language of Greece by revisiting Italy, where the literature of Greece was at that time much cultivated, and that his death took place suddenly when on the point of taking his departure from Vienna for that purpose. This work, which after all was but an abridgment of the original, was completed by Muller, under the title of 'Johannis de Monteregio et Georgii Purbachii Epitome in Cl. Ptolemæi Magnam Constructionem,' &c., and published by him at Basle in 1543. An analysis of its contents will be found in the 'Histoire de l'Astronomie du Moyen Age,' pp. 262-292; but any further notice of it belongs to the article REGIOMONTANUS.

Purbach died at Vienna, April 8, 1461, in the thirty-eighth year of his age. His remains were interred in the cathedral of that city, where a Latin epitaph indicates his tomb

His published works not already mentioned are: 1, 'Tabulæ Eclipsium,' fol., Vien., 1514, in which is given a list of his unedited manuscripts; 2, 'Elementa Arithmetices,' 4to., Viteb., 1536; 3, 'De Sinibus,' Nürnb., 1541; 4, 'De Quadrato Geometrico,' Nurnb., 1544.

(*Georgii Peurbachii et Joannis Mulleri Regiomontani Vita. Authore Petro Gassendo*, Hagæ, 1655, 4to.; Montucla, *Hist. des Math.*; *Biog. Univers.*, article 'Peurbach,' by Delambre; Hutton's *Dictionary*, &c.)

PURCELL, HENRY, the pride and boast of the English school of music, was born in the year 1658, in the city of Westminster, it is generally supposed. His father Henry, and also his uncle Thomas Purcell, were appointed gentlemen of the chapel-royal at the Restoration, and are named, in the archives of the heralds' college, among the persons who officiated at the coronation of Charles II. The young Henry lost his father when but six years of age, about which time he appears to have entered as one of the children of the chapel under Captain Cook, then master, to whom therefore it is rather more than probable he was indebted not only for his initiation in the principles of music, but for much of his knowledge of its practice, and of its theory as applicable to composition. It is true that on Dr. Blow's monumental tablet in Westminster Abbey, it is triumphantly recorded that he was 'master to the famous Mr. Henry Purcell;' and no doubt the youthful musician, when he quitted the chapel on his voice changing, received some instructions from Blow, a master then in high repute, and from whom a few lessons were enough to recommend to public notice a young man on his entrance into the world; but to Cook the credit is due for the right guidance of Purcell's inborn genius, and for its early cultivation. Sir John Hawkins says, 'it is certain that he was a scholar of Pelham Humphrey, who was Cook's successor,' but gives no authority for this, and assigns no reason for his belief. Humphrey became master of the children in 1672, when Purcell had attained his fourteenth year, who consequently could not have remained long, if at all, under the tuition of the new master: Cook therefore must not on such doubtful evidence be deprived of the praise to which he is entitled for his large share in the education of our great English composer. But, as Dr. Burney has well remarked, 'there is nothing more common than this *petit larceny* among musicians. If the first master has drudged eight or ten years with a pupil of genius, and it is thought necessary, in compliance with fancy or caprice, that he should receive a few lessons from a second, this last instantly arrogates to himself the whole honour both of the talents and cultivation of his new scholar, and the first and chief instructor is left to sing *sic vos non vobis*.'

Purcell was remarkable for precocity of talent, and seconded the liberality of nature by his zeal and diligence. While yet a boy-chorister he composed more than one anthem; and in 1676, though only eighteen years of age, was chosen to succeed Dr. Christopher Gibbons as organist of Westminster Abbey, an appointment of high professional rank. Six years after, in 1682, he became one of the organists of the royal chapel, and there, as well as at the Abbey, produced his numerous anthems, many of which appear in different collections, and nearly all of them have recently been published in one complete work. These were eagerly sought, almost as soon as written, for the use of the various cathedrals, and thus his fame quickly travelled to the remotest parts of England and Ireland. Had Purcell confined himself to church music only, he would have stood on very lofty ground as compared with either his predecessors or contemporaries, and his works would have been transmitted with honour to after-ages; but the greatness of his genius is most conspicuous in his compositions for the chamber and the stage. In these the vividness of his imagination and the fertility of his invention appear in all their affluence, because unrestrained by the character of the poetry to which he gave musical expression, and unincumbered by what is termed musical erudition, a kind of learning which time (even a century and a half ago) and a laudable feeling of veneration had rendered an almost necessary attribute of cathedral harmony. The versatility of his talent and the division of his labours between the church and the theatre, led his facetious friend Tom Brown, in his 'Letters from the Dead to the Living,' to say that musical men 'hang between the church and the playhouse, as Mahomet's tomb does between the two loadstones, and must equally incline to both, because by both are equally supported.'

Purcell's first essay in dramatic music, when only nineteen years of age, was his setting the songs, &c. in Nahum Tate's 'Dido and Æneas,' an operetta written for a boarding-school of celebrity. In this is the simple and beautiful duet, 'Fear no danger,' once sung everywhere and by everybody, but now almost forgotten. The music in Nat. Lee's 'Theodosius, or the Force of Love,' performed at the Duke's theatre, in 1690, was his first work for the public stage. In the same year he set new music to 'The Tempest,' as altered by Dryden, which is still heard with delight, and also the 'Prophetess, or Diocletian,' altered by Dryden and Betterton from Beaumont and Fletcher. In 1691 he composed the songs, &c. in Dryden's 'King Arthur,' among which are the inimitable frost-scene, the very original and lovely air, 'Fairest Isle,' and the charming duet, 'Two daughters of this aged stream are we.' In 1692 appeared Sir R. Howard's and Dryden's 'Indian Queen,' with Purcell's music. The fine incantation scene in this, 'Ye twice ten hundred deities,' is yet often heard in good concerts, but never in fashionable ones. The duet and chorus, 'To arms,' and the air, 'Britons, strike home!' in Dryden's alteration of 'Bonduca,' are national property—are our war-songs, always received with acclamations when we are engaged in or menaced by hostilities, and frequently performed during peace on account of their beauty, musically considered. These alone will suffice to carry Purcell's name to distant ages. His music in D'Urfey's 'Don Quixote' is remarkably appropriate and clever: the song, 'Genius of England,' has few rivals, and the cantata, 'Let the dreadful engines of eternal will,' sung in the character of the love-distracted Cardenio, is, with the exception of the latter part (now very wisely omitted in the performance), one of the composer's finest creations. He also wrote airs, overtures, and act-tunes for many dramas, among which may be mentioned Dryden and Lee's 'Œdipus,' 'Timon of Athens,' 'The Fairy Queen,' altered from 'A Midsummer-night's Dream,' and Dryden's 'Tyrannic Love, or the Royal Martyr.' [OPERA, p. 442, col. 1.]

The three detached cantatas by Purcell are undeniable proofs of his fancy, energy, and deep feeling. It is sufficient to name 'Mad Bess,' 'Old Tom of Bedlam,' or 'Mad Tom' (the words by Mr. William Basse, Walton tells us, in his 'Angler'), and 'From rosie bowers,' written by Tom D'Urfey, but *not* originally sung in 'Don Quixote,' as Percy seems to think. So well known are these, so highly valued by true connoisseurs, and so much admired by all lovers of music, that one more word in their praise would be superfluous. Our limits will not allow us to enter into any account of, or even to name, his many single songs and duets. After the composer's death they were collected by his widow, and published in two folio volumes, under the title of 'Orpheus Britannicus,' the second and best edition of which is now very rare. His odes, glees, catches, and rounds are numerous, and several of them familiar to the admirers of vocal harmony. In 1683 he published twelve sonatas for two violins and a base. In the preface he says that 'he has faithfully endeavoured a just imitation of the most famed Italian masters, principally to bring the seriousness and gravity of that sort of music into vogue and reputation among our countrymen, whose humour 'tis time now should begin to loathe the levity and *balladry* of our neighbours.' Purcell's esteem for the Italian masters had been before confessed in the dedication of his 'Diocletian' to the duke of Somerset, wherein he modestly remarks, 'Poetry and painting have arrived to their perfection in our country: music is yet but in its nonage, a forward child, which gives hope of what it may be hereafter in England, when the masters of it shall find more encouragement. 'Tis now learning Italian, which is its best master, and studying a little of the French air to give it somewhat more of gayety and fashion. Thus being farther from the sun, we are of later growth than our neighbouring countries, and must be content to shake off our barbarity by degrees.' Here he does justice to the French school, by which he had certainly profited, though in a perfectly fair manner.

Two years after his decease his widow printed the overtures, act-tunes, &c. before mentioned, under the title of 'A Collection of Ayres composed for the Theatre, and on other occasions,' &c. They are in four parts, and continued in use in Dr. Burney's time, till superseded by Handel's concertos and other newer compositions.

We have above alluded to Purcell's compositions for the church, and as regards these must add a few remarks. His published anthems amount in number to upwards of fifty; and to these are to be added a *Te Deum* and *Jubilate* with orchestral accompaniments,—a complete Service, several hymns, motets, and sacred songs. Some of his anthems, especially those in Dr. Boyce's Collection, are still in use in our cathedral and other choirs, and never can be allowed to fall into neglect while the influential persons in those venerable establishments possess any musical discernment. His *Te Deum* and *Jubilate*, to which the epithet 'grand' is the usual prefix, is a work that has seldom if ever been spoken of but in terms of unqualified panegyric. That it evinces many traits of originality—that it displays a vast deal of scientific skill—that an easy, pleasing melody runs through portions of it—and that it has also the merit of being the first of the kind ever produced in this country, cannot be denied: but, on the other hand, there is in its general structure a want of suitable grandeur,—mainly arising from the frequent occurrence of mean passages of pointed, jerking notes in the vocal parts, that take from it much of the solemnity which the subject demands; and these, together with certain divisions that disconnect the words and obscure the sense, produce an effect not only undignified, but nearly bordering on the ridiculous. Besides these greater defects, there are in the work some others of less importance, such as a few conceits, some harsh notes, and occasional errors in accentuation and emphasis. The best excuse for the composer is, that most of the errors we have ventured to point out were common at the time they were committed. Still they are errors, and of magnitude, and should have kept within moderate bounds that warmth of feeling which has led to such unreserved encomiums on what, in our opinion, is by no means to be reckoned among the best of the composer's works.

Purcell died in November, 1695, of consumption, Hawkins surmises; and it is to be wished that this always industrious and sometimes over diligent historian had not snatched from the oblivion to which it ought to have been consigned, a 'tradition' that his death was occasioned by a cold caught in an inclement night, waiting for admittance into his house, Mrs. Purcell having 'given orders to his servants not to let him in after midnight.' We regret to say that this exceedingly improbable story has lately been revived, without the slightest attempt at proof, accompanied by vituperative expressions most injurious to the memory of one who, if we may judge from her language in the dedication to the *Orpheus Britannicus*, was an attached, faithful wife, and incapable of the cruelty alleged against her. Purcell's habits, Hawkins states, were of the most convivial kind, and led him too frequently into the society of 'the witty Tom Brown,' together with other persons of irregular lives; and thus were, most likely, sown the seeds of a disease which at so early a period terminated a life of such inestimable value.

The remains of this great musician lie in the north transept of Westminster Abbey: on a pillar near the spot is a tablet, placed there by the Lady Elizabeth Howard, on which is the subjoined inscription, commonly attributed to Dryden:—

'Here lies
HENRY PURCELL, Esq.,
who left this life,
and is gone to that blessed place
where only his harmony can be exceeded.
Obiit 21mo. die Novembris,
Anno ætatis suæ 37mo.,
Annoq. Domini, 1695.'

On the stone over his grave was a Latin epitaph, now entirely effaced. The original and a translation are both given by Hawkins and Burney. Among the works of Dryden is an epitaph on the death of his friend Purcell, but it cannot be viewed as one of the happiest of the great poet's efforts. Sheffield, Duke of Buckingham, wrote an ode on the same occasion, in which are some noble thoughts concerning the desire of posthumous fame. It concludes with the following praise of the art in which our British composer signalised himself:—

> 'Music exalts man's nature, and inspires
> High elevated thoughts, or gentle kind desires.'

We shall conclude this notice by repeating the substance of some remarks made by us elsewhere a few years ago. Purcell, take him for all in all, is the greatest musical genius this country ever produced; and our deliberate opinion is, that, from the earliest period in the history of the art, down to the time of his death, Europe would in vain be searched to find his equal as a composer of secular music. That he was to some extent indebted to Lulli will hardly be denied; but that he far surpassed what, perhaps in compliment to our second Charles, and to the taste of the time, he occasionally took as his model, every impartial critic must admit. If too his cantatas be compared with compositions in a degree similar, by Alessandro Scarlatti, which have been so highly praised, and so long were vaunted, the vast superiority of the English musician, whether as relates to air, to harmony, to variety of expression, or to beauty of effect, will never be disputed by unbiassed judges. He certainly was not wholly guiltless of the faults of the age in which he lived; or, perhaps, was obliged sometimes to yield his better judgment to the tyrannical demands of custom or of fashion; yet some of his ecclesiastical and most of his secular music, written under the influence of his own feeling, and uncontrolled by the necessity of submitting to the taste of the great and small vulgar, is so rich in melody, so expressive of the depth and energy of true passion, that all who understand the English tongue, who have acquired some knowledge of the language of music, and have no governing predilection for any particular school, confess his power, and admit the originality and vigour of his genius.

PURCHAS, SAMUEL, was born at Thaxted in Essex, in 1577. He was educated at Cambridge, and though Wood says that he could not ascertain at what college or hall, it appears from his own testimony that he was a member of St. John's College; for in speaking of this college he says, 'Where also the author first conceived with this travelling genius, whereof without travelling he hath travelled ever since.' (*Pilgrimmes*, part iii.; *Dedication to Lord Keeper Williams.*)

In 1604 Purchas was instituted to the vicarage of Eastwood in Essex, but he soon left this cure to a brother, and went to live in London for the sake of greater advantages in preparing and printing the collection of travels which he had begun to make. In July, 1615, he was incorporated bachelor of divinity at Oxford, as he stood at Cambridge, having previously been collated by the favour of Dr. John King, bishop of London, to the rectory of St. Martin's Ludgate, in London. He also became chaplain to archbishop Abbot, but he never obtained higher preferment. By the publication of his books he brought himself into debt, and it was reported that he died in prison; but Wood affirms that he died in his own house a little while after the king (Charles I.) had promised him a deanery, about 1628, aged fifty-one.

The works of this author are the following:—1, 'Purchas his Pilgrimage, or Relations of the World, and the Religions observed in all Ages, and Places discovered, from the Creation unto this present,' 1 vol. fol., 1613, 1614, 1617, 1626. The materials of this work he borrowed, as he says, of above thirteen hundred authors of one or other kind, in he knew not how many hundredths of their epistles, treatises, and relations. (*Dedication to Archbishop Abbot*, prefixed to fourth edition.) 2, 'Purchas his Pilgrimmes,' in four parts or vols., fol., 1625, each volume containing five books. The difference between these volumes and the former publication may be best shown in his own words: 'These brethren holding much resemblance in name, nature, and feature, yet differ in both the object and subject. This (the 'Pilgrimage') being mine own in matter, though borrowed, and in form of words and method; whereas my Pilgrims are the authors themselves, acting their own parts in their own words, only furnished by me with such necessaries as that stage further required, and ordered according to my rules.' (*Dedication*, as above.) 3, 'Microcosmus, or the History of Man,' 8vo., 1619; 4, 'The King's Tower, and triumphant Arch of London,' 8vo., 1623; 5, 'A Funeral Sermon on Psalm xxxix. 5,' 8vo., 1619.

Of these five publications, the first two are best known, though they are now very scarce. They are curious, and in some respects valuable, and are probably the first works of the kind in our language. The dedications and prefaces particularly show that Purchas was an honest, a benevolent, and a pious man, and that he was of unwearied industry in performing his clerical duties, as well as in preparing his books for publication. He is described by a foreign writer, quoted by Wood, as 'an Englishman admirably skilled in languages, and human and divine arts, a very great philosopher, historian, and theologian, a faithful priest of his own church, very widely known for his many excellent writings, and especially for his large volumes pertaining to the East and West Indies.'

(Wood's *Fasti Oxonienses*; *Biog. Brit.*; the latter contains a good description of Purchas's two principal works.)

PURCHASE. [Property.]

PURGATION. [Ordeal.]

PURGATORY ('a place of expiation,' from the Latin verb *purgare*, 'to cleanse') is the name given by Roman Catholics to an intermediate state of souls after death, and before the final judgment, during which they are supposed to expiate by certain punishments the guilt which they have incurred through life. Roman Catholic divines teach that it is only the souls of those who die in a state of repentance and in the communion of the church that are admitted into purgatory; those who die impenitent, or in a state of unbelief, are doomed to everlasting punishment. As for the duration of the term of expiation in purgatory, that is a matter which rests with divine justice, and varies according to the guilt of the parties, but Roman Catholics believe that the prayers of the living and other pious works may serve to shorten the term of souls in purgatory. This has given rise to the doctrine of indulgences, with which that of purgatory is closely connected. [Indulgence.] The Protestant and other churches which dissent from the church of Rome do not believe in purgatory. No mention of purgatory appears before the time of Augustin, who in some of his works speaks of it in terms not very explicit. The doctrine is said to have been first inculcated as a matter of belief by Gregory the Great, at the end of the sixth century. In the Council of Ferrara, A.D. 1438, which effected a temporary reconciliation between the Greek and Roman churches, the question of purgatory was discussed at length. Mark of Ephesus, on the part of the Greeks, stated the belief of his church in this respect to be that souls were sent after death to a place of darkness and mourning, but not of fire, where they remained for a season in affliction and deprived of the light of God. He admitted that alms and other pious works might shorten or mitigate their penance, but he held that even the saints or souls free from stain would not be admitted to perfect beatitude till the resurrection of their bodies at the final judgment.

PURITANS, a name first given in the reign of Queen Elizabeth to such clergymen of the church of England as declined to subscribe to its liturgy, ceremonies, and discipline, according to the requirements of the bishops in their respective dioceses. Fuller assigns the origin of this name to the year 1564, and Strype to the year 1569; but it seems not very easy to ascertain the exact date when any such name might have been first used. The clergymen so called were advocates for a further reformation than the existing authorities deemed it proper to sanction; they desired a form of worship more simple and *pure* than they believed that to be of the church as then established. They were called Puritans probably out of derision, and the name was shortly applied to the laity as well as to the clergy. This name in the time of Fuller evidently savoured more of contempt than it does at present; for he speaks of it as 'the odious name of Puritans; a name which in this notion first began in this year (1564); and the grief had not been great, if it had ended in the same. . . . We will therefore decline the word to prevent exception; which, if casually slipping from our pen, the reader knoweth that only non-conformists are thereby intended.' (*Church Hist. of Britain*, b. ix., p. 76, ed. 1655.) The Puritans were by other writers of the seventeenth century generally called non-conformists, a name first applied to men who objected to the clerical vestments about 1550. 'For now,' says Fuller, 'non-conformity in the days of King Edward was conceived; which afterwards, in the reign of Queen Mary (but beyond sea at Frankfort), was born; which, in the reign of Elizabeth, was nursed and weaned; which, under King James, grew up a young youth, or tall stripling; but, towards the end of King Charles's reign, shot up to the full strength and stature of a man, able not only to cope with, but conquer the hierarchy its adversary.' (*Ibid.*, b. vii., sect. i., 23.) The reader is referred, for a general history of the Puritans, to the work of Neal, on the one hand, and, on the other hand, to the works of Strype and Collier. On the political influence exercised by the Puritans, Hallam's *Constitutional History of England* may be consulted. [Dissenters; Non-conformists.]

PU'RPURA. (Conchology.) [Entomostomata, vol. ix., p. 458.]

PURPURIC ACID. This substance was first prepared and described by Dr. Prout. When uric acid [Uric Acid] is gently headed with nitric acid diluted with about six times its weight of water, it dissolves with effervescence, and decomposition of the nitric acid. If the solution be evaporated with a gentle heat, it becomes, on drying, of a fine red colour, which disappears when it is dissolved in water. When this solution is saturated with ammonia, the red colour is restored, and granular crystals of purpurate of ammonia, of a deep red colour, are deposited; when these are decomposed by hydrochloric acid, a yellow powder separates, which is purpuric acid; if however the salt, previously to decomposition, be treated with potash, then the ammonia is expelled, and sulphuric acid added separates colourless purpuric acid.

The properties of this acid are, that it is so little soluble in water, that one part requires 10,000 even of boiling water for solution; the solution is sometimes colourless and at other times pale red, or yellow, but no cause has been assigned for these variations. Purpuric acid is inodorous and insipid; it reddens litmus paper; neither alcohol nor æther dissolves it. It does not fuse when heated, but becomes red; when heated in the air, it burns without yielding any peculiar odour. When decomposed in a retort, it yields carbonate of ammonia, hydrocyanic acid, a small quantity of empyreumatic oil, and a pulverulent charcoal. Nitric acid dissolves it with effervescence, and converts it into oxalic acid. It dissolves in concentrated sulphuric acid, and water precipitates it from the solution. It is also soluble in boiling concentrated acetic acid; but neither citric, oxalic, nor tartaric acid dissolves it. Authors differ extremely as to the composition of this acid; the variation is indeed so great as scarcely to admit of the supposition that they can have operated on the same substance as analyzed by Dr. Prout. It has indeed been lately asserted by Fritzche, that the substance obtained by the action of acids on purpurates is not purpuric acid, but is principally *murexane* resulting from its decomposition.

We shall state the results of the analyses of Dr. Prout (1), Fritzche (2), and Kodweis (3), premising that we have seen the last stated only in symbols, and the results are adapted to the numbers employed in this work:—

(1)

Two equivalents of hydrogen .	4·54
Two equivalents of carbon .	27·27
Two equivalents of oxygen .	36·36
One equivalent of azote .	31·81
	99·98

(2)

Four equivalents of hydrogen .	1·6
Sixteen equivalents of carbon .	38·4
Ten equivalents of oxygen .	32·0
Five equivalents of azote .	28·0
	100·0

(3)

Six equivalents of hydrogen .	2·04
Eighteen equivalents of carbon	37·07
Twelve equivalents of oxygen	32·65
Six equivalents of azote .	28·24
	100·00

The salts of purpuric acid are termed purpurates; we shall state the properties of a few of these compounds, copied chiefly from Dr. Prout. This acid combines with the alkalis, alkaline earths, and metallic oxides, and is capable, with the assistance of heat, of decomposing the alkaline carbonates with effervescence.

Purpurate of Ammonia.—This salt is obtained by saturating the acid with the alkali; it crystallizes in quadrangular prisms, which, when viewed by transmitted light, are transparent, and of a deep garnet-red colour; but by reflected light, their two broadest opposite faces appear of a brilliant green, while their other two opposite faces appear of a dull reddish-brown colour, or, if the light be very strong, slightly green. This salt is soluble in about 1500 parts of water at 60°, but in boiling water is much more soluble; the solution is of a beautiful deep carmine or rose-red colour; it is inodorous, but has a slightly sweetish taste. Alcohol and æther dissolve this salt very slightly if at all. It does not appear to have been analyzed.

Purpurate of Potash.—According to Fritzche, this is best obtained by decomposing a boiling solution of purpurate of ammonia by means of excess of nitrate of potash. This purpurate consists of very small reddish-brown crystals; it may however be obtained in large crystals, which have the colour and lustre of the ammoniacal salt. It is difficultly soluble in water, and much less so in saline solutions, and hence the advantage of using excess of nitre in preparing it. By Fritzche's experiments it appears to be a neutral salt.

Purpurate of Soda is of a dark brick-red colour, and may be obtained in crystals; it is much less soluble in water than the potash salt, requiring 3000 times its weight for solution, or even more at 60°. The purpurates of lime, barytes, and strontia are still less soluble than those above described; they are of a deep greenish colour, but when dissolved in water they impart a purple colour to it. In the opinion of Berzelius there are two salts of lime; one of which is a bulky red crystalline powder, and the other, which is greenish-black, appears to be a subsalt. The purpurate of magnesia is very soluble.

When purpurate of ammonia is added to a solution of metallic salts, the effects produced are as follows:—Cobalt, a granular reddish precipitate; zinc, a fine yellow; tin, a scarlet precipitate; mercury, protosalts, a purple precipitate; persalts, a pale rose precipitate; silver, a deep purple one; the salts of lead, iron, nickel, and copper, the chlorides of gold and platina, alter their colour by the addition of purpurate of ammonia, but are not precipitated by it.

With respect to the characteristic properties of the purpuric acid, Dr. Prout is of opinion that it may be readily distinguished from all other substances by the beautiful colours exhibited by its alkaline and earthy salts, independently of its other properties, which are very peculiar. He further observes that the well known pink sediment which generally appears in the urine of those labouring under febrile affections, appears to owe its colour to the purpurate of ammonia, and perhaps occasionally to the purpurate of soda; and he has suggested that some of the purpurates, especially that of lime, might be used as a paint, and that others might be employed in dyeing.

PURPURI'FERA, Lamarck's name for a family of mollusks belonging to the section of his order *Tracheli-poda*. The family consists of the genera *Cassidaria, Cassis, Ricinula, Purpura, Monoceros, Concholepas, Harpa, Dolium, Buccinum, Eburna*, and *Terebra*. The whole of these genera are treated of in the article ENTOMOSTOMATA.

PURSER. [NAVY, pp. 121, 122.]

PURSLANE. There are two varieties of the garden purslane, the *Green* and the *Golden* (the Portulaca sativa and oleracea of botanists), but these cannot be considered truly distinct species, for seeds from the same individual produce occasionally both green and golden-leaved plants. They are annuals, with fleshy succulent leaves, probably indigenous to the East Indies, but now apparently wild in the South of Europe and South America.

Purslane was formerly more used than at present, at least in this country, in salads, as a pot-herb, in pickles, and for garnishing. It is considered to be very cooling, and hence in warm countries it is more esteemed. Any light soil will suit it; being succulent, it will even thrive in sandy soil. It requires to be sown in April, or when the danger of frost is over, and covered very slightly with a little fine mould. Successional sowings may be made in May, June, and July.

PURVEYANCE (*purveance*, a providing), a prerogative formerly enjoyed by the king through the means of officers called purveyors, of purchasing provisions and other necessaries for the use of the royal household, and of employing horses and carriages in his service, in preference to all other persons, and without the consent of the owners. A privilege of the same nature was also exercised by many of the great lords. The parties whose property was thus seized were entitled to a recompense; but what they received was so inadequate, and so many abuses were committed under the pretext of purveyance, that it seems to have been always considered a most intolerable grievance. About forty statutes were passed upon the subject, many of them, like all the important early statutes, being a re-enactment of those preceding. Some of the most stringent occur in the 36th year of Edward III. The parliament of that year, which is said to have been held 'for the honour and pleasure of God, and the amendment of the outrageous grievances and oppressions done to the people, and the relief of their estate,' after a general confirmation of former statutes, immediately proceeds to enact five statutes on the subject of purveyance. These statutes confine the exercise of it to the king and queen, and provide that for the future 'the heinous name of purveyor shall be changed into that of buyer:' they forbid the use of force or menaces, and direct that where purveyors cannot agree upon the price, an appraisement shall be made, &c. &c. The provisions of these statutes are very full and satisfactory, but they appear to have wholly failed in their operation. Other statutes were passed, but without effect. Several of the charges against Wolsey were the exercise of purveyance on his own behalf. (4 *Inst.* 93.) In the time of Elizabeth, two attempts were made in the same year by the Commons to regulate the abuses of purveyance. The queen was extremely indignant at this, and desired the commons not to interfere with her prerogative. In the early years of her reign, Elizabeth seems to have employed this prerogative for the purpose of victualling her navy. She afterwards revoked the warrants issued for that purpose, and designed likewise to have taken away the commissions relating to the provision for her own household, some counties having agreed, some time after, to furnish it at a certain rate, to get rid of the collectors—a kind of vermin which the Queen called *harpies*. During the first parliament of James I., Bacon, on presenting a petition to the king, delivered his famous speech against purveyors, which forms a sort of compendium of the heavy charges made against them. Several negotiations took place in that reign for the purchase of the prerogative of purveyance, but nothing was done. Under the Commonwealth it fell into disuse. Purveyance was not formally abolished till after the Restoration. By the 12 Ch. II., c. 24, this branch of the prerogative was surrendered by the king, who received in lieu of it a certain amount payable on exciseable liquors. Probably in the earlier periods of our history the existence of purveyance was almost necessary for the support of the royal household, especially during the progresses which were then so frequent. This seems almost a necessary inference from its continuance in spite of so many attempts to suppress it. Even after its final abolition by the statute of Charles II. several temporary statutes were passed, in that and the succeeding reign, for its partial revival on the occasion of royal progresses. On behalf of the navy and ordnance, a statute to that effect occurs as late as 11 and 12 Will. 3. (Camden, 388; Bacon's *Works*, vol. vi., p. 3, Montagu's edit.; Hume's *Hist.*; 1 Bl. *Com.*, 287; 3 *Inst.*, 82; 4 *Inst.*, 273.)

PUS. [ABSCESS; INFLAMMATION.]

PUSHKIN, ALEXANDER SERGEIVITCH, called by some the Russian Byron, and certainly the most distinguished poet of Russia in the present century, was born at St. Petersburg, May 26th (June 7th), 1799, and was educated in the Imperial Lyceum at Tzorskoe-Selo, which he quitted in 1817. While at that seminary he appears to have displayed more of natural quickness than of application, for though he made very little progress in his studies, he had even then begun to write poetry. On quitting the Lyceum, he began to exercise his pen with more of enthusiasm than of discretion in favour of liberalism; and although his first productions of the kind were circulated only in manuscript, his opinions became known, and he was represented to the government as the advocate of republican opinions. This occasioned his being sent into a kind of nominal banishment by the emperor Alexander in 1820, being compelled to accept some subordinate situation under the governor-general of Odessa. Perhaps Siberia would have been the place of his destination, had not his 'Ruslan and Liudmila' just then appeared, and been warmly received by the public. Of this legendary poem, in six cantos, which carries us back to the half-fabulous time of Vladimir, the Russian Charlemagne, a tolerably full account is given in an article on Russian literature in the second volume of the

Foreign Review,' where it is said, 'Such is a brief outline of this romance, which is related with a grace and felicity that would do credit to the author of the "Bridal of Triermain."' A translation of an episode from the first canto may also be found in St. Maure's 'Anthologie Russe.'

The success of this, his first production of any length, did not however induce Pushkin to cultivate this kind of epic, if we may so term it, for he thenceforth abandoned it altogether, and adopted in his subsequent poetical narratives a looser and more lyrical form, in which, taking for his subject some single incident or brief and detached historical episode, he renders it a vehicle for the delineation of character, the expression of impassioned sentiment and feelings, and the portraiture of local manners and scenery. His earliest production of this class, his 'Plennik Kavkaskoi, or Prisoner of the Caucasus' (1822), is a mere sketch, most meagre indeed in its outline, relating no more than the escape of a young Russian captive from a horde of wild Tcherkassians, through the assistance of a Tcherkassian maiden; but it is vigorously touched, the images are as poetical as they are distinct, and the style is eminently graphic, though perfectly simple, and without any of that common-place frippery of fine words and phrases which are so frequently employed to conceal the inanity of a writer's ideas. This poem was translated into German almost immediately after its appearance.

To the 'Plennik' succeeded his 'Fountain of Bakhtchisarai' (1824), a production of much superior interest to the former, and in which the characters of Zarema and Maria, the former of whom has not a few traits in common with Byron's 'Gulnare,' are strikingly contrasted. For the manuscript of this poem, which consists of only six hundred lines, the author obtained 3000 rubles—a degree of remuneration then almost unprecedented. His reputation was now fixed, and the public impatiently waited for other productions of his muse. But he allowed an interval of nearly three years to elapse (1824-7) between writing his 'Tzigani' ('The Gypsies') and its being printed; and of his 'Evgenii, or Eugenius Onægin,' though the first chapter or canto appeared in 1825, the sixth was not printed till 1828. The 'Tzigani' had indeed been extensively circulated in manuscript previously to its issuing from the press, and in that form had acquired a celebrity that was no doubt enhanced by the kind of mystery attending it. It is a half-narrative, half-dramatic composition, constructed out of exceedingly slight materials, and gives a picture of the life of the gypsy tribes in Bessarabia, one evidently coloured after nature, but not calculated to render any one enamoured with the simplicity of that nomadic race. The 'Onægin,' avowedly a production akin to Byron's 'Beppo,' is a sort of novel in verse, descriptive of Russian life and manners in the capital and the provinces, and it is generally understood that the hero of it, whose name it bears, was intended by Pushkin for a poetical portrait of himself.

In 1829 appeared almost the last and also the best of his narrative poems, namely that entitled 'Pultava,' the hero of which is the same person as Byron's 'Mazeppa,' but here exhibited under a very different aspect—not as the blooming page, but as the Hetman of the Kozacks, who, notwithstanding his well-matured years, inspires a maiden, whom he has carried off from her parents, with an ardent attachment. An analysis of this poem, together with spirited translations of one or two scenes from it, will be found in the ninth volume of the 'Foreign Quarterly;' and the same article also contains some account of the 'Fountain of Bakhtchisarai' and the 'Tzigani.' The extracts there introduced are the more interesting, as not a single specimen of Pushkin occurs in Bowring's 'Russian Anthology,' that work having been published before Pushkin had risen into celebrity.

His dramatic poem of 'Boris Godunov,' produced about this period, is one of the most interesting of all his productions, in which, while historical fidelity as to the principal events is strictly observed, the poetical element prevails both in the language and the characters and situations; besides which merits, this piece possesses no small attraction as a masterly picture of national manners and feelings, replete with force and truth. After this, Pushkin nearly abandoned poetry altogether, and applied himself to prose composition, having been not only recalled from exile, but taken into favour by the emperor Nicholas, who appointed him historiographer, with a pension of 6000 rubles. This change in his fortunes was—if it did not occasion—accompanied by no less striking a change in his opinions, which, after being on the side of liberalism, settled into the contrary extreme. On the other hand, his popularity in the literary world began to decline; at all events, it rather abated than increased, for during the last seven or eight years of his life, his pen was almost inactive, the chief thing he produced in that time being a history—not of Peter the Great, as was expected—but of the rebel Pugatchev. His other productions during that interval amount to no more than a few tales and essays, and his articles in the 'Sovremennik, or Contemporary,' a literary quarterly miscellany, projected by him in 1836, and afterwards continued for the benefit of his family. Several of his posthumous papers, including the 'History of the Iron Mask,' 'Memoirs of Moreau de Brasse,' and fragments of various unfinished tales, romances, &c., have since appeared in that publication, which also contains a circumstantial narrative of his last moments, by one of his friends. His death was in consequence of a wound received in a duel with an officer; and after lingering two days, at times in excessive agony, he expired at St. Petersburg, January 29th (February 10th), 1837, in his thirty-eighth year. Besides paying his debts and bestowing a pension of several thousand rubles upon the poet's widow and family, the emperor commanded a splendid edition of all his works to be published at his own expense.

PUSTULIPORA. [MILLEPORIDÆ.]

PUTCHUK is the name by which a fragrant root is designated in the price-currents of Calcutta and Bombay, whence it is exported to Canton, being highly esteemed by the Chinese as an incense. From the places of export this would appear to be a product of India, but neither the plant which yields it nor the place where it grows has been discovered until very recently. The discovery is interesting, as the Putchuk is a substance which was known to the antients. Dr. Royle, while in the north-western provinces of India, obtained a root which formed a considerable article of commerce, and which was said to be brought from still farther north, that is, from Lahore. It was warm and aromatic in taste, fragrant in odour, and frequently called *orris (Iris)-root* by Europeans in India, though by the natives in northern India it is called *kooth*. On comparing specimens of kooth which he obtained in northern India with what was called *putchuk* in Calcutta, he found that they were identical, and he was subsequently informed by Mr. Beckett, who was long settled as a merchant in northern India, that what the latter purchased from Umritseer under the name of kooth, he sold in Calcutta by that of putchuk, so that there can be no doubt of the identity of the two substances; but all that had been ascertained with respect to the place where it was produced, was that it seemed to be to the north of the Sutledge.

Kooth, being used in India as a medicine, as well as exported to China, is described in the Persian works on Materia Medica in use in that country, and has assigned to it *kust* as the Arabic, *kooshta* as the Syriac, and *koostus* as the Greek name. Three kinds are described. Dr. Royle states that he was only able to meet with two kinds in India, one called *koost-hindee*, and the other *koost-arabee* these evidently refer to two of the three kinds of Costus described by Dioscorides as the Arabian, Indian, and Syriac. (*Illust. Himal. Bot.*, p. 360.) There can be little doubt therefore that the kooth or putchuk is one of the kinds of costus of the antients, which was highly esteemed by them, and formed an ingredient in their most famous compound alexipharmic confections, such as the Theriaca and the Mithridatium. It was also highly esteemed by them as an incense, as, in the line of Propertius, 'Ure puer costum Assyrium redolentibus aris;' and is mentioned by Horace as 'Achaemenium costum' (*Od.*, iii. 1).

The identity of *kooth* and *costus* was however long ago ascertained, though not generally known, as is evident in the following passage from Garcias ab Horto, in Clusius (*Exot.*, lib. x.), 'Est ergo Costus dictus Arabibus *Cost* aut Cast; in Malacca, ubi ejus plurimus est usus, *Pucho*, et inde vehitur in Sinarum regionem.' In MacCulloch's 'Commercial Dictionary,' Putchook is described as 'the root of a plant growing in Sinde. When burned, it yields a fine smell. The Chinese beat it into a fine powder, which they burn as incense in the temples of their gods.' Of the Putchuk 6697¾ bazar maunds, of the value of 99,903 rupees, were exported from Calcutta in the year 1837-38.

On Dr. Falconer's proceeding on his journey to Cashmere, Dr. Royle requested him to make inquiries respecting this substance, and he discovered that it was exported from the valley in large quantities to the Punjab, whence it finds its way to Bombay and Calcutta: and that it is sold in China at an advance of about three thousand per cent. on the price at which it is gathered in Cashmere. Dr. Falconer subsequently found it growing in great abundance all round the elevated summits of Cashmere. From the plants with which it is associated, and the circumstances under which the Koot grows, being one of the Compositæ, or Thistle tribe, with feathered seed, of which when once established the dissemination becomes easy, Dr. Falconer has no hesitation in thinking that it could be produced to an unlimited extent, of the best quality, in the Himalayas at elevations of from 7500 to 9000 feet above the sea, and that the Choor Mountain alone might be brought in a few years to produce thousands of maunds of it. Preparatory to diffusing the Koot or Costus, he has introduced it into the Himalayan nursery attached to the Saharumpore botanic garden.

Finding that it belongs to a new genus, he has named it Aucklandia, in honour of George earl Auckland, Governor-General of India, 'as a distinction well merited by his lordship's services in the cause of Indian botany.' (Royle, *On the Productive Resources of India.*)

PUTEOLI. [Pozzuolo.]

PUTNEY. [Surrey.]

PUTRANJI'VA, an Indian genus referred by Dr. Roxburgh to Nageia, but which has been separated by Dr. Wallich under the above name, which is a Sanscrit compound, consisting of the words 'pootra,' *a son*, and 'jeeva,' *life*, in consequence of the seeds being strung by parents round the necks of children, under the supposition that they will preserve them in health. They are sold in bazaars throughout India for this purpose. P. Roxburghii, the only species known, forms a large timber-tree, with an erect straight trunk, and a white close-grained very hard wood. The head is large and shady, composed of numerous spreading branches, with shining dark-green leaves arranged on two sides of the branchlets. The flowers are diœcious, the male ones crowded together; the perianth small, calyx-like, four- to five-leaved; corol none; stamens three; filaments thread-like, all or only two united together, and the third free. The female flowers solitary in the axils of the leaves, with long footstalks; perianth five-leaved; ovary ovate, oblong, three-celled; cells two-seeded; styles three, filiform; stigmas crescent-shaped and toothed; drupe one-seeded. Young plants of this tree have been cultivated in moist stoves in this country. The genus has been referred to the natural family of Myricaceæ, but is considered by Endlicher as more nearly allied to the Antidesmeæ.

PUTREFACTION. [Decomposition; Fermentation; Interment.]

PU'TSCHIUS, ELIAS, was born at Antwerp in 1580. He became early distinguished as a scholar, and at the age of twenty-one he published an edition of Sallust with fragments and notes. Four years afterwards he published the work by which he is chiefly known, 'Antient Authors of Latin Grammar,' small folio, Hanau, 1605. These authors are thirty-three in number, of whom several were never before printed, and the rest were so much corrected that they might seem, as he says in the title-page, to be then published for the first time. This work is dedicated to Joseph Scaliger, and it appears probable, from the character of the dedication, that Putschius had been a pupil of Scaliger. Three indexes are appended; the first of authors, the second of Greek words, and the third, which is most copious, of things and words in general. This collection of antient grammarians is of great value to all who are desirous of gaining a critical knowledge of the Latin language, and it also conveys indirectly many aids to the student of the Greek. Putschius died at Stade, March 9, 1606, in his 26th year. (Fabricius's *Bibliotheca Latina* contains an ample account of the treatises collected by Putschius.)

PUTTY, the useful cement used by glaziers for fastening the glass in the frames of windows, is composed of linseed-oil and whiting. The whiting should be well dried, and then pounded and sifted till it becomes a fine powder and is quite free from grit. The whiting, a little warm, should be gradually added to the oil, and well mixed by means of a piece of stick or a spatula. When it is sufficiently stiff, it should be well worked with the hand on a table, and afterwards beaten on a stone with a wooden mallet, till it becomes a soft, smooth, tenacious mass. Putty by exposure to the air gradually hardens till it becomes almost like stone. A ball of putty, when left some days, becomes somewhat hard, but may be easily softened by beating.

PUY, LE, a town in France, capital of the department of Haute Loire, and the seat of a bishopric, situated on the south bank of the Borne, one of the early feeders of the Loire; 273 miles in a direct line south by east of Paris, or 304 miles by the road through Nevers, Moulins, and Clermont-Ferrand; in 45° 2′ N. lat. and 3° 52′ E. long.

Le Puy originated in the eighth century, from the resort of pilgrims occasioned, it is thought, by the sanctity of an image of the Virgin. The town, thus formed, took its name from the old Aquitanian word *Puech*, or *Puich*, 'mountain,' a name descriptive of its situation on the slope of Mount Anis crowned with the volcanic rock Corneille. The site of the town, which lies among the high lands of central France, is about 2000 feet above the level of the sea. In the middle ages, Le Puy was the capital of Le Veley, and the place of assembly for the states of that province. In the religious wars of the sixteenth century, it suffered severely, and was one of the last places which held out in France against Henri IV.

Owing to its situation, the town presents a picturesque appearance; but the streets are ill laid out, steep, narrow, dirty, and paved with lava; the houses are of lava, and are for the most part old and ill built. The cathedral, built in the tenth century, the most striking public edifice in the town, is not worthy of the high encomiums which have been bestowed upon it. Its architecture is heavy and inelegant; and it is in a great degree hidden by the adjacent buildings of the hospital and episcopal palace. Even its lofty situation loses part of its effect by the superior elevation of the summit of the rock Corneille, on which summit are the ruins of the antient castle. The front of the cathedral is approached by an immense staircase of more than a hundred steps. The interior contains a good picture of the Massacre of the Innocents, an elaborate carving of the Martyrdom of St. Andrew in relief on wood, and the reputed miraculous image of the Virgin, to which it is supposed the town owes its origin. The material, cedar wood, covered with bands of fine linen firmly glued on the wood in the manner of an Egyptian mummy, and painted in distemper, and its posture, seated like some of the Egyptian divinities, indicate an Eastern origin. If brought hither, as some suppose, by one of the Crusaders, it cannot have been the object of the pilgrimages from which the town took its rise. It was certainly much venerated in the middle ages; and among those who visited it were several popes and nine kings of France. There are three other churches: that of St. Laurent is the burial-place of the bowels of Bertrand Duguesclin, whose tomb was destroyed by Baron des Adrets, the Huguenot leader, in the religious wars; that of St. Michel is remarkable for its situation on the summit of a conical volcanic rock, in which is cut a flight of more than two hundred and fifty steps. As the church is surmounted by a pointed spire, it presents, with the rock on which it stands, the appearance of an enormous cone or obelisk. The office of the prefecture is a handsome modern building, and there are a town-hall, three hospitals, and buildings for the seminary for the priesthood, for the college or high school, for the commercial court, and for the two justices of the peace; there are also a range of cavalry barracks and a large prison. The lower part of the town is partially surrounded by a kind of boulevard, and there is an agreeable public walk.

The population of Le Puy, in 1826, was 14,988; in 1831, was 14,844 for the town, or 14,930 for the whole commune; in 1836 it was 14,924 for the commune. The chief manufacture is that of blond and other lace, which employs all the poorer women in the town and neighbourhood. The lace is exported, chiefly to North America. Blankets and woollen stuffs, and coarse woollen cloths, are made; woollen yarn is spun, and wool dyed. Lime-burning, brewing, and the tanning and currying of all kinds of leather are carried on; goatskin bags or bottles for wine, oil, &c. are made; and hats, nails, and the small bells used by the muleteers and carriers in the centre and south of France are manufactured. The trade carried on is chiefly in grain and pulse, in which the neighbourhood is very productive, lace, and leather. There are fifteen yearly fairs. A great quantity of wine is produced in the neighbourhood, but, from its inferior quality, it is consumed only among the poorer classes.

There are, besides the institutions already mentioned, a cabinet of natural history, a museum of paintings, sculptures, and antiquities; a public library of 6000 volumes; a theatre, and a departmental nursery.

Le Puy is in the volcanic district of Central France; the surrounding mountains are granitic, capped with masses of rock of volcanic origin. The cubical rock Corneille, which commands the town, that of Polignac, about a mile distant, and that of St. Michel, crowned by the church of that name, are all of volcanic origin; and at the village of Expailly, close to the town, are a group of basaltic rocks, in the form of perpendicular prisms, and on a neighbouring mountain other basaltic rocks, formed of horizontal prisms. Among these natural curiosities are the remains of some buildings of the Roman period or of the middle ages.

The arrondissement of Le Puy comprehends 112 communes, and has an area of 860 square miles. The population in 1831 was 129,722; in 1836, 130,844. It is divided into fourteen cantons or districts, each under a justice of the peace.

The diocese of Le Puy comprehends the department of Haute Loire. The bishop is a suffragan of the archbishop of Bourges.

PUY DE DÔME, a department of Central France, bounded on the north by that of Allier, on the east by that of Loire, on the south by those of Haute Loire and Cantal, and on the west by those of Corrèze and Creuse. Its form approaches to that of a regular quadrangle, having its greatest length from east to west, from the neighbourhood of St. Anthème to the banks of the Chavanoux, 72 miles; and its greatest breadth from north to south, from the neighbourhood of Montaigu to the border of the department of Cantal, 60 miles. The area of the department is estimated at 3087 square miles, exceeding the average area of the French departments in the proportion nearly of 4 to 3, and surpassing the conjoint areas of the English counties Kent and Sussex. The population in 1831 was 573,106; in 1836, 589,438: showing an increase in five years of 16,332, or nearly three per cent., and giving 191 inhabitants to a square mile. Both in amount and density of population it is inferior to very few departments, and very far exceeds the average in both respects. In density of population it slightly exceeds the county of Sussex, but falls far below Kent. Clermont-Ferrand, the capital, is near the mountain Puy-de-Dôme, on a small feeder of the Allier, 216 miles in a direct line south by east of Paris, or 232 miles by the road through Nevers and Moulins; in 45° 46′ N. lat. and 3° 5′ E. long.

The department is very mountainous The principal chain of the Auvergnat mountains crosses the department from north to south. The Monts-Dômes, in the centre of the department, form part of the chain; the loftier group of the Monts-Dor, which are to the south of the Monts-Dômes, also belong to it. On the eastern border of the department is the chain of the mountains of Forez, and La Madeleine, or La Made, separated from that just described by the broad valley of the Allier; and on the north-western border, separated from the principal chain by the valley of the Sioule, is a subordinate ramification of the Auvergnat mountains. We subjoin the altitudes of the principal summits of the main chain·—Monts-Dômes—Puy-de-Dôme, 4839 feet; Petit Puy or Dôme, 4183 feet; Puy Chopine, 3908 feet; Grand Sarcoui, 3436 feet; Grand Suchet, 4095 feet; Puy de Pariou, 4009 feet; Puy de Côme, 1273 feet; Monts-Dor—Pic de Sancy, summit of Mont-Dor, 6224 feet; Puy Gros, 5925 feet; Puy de Montchar, 3931 feet; Cacadogne, 5929 feet; Puy Ferrand, 6116 feet; Puy de l'Angle, 5748 feet; Puy de la Haute Chaux, 5627 feet; Roche Vendeix, 3872 feet; Roche Sanadoire, 4259 feet. (*Comp. to Alm.* for 1833; Malte-Brun.)

The geology of the department is described elsewhere: it forms part of the district of Auvergne. [AUVERGNE, *Geology of*, vol. iii., p. 157; FRANCE, *General Geological Character*, vol. x., p. 408, seq.]

The department yields coal, lead, ironstone, and antimony. In 1825 a rich bed of alum was discovered at the foot of the Puy de Sancy in Mont-Dor. The number of coal-works in 1834 was eight, giving employment to 164 labourers, of whom 100 worked in the mines. The quantity of coal produced in 1834 was 9830 tons; in 1835, 11,387 tons. There are no iron-works. Gypsum is quarried.

There are several mineral springs, hot and cold. Those of Mont-Dor are the most frequented. Their temperature is 45° Réaumur, or 133° Farenheit: they are sudorific. There are other warm springs at Châtel Guyon (30° Réaumur, 100° Fahrenheit), St. Mark (25° Réaumur, 88° Fahrenheit), St. Nectaire (38° Réaumur, 118° Fahrenheit), Bourboule (52° Réaumur, 149° Fahrenheit), Châteauneuf (38° Réaumur, 118° Fahrenheit). There are cold mineral waters at Bar, Châteldon, Vic-le-Comte, and St. Myon, the last chalybeate.

The department belongs to the basin of the Loire, except a small portion at the south-western corner, which is included in the basin of the Garonne. The Loire itself is beyond the boundary of the department; but the Allier, one of its principal tributaries, enters the department on the south side, between Auzon and Nonnette, and flows northward for about 58 miles, till it enters the department of Allier above Vichy. It receives numerous tributaries; the Alagnon, the Couze, the Crouse, the Couses, the Monne, the Lachau (which receives the Ambène and the Morges), all small streams from the main chain of the Auvergnat group on the left bank; and the Dore, which receives the Acredogne and some smaller streams from the mountains of Forez, and La Madeleine, on the right bank. The Sioule, which joins the Allier in the department of Allier, waters the valley between the principal Auvergnat chain and the subordinate ramification. It receives the Couleiron, the Sioulet, and some other small streams. The Cher, one of the principal feeders of the Loire, just touches the north-western border. That portion of the department which is in the basin of the Garonne is watered by the Dordogne, which rises on the slope of Mont-Dor, and its tributaries the Chavenoux and others. There are several small lakes in the principal chain or the subordinate ramifications of the Auvergnat mountains; from the latter lakes some of the feeders of the Sioule flow. Lake Pavin, near Mont-Dor possesses some remarkable features. It is in a circular basin or hollow, resembling the crater of a volcano. Its margin is covered with wood, which owes its verdure to the refreshing dews produced by the copious evaporation of the lake, which is of great depth. The waters are very dark. The little river Crouse flows from this lake. The rivers and lakes abound with fish.

None of the rivers are navigable, except the Allier; and in Brué's *Map of France* (Paris, 1818) the navigation of the river is marked as commencing just where it quits the department. But the official document, *Statistique de la France*, assigns to it a navigation of 58 miles within the department, comprehending all that part of its course which is within the boundary. The difference arises from this part of the river being navigable at particular seasons, and only with the stream. There are no canals; and the industry of the department suffers materially from the want of water-conveyance.

There are seven government roads, having an aggregate length of 278 miles, viz. 127 in good repair, 84 out of repair and 67 unfinished (1 Jan., 1837). The principal road is that from Paris by Clermont to Montpellier. It enters the department on the north, a short distance beyond Gannat in the department of Allier, and runs through Aigue-Perse, Riom, Clermont, Issoire, and St. Germaine-Lambron, beyond which it enters the department of Haute Loire. A road runs eastward from Clermont by Thiers to Lyon (Rhône); another westward by Aubusson (Creuse) to Limoges (Haute Vienne); and a third south-west by Tulle (Corrèze) and Périgueux (Dordogne) to Bordeaux (Gironde), with a branch by Aurillac (Cantal) to Toulouse (Haute Garonne). The departmental roads have an aggregate length of 223 miles, of which (1 Jan., 1837) 111 were in repair, 44 out of repair, and 68 unfinished. The bye-roads and paths have an aggregate length of 7000 to 8000 miles.

The soil varies. The sides of some of the volcanic 'puys,' or mountains, are covered with fine grass, in which numerous cattle are pastured, and others are covered with extensive woods; the lower hills and slopes are occupied by fields of rye, oats, hemp, buckwheat, and potatoes, or by sheep-walks, with a little wood. The mountains of Forez and La Madeleine are covered with woods or with barren heaths. The valley of the Allier, known as the 'Limagne of Auvergne,' is eminent both for fertility and beauty: it produces in great abundance wheat, barley, oats, wine, and fruits of various kinds, especially walnuts, and hemp. The higher grounds produce rye. The quantity of land in the department under the plough is estimated at nearly one-half the whole area. The meadows occupy one-ninth of the area the heaths and open pastures occupy one-fourth. The quantity of cattle reared is very great· they form an im portant article of traffic, and furnish an abundance of cheese and butter, of which the cheese is exported in considerable quantity. The vineyards are not so extensive as in many other departments: the best red wines are those of Chanturgue, Chateldon, and Ris; the best white wines are those of Corent. The woodlands occupy above a tenth of the area. The pine grows on the summits of the mountains, below them the beech grows, and still lower down are the oak, the service-tree, and the chestnut: the last furnishes an important article of food to the poor mountaineers. A considerable quantity of charcoal is made, and timber for masts and building is exported; walnut-oil is also an important article of trade.

The peasantry of the department are a primitive race, little instructed, and wedded to long established usages. In their heavy wooden-soled shoes, or sabots, they drive their cows or oxen attached to creaking cars, the wheels of which are without tire, or guide their clumsy plough: the words with which they stop their team, 'sta, bos,' indicate by their Latin form the long continuity of their usage. Their cottages are wretched, and their fare miserable. They are however industrious and honest: but long-standing prejudices have obstructed their improvement.

The department is divided into five arrondissements, as follows:—

Arrondissement.		Area in sq. miles.	Communes.	Population in 1831.	Population in 1836.
Clermont	Central & West	692	107	171,566	175,910
Ambert .	S.E.	473	52	87,616	90,675
Issoire .	S. & S.W.	705	116	99,559	100,740
Riom .	N. & N.W.	885	130	146,495	151,456
Thiers .	N.E.	332	39	67,870	70,657
		3087	444	573,106	589,438

It comprehends forty-seven cantons or districts, each under a justice of the peace.

The arrondissement of Clermont contains Clermont-Ferrand, capital of the department (population in 1831, 24,077 town, 28,257 whole commune; in 1836, 32,427 commune) [CLERMONT-FERRAND], on a feeder of the Allier; St. Amand, Montons, Le Crest, Les Martres, Cournon (population 2664), Lempde (population 1883), Beaumont (population 1858), Aubières (population 3513), Cebassat (population 2583), Gerzat (population 2498), and Pont du Château (population 3429), between the main chain of the Auvergnat mountains and the Allier: Beauregard, Vertaizon (population 2735), Mirefleur, Vic-le-Comte (population 2150 town, 3153 whole commune), and Billom (population 4157 town, 4746 whole commune), near the east bank of the Allier. All these places are in the Limagne. Rochefort, near the Sioule, Herment, near the Sioulet, and Bourg Lastic, near the Chavanoux, are on the western side of the principal mountain-chain. Les Martres, or more fully Les Martres de Vayre (population in 1831, 1920 town, 3026 whole commune), is near the bank of the Allier; the townsmen carry on trade in wine. Montons has probably about the same population in its commune. Pont du Château occupies the summit and slope of a hill on the left bank of the Allier, over which river is a fine bridge of eight arches. On the highest ground in the town is a mansion formerly belonging to the family of Montboissier, now to the municipal authorities; and attached to this mansion is a park. Pont du Château is a place of rendezvous for the boats which descend the stream, laden with coal, wine, &c. A considerable fishery is carried on on the river. Limestone quarries are worked in the neighbourhood, from which chalcedony and crystals of quartz are procured. Beauregard has a castle or mansion, formerly belonging to the bishops of Clermont, commanding a fine prospect. Vic-le-Comte (otherwise Vic-sur-Allier) takes its designation from having been for a long time the residence of the counts of Auvergne. It has mineral waters of considerable repute, and the ruins of a very beautiful antient chapel. Billom was in the middle ages the seat of a school of good repute, and was a place of some note during the war of the League. The townsmen spin linen-yarn, and carry on trade in the hemp and oil produced in the surrounding country. There is a commercial tribunal at Billom. The antient school exists at present as a secondary ecclesiastical school, and is under the direction of some Jesuits. Herment has sixteen yearly fairs for horses, horned cattle and sheep, grain, hemp, yarn, charcoal, and coal.

In the arrondissement of Ambert are Ambert (population in 1831, 3470 town, 7650 whole commune; in 1836, 8016 commune) [AMBERT], Olliergues, Marsac (population 3206). Arlant or Arlanc (population 3567), on or near the Dore; St. Anthême (population 3286), and Viverols, in the country on the right bank of that river; and Cunlhat or Cunlhac (population 3470), St. German-Lherm, and St. Bonnet, in the country on the left bank. Olliergues or Oliergues has some manufactures of coarse linens and other woven stuffs. Marsac has manufactures of tapes, laces, linens, &c.; also some tanyards. Arlant and Viverols have manufactures similar to those of Marsac. Camlets, linens, and other woven goods are also made at Cunlhat. St. Germain-Lherm has several fairs for cattle, wool, woollen yarn, and hemp. At the village of St. Amand-Roche-Savine, between Ambert and Cunlhat, lead-mines are worked.

In the arrondissement of Issoire are Issoire (population in 1831, 5990 for the commune; in 1836, 5741), Nonette, St Germain-Lambron (population 1938), and La Mongie, on or near the Allier; Sauxillanges and Usson, in the country or the east or right bank of that river; Ardes, on the Couze; Besse and Vodable, on or near the Crouse; Champeix, on the Couses, and La Tour, on a feeder of the Dordogne west of Mont-Dor. Issoire is a walled town on the Couze, a short distance from its junction with the Allier. It was formerly a place of strength, and in the war of the League sustained two sieges, by which it was nearly destroyed. The town is small and ill built. It has a very antient church, adorned outside with ornaments in mosaic. There is a covered market built of granite. The population is partly agricultural, the principal articles of growth in the neighbourhood are wine and hemp (which are sent, the former to Paris, the second to Nantes), and walnuts, in the oil of which considerable trade is carried on. The neighbouring district yields antimony and coal. Copper cauldrons and other utensils are made in the town. There are some judicial and fiscal government offices. Issoire was a place of some importance in the middle ages. Nonette is on a hill, nearly surrounded by the Allier, and was in the middle ages a place of strength. The counts of Auvergne had a castle here, which was rased in 1658 by order of the king, Louis XIV. At St. Germain-Lambron considerable trade in corn and wine is carried on; and there are several yearly fairs for cattle, timber, and corn. There are coal-pits near La Mongie. At Sauxillanges woollen stuffs, scythes, sickles, saws, and earthenware are made. Usson has the ruins of a castle, built of basalt, one of the strongest fortresses of the middle ages. It was for twenty years the residence of Marguerite (Margaret) of France, queen of Henri IV.; and was razed in the reign of Louis XIII. Besse is in the midst of picturesque scenery. It is built of basalt. The townsmen carry on trade in cattle and cheese. Flax is extensively cultivated in the surrounding district. Vodable or Vaudable has some ruins of a former residence of the counts of Auvergne. La Tour, distinguished as La Tour d'Auvergne, situated on a basaltic height, was the hereditary lordship of the last family which possessed the county of Auvergne. The ruins of the castle of these nobles still remain. There are several considerable yearly cattle-fairs. In the commune of Auzat, on the Allier, near Issoire, are iron and coal mines, and a glass-house for making bottles.

Just within the limits of this arrondissement is the village of Mont Dor-les-Bains. It is on the north-western slope of Mont Dor, near the source of the Dordogne, over which there is an iron bridge. The baths, a modern erection of volcanic rock, and of simple but solid and elegant architecture, are on the site of those erected by the Romans, by whom the mineral waters of the place were esteemed. The village, which has of late years been much enlarged and improved, is frequented during the season (which lasts from the commencement of June to the middle of September) by a great number of bathers. There are some remains of Roman buildings, and the picturesque scenery which surrounds Mont Dor increases the attractions of the place.

In the arrondissement of Riom are Riom (pop. in 1831, 11,992 town, 12,379 whole commune; in 1836, 11,473 commune [RIOM], and Ennezat, on the Ambène or Eubenne, a feeder of the Lachau; Volvic (pop. 1914 town, 3032 whole commune), on another feeder of the Lachau; Manzat, Combrondes, and Artonne, on the Morges, a third tributary of the same stream; Randans and Aigueperse (pop. 3217) near the northern boundary of the department; Pont Gibaud, St. Gervais, and Menat, on or near the Sioule; and

Giat, Pionsat, and Montaigu les Combrailles, near the north-western boundary of the department. Volvic is on a volcanic site, and is built of lava quarried in the neighbourhood. There is in the town a school of design and of sculpture for architectural ornaments, the works of which, comprehending shafts of columns and capitals, funereal monuments and slabs, are chiefly of lava. The quarries are very curious; they furnish a section of successive currents of fused volcanic matter, increasing in closeness of grain in proportion as they are deeper beneath the surface. The lava is generally porous, but susceptible of a certain polish so as to be available for sculpture. Clermont-Ferrand, Riom, and most of the neighbouring towns are built of it; and for many years past large quantities have been sent to Paris for foot-pavements. Aigue-Perse is pleasantly situated, and consists of one wide and very long street on the road from Paris to Clermont, lined with houses, generally well built. The principal church has a tolerably good painting of St. Sebastian. Near the town is the château of La Roche, the birthplace of the celebrated chancellor Michael L'Hopital, and a spring, from which noxious exhalations of carbonic acid gas arise. At Pont Gibaud are a saw-mill and an extensive flour-mill. There are mineral springs and lead-mines in the neighbourhood. Black and red tripoli are obtained near Menat. Giat has a monthly fair for cattle, butter, and cheese.

In the arrondissement of Thiers are Thiers (pop. in 1831, 6586 town, 9836 whole commune; in 1836, 9962 commune), on a feeder of the Dore [Thiers]; Croupière or Courpierre, Puy-Guillaume, Châteldon, and Ris, on or near the Dore; Maringues (pop. 3072 town, 4181 whole commune) on the Lachau; Lezoux (pop. 1630 town, 3447 whole commune), between the Allier and the Dore; and Vollorre or Vollore (pop. 3881), in the country east of the Dore. At Courpierre is a bone-mill for grinding bones for manure. At Puy-Guillaume the pines of the neighbouring mountains are cut by saw-mills into deals and planks. Châteldon has mineral waters; and both this town and Ris are situated in a wine-growing district, and carry on trade in wine. At Maringues, chamois and other leather is manufactured, and a large corn-trade is carried on, favoured by the situation of the town, which is in the most fertile district of the Limagne. Lezoux, on the road between Thiers and Clermont, is a neat town, with a fine market-place, two small public walks, and an hospital. There are four yearly fairs, at which considerable business in corn and hemp is done. In the neighbourhood of Vollore is a Roman milliary column with an inscription in honour of the emperor Claudius Cæsar. At St. Remy, near Thiers, which, though only a village, has a population of about 4000, a considerable quantity of cutlery is manufactured.

The industry of the department is considerable; the paper of Ambert, the cutlery of Thiers, and the lava ornaments of of Volvic are among its principal productions; but its development is checked by the want of sufficient means of water-carriage. The project has been conceived of forming a lateral canal on the bank of the Allier, but no steps have been taken to carry the plan into effect.

The department constitutes the diocese of Clermont, the bishop of which is a suffragan of the archbishop of Bourges. It is in the jurisdiction of the Cour Royale of Riom, and in the circuit of the Académie Universitaire of Clermont, and in the nineteenth military division, the head-quarters of which are at Lyon. It returns seven members to the Chamber of Deputies. In respect of education it is one of the most backward of the departments of France. Of the young men enrolled in the military census of 1828-29, only 19 in every 100 could read and write, while the average of France was more than twice that number.

At the period of Cæsar's invasion the country now included in this department formed part of the territory of the Arverni or Arvernians, one of the most powerful of the Celtic nations, and leaders, with the Sequani, of one of the two great factions into which the Gauls were divided. Strabo writes the name of this nation 'Αρουερνοί, Plutarch 'Αρβερνοί. They had several other nations dependent upon or subject to them, as the Eleuteti, the Cadurci, the Gabali, and the Velauni. They had sustained some severe conflicts with the Romans before Cæsar's time; and in the general revolt against Cæsar, in the seventh year of his command, they acted a conspicuous part. Vercingetorix, the leader of that revolt, was an Arvernian [Bourges; Bourgogne]; and Gergovia, the siege of which Cæsar was obliged to raise, was an Arvernian town in the neighbourhood of Clermont. The site of Gergovia is a mountainous ridge composed of volcanic and calcareous rocks, rising to between 2400 and 2500 feet above the level of the sea; it has a tolerably level summit nearly four miles in circuit, and agrees in other respects with the description of the locality given by Cæsar (*De Bell. Gall.*, lib. vii., 36-46).

In the subdivision of the diocese of Gaul under the emperors, the Arverni were included in the province of Aquitania Prima. The chief town of the nation, called at first Augustonemetum, afterwards Arverni, may be identified with Clermont-Ferrand, the capital formerly of the province of Auvergne, and now of the department. A station in the Peutinger Table, called by the frequently occurring name of Fines, was probably near the boundary of the department, in the subordinate ramification of the Auvergnat mountains. Martialis, mentioned by Sidonius Apollinaris, was near Volvic; and a station, the name of which appears in the Peutinger Table in the mutilated form Ub...m (perhaps Ublium or Ulbium), may be conjectured to be Olbie or Olby, on one of the early tributaries of the Sioule.

On the overthrow of the Romans, the country came into the hands of the Visigoths, and subsequently of the Franks. In the middle ages it was included partly in the county of Auvergne, but chiefly in the Dauphiné of Auvergne. A considerable district belonging to the province of Bourbonnais, and a small portion of Forez, a subdivision of the province of Lyonnais, are also included.

PUY LAURENS. [Tarn.]

PWLLHELI. [Caernarvonshire.]

PYDNA. [Macedonia.]

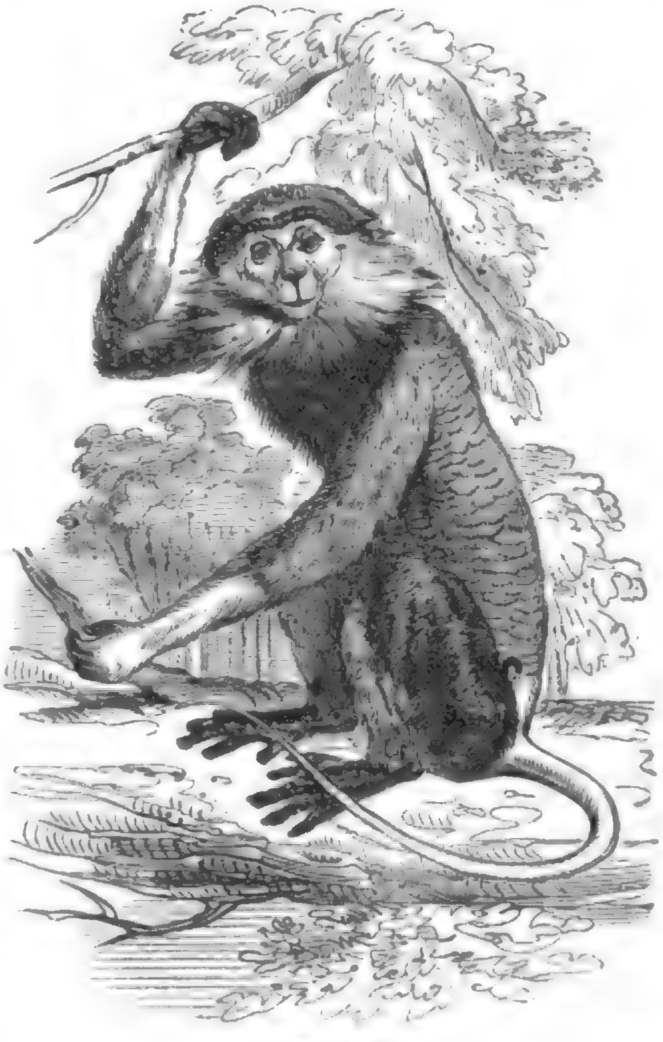
PY'GATHRIX, M. Geoffroy's name for the Douc, or Cochin-China Monkey (*Lasyopyga*, Ill.).

Generic Character.—Head rounded; muzzle moderately prolonged; tail long; cheek pouches; hands longer than the fore-arms and the legs; anterior thumbs very short and slender; no callosities; buttocks fringed with long hairs.

Dental Formula:—

$$\text{Incisors } \frac{4}{4} : \text{ canines } \frac{1-1}{1-1} : \text{ molars } \frac{5-5}{5-5} = 32.$$

Example, *Pygathrix Nemæus*, Geoff. (*Lasiopyga Nemæus*, Ill.; *Simia Nemæus*, Linn., *Mant.*)



Pygathrix Nemæus.

This very rare monkey is perhaps the most remarkable of the whole tribe for the variety and liveliness of the colours with which it is marked, and which are the more striking from being distributed in large masses.

Description.—Upper part of the head brown with a dark reddish chesnut frontal band. The cheeks are clothed with very long and whitish or yellowish white hairs. The back, the belly, the arms, and the sides are grey with a somewhat greenish cast; the tail is whitish, and so are the rump and the fore-arms; the anterior fingers are blackish; the hips and thighs are blackish, and the legs of a brightish red chesnut; the more exposed parts of the face are of a reddish tint. Length rather more than two feet when erect; length of tail about 1 foot 7 inches.

Locality.—Cochin-China. Little or nothing is known of its habits.

PYGODA'CTYLUS. [Bipes; Ophiodes; Scelotes; Scincoideans.]

PY'GOPODES, Illiger's name for those natatorial birds whose wings are well developed, and whose feet are placed very far back so as to facilitate their diving, as Colymbus, Uria, Alca, &c. [Divers; Auk.]

PY'GOPUS. [Bipes; Ophiodes; Scincoideans.]

PYLORI'DIANS, *Pyloridea*, M. de Blainville's name for his ninth family of *Lamellibranchiata*, which he thus characterises:—

Body compressed, more and more cylindrical, the mantle more and more closed and prolonged backwards by two long tubes which are ordinarily distinct, with an anterior and inferior aperture for the passage of a very small and ordinarily conical foot; branchiæ narrow, free, and prolonged in the tube.

Shell regular, rarely irregular, nearly always equivalve, gaping at the two extremities; hinge incomplete, the teeth gradually vanishing (s'effaçant peu en peu); ligament internal or external; two distinct muscular impressions, united by a pallial impression which is very flexuous backwards.

M. de Blainville remarks that all the animals of this family live enclosed in the mud, the sand, or calcareous stone, almost without ever changing their place, always in a vertical position, the mouth below and the anus above. All their shells, he observes, (ordinarily white, and covered with an epidermis), hardly ever exhibit any striæ from the umbo to the base, but only lines of growth (stries d'accroissement).

Section 1. (Ligament internal.)

Pandora.

Generic Character.—*Animal* oval, compressed, rather elongated, with the mantle in form of a case, terminating backwards by two tubes united at their base only, and rather short, opening anteriorly for the passage of the foot, which is large, triangular, thick and swollen at its extremity; branchiæ large, free backwards, where the two pairs are united and terminate in a point in the siphon; labial appendages rather large, triangular, and not striated.

Shell delicate, regular, elongated, compressed, inequivalve, inequilateral, having the right valve flattened and the left more or less convex; umbones but little distinct; hinge composed of a cardinal tooth in the right valve, corresponding with a cavity in the left; ligament internal, oblique, triangular, inserted in a little pit with rather projecting edges; muscular impressions rounded, that of the mantle but little apparent and forming a small excavation. (Rang.)

M. Deshayes, for cogent reasons detailed in the last edition of Lamarck, is of opinion that both *Corbula* and *Pandora* should be arranged with the *Myæ* in the same family, viz. the *Myarians*, or *Myidæ*, and thus the family *Corbulidæ* would be obliterated as useless. He observes that when Lamarck wrote, but two living species were known. When M. de Blainville and M. Rang wrote, no more living species had been discovered, but they notice two fossil species. M. Deshayes further remarks, that Mr. G. B. Sowerby has published seven species in his *Species Conchyliorum*, and he refers to the descriptions of Mr. Say and of M. Quoy in the *Voyage of the Astrolabe*. This, with two fossil species, one from the environs of Paris and the other from Italy, makes, he observes, twelve species in a genus to which two species only were known to belong for some years. Notwithstanding this declaration, only eleven species, including but one fossil, appear in the text. In his Tables the number of living species given is seven and of fossil (tertiary) three. A *new species* and *Pandora rostrata* are recorded as both living and fossil (tertiary).

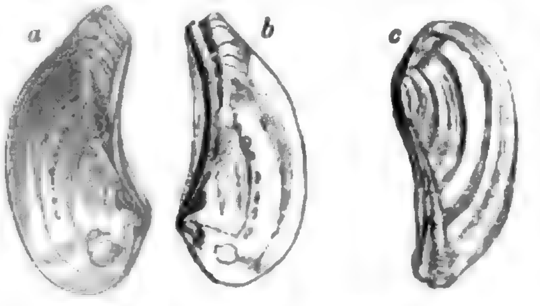
Habits of the Genus.—The *Pandoræ* live sunk in the sand so deep that it requires some difficulty to get them out. They have been found at depths varying from the surface to ten fathoms.

Geographical Distribution.—Wide. Species are recorded from Norway, the European seas, including the Mediterranean, the Pacific, the coasts of Georgia and Florida in North America, and New Zealand.

Example, *Pandora rostrata*.

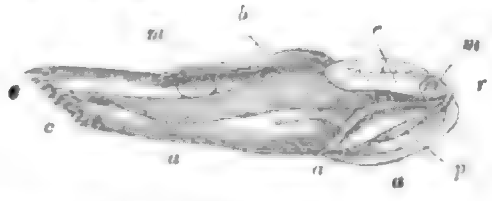
Description.—Shell with the anterior side produced, attenuated, rostrated, and angulated in each valve.

Localities.—Coasts of England and France, and the Mediterranean.



Shell of Pandora Rostrata.

a, Interior of deep valve; *b*, interior of flat valve; *c*, valves closed.



Soft parts of Pandora Rostrata.

a, *a*, *a*, *r*, Mantle, opened anteriorly to show the issue of the foot; *p*, foot; *b*, rectum; *e*, liver covered by the ovary; *m*, adductor muscles; *c*, *c*, tubes.

Mr. Cuming informs us that he has brought home several new species of *Pandora* from the Philippine Islands.

Mr. Garner, in his interesting paper 'On the Anatomy of the Lamellibranchiate Conchifera,' gives a view of the soft parts of a Pandora in the shell. (*Zool. Trans.*, vol. ii., pl 18, *fig.* 6.)

Anatina.

Generic Character.—*Animal* oblong, rather thick, having the mantle closed by a rather large membranous lamina with a small rounded aperture at the antero-inferior part for the passage of a linguiform foot; two elongated tubes separated deeply at their extremity, the lower being rather greater than the upper; branchiæ narrow, free, and pointed backwards.

Shell delicate, sometimes translucent, oval, elongated or oblong, gaping at one or both extremities, equivalve; very inequilateral; umbones placed backwards, the upper anterior border being longer than the posterior; hinge without teeth, but having in their place a horizontal excavated apophysis or spoon-shaped process, receiving the internal ligament, and sustained by a lamina which is oblique and decurrent into the interior of the shell; muscular impressions distant, oval, united by a pallial impression which is but litte marked, but having a deep and rounded excavation backwards. (Rang.)

The genus *Anatina* does not appear in the Tables of M. Deshayes, but *Thracia* does. In the last edition of Lamarck, that acute malacologist observes, that having discovered in the hinge of many of the *Anatinæ* of Lamarck, as well as in that of other species which Lamarck did not know, a frail process (*osselet caduc*) which is free and retained solely by a part of the ligament, he has circumscribed certain genera founded upon the form and position of this process. Thus, he observes, there exists in the three first species of Lamarck's *Anatinæ* (*Lanterna*, *truncata*, and *subrostrata*) a tricuspid process or *osselet* applied upon the anterior side of the spoon-shaped processes; two branches of the process or osselet reach to the umbo, and there occasion a natural and constant fissure, closed by a very delicate membrane; the spoon-shaped process is narrow, and sustained by a buttress-like lamina. These shells are excessively delicate, and gape very much posteriorly.

He further remarks that in the *Anatina trapezoïdes*, of which Bruguière made a *Corbula*, and on which Schumacher founded his genus *Periploma*, the cardinal process or *osselet* is in the shape of a wedge (coin) placed between the dorsal border and the spoon-shaped process; the umbo is not slit, and the shell, which is very inequivalve, does not gape.

A quadrangular osseous plate applied along the border, and sustained between spoon-shaped processes, which are very narrow and do not project, characterises another genus, to which M. Deshayes has given the name of *Osteodesma*. Example, *Osteodesma corbuloïdes* (*Mya Norvegica*, Chemn.; *Amphidesma corbuloïdes*, Lam.). The *Anatina longirostris* of Lamarck belongs to this genus.

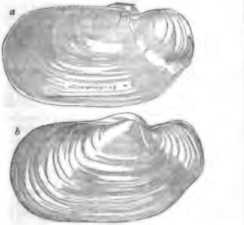
Finally, M. Deshayes remarks that the *Anatina myalis* of Lamarck appears to have no *osselet* at the hinge, but its ligament and spoon-shaped processes have a particular form. On this species Dr. Leach founded his genus *Thracia*, which M. Deshayes adopts, and to which he has added many species.

Thus, M. Deshayes reduces the true *Anatinæ* to three species only, and from the other species adds the genera *Periploma*, Schum., *Osteodesma*, Desh., and *Thracia*, Leach. These may be comprised under the family name of *Anatinidæ*.

We select as an example one of the true *Anatinæ*, viz. *Anatina subrostrata*.

Description.—Shell ovate, membranaceous, anterior side attenuated and subrostrated.

Locality.—Seas of New Holland. Lamarck adds, the Indian Ocean.



Anatina Subrostrata.
a, Inside view of valve, showing the hinge, &c.; *b*, external view; valves closed.

Habits.—The *Anatinæ* have hitherto been found for the most part in sands and shallow water.

Mr. Cuming informs us that he has brought home several new species of *Anatinidæ* from the Philippine Islands.

Anatinæ prismatica and *costata*, described by Mr. G. B. Sowerby, from Mr. Cuming's 'Western Voyage' (*Zool. Proc.*, 1834, *Müller, Syn.*), are not noticed in the last edition of Lamarck (1835), nor are *Periplomata lenticularis* and *planiuscula* described by Mr. G. B. Sowerby from the same collection (*loc. cit.*). M. Deshayes (ed. Lam.) observes that he knows but of one species of *Periploma*, viz. *Periploma trapezoïdes*.

Mya.

Generic Character.—*Animal* oblong, a little compressed, enveloped in a rather delicate mantle adhering by its borders, closed by a membranous lamina and forming backwards round the tubes a loose envelope in which they are withdrawn; tubes united, of moderate length, a little separated at their summit and radiated at their orifices; foot very small, conical, coming out of the mantle by a small slit situated at its antero-inferior border, in the median line; branchiæ moderate, not much elongated, unequal on the same side; mouth small, having triangular appendages striated like the branchiæ.

Shell enveloped with an epidermis prolonged upon the tubes and mantle of the animal, rather solid, gaping at both extremities, equivalve; umbones projecting but little; hinge composed of one or two oblique folds, diverging backwards from a horizontal, compressed, spoon-shaped process, belonging to the left valve and corresponding to an equally horizontal fosset in the right valve; ligament internal, inserting itself between the fosset and the spoon-shaped process; muscular impressions distant, the anterior elongated, the posterior rounded; pallial impression narrow and deeply excavated. (Rang.)

M. Deshayes, in the last edition of Lamarck, states that there are some species which so connect the *Myæ* with the *Sphæniæ* of Turton, that their genus is only to be determined arbitrarily, and he cites for example *Myæ plana*, *subangulata*, and *gregaria* of Sowerby (*Min. Con.*), in support of this observation. He remarks that between the *Sphæniæ* and the *Corbulæ* properly so called, there exists an insensible transition which permits the separation of the two groups still less than the *Myæ*, and adds that an attentive examination of more than forty species of *Corbulæ*, both living and fossil, discovered to him the relationship which they bear to the *Myæ*. M. Deshayes concludes by observing, that if one could suppose the spoon-shaped processes of the *Myæ* to become flexible, and for it to be possible to bring them to the horizontal position from the perpendicular, we should evidently have the hinge of a *Lutraria*; but by stopping the bend of those processes at about an angle of forty-five degrees, we should have the hinge of *Anatina globulosa*, the *Tugon* of Adanson (*Mya Tugon*, Desh., *Encycl. Méth.*), which is in fact intermediate betweeen the *Myæ* and the *Lutrariæ*.

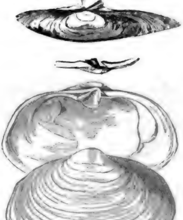
The number of species given in the Tables of M. Deshayes is four living and five fossil (tertiary); *Myæ truncata*, *arenaria*, and *Tugon* are recorded as both living and fossil (tertiary). In the last edition of Lamarck four species only are given, and two of these are noted by M. Deshayes as not being *Myæ*, viz. *Mya erodona*, which he states to be a *Corbula*, and *M. Solemyalis*, which belongs to his genus *Osteodesma*, as already mentioned.

Habits of the Genus.—The Myæ live buried in sandy beaches, wherein they often lie with the tube just projecting: they are also found in the silt of æstuaries.

Example, *Mya arenaria*.

Description.—Shell ovate, rounded anteriorly. The subjoined cut shows the hinge, muscular impressions, markings, and general form of the shell.

Locality.—British Channel, European seas.



Mya arenaria.

Lutricola.

Generic Character.—Body oval, very much compressed or subcylindrical, the mantle only closed in the half of its lower border; foot small, projecting but little beyond the abdominal mass; tubes long, distinct or united.

Shell oval or elongated, regular, equivalve, more or less inequilateral, sometimes scarcely gaping, the edges constantly simple and trenchant, the umbones but little marked; hinge subsimilar, formed of two very small diverging cardinal teeth, sometimes effaced before a large triangular fosset; ligament double, the external posterior rather small, the internal much thicker, and inserted in the fossets; two distinct muscular impressions united by a pallial impression, which is deeply sinuous backwards. (De Blainv.)

M. de Blainville divides the genus *Lutricola* into the two following sections:—

A.

Oval or orbicular species nearly equilateral, very much compressed, gaping but little; hinge similar; internal ligament inserted in the fosset of a vertical spoon-shaped process; two distinct tubes. (Genus *Ligula*, Leach.)

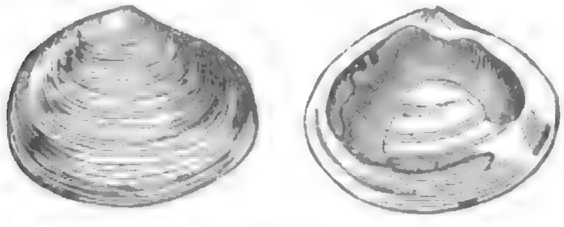
*

Without longitudinal striæ.

Example, *Lutricola compressa*.

Description.—Shell somewhat thin, compressed, rounded-trigonal, squalid, transversely striated, dirty grey, sometimes yellowish or reddish.

Locality.—British Channel.



Lutricola compressa.

B.

Striæ from the umbo to the base.

Example, *Lutraria rugosa* (*Mactra rugosa*, Gm.).

Locality.—European seas.

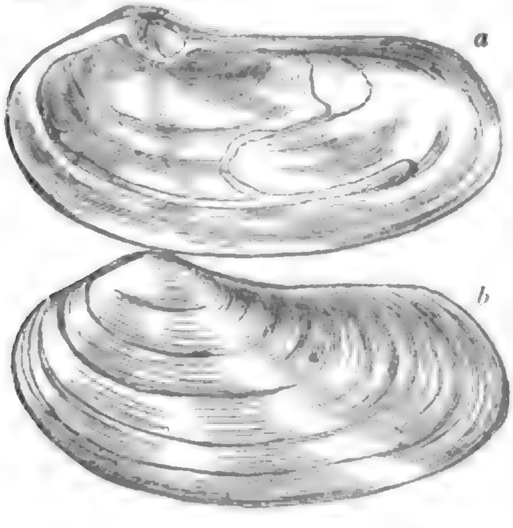
B.

Oblong species, subcylindrical, gaping very much; two very strong hinge-teeth; spoon-shaped process of the ligament vertical. (Genus *Lutraria*, Lam.)

Example, *Lutraria solenoïdes* (*Mya oblonga*, Gm.; *Mactra hians*, Dilw.).

Description.—Shell oblong, with transverse rugiform striæ, anterior end very long, apex rounded, gaping much; dirty white or reddish.

Locality.—European seas.



Lutraria solenoides.
a. Internal view of valve; b, external view.

M. de Blainville observes that the species of this genus belong generally to the seas of Europe, three only out of eleven recent species coming from the Indian Ocean. He notices one fossil species from the *faluns* of Touraine.

The genera above collected under the name of *Lutricola* by M. de Blainville belong to the genus *Lutraria* of Lamarck, in the last edition of whose *Animaux sans Vertèbres* M. Deshayes remarks that notwithstanding the observations of Lamarck, the *Lutrariæ* are not so clearly distinguished from the *Mactræ* as one might think. Moreover, he observes, there is so close a resemblance between the animals of the two genera, when deprived of the shell, that it would be impossible to distinguish them; and if the shells themselves be examined, an insensible transition will be found between them and those of the Mactræ. In the two first species of *Lutraria* (*solenoïdes* and *elliptica*) are found a spoon-shaped process and the cardinal tooth in the form of a V, as in the *Mactræ;* the lateral teeth are effaced or rudimentary; but in the third species (*L. rugosa*) the lateral teeth, though very short, show themselves nevertheless as strongly as in many species of *Mactræ*, and if this species preserving the external form of the *Lutrariæ* be followed by *Mactra striatella* and some others, the passage between the genera will be established; for it is impossible to find in the hinges of these species sufficing generic characters. If these three species of Lutrariæ, continues M. Deshayes, pass insensibly into the *Mactræ* [Conchacea, vol. vii., pp. 430, 431], it is different with regard to the greater part of the second section (*L. compressa*, *L. tellinoïdes*, &c.), which bear more resemblance to *Amphidesma* [Conchacea, vol. vii., pp. 429, 430]. Nevertheless those species preserve some traits of resemblance to the *Lutrariæ* which ought not to be neglected. The animals of these species approach more to that of the *Tellinæ* [Conchacea, pp. 428, 429], in the form and length of their siphons, than to those of the *Lutrariæ* and *Mactræ;* so that till the relationships shall be definitively fixed, it will be better to retain the genus *Ligula*, instituted for them by Dr. Leach.

Habits.—Sandy beaches are the localities in which the *Lutrariæ* are principally found buried.

The number of species given in the Tables of M. Deshayes is eleven recent and six fossil (tertiary). *Lutrariæ elliptica*, *rugosa*, and a new species are recorded as both living and fossil (tertiary). In the last edition of Lamarck sixteen species are described: of these *Lutrariæ solenoïdes* and *elliptica* are noted as recent and fossil; and *Lutrariæ crassidens*, *latissima*, and *sanna* as fossil only.

The place of the genus *Anatinella* (G. B. Sow.) is, in the opinion of M. Deshayes, between the *Lutrariæ* and *Thraciæ*, and that of *Cumingia* (G. B. Sow.) [Conchacea, vol. vii., p. 430], between the *Lutrariæ* of the second section and the *Amphidesmata*. The genus *Lyonsia* of the last-named author (*Zool. Proc.*, 1834; Müller, *Syn*) appears to belong to the *Anatinidæ*. It is placed by Müller immediately before *Anatina*, and under the family *Myacea*, Mke.

Section 2. (Ligament external and convex.)

Psammocola.

Of the genera, or rather subgenera, enumerated by M. de Blainville, and noticed in the article Psammocola, M. Deshayes is of opinion that the genus *Psammobia* should be retained. It comes near to the *Tellinæ*, differing from them more in the shell, which has not the irregular posterior bend, than in the animal, if reference be made only to the figure of Poli. The species figured by MM. Quoy and Gaimard, in the 'Voyage of the Astrolabe,' presents particular characters, observes M. Deshayes, different from those which *Tellinæ* have hitherto shown. *Psammotæa*, he thinks, should not be continued as a genus. (Edit. Lam.)

The species are numerous. In his Tables M. Deshayes gives eighteen as the number of recent *Psammobiæ*, and notices four as fossil (tertiary). *Psammobiæ vespertina* and *muricata* he notes as both living and fossil (tertiary). The number of species of *Psammotæa* recorded is eight recent and one fossil.

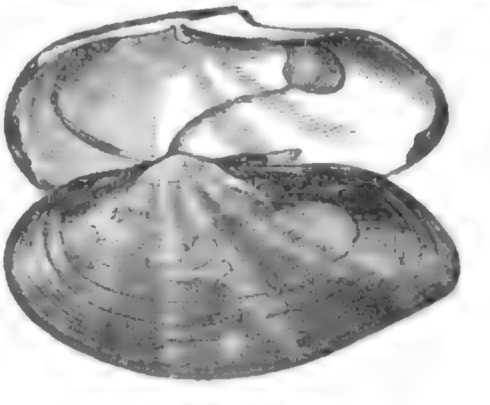
Habits of Psammobia.—Species of this genus have been found in sands at depths varying from near the surface to thirteen fathoms.

Mr. Garner, in his paper on the *Lamellibranchiata* above quoted, gives figures of the animal of *Psammobia florida* in its shell and out of it.

Soletellina.

Generic Character.—Animal unknown.

Shell oval oblong, compressed, with sharp edges, both curved; equivalve, subequilateral, much more wide and rounded at the cephalic extremity than at the other, which is more or less attenuated and subcarinated; the umbones



Soletellina radiata.

submedian, not projecting much; hinge formed of one or two very small cardinal teeth; ligament thick, convex, and supported on very elevated nymphal callosities; two rounded, distant, muscular impressions; pallial impression very sinuous backwards. (Blainv.)

M. de Blainville observes that this genus, which he instituted for four or five species of Lamarck's *Solens*, differs very little from *Psammocola*.

Example, *Soletellina radiata* (*Solen rostratus*, Lam.).

Description.—Shell transversely oblong, violaceous, with many obscure rays; anterior side attenuated and rostrated.

Locality.—Oriental seas.

M. Deshayes observes that *Solen violaceus* and *S. rostratus*, Lam., are referred to the genus *Soletellina* of De Blainville; but he thinks, from the characters of the shells, they ought to belong to *Psammobia*. The animals are unknown.

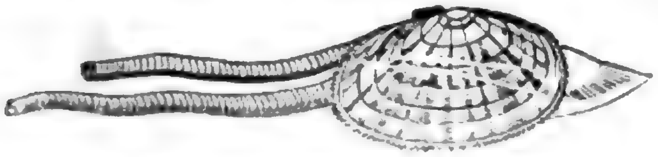
Sanguinolaria.

Generic Character.—*Animal* very like that of *Psammobia florida*. (Garner, 'Zool. Trans.,' vol. ii., pl. 18, *figs.* 1, 2.)

Shell oval, a little elongated, very much compressed, hardly gaping, equivalve, subequilateral, equally rounded at both extremities, without any posterior carination; umbones slightly indicated; hinge formed of one or two approximated cardinal teeth in each valve; ligament projecting, convex; two rounded muscular impressions, which are distant and united by a narrow pallial impression, which is very sinuous backwards. (Blainv.)

Example, *Sanguinolaria Occidens*.

Both M. de Blainville and M. Rang state that the animal of *Sanguinolaria* is unknown.

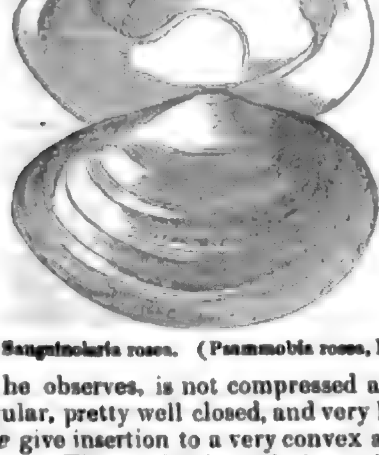


Animal of Sanguinolaria occidens in the shell. (Poli.)

Shell radiated and spotted with whitish and red.

Locality.—Mediterranean.

M. de Blainville speaks of this genus as differing but little from the preceding, and indeed most malacologists have felt the difficulty of discriminating between these closely similar forms. Of the four species recorded by Lamarck, M. Deshayes says that the three first, viz. *Sanguinolariæ occidens, rosea*, and *livida*, are *Psammobiæ*; and that the last, *Sanguinolaria rugosa*, ought alone to remain as a species of the genus. He remarks that Mr. G. B. Sowerby, who has perceived the necessity of reforming the genus, has preserved *Solen sanguinolentus* as its type, joining to it those Solens of which M. de Blainville makes his *Soletellinæ*, whilst he places among the *Psammobiæ* the two species which, in the opinion of M. Deshayes, are true *Sanguinolariæ*. M. Deshayes does not admit Mr. Sowerby's opinion, not only because it is posterior to his own, but also because he believes that all the *Sanguinolariæ* of Sowerby have the characters of *Psammobiæ*, which is not the case with the species (*Sanguinolaria rugosa ?*) which he retains.



Shell of Sanguinolaria rosea. (Psammobia rosea, Desh.)

This species, he observes, is not compressed and tellinoïd; it is thick, regular, pretty well closed, and very long and very thick *nymphæ* give insertion to a very convex and thick external ligament. The cardinal teeth in each valve, continues M. Deshayes, are two; the largest are bifid and cordiform; the muscular impressions are nearly equal and rounded, and the pallial impression forms on the posterior side a narrow and not deep sinuosity.

Description.—Shell semiorbiculate, slightly convex, white, with rosy umbones; the striæ transverse and arcuate.

Locality.—Jamaica. (Lam.)

Habits.—*Sanguinolariæ* have been found in sands and sandy mud, at depths varying from five to thirteen fathoms.

Mr. Cuming informs us that he has collected several new *Sanguinolariæ* and *Soletellinæ* at the Philippine Islands, &c.

Solecurtus.

Generic Character.—Both M. de Blainville and M. Rang mention the animal of *Solecurtus* as unknown. But see Poli (*Test. utriusque Siciliæ*, vol. i., tab. xii.), and No. 132 E of the *Preparations of Natural History in spirit*, in the museum of the College of Surgeons.

M. de Blainville separates his *Solecurtus* into the following sections:—

A.

Flat, delicate species with an interior bar running obliquely from the umbo to the abdominal edge.

Example, *Solecurtus radiatus*.

B.

More cylindrical species, without an internal bar.

Example, *S. strigilatus*.

C.

Species still more elongated and subcylindrical.

Example, *S. Legumen*.

M. Deshayes confines the genus to those species which have all the same character with *S. strigilatus*.

Generic Character.—*Animal* much too large for the shell; lobes of the mantle thick forward, soldered together on their posterior moiety, and prolonged on this side into two great unequal siphons united near their summit; foot linguiform, large, very thick; labial palps very long and narrow; branchiæ narrow and very long, extending throughout the length of the branchial siphon.

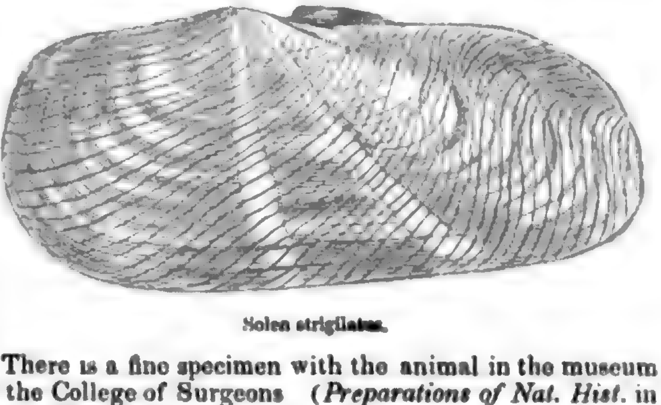
Shell oval-oblong, transverse, covered with undulating oblique and longitudinal striæ, gaping at both extremities. Hinge median, two cardinal teeth in one valve, one, rarely two, on the other, non-intrant; nymphæ callous, thick, supporting an external and convex ligament; pallial impression very deeply sinuous. (Desh.)

M. Deshayes records four species:—1, *Solen strigilatus*, Lam.; 2, *Solen candidus*, Ren., living in the Mediterranean, and fossil in Sicily and Italy; 3, *Solen Quoyi* (*Voyage of the Astrolabe*, pl. 83, f. 11, 12, *Solen candidus*), South Pacific Ocean, smaller and proportionately wider than No. 2; 4, *Solen Parisiensis*, Desh. (*Solen strigilatus*, Lam., and of Deshayes, in *Descr. des Coq. Foss.*). This, which is fossil in the neighbourhood of Paris, Grignon, Courtagnon, Mouchy, Parnes, &c., had been previously confounded by M. Deshayes with *S. strigilatus*, Linn.

Example, *Solen strigilatus*.

Description.—Shell oval oblong, very convex, rosy with two white rays, sculptured with oblique striæ.

Locality, Mediterranean. Lamarck adds Atlantic Ocean



Solen strigilatus.

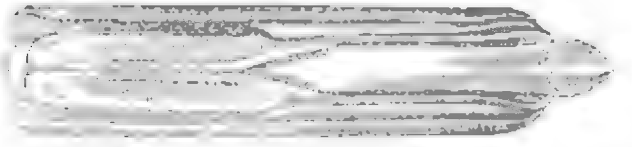
There is a fine specimen with the animal in the museum of the College of Surgeons (*Preparations of Nat. Hist.* in spirit, No. 132 E.).

Solen.

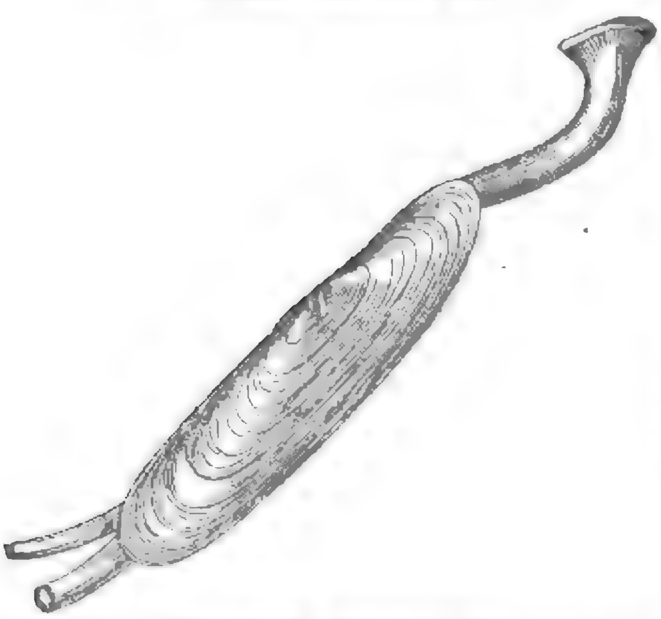
Generic Character.—Animal very much elongated, more or less cylindrical or compressed; mantle closed throughout its length, adhering by its borders, and bound to the lower edge of the shell by a double membrane, which folds back upon itself to form the epidermis, presenting backwards a single tube, double in the interior, conical, annulated, susceptible of much elongation, with two simple orifices, that of the siphon being greater than that of the anus; open entirely in front for the passage of a stout foot, which is conical, convex in its middle, pointed at its extremity, and which terminates the body of the animal in a straight line; branchiæ long, narrow, pointed backwards, nearly of equal size, adhering to two lines forward, one on each side of the body, uniting at last at a certain distance backwards on a single line, and then free and floating up to the entry of the siphon; labial appendages not striated like the branchiæ, elongated, triangular, recurved, and directing their point backwards: mouth small, anus at the extremity of a very small tube floating in the cavity above the free part of the branchiæ.

Shell rather delicate generally, translucid, equivalve, extremely inequilateral, elongated, gaping, truncated at both extremities, and with nearly parallel edges; umbones entirely anterior, hardly distinct; hinge composed of one or two teeth; ligament convex, slightly elongated; muscular impressions very distant, the anterior oblong, elongated, rather narrow, the posterior rather rounded; pallial impression straight, very long, terminated backwards by a short bifurcation. (Rang.)

In the second volume of 'The Descriptive and Illustrated Catalogue of the Museum of the College of Surgeons (Physiological Series),' will be found (pl. xix.) two figures of the soft parts of a Razor-shell (*Solen Siliqua*, Linn.), which will throw great light on the organization of this interesting genus. They are represented with the anterior extremity downwards (the natural position of the animal in the sand wherein it burrows when pressed so deftly that it requires sharp digging to overtake it), the anal and branchial tubes projecting from the surface when it is undisturbed, in order to maintain a communication with the sea-water. There may seem an apparent discrepancy between these accurate figures from the MS. catalogue of drawings (No. 28), and M. Rang's description in that part where he describes the mantle as closed throughout its length, and that part of the description of the plate which refers to 'the closed part of the mantle,' and 'the open part of the mantle.' The closed part of the mantle speaks for itself; the 'open part of the mantle' is evidently that which, in M. Rang's description, is 'bound to the lower borders of the shell.' The catalogue informs us that there is a third drawing (No. 29, M.S. Cat.), showing principally the viscera, which are placed at and in the basis of the pendulous body or foot. The mouth, the liver, the stomach, the intestines, and the anus are severally indicated.



Solen Vagina. Shell and soft parts.



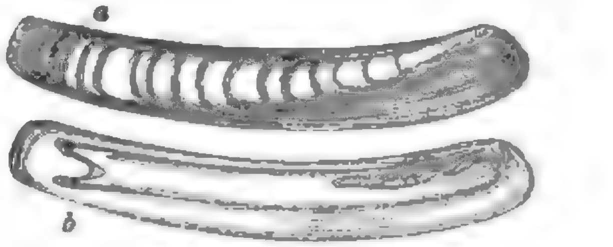
Solen Legumen. Shell and soft parts.

The Catalogue further states that the branchiæ in this class of mollusks are composed of highly vascular membranes, supported by close-set parallel transverse filaments of a delicate horny texture: these are crossed at regular intervals by transverse lines or joints; and along either side of each supporting filament minute vibratile cilia are situated, which move rapidly in different directions, and excite and maintain a perpetual current of sea-water over the surface of the respiratory organs.

Pl. 18, fig. 8, of Mr. Garner's paper 'On the Anatomy of the Lamellibranchiate Conchifera, shows the stomach, intestine, heart, &c. of *Solen Ensis*. Mr. Garner observes that in *Solen*, *Hiatella*, *Pholas*, &c., the branchiæ are prolonged into the inferior siphon, and so get access to the interior interlaminary spaces of the *branchiæ* (oviducts of some); and by the superior siphon, the *ova*, *fæces*, and secretions are discharged.

Habits of the Genus.—The species live in sandy beaches, wherein they often lie buried in a vertical position two feet deep, though their ordinary habit is to go only so low in the sand or silt (for they are found also in æstuaries) as to leave the tube just projecting. They may be said to have regular burrows. When the animal is undisturbed and the tide is in, it lies with the tubes at the entrance of its perpendicular hole; if it be disturbed, down it goes: in short its life is spent in descending to the depths of its burrow and ascending from it again to the surface by means of the extension and contraction of its great muscular foot, which is situated at that part of the shell which is lowest. They have been found at depths varying from near the surface of the sea to thirteen fathoms.

Localities. — Mediterranean. Lamarck adds Atlantic Ocean.



Shell of Solen Ensis.
a, external view of valves closed; b, internal view of valve.

Locality.—Seas of Europe and America. (Lam.)

M. de Blainville thus divides the genus:—

A.

Species somewhat curved longitudinally; umbo not terminal.

Example, *Solen cultellus.*

B.

Species straight, or hardly curved; umbo terminal.

Example, *Solen Vagina.*

M. Deshayes, in his Tables, makes the number of recent species of Solen twenty-six; and nineteen the number of the fossil (tertiary). He records *S. Vagina*, *Legumen*, *coarctatus*, *strigilatus*, *candidus*, and *Siliqua*, as found both in a living and fossil (tertiary) state; and *Solen siliquarius* as being found in more than one tertiary formation. This number includes *Solecurtus*. In the last edition of Lamarck, the number of species, including *Solecurtus*, &c., is twenty-one in all; but with regard to *Solen Vagina*, M. Deshayes remarks, that having seen the types in Lamarck's collection, he is sure that the three varieties constitute three distinct species; and he adds that Lamarck, misled by a resemblance in the external form, has given as the fossil analogue of var. b. *Solen Vagina abbreviata* (Rumph., *Mus.*, t. 45, f. M.).

The genus *Solenella* of Mr. G. B. Sowerby (*Zool. Proc.*, 1832; Müll., *Syn.*), a marine genus allied to *Solecurtus* of M. de Blainville, may here be noticed. In it the general form and characters of *Solecurtus* are combined with a series of minute sharp teeth characteristic of *Nucula*. Mr. Sowerby states that it appears to belong to the family of the *Solenaceæ*, and that it may be at once separated from the *Mactraceæ*, to which, in his opinion, *Nucula* belongs, by the circumstance of the whole of the ligament being external. Established on *Solenella Norrisii*, which was founded by Mr. Cuming at Valparaiso.

Solemya.

Generic Character.—*Animal* oval, transverse; lobes of the mantle united for their posterior half, terminated by two short and unequal siphons; foot proboscidiform, truncated anteriorly by a disk, or kind of sucker, the borders of which are fringed; a single branchia on each side in form of a plumule, the barbs of which are isolated up to the base; anus terminal, not floating. (Deshayes.)

Shell very delicate, fragile, compressed, elongated, rounded at its extremities; the borders straight and parallel, gaping a little backwards, regular, equivalve, very inequilateral, covered with a shining epidermis, which invests it on all sides, except in front and behind; anterior side much longer than the posterior; umbones but little distinct; hinge composed of a cardinal, dilated, compressed tooth, which is very oblique, a little curved above, serving for the insertion of the ligament in each valve; ligament almost entirely posterior; muscular impressions small, rounded, distant; some traces of a pallial impression. (Rang.)

M. Deshayes remarks that *Solemya*, perfectly characterised by the structure of the *branchiæ*, approaches the *Solens* more than any other genus in the rest of its organization. He adds that he had thought, before the animal of *Glycymeris* was so completely known, and from the resemblance of the shells, that *Glycymeris* and *Solemya* ought to be placed at the commencement of the family of *Solens*. Only three species appear to be known, *Solemyæ Australis*, *Mediterranea*, and *Borealis*. The first from New Holland; the second, as the name implies, from the Mediterranean; and the last from North America (Rhode Island).

Habits of the Genus.—Sands are the localities in which the genus has been found.

Panopæa.

Generic Character.—Animal unknown.

Shell thick, solid, convex, oblique, elongated, gaping at both extremities, equivalve, inequilateral, rather irregular; umbones well marked, contiguous, rather curved forward, and more approximated to the anterior than the posterior part; hinge presenting a conical tooth in each valve in front of a fosset, and of a thick callosity, not projecting outwards, and but little elongated, on which is inserted the external, posterior, and convex ligament; muscular impressions irregularly oval, the anterior the longest, both united by a pallial impression, which is wide, parallel to the border of the shell, and rather deeply excavated backwards. (Rang.)

M. Deshayes observes that when Lamarck published this part of his work, he knew but one species of *Panopæa;* but M. Deshayes, on examining his collection, found that his *Glycymeris Arctica* was of the former genus. At the time M. Deshayes made his Tables, the number of species recorded appears to have been two recent and three fossil (tertiary); and of these, *Panopæa Aldrovandi* is noted as both living and fossil (tertiary). Six (recent and fossil) is the number stated by M. Deshayes in the last edition of Lamarck.

Habits of the Genus.—*Panopæa* has been found in sands and shallow water.

Glycymeris.

Generic Character.—Animal elongated, thick, cylindraceous, having the lobes of the mantle very thick, open only at the anterior extremity for the passage of a small cylindrical foot, and terminated posteriorly by two siphons, united into a single cylindrical very fleshy mass, and never capable of entering the shell; mouth moderate, oval, accompanied on each side by two large equal triangular palps, joined by their base to the anterior adductor muscle. Branchiæ long and thick, two on each side nearly equal. (Deshayes, after Audouin.)

Shell with a strong epidermis, elongated, rounded, gaping at both extremities, rather irregular, equivalve, very inequilateral; umbones projecting but little, skinned (*écorchés*); hinge toothless, presenting only a thick and but little elongated callosity; external ligament supported by *nymphæ* projecting outwards; muscular impressions distinct and very distant; pallial impression well marked, not excavated posteriorly; valves thickened by callosities in the interior. (Rang.)

The number of species in the Tables of M. Deshayes is one living. In the last edition of Lamarck the same zoologist observes that he has examined the three shells comprised in Lamarck's genus, and that the first only (*Glycymeris Siliqua*) belongs to it. The second (*Glycymeris Arctica*) is, he adds, a true *Panopæa*; and the third (*Glycymeris margaritacea*) is the detached valve of a *Clavagella*, from Grignon.

Habits of the Genus.—Found on sands: moderate depths.

Saxicava. [LITHOPHAGIDÆ, vol. xiv., p. 50.]

Byssomya. (See the article.)

Rhomboides.

Generic Character.—*Animal.*—Body rhomboïdal, elongated, rather compressed, with two distinct tubes backwards; a rather wide slit at the anterior and inferior part of the mantle for the exit of a small conical foot, with a byssus the filaments of which are enlarged at the extremity.

Shell rhomboïdal, rather irregular, striated longitudinally, very inequilateral; umbones very distinct and very anterodorsal; hinge formed by two small cardinal teeth; ligament external, posterior, rather projecting; two rounded muscular impressions.

Example, *Rhomboides rugosus*. Poli, t. 2, p. 21, tab. xv., f. 13.

M. de Blainville established this genus upon a small mollusk figured and described by Poli under the name of *Hypogæa barbata*, and which he refers to the *Mytilus rugosus* of Gmelin. The animal, continues M. de Blainville, is tolerably like *Byssomya;* but the shell is entirely different, and would belong to the genus *Petricola* of Lamarck; but it does not perforate, and lives affixed to rocks by its byssus. M. de Blainville concludes by observing that the genus would perhaps be better placed among the irregular *Veneres*. M. Rang thinks that the genus comes extremely near to *Byssomya*.

Hiatella.

Generic Character.—*Animal* unknown. Shell delicate, elongated, subrhomboïdal, equivalve, very inequilateral, gaping at its inferior border and posterior extremity; umbo very anterior and curved forwards; hinge dorsal, formed of a single tooth in one valve corresponding with a notch on the opposite valve, or of a small tooth with a cardinal fosset on each valve; ligament probably external and dorsal; muscular and pallial impressions unknown. (De Blainville.)

M. de Blainville divides the genus into the following sections:—

A.

Species with a tooth in one valve only.

Example, *Hiatella bicperta.*

B.

Species with a small tooth on each valve. (Genus *Biapholius*, Leach.)

Example, *Hiatella Arctica* (*Mya Arctica*, Oth., Fabr.). M. de Blainville remarks that this genus, established by Daudin, is but badly known, and that it contains but three living species, two from India and the other from the North Seas.

M. Rang, who remarks also on the incomplete knowledge of this genus, thinks that this, perhaps, is not the place for it.

Gastrochœna. (See the article.)

Clavagella. (See the article.)

Aspergillum. (See the article and TUBICOLIDÆ.)

FOSSIL PYLORIDEA.

Our limits will not permit more than a reference to the information given under the heads of the respective genera, and the statement that *Gastrochæna*, *Panopæa*, *Mya*, *Lutraria*, *Psammobia*, *Sanguinolaria*? and *Solemya*? occur below the chalk. *Psammobia* and *Mya* are recorded by Mr. Murchison (*Silurian System*), the former as occurring in the lower Ludlow rock, the latter in the Aymestry limestone.

PYLO'RUS. [DIGESTION; STOMACH.]

PYLOS. [BRASIDAS; CLEON; MESSENIA; NAVARINO.]

PYM, JOHN, was descended from a good family in Somersetshire, where he was born in the year 1584. It appears from the abstract of title to certain estates that John Pym was the lord of the manors of Woolavington Pym and Woolavington Throckmorton, near Bridgewater, in the county of Somerset. His son Sir Charles Pym, Bart., afterwards possessed these manors, which at his death descended on coheiresses, and ultimately by marriage passed into the family of Hales (of Kent), who became the representatives of the Pyms.

In the beginning of the year 1599, and the fifteenth year of his age, Pym became a gentleman-commoner of Broadgate Hall, now Pembroke College, Oxford. But he left the University without taking a degree, and went, as Wood supposes, to one of the inns of court.

Pym was early distinguished for his eloquence and knowledge in the common law. He served in several parliaments towards the end of the reign of James I., and in all those held in the reign of Charles I., as member for Tavistock in Devonshire. He soon distinguished himself in the house

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by his abilities and zeal in opposing the measures of the court.

In 1626 he was one of the managers of the articles of impeachment against the duke of Buckingham; and in the Short Parliament, which met on the 13th of April, 1640, he was one of the most active members. When the Long Parliament met (3rd of November, 1640), the value of Pym's knowledge and experience in the usages of the house, as well as of his talents as a speaker, was strongly felt. The reason of this is made apparent by the following words of Clarendon:—'The long intermission of parliament,' he says, 'having worn out most of those who had been acquainted with the rules and orders observed in those conventions' (*Hist.*, vol. iv., p. 437, Oxford, 1826).

On the 7th of November, the first day in which the house entered upon business, Pym made a long speech respecting grievances. He classed them under three heads, namely: 1, privilege of parliament; 2, religion; 3, liberty of the subject. Each of these divisions, as was usual in that age, he again divided into a great number of subdivisions.

The style of Pym's oratory, as far as we can judge of it from those speeches of his which were printed at the time, and have come down to us among the innumerable small quartos of that age which are preserved in the British Museum, is nervous, terse, and polished.

Upon the 11th of November a motion was suddenly made by Mr. Pym, who declared that he had something of importance to make known to the house, and desired that the outward room should be cleared of strangers, and the outer doors upon the stairs locked. This being done, Pym began. He alluded by way of exordium to the grievances under which the nation laboured. He inferred from these that a deliberate plan had been formed of entirely changing the frame of government. Then he thus continued:—'We must inquire from what fountain these waters of bitterness flow; what persons they are who have so far insinuated themselves into his royal affections as to be able to pervert his excellent judgment, to abuse his name, and wickedly apply his authority to countenance and support their own corrupt designs. Though he doubted not there would be many found of this class who had contributed their joint endeavours to bring this misery upon the nation; yet there was one who both by his capacity and inclination to do evil enjoyed an infamous preeminence; a man who in the memory of many present had sat in that house, an earnest vindicator of the laws, and a most zealous assertor and champion of the liberties of the people; but he had long since turned apostate from those good affections, and, according to the custom and nature of apostates, was become the greatest enemy to the liberties of his country, and the greatest promoter of tyranny that any age had produced.' He then named 'the earl of Strafford, lord-lieutenant of Ireland, and lord president of the council of York, who, he said, had in both places, and in all other provinces wherein his services had been used by the king, raised ample monuments of his tyrannical nature; and that he believed if they took a short survey of his actions and behaviour they would find him the principal author and promoter of all those counsels which had exposed the kingdom to so much ruin.'[*] He then instanced some imperious actions done by him in England and Ireland, some proud and over confident expressions in discourse, and certain passionate advices he had given in the most secret councils of state; adding, says Clarendon, some lighter passages of his vanity and amours; and so concluded, 'that they would well consider how to provide a remedy proportionable to the disease, and to prevent the further mischiefs they were to expect from the continuance of this great man's power and credit with the king, and his influence upon his counsels.'[†]

It is unnecessary to detail here the impeachment of Strafford, which followed, and in which Pym bore so prominent a part. On the 25th of November (1640), at a conference between the two houses in reference to the subject of this impeachment, Mr. Pym made a speech, in which he attempted with considerable though unsuccessful ingenuity to prove that the earl of Strafford was guilty of treason, on the ground that 'other treasons are against the rule of the law; but this is against the being of the law.' The laws against treason in England having been made to protect the king, not the subject, it would be in vain to look in the Statute of Treasons, the 25th Edw. III., st. 5, c. 2, which at that time constituted the English law of treason (the statutes of Henry VIII., making so many new treasons, having been repealed by 1 Mary, c. 1), for any definition or description, or even any mention of that of which Strafford was accused, viz. an attempt to increase the power of the king, and to depress that of the subject. Pym was partly aware of this, and he endeavoured to meet it by saying that this treason of which he speaks 'is enlarged beyond the limits of any description or definition.'

On the 26th of February, 1640, when the articles against Laud had been read, Pym made a powerful speech against him. By a somewhat quaint ingenuity he applies to Laud the expression, 'Spiritual wickednesses in high places.' 'My lords, there is an expression in the Scripture which I will not presume either to understand or to interpret; yet to a vulgar eye it seems to have an aspect something suitable to the person and cause before you. It is a description of the evil spirits, wherein they are said to be spiritual wickednesses in high places; crimes acted by the spiritual faculties of the soul, the will and understanding exercised about spiritual matters concerning God's worship and the salvation of man, seconded with power, authority, learning, and many other advantages, do make the party who commits them very suitable to that description, "spiritual wickednesses in high places."'[*]

He says afterwards, 'It is a miserable abuse of the spiritual keys to shut up the doors of heaven, and to open the gates of hell; to let in profaneness, ignorance, superstition, and error.'

We are furnished by Clarendon with some interesting information respecting the manner of life about this time of Pym and one or two of his illustrious friends. 'When Mr Hyde sat in the chair,' says Clarendon, 'in the grand committee of the house for the extirpation of episcopacy, all that party made great court to him (Clarendon); the house keeping those disorderly hours, and seldom rising till after four of the clock in the afternoon; they frequently importuned him to dine with them at Mr. Pym's lodging, which was at Sir Richard Mauly's house, in a little court behind Westminster Hall, where he and Mr. Hambden, Sir Arthur Hazlerig, and two or three more, upon a stock kept a table, where they transacted much business; and invited thither those of whose conversion they had any hope.'[†]

Clarendon also mentions that they sometimes went out after dinner to ride in the fields between Westminster and Chelsea.

At the conference held between the two houses on the 25th of January, 1641, on presenting to the lords certain petitions which the Commons had received from various parts of the kingdom, London, Essex, &c., Mr. Pym made a speech, concluding with the following remarkable peroration:—'I am now come to a conclusion, and I have nothing to propound to your lordships by way of request or desire from the House of Commons. I doubt not but your judgments will tell you what is to be done; your consciences, your honours, your interests will call upon for the doing of it; the Commons will be glad to have your help and concurrence in the saving of the kingdom; but if they should fail of it, it should not discourage them in doing their duty. And whether the kingdom be lost or saved (as through God's blessing I hope it will be), they shall be sorry that the story of this present parliament should tell posterity that in so great a danger and extremity the House of Commons should be enforced to save the kingdom alone, and that the House of Peers should have no part in the honour of the preservation of it, you having so great an interest in the good success of those endeavours in respect of your great estates and high degrees of nobility.

'My lords, consider what the present necessities and dangers of the commonwealth require; what the Commons have reason to expect; to what endeavours and counsels the concurrent desires of all the people do invite you: so that applying yourselves to the preservation of the king and kingdom, I may be bold to assure you, in the name of all the commons of England, that you shall be bravely seconded.'[‡]

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[*] Clarendon, vol. i., pp. 300; i. 300, edit. Oxf., 1826.

[†] Ibid, 96.

[*] Rushworth, part iii., vol. i., p. 199, fol. 1721. 'Speech, &c. of John Pym, Esquire,' 1641.

[†] 'Life,' vol. i., p. 90, Oxf., 1927.

[‡] Rushworth, part iii. vol. i., p. 511, fol. 1721.
'A Speech delivered at a Conference with the Lords, January 25, 1641,' 4to., 1641.

Die Martis, 25th January, 1641.

'It is this day ordered by the Commons House of Parliament that Mr. Speaker, in the name of the house, shall give thanks unto Mr. Pym for his so well performing the service he was employed in by the Commons of this

It will convey some idea of the effect of Pym's eloquence to state that when he made his celebrated speech at Guildhall, the acclamations were so loud at the end of every period, that he was frequently compelled to remain silent for some minutes. So great indeed were his power and popularity, that he received the appellation of King Pym.

The influence of Pym on the counsels of the parliament having exposed him to the chief odium of the opposite party, he some time before his death, in 1643, published a vindication of his conduct, in answer to the reproaches of having been the promoter of all the innovations which had been introduced into the church of England, and the person who had produced all the evils which then afflicted the kingdom. In this paper he declared that he was and ever had been and would die a faithful son of the Protestant religion, without having the least tincture of anabaptism, Brownism, and the like errors; and he justified his consenting to the abolishment of episcopacy. With regard to the reports of his being the author of the differences then subsisting between the king and his parliament, he affirmed that he never had a single thought tending to the least disobedience or disloyalty to his majesty, whom he acknowledged for his lawful sovereign, and would spend his blood as soon in his service as any other subject in the kingdom. That it was true, when he perceived his life aimed at, and heard himself proscribed as a traitor, he had fled for protection to the parliament, who justly acquitted him and the other gentlemen accused with him of the guilt of high treason. If this therefore had been the occasion of his majesty's withdrawing from the parliament, the fault could not in any measure be imputed to him, or to any proceeding of his, which had never gone further, either since his majesty's departure or before, than was warranted by the known laws of the kingdom and the indisputable power of the parliament.*

In November, 1643, Pym was appointed lieutenant of the ordnance. He died at Derby House, on the 8th of December of the same year, and on the thirteenth of that month he was buried in Westminster Abbey, his body being carried to the grave by six members of the House of Commons. He left several children by his wife, a woman of singular accomplishments, who died about the year 1620.

'As his life, such was his death,' says one who stood by him when he lay on his death-bed.'† He enjoyed, all the time of his illness, the same 'evenness of spirit' which he possessed in health, with an addition of a more 'clear evidence of God's love in Jesus Christ,' and a most ready subjection to God's will, declaring to Marshall that 'it was to him a most indifferent thing to live or die: if he lived, he would do what service he could; if he died, he should go to that God whom he had served, and who would carry out his work by some others.' A little before his end, having recovered out of a swoon, and seeing his friends weeping around him, he cheerfully told them he had looked death in the face, and knew and therefore feared not the worst it could do, assuring them his heart was filled with more comfort and joy, which he found and felt from God, than his tongue was able to utter.

A report was put in circulation by his enemies that Pym died of the loathsome disease called *morbus pediculosus*. However there exists a document, attested by seven physicians, two surgeons, and one apothecary, which states that the disease of which he died was an imposthume in the bowels. And Ludlow mentions that Pym's body was for several days exposed to public view in Derby House, before it was interred, in confutation of those who reported it to be eaten with lice.‡

PYNAKER, ADAM, a celebrated landscape painter of the Dutch school, was born in 1621, at the village of Pynaker, between Schiedam and Delft, and always retained the name of the place of his birth. It does not appear under what master he studied; he went however to Rome for improvement, and remained three years in that city, where he made such good use of his time, that he returned to his own country with the reputation of an excellent painter. He in general preferred a strong morning light, which allowed him to give his trees a more lively verdure. His landscapes are enriched with picturesque ruins or fine buildings, and his figures are spirited and suitable to his subjects. He is much esteemed for the skill with which, by a judicious disposition of the ground, interrupted by breaks, and diversified by hills and valleys, he gives the effect of distance gradually receding from the view as far as the eye can reach. His larger pictures are by no means equal to his smaller ones, which are highly esteemed. They are very scarce, in this country at least; for Dr. Waagen does not appear to have met with even one, in any of the great collections which he visited, and which are described in his work 'On the Arts in England.' In his volume on France he mentions several which he saw in the galleries of Paris. Pynaker died in 1678, at the age of 52.

PYRALLOLITE occurs crystallized and massive. Primary form, according to Levy, an oblique-angled parallelopiped. Cleavage parallel to the two lateral faces of the primary form, and to one of the diagonal planes. Fracture earthy. Hardness, scratches carbonate of lime, and is scratched by felspar. Colour white and greenish; transparent on the edges; lustre resinous. Specific gravity 2·55 to 2·60.

Before the blowpipe, becomes at first black, and afterwards white; swells and fuses on the edges into a glass; with borax gives a transparent glass.

Massive Variety.—Yellowish, in small laminar masses, with white carbonate of lime, red phosphate of lime, and green pyroxene.

Occurs at Storgard, Pargas, Finland.

Analysis by M. Nordenskiöld:—

Silica, 56·62; magnesia, 23·38; alumina, 5·38; lime, 5·58; oxide of iron, 0·99; oxide of manganese, 0·99; water, 3·58.

PYRAMID (*πυραμίς*), a solid figure contained by a polygonal base, and the triangles formed on the sides of the base by lines drawn from one point to the angles of the base. It is among plane solids what the cone is among curvilinear ones, and its solid content is one-third of that of a prism of the same base and altitude; that is, the number of square units in the base, multiplied by the number of linear units in the altitude, and the product divided by 3, gives the number of cubic units in the content.

The properties of a pyramid are important in the theory of PROJECTIONS, particularly the following:—Every quadrangular pyramid (or pyramid with a quadrangular base) has one section, and one only, which is a parallelogram. To find it, let the vertex be V, and let opposite sides of the base meet in A and B. Then every plane parallel to AVB cuts the pyramid in a parallelogram, one of whose angles is equal to the angle AVB.

PYRAMIDELLA, Lamarck's name for a genus of his *Plicacea*, and placed by M. de Blainville among his *Auriculacea*.

Generic Character.—Animal unknown.

Shell smooth, polished, without an epidermis, conical, elongated, or subturriculate; aperture oval from behind forwards; the outer lip extremely trenchant, toothed internally; the inner lip entirely formed by the tortuous and much plicated columella.

The number of species given in the Tables of M. Deshayes is eleven living and eight fossil (tertiary). *Pyramidellæ terebellata* and *acicula* are there noted as occurring in more than one tertiary formation. The living species inhabit the seas of warm climates in both the Old and New World.

PYRAMIDS. The pyramids of Egypt, especially the two largest of the pyramids of Jizeh, are the most stupendous masses of building in stone that human labour has ever been known to accomplish; and we have records of their having been objects of wonder and curiosity from the age of Herodotus, who was born 484 years B.C., to the present time.

The Egyptian pyramids, of which, large and small, and in different states of preservation, the number is very considerable, are all situated on the west side of the Nile, and they extend, in an irregular line and in groups at some distance from each other, from the neighbourhood of Jizeh, in 30° N. lat. as far south as 29° N. lat., a length of between 60 and 70 miles.

The pyramids of Jizeh are nearly opposite to Cairo. They stand on a plateau or terrace of limestone, which is a projection from the Libyan mountain-chain. The surface of the terrace is barren and irregular, and is covered with sand and small fragments of rock: its height, measured

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house at this conference. And it is further ordered, that Mr. Pym be desired to put the speech he made at this conference into writing, and to deliver it into the house, to the end it may be printed.

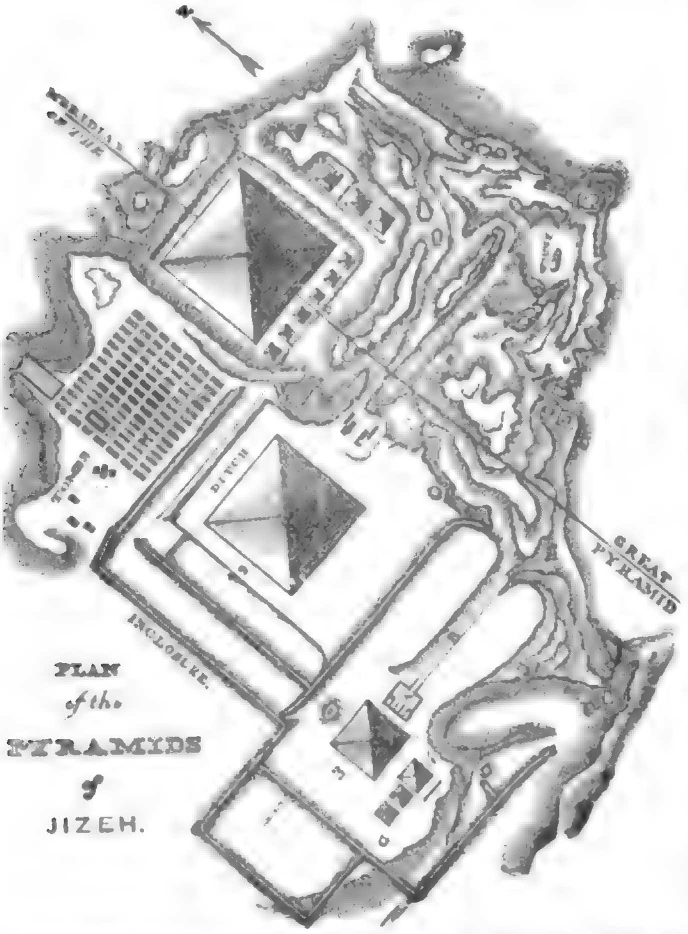
'H. Elsynge, Cler. Parl. D. Com.'

[*] Rushworth's 'Collections,' part iii., vol. ii., p. 376.

[†] Stephen Marshall, 'Sermon at Pym's Funeral,' p. 29.

[‡] Ludlow's 'Memoirs,' p. 31. fol., edit. London, 1751.

from the base of the great pyramid, is 164 feet above the Nile in its low state, taken at an average of the years 1798 to 1801. The north-east angle of the great pyramid is 1700 yards from the canal which runs between the terrace and the Nile, and about five miles from the Nile itself. The accompanying plan, which is copied from the great French work, 'Description de l'Egypte,' shows the relative situations and sizes of these pyramids, and also the catacombs cut in the rock, the ruined buildings, and the great sphinx.



A. remains of an antient building; B, causeway; D, pyramids, dilapidated: G, pyramids with receding platforms.

Herodotus was informed by the priests of Memphis that the great pyramid was built by Cheops, king of Egypt, about 900 B.C., or about 450 years before Herodotus visited Egypt. He says that 100,000 men were employed twenty years in building it, and that the body of Cheops was placed in a room beneath the bottom of the pyramid, surrounded by a vault to which the waters of the Nile were conveyed through a subterraneous tunnel; a chamber under the centre of the pyramid has indeed been discovered, it is about 56 feet above the low-water level of the Nile. The second pyramid was built, Herodotus says, by Cephren, or Cephrenes, the brother and successor of Cheops; and the third by Mycerinus, the son of Cheops.

It will be seen, from the preceding plan, that there are three large pyramids and several smaller ones. All of them have square bases, and their sides face the cardinal points.

The pyramid of Cheops consists of a series of platforms, each of which is smaller than the one on which it rests, and consequently presents the appearance of steps, which diminish in length from the bottom to the top. Of these steps there are 203, and the height of them decreases, but not regularly, from the bottom to the top, the greatest height being nearly four feet and two-thirds (4·628), and the least rather more than one foot and two-thirds (1·686). The horizontal lines of the platforms are perfectly straight, and the stones are cut and fitted to each other with the greatest nicety, and joined by a cement of lime with little or no sand in it. It has been ascertained that a bed eight inches deep has been cut in the rock to receive the lowest external course of stones. The vertical height, measured from this base in the rock to the top of the highest platform now remaining, is 456 feet. This platform has an area of about 1067 square feet, each side being 32 feet 8 inches. If to this were added what is necessary to complete the apex of the pyramid, the total height would be about 479 feet. Each side of the base, measured round the stones let into the rock, is rather more than 763 feet (763·4), and the perimeter of the base is therefore 3053·6 feet. M. Jomard's figures differ a little from the above, in consequence of his measuring, not the lowest course of stones let into the rock, but the base of the steps which rest upon them. The whole height, according to him, would be nearly 473 feet, and he gives the following dimensions:—

	Feet.
Diagonal of the base . . .	1069·457
Length of the edge, formed by the intersection of two adjacent sides . .	605·888

The following are the angles of the pyramid:—

	°	′	″
Angle of the base of the triangle forming one of the four faces	57	50	40
Angle of the vertex of ditto	64	0	40
Angle of an edge with the diagonal of the base . .	41	57	
Angle formed by two opposite edges . .	97	6	
Angle of the face with the plane of the base . .	51	19	4
Angle of two opposite faces	77	21	50

From this it appears that the faces of the pyramid are not equilateral triangles, as has sometimes been supposed.

The area of the base, measured along the outside of the stones let into the rock, is 64,753 square yards, or about 13¼ acres. This area is about the same as Lincoln's Inn Fields, London, measured by the wall of Lincoln's Inn garden and the sides of the houses within the court-yards. The surface of each face, not including the base let into the rock, is 25,493 square yards; and that of the four faces is consequently 101,972 square yards, or more than 21 acres. The solid content of the pyramid is about 3,394,307 cubic yards, which (not making any deductions for chambers and passages in it) has been estimated to be six times the mass of stone in the Plymouth breakwater. Reckoning the total height at 479 feet, the pyramid would be 15 feet higher than St. Peter's at Rome, and 119 higher than St. Paul's, London.

The entrance to the great pyramid is on the north face, about 47½ feet above the base, and on the level of the 15th step from the foundation. The entrance, which is nearly 21 feet east of the perpendicular which bisects the face, is easily reached by the mass of rubbish at the base, which has chiefly fallen from the top. The passage to which the opening leads is 3 feet 7½ inches square, with a downward inclination of 26°, or 26° 30′ at most. It is lined with slabs of limestone well joined together. This passage leads to another, which has an ascending inclination of 27°. The descending passage is 73 feet long to the place where it meets the ascending passage, 109 feet long, at the top of which there is a platform, with the opening of a well or shaft, which goes down into the body of the pyramid, and the commencement of a horizontal gallery 127 feet long, which leads to the queen's chamber, 17 feet long, 14 wide, and 12 high. But another passage or gallery 132 feet long, 26½ high, and nearly 7 wide, commences at the platform, and is continued in the same line as the former ascending passage, till it reaches a landing-place, from which a short passage leads to a small chamber or vestibule, whence another short passage leads to the king's chamber, which, as well as the vestibule and intermediate passage, is lined with large blocks of granite well worked. The king's chamber is 34¼ feet long, 17 wide, and 19½ high. The roof is formed of nine slabs of granite reaching from side to side: the slabs are therefore more than 17 feet long by 3 feet 9½ inches wide. This chamber contains a sarcophagus of red granite; the cover is gone, having probably been broken, and carried away. The sarcophagus is 7 feet 6¼ inches long, 3 feet 3 inches wide, and 3 feet 8¼ inches high on the outside, the bottom being 7½ inches thick. There are no hieroglyphics upon it.

Mr. Davison, in 1763, discovered a chamber immediately over the king's chamber, which is reached by mounting by a ladder to a hole at the top of the upper ascending gallery; and Colonel Vyse has since (1836-7) discovered three other chambers, also above the king's chamber. All these chambers are from three to four feet longer than the king's chamber, and about the same width, the slabs which are the roof of the one forming the pavement of that which is above it; but none of them is much more than three feet high. They have probably been formed merely to lessen the weight of the mass above the king's chamber.

Captain Caviglia, in 1816, discovered that the entrance passage did not terminate at the bottom of the ascending passage, but was continued downwards in the same inclined plane 200 feet farther, and by a short horizontal passage opened on what appeared to be the bottom of the well. The passage however continued in the same direction 23 feet farther, then became narrower, and was continued horizontally 28 feet more, when it opened into a large chamber cut in the rock, and under the centre of the pyramid. This chamber is about 26 feet by 27. Another passage 55 feet long leads from this chamber, but it appears to terminate abruptly.

The well, which appeared to Mr. Davison and Captain Caviglia to descend no lower than where it was intersected by the descending passage, its depth there being 155 feet, was afterwards cleared out by the French to the depth of 207·75 feet, of which about 145 feet are in the solid rock; so that the base of the pyramid being 164 feet above the low-water level of the Nile, the present bottom of the well is 18 feet 6 inches above the Nile; but the actual bottom does not appear to have been yet reached. The temperature within the body of the pyramid was found to be 81° 5′ Fahrenheit, and in the well it was still higher

Herodotus was informed that the chambers cut in the solid rock were made before the building of the pyramid was commenced. It is evident that it was intended that the pyramid should not be entered after the body or bodies were deposited in it, as blocks of granite were fixed in the entrances to the principal passages in such a manner as not only to close them up, but to conceal them. There are traces however of the pyramid having been entered both by the Romans and the Arab conquerors of Egypt.

As the pyramids consist of a series of platforms, each smaller than the one on which it rests, the height of none of them being so much as five feet, and that height diminishing upwards, it is obvious that the stones could be lifted by manual labour and levers successively from step to step, so as to complete each platform before the next was commenced; but there is a passage in Herodotus respecting the building of this pyramid which is attended with a little difficulty. He says (ii. 124, 125), 'The pyramid was made in the following manner, in the form of steps, which some call *crossæ* (battlements), and others *bómides* (little altars). When they had first built it in this fashion, they raised the remaining stones by machines or contrivances of short pieces of wood. They raised them from the ground to the first tier of steps, and when the stone had ascended to this tier, it was placed on another machine standing on the first row, and from this row it was dragged upon the second row on another machine. As many tiers of stones as there were, so many machines also were there; but, according to another account (for I think it right to give both accounts as they were given to me), they transferred the same machine, it being easily moved from step to step as they raised each stone. The highest parts were accordingly finished first; then the parts next to the highest, and last of all the parts near the ground and the very bottom.'

The 'remaining stones' have sometimes been interpreted to mean casing-stones, similar to those which yet remain on the upper part of the pyramid of Cephren, and by which the whole surface was made smooth. And this indeed would be the only judicious way of putting on such a casing; otherwise, if they began from the bottom, the lower part of the pyramid would be rendered inaccessible, and the stones could only be carried up by external contrivances. There is no doubt that it had such a casing, but the difficulty is, that not a stone that can be proved to have belonged to it now exists either on or about the great pyramid. It is probable that the outer stones, which Herodotus says were highly polished, have been carried off for purposes of building, but it is extraordinary that not one should remain as a solitary witness for the veracity of the Father of History.

Herodotus also informs us, that when the great pyramid was designed, they began by making a causeway for the conveyance of the stone. This causeway, was 3000 Greek feet in length, 60 in breadth, and 48 high at its greatest elevation. It was made of highly polished stone covered with sculptures; and in his opinion was as wonderful a work as the pyramid itself. Of this causeway however there are now no traces, though remains of causeways, along which the materials of the pyramids were probably conveyed, may be seen in many places, and particularly in that part of the plan marked B, where there is a causeway about 800 feet long, formed of very large stones, leading to the building A, on the east side of the third pyramid.

The materials of all the pyramids are limestone, and Belzoni is of opinion that part of the stone for the second pyramid was procured immediately on the spot, judging from the manner in which the rock has been cut away round the pyramid. Herodotus certainly understood that all the stone was brought from the mountains near Cairo, where there are indeed antient quarries of great extent; but it seems probable that the greatest part of the materials came from the west side of the Nile. The blocks of granite were of course brought from Syene, which is nearly 500 miles higher up the Nile. The rock on which the great pyramid stands has been found to project at least as high as 80 feet into the body of it. The stones of which it is built rarely exceed nine feet in length and six and a half in breadth; the thickness has been already stated.

The ascent of the great pyramid, though not without difficulty and danger, from the broken state of the steps, is frequently accomplished, and even by females. Belzoni describes the view from the top in terms of enthusiastic admiration.

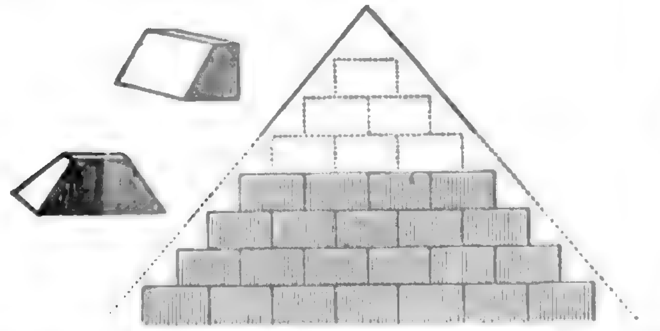
The pyramid of Cephren, the second in size, has the following dimensions, according to Belzoni —

	Feet.
Side of the base	684
Vertical height	456
Perpendicular bisecting the face of the pyramid	568
Coating from the top to the place where it ends	140

The angle which measures the inclination of each face to the base is 52·5°, and consequently this pyramid has a steeper ascent than the first. This second pyramid does not rise from the natural level of the plateau, but out of an excavation or deep cut made in the solid rock all round the pyramid. The rock in which this excavation has been made is higher than that on which the great pyramid stands, so that both pyramids may stand on the same level, but this does not seem to have been accurately ascertained.

Belzoni, after great exertion, succeeded in opening the second pyramid, and after traversing passages similar to those in the great pyramid, reached the main chamber, which is cut out of the solid rock. It is 46 feet 3 inches long, 16 feet 3 inches wide, and 23 feet 6 inches high. The covering is made of blocks of limestone, which meet in an angular point, and form a roof of the same slope as the pyramid. The chamber contained a sarcophagus, formed of the finest granite, which is 8 feet long, 3 feet 6 inches wide, and 2 feet 3 inches deep in the inside. There were no hieroglyphics on it. Some bones were found in it, which were ascertained to be those of an ox. From an Arabic inscription on the wall of the chamber, it appears that some of the Arab rulers of Egypt had entered this pyramid and closed it again. Belzoni also discovered another chamber in this pyramid.

The ascent of the upper part of the second pyramid is extremely difficult and dangerous. Mr. Wilde, who published, in January, 1840, a 'Narrative of a Voyage to Madeira, Teneriffe, and along the shores of the Mediterranean,' made the ascent; and as his account of the enterprise illustrates the subject of the casing, and is also interesting in itself, we give an extract from it, omitting such sentences or parts of sentences as are foreign to our purpose. 'I engaged two Arabs to conduct me to the summit of the pyramid, one an old man, the other about forty, both of a mould which for combination of strength and agility I never saw surpassed. We soon turned to the north, and finally reached the outer casing on the west side. All this was very laborious, to be sure, though not very dangerous; but here was an obstacle that I knew not how themselves could surmount, much less how I could possibly master; for above our heads jutted out like an eave or coping the lower stones of the coating, which still remain, and retain a smooth polished surface. As considerable precaution was necessary, the men made me take off my hat, coat, and shoes at this place: the younger then placed his raised and extended hands against the projecting edge of the lower stone, which reached to above his chin; and the elder, taking me up in his arms as I would a child, placed my feet on the other's shoulders, and my body flat on the smooth surface of the stone. In this position we formed an angle with each other, and here I remained for upwards of two minutes, till the older man went round, and by some other means contrived to get over the projection, when, creeping along the line of junction of the casing, he took my hands, drew me up to where he was above me, and then, letting down his girdle, assisted to mount up the younger but less active and less daring climber of the two. We then proceeded much as follows:—One of them got on the shoulders of the other, and so gained the joining of the stone above, which was often five feet asunder; the upper man then helped me in a similar action, while the lower pushed me up by the feet. Having gained this row, we had often to creep for some way along the joining to where another opportunity of ascending was afforded. In this way we proceeded to the summit, and some idea may be formed of my feelings when it is recollected that all these stones of such a span are highly polished, are set at an angle less [more?] than 45°, and that the places we had to grip with our hands and feet were often not two inches wide, and their height above the ground upwards of four hundred feet. A single slip of the foot, and we must all three have been dashed to atoms long before we reached the ground. On gaining the top my guides gave vent to sundry demonstrations of satisfaction, clapping me on the back, patting my head, and kissing my hands. From all this I began to suspect that something wonderful had been achieved; and some idea of my perilous situation broke upon me when I saw some of my friends beneath waving their hats, and looking up with astonishment as we sat perched upon the top, which is not more than six feet square. The apex stone is off, and it now consists of four outer slabs and one in the centre, which is raised up on its end, and leans to the eastward. I do not think that human hands could have raised it thus from its bed, on account of its size and the confined space they would have to work in. I am inclined to think the top was struck with lightning, and the position thus altered by it. The three of us had just room to sit upon the place. The heat was most intense, and the stones so hot that it was unpleasant to sit on them very long, and it would be rather too dangerous an experiment to attempt standing. The descent was, as might be expected, much more dangerous, though not so difficult. The guides tied a long sash under my arms, and so let me slide down from course to course of these covering stones, which are of a yellowish limestone, somewhat different from the material of which the steps are composed, and totally distinct from the rock of the base or the coating of the passages.' The accompanying cut shows the shape of these stones, and how they were placed.



The upper part of the above design shows the coating, and the lower the steps: the upper left-hand figure gives the shape of the casing-stones, and the lower, that of those used at the corners.

The pyramid of Mycerinus, the third of the Jizeh group, is about 174 feet high; the side of the base is 330 feet, and the angle made by the plane of the face with the plane of the base is about 45°. Belzoni says that he found on the north side a considerable number of blocks of granite, which had evidently formed the coating: 'Proceeding yet lower as I cleared away the rubbish, I found that part of the coating still remained in its place down to the base.' This pyramid has not been opened.

The side of the base of the fourth pyramid is probably not more than 130 feet. Two pyramids to the west of the fourth consist each of four receding platforms, similar to the Mexican pyramids, and each of these platforms is ascended by high narrow steps, in which also they resemble the Mexican pyramids. The summit is a platform. Of the three pyramids which appear in the plan on the east side of the great pyramid, the middle one appears to be the pyramid which, as Herodotus tells us, was built by the daughter of Cheops.

There are some large pyramids at Sakkârah. One of them is next in dimensions to the pyramid of Cheops. Each side of the base is about 656 feet, and the height is 339 feet. It is built in receding platforms, and the interior is described by Wilkinson as a sort of hollow dome supported here and there by wooden rafters. At the end of the passage opposite to this dome is a small chamber, on the doorway of which there are some hieroglyphics, but this chamber and passage appear to be of a later date than the rest of the pyramid.

At Dashour there are also some large pyramids. One of them has a base, each side of which is 700 feet, a perpendicular height of 343 feet, and 154 steps. It has a little of the coating remaining on the top. The entrance is on the north face, and there is a principal chamber and some smaller chambers and passages similar to those which we have described in the great pyramid. In another pyramid, almost as large as the preceding, at the height of 184 feet, the plane of the side is changed, and a new plane of less inclination completes the pyramid; for which diminution of the angle there seems to be a sufficient reason, since the lower part of the side appears to make an angle of 70° with the base. This pyramid has been entered, and found to contain chambers and passages similar to the others. Near the first of these pyramids is one built of bricks. The base is a rectangle of 100 paces on one side and 75 on the other. The bricks are made of loam and chopped straw, and are sun-dried.

At Thebes there are some small pyramids of sun-dried brick, in which the central chambers have vaulted roofs. Judging from the style of the frescoes, Wilkinson infers that they date at least as far back as 1230 B.C., and from other buildings he concludes that brick vaults and arches were constructed by the Egyptians as early as 1540 B.C.

Herodotus informs us that in the lake Mœris, 'about the middle of it, there are two pyramids, each rising 300 feet above the water. The part that is under the water is just the same height. On the top of each is a colossus of stone, seated in a chair.' It is probable that these pyramids were built on an island in the lake, and that he was misinformed as to the depth under the water.

There are numerous pyramids in Nubia, perhaps eighty or more, but they are generally small. Many of them have propyla attached to one side, as if forming the entrance to the building. There are three groups of such pyramids at a place called Assur, near the Nile (about 17° N. lat.). They are built of sandstone, and the propyla are adorned with sculptures after the Egyptian fashion. They do not appear to have been entered. The sides of most, perhaps all, of the Nubian pyramids do not face the cardinal points. There is a group of pyramids at a place called Nourri, in lat. 18·25° N., a few miles north of Jebel Barkal, on the opposite (the east) side of the river. The largest of these pyramids contains within it another of a different date, stone, and architecture. The inner pyramid is seen in consequence of part of the outer one having fallen off. The base line is about 155 feet, and the height about 104 feet.

But buildings of this description are not confined to Egypt and Nubia. The temple of Belus (the Birs Nemroud), and the Mujelibé, at Babylon, were pyramidal buildings. The perimeter of the base of the Birs Nemroud is 762 yards. The Mujelibé has an oblong base, the sides of which face the cardinal points. The northern side is 200 yards, the southern 219, the eastern 182, and the western 186. The highest part of it which remains is 140 feet. There are passages in it, and a hollow shaft 60 feet square. Coffins and skeletons have been discovered in it. [BABYLON.]

Xenophon, in his account of the retreat of the ten thousand, speaks of a stone pyramid which he saw near the Tigris, about forty-five miles south of the present Mosul, the height of which he estimated at 200 feet. There are some temples of the pyramidal form near Benares, in the East Indies. But next to those of Egypt the most extraordinary pyramids now existing are those of Mexico. At Teotihuacan, eight leagues north-east of the city of Mexico, there are two large pyramids, surrounded by several hundred small ones placed in lines running due north and south, and east and west. The two large pyramids are formed of clay mixed with small stones, but they were cased with a sort of porous amygdaloid. They consist of four receding platforms, each of which is formed into a number of small steps, the edges of which were visible when Humboldt visited them. A colossal stone statue, covered with plates of gold, stood on the summit of each, but the soldiers of Cortez carried off the gold, and the statues were broken. The largest of the small pyramids is not above thirty feet high. The great pyramid of Cholula in Mexico has a base each side of which is 1440 feet, and the area of the base is

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therefore upwards of forty-seven acres and a half, more than three times the base of the great pyramid of Jizeh, but the present height is much less, being only 177 feet. The platform on the top has an area of more than 50,000 square feet, and a church has been built in the centre of it. This pyramid is built of alternate layers of clay and sun-dried bricks. [Cholula.] A small pyramid, built entirely of well-hewn stones of a remarkable size, has been discovered, which had escaped the notice of the early Spaniards. It is 59 feet high, and each side of the base is 82 feet. The casing of the platforms is adorned with hieroglyphic sculptures. It is to the east of the pyramid of Teotihuacan. Several other pyramidal buildings were discovered in Mexico by Captain Dupaix, between 1806 and 1808, in three successive expeditions which were prosecuted under the authority of the Mexican government. The Mexican pyramids, like those of Egypt, and the Babylonian and the Indian, have the four sides facing the four cardinal points; but this rule has not been observed in building the Nubian pyramids.

The East Indian, the Babylonian, and the Mexican pyramids appear to have been partly religious and partly sepulchral: but there is no trace of evidence to show that the Egyptian pyramids were built for any purpose but that of preserving the bodies and perpetuating the names of those who built them. Most of them were cased in such a manner as to render the ascent difficult and dangerous, if not impossible. The passages to the sepulchral chambers, and indeed to all the chambers, were carefully closed and concealed, and nothing has been found in any of them but coffins and their mouldering contents. As to their having been built for astronomical purposes, about which there has been much discussion, in addition to there being nothing to prove that they ever were used for such purposes, it may be asked, why build two of such enormous size so close together, when one would have answered the purpose, and why build so many of all sizes?

The preceding account has been abridged from the chapter on the pyramids in the 'Egyptian Antiquities,' vol. ii., in the 'Library of Entertaining Knowledge,' with some trifling alterations and additions. See also Savary's 'Letters on Egypt,' Lond., 1799; 'Description de l'Egypte,' vol. v., Paris, 1829; Wilkinson's 'Topography of Thebes and General View of Egypt,' London, 1835; Wilde's 'Narrative,' Dublin, 1840.

PYRARGILLITE occurs in four-sided prisms, with bevelled edges and massive; frequently traversed by chlorite. Colour black or blue; in the former case shining, in the latter dull. Emits an argillaceous odour when heated. Dissolves entirely in nitric acid.

It is found in granite near Helsingfors in Finland.

Analysis by Nordenskiöld:—Silica, 43·93; alumina, 28·93; xide of iron, 5·30; magnesia, 2.90; potash, 1·05; soda, 1·83; owater, 15·47.

PYREICUS, a Grecian painter of uncertain age and country, but he most probably lived shortly after the time of Alexander. He was the head of the antient *genre* painters (peintres du genre bas), or of those who practised in the lower classes of art, formerly so prevalent in the Netherlands, and which the Greeks termed Rhyparography (*ῥυπαρογραφία*). According to Pliny (xxxv. 10·37), Pyreicus stood without a rival in this line of art, and though in an humble style, he attained the greatest fame. He painted barbers' shops and coblers' stalls, shell-fish and eatables of all sorts, and the like: on this account he was called by the Greeks Rhyparographos, that is, literally, 'dirt-painter.'

PYRENEES, a range of mountains extending from the Mediterranean Sea to the Bay of Biscay, and constituting a natural barrier between France and Spain. They were well known to the antients, especially to the Romans, within the boundary of whose empire they were comprehended. The etymology of the name is uncertain: it is written by Strabo usually in the singular, Purénê (*πυρήνη*):* by Cæsar it is written in the plural form, Pyrenaei Montes; by Pliny indifferently in the singular or plural; and Lucan has given it (*Pharsalia*, i. 689) in the Greek form, Pyrénê. Historically these mountains are associated with the celebrated march of Hannibal and the warfare of Cæsar against the Pompeians in Spain. In a later period they formed the limit of the Frankish conquests under Clovis, but were passed by the ambition and power of Charlemagne, who however lost his rear-guard among their defiles. In the middle ages they were crossed by the French in their successive wars in Spain; and by Edward the Black Prince in his expedition to support Peter the Cruel; and in modern times they were the scene of severe conflict in the Spanish wars of Napoleon, especially when the French were driven out of the Peninsula by the Duke of Wellington, in the winter campaign of 1813-1814.

The Pyrenees are usually considered as occupying the limits which we have assigned, and as constituting an insulated chain; but this is hardly correct. On the east, their ramifications are connected with those of the Cévennes [Cevennes]; and on the west, the prolongation of the Pyrenees forms the mountains of Guipuzcoa, Biscay, Asturias, and Gallicia, the loftiest summits of which all but equal in height those of the Pyrenees proper, and the extremities of which terminate in the capes Ortegal and Finisterre, and the other headlands of the north-west of Spain. Our present article will however comprehend a notice of that part only of the system to which the name of Pyrenees is usually applied.

The area occupied by these mountains is comprehended between 42° 10′ and 43° 20′ N. lat., and between 3° 20′ E. and 2° 0′ W. long. The length of the chain from Cape Creux, or Creuz, near the town of Rosas, or Roses, in Catalonia, on the coast of the Mediterranean, to the port of Passages in Guipuzcoa, is about 270 miles in a straight line from east by south to west by north. The breadth varies: it is greater near the central part of the chain than toward the extremities. Between Tarbes and Jaca, and again between Pamiers and Urgel, the breadth may be stated in round numbers at 60 miles; between La Bastide de Clarence, near Bayonne, and Pampeluna, near the western extremity, it may be estimated at 40 to 45 miles; and between Collioure and Figueras, near the eastern extremity, it is diminished to about 20 miles.

The Pyrenees pass along the border of the following districts of France, enumerated for the most part in their order from east to west:—Le Valespir, Le Conflent, La Cerdagne Française (to the north of which are Le Capsir and Le Donezan), and the valley of Carrol, all in the province of Roussillon, which now forms the department of Pyrénées Orientales; the county of Foix and the district of Couserans, the latter in the province of Languedoc, and both now in the department of Arriège; Le Haut Comminge (including the district properly so called, and the valleys of Betmale, Biros or Birosse, Luchon, Larboust or L'Arbouste, Oeil, and Louron), now divided among the three departments of Arriège, Haute Garonne, and Hautes Pyrénées; Les Quatre Vallées, or the four valleys of Barousse, Aure, Neste, and Magnoac, forming part of the county of Armagnac in Gascogne; and the valleys of Campan, Barèges, Lavedan, and Azun, in the county of Bigorre, all now included in the department of Hautes Pyrénées: the valleys of Asson, or Ossau, Aspe, and Barreton, in Béarn; the Pays des Basques (including the Pays de Soule, Basse Navarre, and the Pays de Labour), all in Gascogne, and all now included in the department of Basses Pyrénées.

In Spain the Pyrenees pass through Catalonia, in which are included Spanish Cerdagne, and the valleys of Andorre, Paillass or Paillas, and Arran, with a number of smaller valleys; Aragon, including the valleys of Venasque, Gistain or Justau, Bielsa, Broto, Canfran, Echo, and others; and Navarre, including the valleys of Roncal, Ahescoa, Roncevaux, or, as the Spaniards write it, Roncesvalles (where Charlemagne's rear-guard was cut off by a combination of enemies), Erro, Henqui, Lanz, Bastan, and Lerin. Andorre, a valley locally in Catalonia, has existed for a thousand years, almost unnoticed, as an independent republic. [Andorre.]

The range of the Pyrenees may be regarded as consisting of two parts, both having the same general direction, but not forming one continuous line: the point of dislocation is near the head of the Garonne; from thence to the Mediterranean the principal ridge is more advanced toward the north than between the head of the Garonne and the Bay of Biscay. The point at which the two parts of the chain approach each other is occupied by a group of mountains which unite them to one another. The Spanish or southern slope of the Pyrenees is generally considered to be steeper than the northern or French side: the ascents on the Spanish side are invariably more rugged and difficult; and while on the south side of Mount Perdu and other lofty mountains the summits rapidly diminish in height, there are several peaks on the north side which scarcely yield to Mount Perdu itself in elevation. The French valleys generally ascend toward the main ridge by a succession of steps and terraces.

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* The name Πυρήνη occurs in Herodotus, ii. 33, but it is there given to a city near which the river Ἴστρος (the Danube) has its sources.

From each side of the principal range a number of smaller branches are thrown off, forming, as it were, buttresses to the principal range, and enclosing valleys between them. These lateral branches are thrown off at the points where the main ridge rises into lofty summits; while the heads of the valleys are marked by depressions, which constitute the natural passes between one side and the other of the mountains. Towards the extremities of the Pyrenees, especially towards the eastern extremity, these depressions are called 'cols' (*i.e.* necks), as in the Alps: in the central part, and, in some cases, toward the western extremity, they are more commonly designated 'ports.' Other terms of similar meaning are also used occasionally. The principal branches thrown off on the northern side are the Corbières, near the eastern end of the range, which connect the Pyrenees with the Cevennes; and a range, without name, which separates the basins of the Adour and the Garonne.

All the great valleys of the Pyrenees are transverse. The head of the valley is usually at a 'col' or a 'port,' and the valley extends twenty, thirty, or even forty miles toward the north or south, bounded by the lateral branches of the mountains. The longest valleys, as that of the Garonne, and the valley of Lavedan, which is watered by the Gave de Pau, are near the centre of the great range. There are some valleys which have their direction parallel to the principal range: and though not equal in extent to the transverse valleys, yet some of them are near twenty miles in length. Sometimes the mouth, or opening of the valley into the plain, is open or broad; in other cases the valleys have narrow entrances. Many of them in their course present a succession of basins, or circular hollows, called by the mountaineers 'oules,' *i.e.* pots or boilers,[*] through which the stream which waters the valley winds slowly, assuming a character in keeping with the quiet scenery of these secluded spots. These basins are usually elevated one above the other, and they communicate by narrow and deep ravines, or by a slope or descent more or less steep. In the upper part of the valleys, where these basins are more frequent and more perfect in their form, they often contain lakes. These lakes are numerous on the French or northern side of the mountains; on the Spanish or southern side they are seldom seen. Some of them are in very elevated sites. Malte-Brun (*Géographie Universelle*) enumerates eight which are at an elevation of above 2000 metres (= 6557 English feet). When they are of such elevation as to be surrounded with glaciers, they are commonly frozen. The lake at the 'port' of Oo (elevation 8800 feet) is covered with ice all the year round; the lake of Mont Perdu (elevation 8393 feet), and the lakes of Estom Soubiran, in the valley of Cauteretz, are covered with ice until the end of August. The most elevated lake given by Malte-Brun is that of the Pic du-Midi (8813 feet).

The basins described above seldom if ever exceed eight miles in length by three or four in breadth. They are always at the point of junction of several valleys or gorges, and their extent bears a proportion to the number of valleys or gorges which open into them. They are found also in the elbows formed by the alteration in the direction of a valley. Their soil is alluvial, and often marshy or composed of peat. The manner in which the streams that water them break away through deep and narrow gorges is a proof that they have been antiently the beds of lakes, the water of which has been drained off by bursting through the rocky barrier by which they were surrounded.

The sides of the mountains which skirt the valleys seldom rise with an unbroken slope to their summit, but consist of a succession of slopes of varying inclination, with small plains or terraces intervening. Those terraces or plains in the mountains which rise on one side of a valley usually correspond in elevation and in the strata which compose them to those of the mountains on the other side. This arrangement is observable in the upper districts of the valleys; in the lower districts, where the mountains are of inferior height, they frequently consist of an unbroken slope from their base to their summit. At the head of some of the valleys is found one of the hollows or basins, locally termed 'oules,' surrounded by walls of almost perpendicular rock called 'cirques,' and sometimes 'amphitheatres.'

The line of perpetual congelation in the Pyrenees appears not to have been ascertained. Ramond fixed it at from 1350 to 1400 toises (8600 to 9000 feet English measure); but on some mountains, as on the Pic-du-Midi of Bigorre, which exceeds this limit (9544 feet), the snow melts in August. Malte-Brun gives the line of perpetual congelation at 2826 mètres (=9266 feet) on the northern slopes, and 2534 mètres (=8308 feet) on the southern. The climate in the neighbourhood of the Pyrenees varies considerably. It is warmer at the extremities, because of the inferior height of the mountains and the proximity of the sea, this is especially the case at the eastern extremity, where the olive grows luxuriantly. The winters are short, and in the lower valleys snow rarely lies more than a day or two. In the upper valleys the climate is more rigorous. The pine and the fir, the box, the rhododendron, the Alpine rose, and a variety of other trees and shrubs, grow on the sides. The summers are very warm, and vegetation in all the valleys is very luxuriant. Thunder-storms are frequent, and are accompanied by rains, which cool the air greatly.

Numerous streams rise both on the northern and the southern side of the Pyrenees. Those on the southern side, except a few near the eastern extremity, flow into the Ebro. The Arga, which passes Pampeluna, the Iratie, the Esca, and several others are received by the Aragon, which rises near the Pic-du-Midi, and flows westward into the Ebro at Alfaro, between Calahorra and Tudela. The Gallego, or Gaillego, receives a number of mountain-streams, and joins the Ebro below Saragossa. The Cinca and the Segre, which unite and flow into the Ebro near Mequinenza, receive all the drainage of the southern slope from the neighbourhood of Barèges to that of Mont Louis: several of the tributaries of these rivers, as the Ara, the Essera, the Noguera or Nogurra, the Ribagorsana, and the Noguera Pailleressa, are considerable streams. The Cardonner, the Fluvia, the Ter, and some others near the eastern extremity flow immediately into the Mediterranean.

The waters of the northern slope near the western extremity chiefly flow into the Adour. The Bidassoa indeed flows directly into the Bay of Biscay, but it is an inconsiderable stream, and would be of no importance but from the accidental circumstance of its forming the boundary between France and Spain. The Adour itself rises in the valley of Campan above Bagnères de Bigorre, and all the streams to the westward, as far as the Nive and the Hourepeleco, which rise in the neighbourhood of St. Jean-Pied-de-Port, fall into it. Eastward, from the source of the Adour to the source of the Arriège in the valley of Carrol, near the town of Ax, the waters all fall into the Garonne. The Garonne itself rises at the head of the valley of Arran, just at the point where the two portions of the principal range of mountains approach each other. Mont Maladetta, or Maudit (Maledictus, 'accursed'), is on the south side of this valley. The Spanish river the Noguera Pailleressa rises very near to the source of the Garonne, and flows in an opposite direction. The streams eastward of the Arriège fall into the Aude, which waters Carcassonne, except the Tech, the Tet, and the Gly, which fall immediately into the Mediterranean.

There are numerous mineral springs in the neighbourhood of the Pyrenees; several of those on the French side are of considerable repute. Those of Bagnères de Bigorre, Bagnères de Luchon, and Barrèges, are noticed elsewhere. [BAGNERES DE BIGORRE; BAGNERES DE LUCHON; BARREGE.] Those of St. Sauveur, in the valley of Lavedan; of Cauterets or Cauteretz; of Eaux Bonnes, in the valley of Ossau; of Eaux Chaudes, in an adjacent valley; of Ax, in the valley of the Arriège; of Aleth, in that of the Aude; and some others, are also of considerable note.

In the higher Pyrenees glaciers are of frequent occurrence; they are found adjacent to the loftiest peaks. Avalanches also occur, as in the Alps. The glaciers of the Pyrenees are found on the slopes of the loftier mountains, not occupying deep gorges or valleys, as in the Alps: neither are they, as in the latter mountains, contiguous, but separated frequently by considerable intervals. They are frequently traversed by deep fractures or chasms. Glaciers are found only in one part of the mountains between the valleys of Arran and Ossau, and for the most part on the northern slope of the mountains. The principal are those of Maladetta, Crabioules, Mont Perdu, Brèche de Roland, Viguemale, and Neouvielle, which take their names from the peaks or depressions adjacent.

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[*] The word 'oule (*houle* or *ouil*) means a large pot or kettle, and appears to contain the same element as the Latin 'olla.'

The recesses of the Pyrenees are the haunts of the izard, a variety of the chamois, of smaller size and brighter colour, possessing, it is probable, less strength and agility than the chamois of the Alps. The bear and the wolf are also found, but the bear is not so ferocious as that of Switzerland. The slopes of the mountains afford pasturage in summer to numerous flocks, which are driven thither from the plains or lower slopes where they pass the winter. Iron, copper, and lead and silver mines are wrought, and fine statuary and other marble, including some of the most beautiful varieties, is quarried. The shepherds and other mountaineers are a fine intelligent race of men, especially those on the southern or Spanish side, and, on the north side, the Basques, who inhabit the western part of the chain. An unhappy and despised race of men, disfigured, like the mountaineers of Valais in the Alps, by wens or goîtres, are found in the Pyrenees, where they are called Cagots. They were formerly held in abhorrence, and retained in a state of the utmost degradation and misery. With the general advance of comfort and civilization, and the prevalence of a better spirit, these deformities are becoming less frequent.

We subjoin a table of the elevation of the principal summits and depressions (cols, or ports) of the Pyrenees, and of some of the towns or other inhabited places near or amidst them:—

SUMMITS.

(We have given only those which exceed 9000 feet.

Summit.	Department or Province.	Feet.
Le Canigou	Aude	9,132
Pic Peyrie, or Prigue	Arriège and Pyrénées Orientales	9,037
* Pic Lanoux	Pyrénées Orientales	9,284
* Pic Pedrous	Ditto	9,433
* Pic de Fontargente, or Fonte Argente	Arriège	9,164
* Pic de la Serrère	Ditto	9,592
* Pic du Port de Seguier, or Siguier	Ditto	9,525
* Montcalm	Ditto	10,513
* Estats	Ditto . C. A.	10,611
* Montvallier	Ditto	9,120
* Pic de Montouléon, or Tuc de Mauberme	Ditto	9,424
Montarto, or Pic de Rious	Valley of Arran in Catalonia	9,567
* Crabioules, or Carabioules	Haute Garonne	10,450
* Tuque de Maoupas	Ditto	10,228
Pic Fourcanade	Valley of Arran in Catalonia . C. A.	10,030
Pic de Néthou, or Nétou, or Anethou, the highest summit of Mount Maladetta and of the whole range of the Pyrenees	Ditto	11,318
Inaccessible ridge to the west of the Pic de Néthou	Ditto	10,304
* Pic Poset, or Las Posets, otherwise La Punta de Lardana	Aragon	11,172
Pic Quairat	Haute Garonne	10,038
Pic de Montarouye	Ditto	9,107
Pic des Hermittans	Ditto	9,842
* Pic de Batoa, or Biedous	Hautes Pyrénées	9,918
Pic d'Arré, upper	Ditto	9,525
Ditto, lower	Ditto	9,405
* Pic de Baroudes	Ditto	9,703
Mont Perdu	Aragon	11,264
Cylindre du Marboré	Ditto	10,950
* Pic de la Cascade	Hautes Pyrénées	10,646
* Tour du Marboré	Ditto	9,933
Summit of Le Pimené	Ditto . M. B.	9,380
* Le Taillon	Ditto	10,443
* Troumouse	Ditto	10,399
Pic d'Aiguillon	Ditto	9,646
Commencement of the cascade of Gavarnie	Ditto	10,385
Pic de Campbiel, or Cambielle	Hautes Pyrénées	10,513
Pic Long	Ditto	10,488
Pic de Neouvielle	Ditto	10,235
Pic d'Arbizon	Ditto	9,247
Pic-du-Midi de Bigorre	Ditto	9,432
* Viguemale	Ditto	10.900
Pic de Badescure	Ditto	10,228
* Pic d'Arrieu Grand	Ditto	9,760
* Pic or Som de Soube	Basses Pyrénées	10,178
* Pic-du-Midi d'Ossau	Ditto	9,696
Pic d'Aule	Ditto	9,532

DEPRESSIONS.

Col de Puymoreins	Arriège . M. B.	6,295
* Port de Rat	Ditto	7,403
Port de Lherz, or Lers.	Ditto	4,927
Col de la Couillade	Ditto	6,434
Port de Viella	Valley of Arran in Catalonia	8,145
* Portillon de Burbe	Haute Garonne	4,079
Port de la Picade	Aragon	7,872
* Port de Venasque	Haute Garonne	7,841
* Port de la Glère, or de la Claire	Ditto	7,529
* Port d'Oo	Ditto	9,753
Port de Peyresourde	Ditto	4,991
* Port de Clarabide	Hautes Pyrénées C. A.	9,849
* Port de Lapez	Ditto	8,008
* Port de Plan	Ditto	7,289
* Port Viel or Vieux	Ditto	8,322
* Port de Pinède, or Estaubé	Ditto	8,176
* Brèche de Tuque Rouye	Ditto	9,417
Col de Pimené, or Brèche d'Allans	Ditto	8,176
* Brèche de Roland	Ditto	9,766
* Port de Gavarnie	Ditto	7,423
Port de Campbiel, or Cambielle	Ditto	8,442
Col de Tourmalet	Ditto	7,131
Col de Lavasse, or L'Avase	Ditto . M. B.	5,836
Col de Loubie	Ditto . M. B.	5,672
Port de Canfranc, or St. Christine	Aragon	6,713
* Port de Roncevaux	Navarre . C. A.	5,771
* Port de Arräiz	Ditto . C. A.	4,347

The summits and depressions marked thus * are on the ridge along which runs the boundary of France and Spain. Pic means peak or summit; tuc or tuque, in the patois of the district of Couserans, has the same meaning. Col, port, portillon, and brèche all mean a depression at the head of a valley. These cols or ports form the passages by which the peasantry pass from one valley to another. They are frequented by contrebandiers, or smugglers, a bold and hardy race of men, chiefly Spaniards, remarkable for the coolness which they exhibit in the critical circumstances to which their mode of life frequently exposes them. The most important of these passes are the Col de Pertus commanded by the fortress of Bellegarde, through which runs the road from Perpignan to Barcelona, practicable at all seasons, and for vehicles of every kind; the Col de la Perche, commanded by the fortress of Mont Louis, communicating between French and Spanish Cerdagne; the Port de Salo, through which runs the road from Toulouse and St. Girons to Lerida; the Port de Viella, by which communication is kept up between the valley of Arran and the rest of Spain; the Port de Canfranc, through which runs the road from Oléron by the valley of Aspe to Jaca; the Port of Orisson and the Port of Roncevaux, through which runs the road from St. Jean-Pied-de-Port to Monreal; and the Port de Maya, communicating between Bayonne and Pampeluna. Several of these are not given in our list. The main road from Paris, Bordeaux, and Bayonne to Madrid is near the sea, at the western extremity of the chain.

Towns and other inhabited places.	Feet.
Céret (town), Pyrénées Orientales	317
Arles (town), do.	899
Montferet (village), do.	539
Mont Louis (town), do. . C. A	[illegible]

Towns and other inhabited places.		Feet.
Sue (village), Arriège		3084
Sem (village), do.		3116
Foix (town), do.		1216
Tarascon (town), do.		1501
St. Paul de Jarrat, or Jorat (village), Arriège		1418
Massat (town), Arriège		1919
St. Girons (town), do.		1336
Angoumer (village), do.		1469
Le Maz d'Azil (town), do.		855
Sainte Croix (village), do.		798
Viella, chief town in the valley of Arran, in Catalonia		2863
St. Beat (town), in the valley of the Garonne, Haute Garonne		1748
Bagnères de Luchon (town), Haute Garonne		1989
	M. B.	2013
Hospital of Bagnères de Luchon, do.		4408
Cabin at the Plain des Estangs at the foot of Maladetta, valley of Arran in Catalonia		5839
Hospital of Venasque, Aragon		5542
Village of Venasque, do.	M. B.	3829
St. Lary (village), Hautes Pyrénées		2533
Plan d'Arragnouet (village), do.		4332
Hospital of Plan, Aragon		4864
St. Juan, chief town of the valley of Gistain, Aragon		3629
Bielsa (town), Aragon		3255
Notre Dame de Pinède, nearest habitation to Mont Perdu, Aragon		4224
Notre Dame de Héas, Hautes Pyrénées		4687
Hospital of Boucharo, Aragon		4693
Gavarnie (village), Hautes Pyrénées		4855
Gedre (village), do.		3458
Baths of St. Sauveur do.		2502
Lus, or Luz (town), do.		2400
Barèges (town), do.		4167
	M. B.	4236
Pierrefittes (village), do.		1647
Cauteretz (town), do.	M. B.	3184
Argelez (town), do.		1526
Lourde (town), do.		1336
Tarbes (town), do.		950
	M. B.	990
Bagnères de Bigorre (town), do.	M. B.	1820

The chief authority for the above tables is Mr. Erskine Murray. A few are taken from Malte-Brun (M.B.), and the 'Companion to the Almanack (C.A.) for 1833.' The elevations in the latter are taken from Reboul and Vidal, Charpentier, Bory de St. Vincent, and others. The heights in Malte-Brun are given in mètres, here reduced to English measure, at the rate of 1 mètre = 3·279 feet, or 1 foot = ·305 mètre. Mr. Murray's table we have ascertained to be reduced from that of Charpentier at the rate of 6 feet 4 inches to the toise.

Our chief authority for this sketch of the Pyrenees has been the account of that mountain-range translated from Charpentier's *Essai sur la Constitution Géognostique des Pyrénées*, and subjoined to the Hon. James Erskine Murray's *Summer in the Pyrenees*, 2 vols. 8vo., 2nd edit., London, 1837; compared with Malte-Brun, Balbi, and the *Dictionnaire Géographique Universel*, Paris, 1831.

PYRE'NE'ES, BASSES, a department in the south of France, bounded on the north by the department of Landes, on the north-east by that of Gers, on the east by that of Hautes Pyrénées, on the south and south-west by the provinces of Navarre and Guipuzcoa in Spain (from which it is separated by the Pyrenees), and on the north-west by the Bay of Biscay. Its form is tolerably compact: the greatest length is from east to west, from the village of Montaner near Vic Bigorre (in Hautes Pyrénées) to the mouth of the Bidassoa (which separates France and Spain), 88 miles: the greatest breadth is from north to south, near the eastern side of the department, from near the town of Garlin to the crests of the Pyrenees, near the source of the Gave d'Azun, which flows into the Gave de Pau, about 54 miles. The area is estimated at 2901 square miles, being considerably above the average area of the French departments, and about equal to the conjoint areas of the three English counties of Gloucester, Worcester, and Warwick. The population in 1831 was 428,401; in 1836 it was 446,398: showing an increase in five years of 17,997, or more than 4 per cent., and giving 154 inhabitants to a square mile. In amount of population it is considerably above the average of the French departments; but in density of population it is somewhat below the average; and is, in both respects, surpassed by the united English counties with which we have compared it, in the proportion of two to one. Pau, the chief town, is on the right bank of the Gave de Pau, about 402 miles in a straight line south-south-west from Paris, or 497 miles by the road through Orléans, Vierzon, Châteauroux, Limoges, Périgueux, Bordeaux, Langon, Bazas, Roquefort, and Aire; in 43° 17′ N. lat. and 0° 23 E. longitude. [PAU.]

The southern border of the department is formed by the Pyrenees. The lateral branches of these mountains run from south to north, gradually subsiding into the plain which is watered by the Adour and its tributaries. The elevation of this part, the western extremity, of the Pyrenean range, is, as the name of the department indicates, lower than the central parts. Scarcely any of the summits exceed 9000 feet: we are not aware of more than three; the Som de Soube, on the principal ridge, between the valleys of Azun and Ossau; the Pic-du-Midi of Ossau or Ossan, at the source of the Gave d'Ossau, both in the south eastern corner of the department; and the Pic d'Aule, in the same neighbourhood. [PYRENEES.] The Pic d'Anie, on the principal ridge of the Pyrenees, between the sources of the Gave d'Aspe and the Seison or Soisson, has an elevation of 8398 feet: the mountain of Orhi or Hory, on the same ridge farther westward, has an elevation of about 6530 feet: Mendibelsa, in the canton of St. Jean-Pied-de-Port, has an elevation of 3734 feet: Abady, at the source of the Nive, of 4790 feet; and Hausa, between the valley of Baigorry in the south-western part of the department, and the valley of Bastan in Spain, of 4224 feet. The chief passages across this mountain-frontier are the main road from Paris by Bordeaux and Bayonne to Madrid, which crosses the boundary at the western foot of the mountains near the sea; the Port de Maya, between Bayonne and Pampeluna, capital of Navarre; the Port de Roncevaux, or Roncesvalles, between St. Jean-Pied-de-Port and Monreal and Pampeluna; and the Port de Canfranc, between Oléron and Jaca. [PYRENEES.]

The Pyrenees consist of primitive rocks (especially granite mingled with gneiss), which occupy however but a small space in this department. The transition rocks (grauwacké, grauwacké slate, clay-slate, and transition limestone) form the principal component part of the mountains, skirting the nucleus of primitive rocks by which they are supported. The secondary formations, especially the new red-sandstone or red-marl formation, and the Alpine limestone which overlies it, form the predominant rocks; the former is observed in the higher part of the mountains, where it usually exceeds the transition rocks in elevation; the latter appears in the lower slopes and at the base of the mountains, extending northward in several parts to the banks of the Adour and the Gave de Pau. The immediate vicinity of these rivers, and the north-eastern part of the department, which extends across the Gave de Pau, are occupied by the tertiary formations. Masses of secondary trap rocks are found in the lower part of the valleys of Baigorry, Cize, and Laurhibare, watered by the branches of the Nive; in that of Soule; in those of Baretons, Aspe, and Ossau, watered by the tributaries of the Gave d'Oleron; and in the valley of Asson, watered by a feeder of the Gave de Pau. The formations of the cretaceous group are found on the flanks of the Pyrenees, but so altered in their mineralogical character by their vicinity to the granite, that it requires a careful examination of their characteristic fossils to distinguish them, and most writers have omitted to notice their occurrence.

The mineral wealth of the department is not considerable. There were formerly celebrated copper-mines in the transition formations of the valley of Baigorry. It has been said that mines were worked in this valley by the Romans, at any rate they were successfully worked for a considerable time in the middle ages. After having been given up, the working of them was resumed about the middle of the last century; but after occasioning immense loss to the proprietors and to the companies which successively undertook to work them, they were again abandoned. Iron-ore is obtained in the same valley. There were in the department, in 1834, six establishments for the manufacture of iron, comprehending three furnaces for making pig-iron, and eleven forges for the production of wrought-iron. The fuel employed in three establishments was charcoal alone; in the rest charcoal with other fuel. The mountains afford granite, freestone, and slate, in which some quarries are worked. There are several mineral springs.

The department belongs altogether to the basin of the Adour. The general slope of the soil is to the north-west. A number of rapid mountain-streams flow down from the Pyrenees and fall into the Adour, which has the lower part of its course on the border of the department. Of these streams the Louet, the Larcis, the Lees, and the Gros Lees (which two unite their streams), the Gabas, the Louts, the Luy de France, and the Luy de Béarn (which two also unite), flow through the north-eastern part of the department into one or the other of the adjacent departments of Hautes Pyrénées, Gers, or Landes, and afterwards unite with the Adour. The Gave de Pau, which rises in the department of Hautes Pyrénées, and the Gave d'Oleron (which is formed by the junction of the Gave d'Ossau or Osson, and the Gave d'Aspe), flow through the centre of the department from south-east to north-west, uniting their waters in the adjacent department of Landes and falling into the Adour. The Gave de Pau receives the Baise and the Luzon on its left bank; the Gave d'Oleron receives the Salies on the right, and the Vert and the Seison or Soisson on the left bank. The Bidouze, the Joyeuse, and the Nive flow into the Adour, having the whole of their course in the department or upon its border: the Bidouze receives the Hihouri on its left bank, and the Nive receives the Airi and the Hourepeleco, also on its left bank. The Nivelle and the Bidassoa fall into the Bay of Biscay, but the latter only touches the border of the department (which it separates from Spain), and that but for a short distance.

The navigable rivers of the department are thus given in the 'Statisque de la France:'—Adour, 15 miles; Bidouze, 12 miles; Laran, 9 miles; Ardanabia, 6 miles; Nive, 12 miles; Nivelle, 6 miles; Bidassoa, 4 miles—total, 64 miles.

Two of the rivers mentioned in this return, the Laran and the Ardanabia, are not laid down in the maps, nor mentioned in the other authorities which we have consulted; unless, which is very likely, they are designated by some other name. There are no navigable canals in the department. There are some small lakes in the Pyrenees, in the south-eastern corner of the department, and some marshes in the neighbourhood of Pau and Lescar.

There are six *routes royales*, or government roads, having an aggregate length of 261 miles; of which (on January 1, 1837) 227 miles were in good repair, 15 miles out of repair, and 19 unfinished. The principal road is that from Paris to Madrid, which crosses the Adour and enters the department at Bayonne, and runs through St. Jean-de-Luz to the bank of the Bidassoa opposite Irun, where it enters Spain. Roads run from Bayonne—one through the Port de Maya into Spain, and one by the valley of the Adour and the Gave de Pau to Orthès and Pau. The road from Paris to Pau branches off from the road from Paris to Bayonne at Roquefort, in the department of Landes, and enters the department near Garlin. The road from Paris to Orthès, St. Jean Pied-de-Port, and thence by the Port de Roncevaux, or Roncesvalles, into Spain, branches off from the road from Paris to Madrid, at Mont de Marsan, in the department of Landes, and enters this department at Sault de Nouailles. Roads run from Pau, one to Tarbes (in the department of Hautes Pyrénées), and one to Oléron, and from thence by the Port de Canfranc to Jaca in Spain. The departmental roads have an aggregate length of 417 miles, of which (January 1, 1837) 263 were in good repair, 59 out of repair, and 95 unfinished. The aggregate length of the bye-roads and paths is above 6000 miles.

The climate is healthy and mild, and the soil in the lower grounds is tolerably productive. There is however much waste land. The area of the department may be estimated in round numbers at 2,000,000 of acres, of which nearly 400,000 acres (or about one-fifth) are under the plough. The principal grain crops are wheat, rye, barley, oats, millet, and maize: the produce in wheat is by no means equal to the consumption of the department; maize is much used as an article of food. Very fine flax is also grown. There are about 160,000 acres of grass-land, besides nearly 500,000 acres of heath or other open pasture-ground, a large portion of it on the slopes and in the valleys of the Pyrenees. The quantity of cattle is very great, also of pigs, from which the Bayonne hams are made. The breed of horses is considered good; and mules are bred for the Spanish market. The vineyards occupy nearly 60,000 acres; the red wines of Jurançon and Gan are in the highest repute of any grown in the department; the brandy of Hendaye, on the Bidassoa, is also esteemed. There are above 320,000 acres of woodland: the forests are in a great degree composed of the fir, the pine, and the oak that produces the gall-nut: they supply excellent timber for house and ship building, and for the masts of vessels. About 16,000 acres are laid out in orchards and gardens. The mulberry is cultivated for the rearing of silkworms: the walnuts are excellent.

The department is divided into five arrondissements, as follows:—

Name.	Situation.	Area. sq. miles.	Communes	Population in 1831.	1836.
Pau	N.E.	601	204	117,865	122,404
Oléron	S.E.	712	81	74,552	76,312
Orthès	N.	454	152	84,689	87,459
Bayonne	W.	411	53	78,411	84,519
Mauléon	S	723	140	72,884	75,704
		2901	630	428,401	446,398

There are forty cantons or districts, each under the jurisdiction of a justice of the peace.

In the arrondissement of Pau are—Pau (pop. in 1831, 10,597 town, 11,285 whole commune; in 1836, 12,607 for commune) [Pau], Nay or Nai (pop. 3127 town, 3290 whole commune), and Lescar, all on the Gave de Pau; Gan (pop 3027), on the Nées, a small stream which joins the Gave de Pau on the left bank below Pau; Morlaas, between the Luy de France and the Luy de Béarn; Garlin, near the Gros Lees; and Lembeye and Concher, near the Lees. Nay is on the left bank of the Gave, and is a tolerably well built town; the inhabitants manufacture druggets, hosiery, blankets, and other woollens; and carry on trade in linens and in Béarnais handkerchiefs: there are two fairs in the year. Abbadie, a Protestant divine of some note, was born at Nay. The castle of Goaraze or Gouraze, where Henri IV. was brought up, is in the neighbourhood of this town. Lescar is on a hill; it was built in the tenth century, by Guillaume Sanche, duke of Gascogne, and suffered much in the civil wars of the sixteenth century. It was the seat of a bishopric previous to the Revolution, and had a college under the direction of the Barnabites. The present population may be estimated at about 2000. Gan is in the midst of vineyards, which produce good red wine and some white wine. There are some mineral springs near the town, of which no use is made. Morlaas was antiently the capital of Béarn, and had a mint. The townsmen, who amount to more than 1500, carry on some trade in wine.

In the arrondissement of Oléron are—Oléron (pop. in 1831, 5850 town, 6458 whole commune; in 1836, 6620 commune), and Sainte Marie (pop. in 1831, 2718 town, 3371 whole commune), adjacent to each other at the junction of the Gave d'Aspe and the Gave d'Ossau, whose united streams form the Gave d'Oléron [Oleron]; Laruns and Arudy (pop. 1554 town, 1863 whole commune), on the Gave d'Ossau or Osson; Monein (pop. 5028 whole commune), on the Luzon; and Luc, between the Luzon and the Gave d'Oléron. Laruns is frequented by the persons who resort to the waters of Les Eaux Chaudes and Les Eaux Bonnes, which are in the neighbourhood. The waters of Les Eaux Bonnes are furnished by three sources; they acquired great reputation in the sixteenth century from their efficacy in curing some Béarnais soldiers wounded in the battle of Pavia, who called them 'Les Eaux des Arquebusades.' They have since been in repute for their efficacy in pulmonary complaints, and are among the most frequented mineral springs of the Pyrenees. The springs of Lex Eaux Chaudes are five in number: they are recommended in asthmatic complaints, paralysis, and rheumatism. Some trade in wine is carried on at Monein. Luc is a well built place in a pleasant situation, with a population of from 2000 to 3000.

In the arrondissement of Orthès are—Orthès (pop. in 1831, 5195 town, 7121 whole commune; in 1836, 7857 commune) [Orthes], and Lagor, on or near the Gave de Pau; Navarreins, Sauveterre, and Salies (pop. 4730 town, 8420 whole commune), on or near the Gave d'Oléron; La Bastide de Béarn, near the Seison; Morlane, on the Luy de Béarn; Arthès, between the Gave de Pau and the Luy de Béarn; and Arzacq, near the Louts. Navarreins is a fortress of little strength; it was founded by Henri of Albret (maternal grandfather to Henri IV.) in 1569, and resisted an attack of the Catholic army in the religious wars of that century. It is built with tolerable regularity, with broad and straight streets, and is in a fertile plain on the right bank of the Gave d'Oléron, over which there is a stone bridge at the junction of two brooks. There are barracks and a prison. Some weaving is carried on by the townsmen, who scarcely amount to 1500. Salies owes its prosperity to two brine-springs, from which a very white salt is made, and to the hams cured in and about the town, which are exported under the name of Bayonne hams.

In the arrondissement of Bayonne are—Bayonne (pop. in 1831, 13,008 town, 14,773 whole commune; in 1836, 15,912), on the left bank of the Adour, a short distance above its mouth [Bayonne]; Bidache and Guiche, on the Bidouze; La Bastide de Clairence [Bastide, La] and Hasparren (pop. 5357), on or near the Joyeuse; Espelette, on a brook flowing into the Nive; and St. Jean-de-Luz (pop. 2056 town, 2860 whole commune), on the sea at the mouth of the Nivelle. Bidache has a population of from 2000 to 2500: freestone is quarried in the neighbourhood. Hasparren is a busy place, with many tan-yards and currying-shops, the leather made in which is exported to Spain. There is also a considerable trade carried on in cattle both at Hasparren and at Espelette. St. Jean-de-Luz is united by a bridge over the Nivelle, more remarkable for length than for beauty, with the little town or village of Sibourre, the population of which is about 1500 or 2000. St. Jean-de-Luz was formerly a place of considerable trade: in the time of Louis XIV., who was married here to Maria Theresa, Infanta of Spain, it is said to have contained a population of 14,000. It was one of the ports which carried on commerce with the French colonies in America. At present it is much decayed. The harbour is formed by the mouth of the Nivelle, which is tolerably wide, and up which the tide flows. The banks of the river are lined with quays, and the entrance is protected by a pier or breakwater. The inhabitants are chiefly seamen, engaged in the cod or pilchard fishery, or in carrying on some trade with Spain: they are said to speak the Basque tongue with greater purity than any of their neighbours. There is a free-school for teaching navigation. In the neighbourhood of the town some severe fighting took place between the French and Spaniards in 1793, and between the French and the allies under Lord Wellington in 1813-14. At the village of Cambo, on the Nive, are some mineral waters. The bath-rooms, which are of modern erection, are of simple and elegant architecture.

In the arrondissement of Mauléon are—Mauléon (pop. in 1836, 1259 commune) and Licharre, on or near the Seison (which is sometimes called the Gave de Mauléon); Ostabat, St. Palais, and Garris, on or near the Bidouze; and St. Jean-Pied-de-Port, on the Nive. Mauléon was antiently the capital of the valley or district of Soule, and is said to have been the first settlement of the Vascons, or Gascons, on the north side of the Pyrenees. The town is old and ill built, but in an agreeable situation: the population scarcely exceeds 1200. There are two yearly fairs. There are in the town a subordinate court of justice and a high school. St. Palais, a town of 1000 or 1200 inhabitants, is surrounded by an antient wall: it is situated in a fertile corn-district. It was formerly of more importance, and had a mint: it has now a subordinate court of justice. St. Jean-Pied-de-Port is situated, as its name implies, at the foot of one of the ports, or passes, of the Pyrenees: its situation renders it one of the keys of France on this side: its citadel, placed on an eminence, commands the entrance of three gorges, by which there is communication with Spain. The town is small, and has narrow streets, with a church and a prison. The inhabitants, who are about 2000 or 2500 in number, make leather, and carry on trade in wool: there are two cattle-fairs. This town was founded in the eighth century, and was the capital of Basse (Lower) Navarre: it was finally ceded to France by the treaty of the Pyrenees. The village of St. Etienne de Baigorry (pop. 1599 village, 3463 whole commune), was formerly the seat of mining operations of considerable importance: it is in the valley of Baigorry. [Baigorry.]

The population, when exactly given, is, unless otherwise described, that of the whole commune, and from the census of 1831.

The department constitutes the diocese of Bayonne, the bishop of which is a suffragan of the archbishop of Auch: it is in the jurisdiction of the Cour Royale and the circuit of the Académie Universitaire of Pau: it is included in the eleventh military division, the head-quarters of which are at Bordeaux: and it sends five members to the Chamber of Deputies. In respect of education, it is above the average of France. Of the young men enrolled in the military census of 1828-29, forty-seven in every one hundred could read and write, the average of France being thirty-nine in every one hundred.

This department was antiently included in the territories of the Tarbelli, who occupied the coast; of the Sibyllates, who are considered to have occupied the valley or district of Soule; of the Osquidates Montani, who probably occupied the valley of Ossau; of the Monesi, whose name may be traced in the town of Monein; and of some other Aquitanian nations, the names of which are not known. In the Roman division of Gaul, it was included in the province of Novempopulana, a subdivision of Aquitania. There were several Roman towns or posts within its limits. Lapurdum, mentioned in the 'Notitia' as a military post, and which has left a trace of its name in the province of Labour, was at or near Bayonne. Carasa and Imus Pyrenaeus (the foot of the Pyrenees), mentioned in the 'Antonine Itinerary,' in the route between Aquae Tarbellicae (Dax) and Pompelo (Pampeluna), were probably at or near Garris and St. Jean-Pied-de-Port respectively: while the Summus Pyrenaeus, which the Itinerary places in the same route, nearer Pompelo, corresponds to the Port de Roncevaux, or Roncesvalles. The Iluro of Antoninus may be easily recognised in Oléron: Aspaluca was probably at the village of Acous, in the valley of Aspe; and Forum Ligneum (the wood-mart) was probably at Urdos, higher up the same valley. These two places are mentioned in the route between Iluro and Caesaraugusta (Saragossa) in Spain; the Summus Pyrenaeus of this route was probably the Port de Bernère, between the valleys of Aspe and Aragues. The Beneharnum of Antoninus, which gave name to the province of Béarn, appears to have been between Orthès and Lescar, and the Oppidum Novum of the same writer at Nay

In the centuries which immediately succeeded the downfal of the Roman empire, the Visigoths, the Franks, the Gascons, and the Saracens at different times occupied this country. It was subsequently included in the empire of Charlemagne; and in the middle ages a large part of it was comprehended in the viscounty of Béarn, which was possessed by the kings of Navarre, and united to the French crown on the accession of Henri IV. [Bearn.] The parts not included in Béarn were:—the Pays de Labour, capital Bayonne; Basse (or Lower) Navarre, capital St. Jean-Pied-de-Port; and the Pays de Soule, or Vallée de Soule, capital Mauléon, all comprehended under the general title of Pays des Basques [Basques, Pays des], and all included in the military government of Guyenne and Gascogne. [Guyenne.] Béarn, though properly a part of Gascogne, formed a separate military government.

PYRE'NE'ES, HAUTES, a department in the south of France, bounded on the north by the department of Gers, on the east by that of Haute Garonne, on the south by Spain (from which it is separated by the crests of the Pyrenees), and on the west by the department of Basses Pyrénées. The form of the department approaches to that of a quadrangle, the diagonals of which are its longest dimensions. It length from north-west to south-east, from the neighbourhood of Castelnau de Rivière Basse to the source of the little river Pique at the Port de Picade, at the head of the valley of Luchon, is 75 miles; and from north-east to south-west, from the banks of the Gimone opposite Boulogne, to the source of the Gave d'Azun, 57 miles. The area is estimated at 1825 square miles, being much below the average area of the French departments, and rather less than that of the English county of Northumberland. The population, in 1831, was 233,031; in 1836 it was 244,170: showing an increase in five years, of 11,139, or nearly five per cent., and giving nearly 134 inhabitants to a square mile. In amount of population it is very far below the average of the French departments; in density of population also it is considerably below the average, but exceeds, both in amount and density, the English county with which we have compared it. Tarbes, the capital, is 400 miles in a direct line south by west of Paris, or 533 miles by the road through Orléans, Châteauroux, Limoges, Cahors, Montauban, Toulouse, and Auch; in 43° 14′ N. lat. 0° 4 E. long. [Tarbes.]

The surface of the department is very mountainous; the principal ridge of the Pyrenees forms the southern boundary, and the branches from that ridge traverse the department in a northward direction, leaving scarcely any portion of it which can be considered as a plain. The principal of these lateral branches is that which separates the basin of the Garonne from that of the Adour, and which extends through this department into the adjacent department of Gers. That part of the principal ridge which is upon or within the boundary of the department includes some of the loftiest summits of the whole range. Mont Maudit, or Maladetta, and Mont Perdu, lie indeed without the boundary, the first some distance to the south-east, and the second a little to the south; both belong to Spain; but the summits Batoa or Biedous, Arré (Upper and Lower), Baroudes, Pic de la Cascade, Les Tours de Marboré, Le Pimené, Le Taillon, Troumouse, Aiguillon, Campbiel, Pic Long Neouvielle, Arbizon, Pic-du-Midi de Bigorre, Viguemale, or Vignemale, Badescure, Arrieu Grand, all of them exceeding 9000, some exceeding 10,000, and one or two rising to more than 11,000 feet, belong to this department; besides a number of other peaks of considerable height. The ports or passes of Clarabide, Lapez, Plan, Viel or Vieux, Pinède or Estaubé, Gavarnie or Boucharo, Campbiel; the Brèche de Roland, and the Brèche de Tuque Rouye; the Col de Pimené (otherwise Brèche d'Allans), and the Cols of Tourmalet, Lavasse, or l'Avase, and Loubie, also belong to this department. [PYRENEES.] None of the passes are much frequented; perhaps the most so is that of Gavarnie or Boucharo, through which passes the road from Tarbes to Ainsa and Jaca in Spain. Through the Port de Penticouse runs another road from Tarbes by the valley of Cauterez to Jaca, and through the Port de Bielsa, a road from Auch by Arreau to Ainsa in Spain. The glaciers of the Brèche de Roland, Vignemale, and Neouvielle belong to this department.

The principal valleys of the department of Hautes Pyrenees are the valley of Barillos, the valley of Louron, the valley of Aure, into which open the valleys of Rioumajou and Couplan, the valley of Campan, into which opens the valley of Oussouet; and the great valley of Lavedan or Baréges, the upper part of which is sometimes called the valley of Gavarnie or of Gédre, and into which open the valleys of Ossonne, Estaubé, Héas, Poeyasbé, Campbiel, Pragnères, Bastan, Cauterez, Bun, Azun, Estreme de Sales, and Castel-Loubon. We have enumerated the principal valleys in the order in which they occur from east to west; the subordinate valleys, in the order in which they open into the principal ones, commencing at the head of the principal valley on the Spanish frontier. The valleys of Barillos and Campan are a considerable distance northward from the main ridge.

Some of the loftiest mountains of the Pyrenees, as those east of the Port de Clarabide, Vignemale, and Neouvielle, with their respective surrounding peaks, are composed of granitic rocks, which rocks are also found in the upper part of the valley of Lavedan, between Gédre and Gavarnie, in the valley of Héas, in the upper part of the valley of Aure, near the village of Plan, and in detached portions in one or two other places. The Pic-du-Midi of Bigorre, and the surrounding district, extending eastward to Arreau in the valley of the Neste, and westward to Cauteres, or Cauterez, in the valley of Cauterez, are occupied by mica-slate. The greater part of the Pyrenees are however composed of transition rocks, namely, clay-slate and grauwacke, in the neighbourhood of the primitive formations, and limestone toward the foot of the chain and the plains at its base. The red sandstone, or red-marl formation, is found in one or two places, chiefly on the east side of the department. A district extending eastward from the neighbourhood of Bagnères de Bigorre, into the department of Haute Garonne, and having no great extent from north to south, is occupied by the Alpine limestone; and small detached masses of secondary trap rocks are found both in the transition and Alpine limestone districts. The rest of the department, north of a line drawn from west to east, from near St. Pé, passing between Tarbes and Bagnères de Bigorre to Barthe de Neste, is occupied by the tertiary formations.

The mineral produce of the department is not great. Some beautiful varieties of marble are quarried in the valley of Campan. There were in the department, in 1834, two establishments containing three forges for making wrought-iron. Charcoal was the fuel employed.

The department belongs partly to the basin of the Adour, and partly to that of the Garonne. The Adour rises at the upper end of the valley of Campan, through which it flows in a northward direction, passing Campan and Bagnères de Bigorre: it afterwards passes Tarbes and Maubourguet, a few miles below which it quits this department to enter that of Gers. The Lechez, which receives the Soui, and the Louet, join the Adour on the left bank; the Estreux and the Arros, which last receives the Boues, join it on the right. The Arros and Boues belong partly to the department of Gers; the Louet partly to that of Basses Pyrénées. The upper part of the course of the Gave de Pau [PYRENEES, BASSES] belongs to this department: it waters the valley of Lavedan: the Gave d'Azun and the Gave de Bun, which water the valleys of Azun and Bun, and the Gaub and the Lantour, which water the valley of Cauterez, flow directly or ultimately into the Gave de Pau. The principal feeders of the Garonne which belong to this department are the Baise, the Gers, and the Neste. The two former rise in the eastern part of the department, and flow northward into the department of Gers, the Gers being the more easterly of the two. The Baisole and the Baise-devant, which run parallel to the Baise, and ultimately unite with it, have their springs and their courses between the Baise and the Gers. The Baise, before the junction of the Baise-devant, is sometimes distinguished as the Baise-derrière. The Neste rises in the south-eastern corner of the department and flows northward to La Barthe de Neste, where it turns eastward and flows into the department of Haute Garonne: at Arreau it receives on its left bank the little river Sceaux. The Neste above Arreau is sometimes distinguished as the Neste de Louron, and the Sceaux as the Neste d'Aure. They water respectively the valleys of Louron and Aure. The Lourse is a small feeder of the Garonne, into which it flows a short distance above the Neste. The Garonne itself has a small part of its course on the eastern border of the department, near the town of St. Bertrand in the department of Haute Garonne.

There are no navigable streams or navigable canals in the department. The Garonne is used in this part of its course for floating the fir timber cut in the mountains near it. There are numerous lakes in the Pyrenees, but none of them large. The lake of the Port d'Oo, in the south-eastern corner of the department, is perpetually covered with ice: the lakes of Estom Soubiran, in the valley of Cauterez, are covered with ice till the end of August. The Lac de Gaube, at the head of the valley of Cauterez, abounds with trout. Waterfalls are frequent in the mountains; the most remarkable is the fall of the Gave de Pau at Gavarnie, near its source. It is in an amphitheatre at the head of the valley of Gavarnie, surrounded with walls of rock, which rise to the height of above 1500 feet perpendicular. A circle of torrents shoot from these stupendous heights; some, dashing upon the projecting precipices, are split into slender jets, which a passing gust of wind converts into a shower; others, of greater volume and force, shoot from the platform and descend unbroken. The fall of the Adour is the most magnificent of these, and surpasses every other cataract in Europe in height.

There are five government roads (routes royales) in this department; their aggregate length is 179 miles, of which (on the 1st of January, 1837) 154 miles were in good repair, 17 out of repair, and 8 unfinished. The principal road is that from Paris by Auch to Tarbes; continued onward from Tarbes by Lourdes, Argellez, and Lus to Baréges, and by Lus and the valley and port of Gavarnie into Spain. Another road from Tarbes to Baréges passes through Bagnères de Bigorre and Campan; and there are roads from Tarbes to Pau (Basses Pyrénées); from Tarbes by Vic Bigorre and Maubourguet to Aire (Landes) and thence to Bordeaux (Gironde); and from Tarbes by Tournay and Lannemezan to St. Gaudens (Haute Garonne) and other towns on the banks of the Garonne. A road from Auch passes along the valleys of the Gers and the Neste to Sarrancolin, Arreau, and Anzizan, and over the Port de Bielsa to Ainsa in Spain. The departmental roads have an aggregate length of 118 miles, of which (1st of January, 1837) 78 miles were in good repair, 32 miles out of repair, and 8 miles unfinished. The bye-roads and paths have an aggregate length of nearly 3000 miles.

The climate of the department varies with its elevation; from the lofty southern border to the lower grounds of the northern border the vegetation changes from that of the frigid to that of the temperate zone. The surface is

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estimated in round numbers at above 1,100,000 acres. Of this rather more than 230,000 acres are under the plough: the produce in grain is insufficient for the consumption of the department. Some flax is also grown. The meadows occupy about 110,000 acres, and the heaths and open pasture grounds, chiefly on the slopes of the Pyrenees, amount to about 430,000 acres; the lower slopes furnish the winter pasturage and the upper valleys the summer pasturage for the numerous flocks and herds belonging to the active and intelligent peasantry who inhabit the mountains. When the uplands are cleared from snow, the peasant drives his flock or herd up to them; he finds his summer abode in some cleft, or in a cabin previously erected, or, in want of this, builds himself a hut of rude stones. On the approach of winter he drives his cattle to the lower ground, and occupies the hut which has served as a summer habitation to his family, who now descend into the village. Round this hut the fodder which is to assist in sustaining his cattle in the winter is grown: and the skill shown by the peasantry in irrigating their meadows is considerable. The oxen are commonly poor, but some good butter is made. Horses are little used in agriculture, but very much for carrying produce: they are an ill-looking though active race. Mules are bred in considerable number for exportation to Spain, and several of them are fine animals.

The vineyards occupy nearly 40,000 acres: the best red wines are grown in or near the valley of the Louet, about Castelnau-de-Rivière-basse and Madiran. A considerable part of the wine produced in the department is converted into brandy. There are about 6000 or 6500 acres of orchard or garden ground; and the osier beds cover more than 4000 acres. The woods comprehend an area of 200,000 or 210,000 acres.

The department is divided into three arrondissements, as follows:—

Name.	Situation.	Area in sq. miles.	No. of Communes.	Population in 1831.	Population in 1836.
Tarbes .	N. .	505	197	104,022	110,542
Argelès .	S.W. .	518	100	39,785	40,582
Bagnères	E. .	730	195	89,224	93,046
		1753	492	232,031	244,170

There are twenty-six cantons, or districts, each under a justice of the peace.

In the arrondissement of Tarbes are—Tarbes (pop. in 1831, 9706; in 1836, 12,630) [Tarbes], and Maubourguet (pop. 1506 town, 1725 whole commune), on the Adour; Vic-Bigorre (pop. 3599 town, 3679 whole commune), on the Lechez; Ossun (pop. 3243) and Ibos, on the Soui; Castelnau-de-Rivière-basse and Madiran, on or near the Louet; Rabastens, on the Estreux; Tournay and St. Sever, on the Arros; Trie, on the Baise-derrière; and Gallan, on the Baise devant. Maubourguet has a parish church of great antiquity, built by the Templars; it is of singular architecture, the style being of a mixture of Gothic and Oriental. Vic-Bigorre has brandy-distilleries and tan-yards. The people of Ossun are distinguished from their neighbours by the singularity of their dress, language, and manners; they trade in hams. Castelnau-de-Rivière-basse is on a tolerably extensive eminence commanding the surrounding plain. It has a pretty good 'place,' or square, at one corner of which is the parish church. It has also a market-house. Rabastens was antiently fortified; it was taken and burned by the Roman Catholics under Montluc in the religious wars of the sixteenth century, and the townsmen massacred. The population is about 1500. There are several fairs in the year. Tournay is tolerably well built, with a very large 'place,' or square; but it is a very small town. It has several fairs. St. Sever, distinguished as St. Sever-de-Rustan, has the remains of the large and fine Benedictine Abbey of St. Sever, to which the town owes its name. Trie is tolerably built, and has a large square surrounded with a wooden arcade or piazza. The church is remarkable for its solid architecture and the loftiness of its spire; and there is a bridge over the Baise-derrière, of one arch, very lofty in order to give free passage to the floods to which that river is subject. Gallan, or Galan, is agreeably situated, and has a very antient parish church. It has four yearly fairs for cattle, mules, and corn.

In the arrondissement of Argelès are—Argellès, or Argellez (pop. in 1836, 1420 for the commune), Lourdes (pop. 3161 town, 3818 whole commune), St. Pé (pop. 1983 town, 2754 whole commune), and Lus, or Luz (pop. 1934 town, 2357 whole commune), on the Gave de Pau; Cauterez, on a feeder of the same river, in the valley of Cauterez; and Barèges, on another feeder not far from Lus. Argelès is situated in a delightful valley, abounding in fruits of every description; it has a high school, and a church of very massive architecture. Lourdes is built at the foot and on the side of a hill, the summit of which is occupied by the remains of an antient castle, now used for a prison. The fortifications of the castle were improved by Edward the Black Prince when duke of Aquitaine; and it was long and gallantly defended by the partisans of the English, until the entire expulsion of the latter from this part of France. Lourdes has an hospital; and the court of justice for the arrondissement has its seat here. There are several tan-yards; linens are manufactured, and there are four yearly fairs for corn, horses, and mules. Marble and slate are quarried in the neighbourhood. There are some remains of Roman architecture at Lourdes. St. Pé is surrounded by mountains and forests. It is a curious old town. The inhabitants manufacture linens, handkerchiefs, combs, nails, and tools. Lus, or Luz, has narrow streets and old houses. The church, built by the Templars, appears to have been designed for the purpose of defence it is surrounded by a high wall provided with embrasures. The townsmen manufacture a fabric of silk and wool mingled. About half a mile from Luz, in a picturesque situation, are the baths of St. Sauveur, resorted to by a considerable number of visitors. In the neighbourhood are the ruins of the castle of St. Marie. Cauterez is built in a valley in the neighbourhood of some of the highest mountains and some of the finest scenery of the Pyrenees. It is a fashionable watering-place. The baths are higher up the valley, at some distance from the town; they are adorned with Grecian porticos, esplanades, and terraces. Those persons who cannot walk from the town to the baths are carried in a kind of chair or palanquin by porters. Barrège has been described elsewhere. [Barrege.]

In the arrondissement of Bagnères are—Bagnères de Bigorre (population in 1831, 5633 town, 7586 whole commune; in 1836, 8108 commune) [Bagneres de Bigorre], and Campan (population 3015 town, 4171 whole commune) [Campan], on the Adour; Ansizan, Arreau, and Sarrancolin, on the Neste; Lannemezan, on the Baise-devant; and Monléon and Castelnau de Magnoac, on or near the Gers. Arreau is a very old town; the inhabitants (who are about 1300 to 1500) manufacture the coarse woollens worn by the surrounding peasantry, and woollen hose. Sarrancolin, another old town, has a church built by the Templars. Paper is made in the town, and marble is quarried in the neighbourhood. Lannemezan is a dull place; it has however several considerable cattle-fairs. Monléon is pleasantly situated. At Castelnau de Magnoac considerable trade is carried on; wax is bleached, and wax candles and woollen stuffs manufactured.

The population given above, when given exactly, is (unless otherwise described) that of the commune, and from the census of 1831. When given approximately, it is from returns of an older date.

The department constitutes the diocese of Tarbes, the bishop of which is a suffragan of the archbishop of Auch. It is included in the jurisdiction of the Cour Royale of Pau, and in the circuit of the Académie Universitaire of the same city: it is in the tenth military division, the head-quarters of which are at Toulouse; and it sends three members to the Chamber of Deputies. In respect of education, it is considerably above the average of the French departments. Of the young men who were enrolled in the military census of 1828-29, 53 in every hundred could read and write; the average of France being 39 in every hundred.

This department was antiently comprehended in the territories of the Bigerrones, the Convenæ, the Ausci, the Camponi, the Onobusates, the Tornates, and other Aquitanian nations. The Bigerrones occupied the western, the Convenæ the eastern, and the Ausci the northern part. The Camponi probably occupied the valley of Campan: the Onobusates probably the district of Nébouzan in this department and in that of Haute Garonne. On the subjugation of Gaul, these nations were included in the Roman province of Aquitania, and on its subdivision, in that of Novempopulana. There were several Roman towns or posts within the limits of the department. Turba, now Tarbes, is mentioned in the 'Notitia,' with the description 'ubi Castrum Bigorra.' Gregory of Tours calls it Civitas Bigorra, and it was the capital of the Bigerri or Bigerrones, who have left their name to the province of Bigorre. A place called Aquæ or Aquensis Vicus is shown, by some Roman inscriptions found there, to have been at Bagnères de Bigorre. Tournay, to judge by its name, was probably the capital of the little tribe or nation of the Tornates. Aquæ Convenarum, mentioned by Antoninus, was probably Cap-bern or Capvern, near Lannemezan, where there are still some tolerably frequented mineral springs. Belsinum, also mentioned by Antoninus, may probably be fixed in the neighbourhood of Castelnau de Magnoac, close upon if not within the boundary of the department.

At a subsequent period, these territories were contested by the Visigoths, Franks, Saracens, and Gascons. In the middle ages, the western side, except just the north-western extremity, constituted the county of Bigorre [BIGORRE], subdivided into 'La Plaine,' the district north and west of Tarbes; Le Rustan, about St. Sever; and Les Montagnes, including the valleys of Lavedan, Campan, Barrège, and Azun. The rest of the department, except the valleys of Louron and Oeil in the south-eastern corner, which belonged to the district of Comminges [COMMINGES], was included in Armagnac [ARMAGNAC]. Of this part the north-western extremity, about Castelnau de Rivière-basse, constituted the district of Rivière-basse, in Basse or Noir (Lower or Black) Armagnac: the remainder was divided between the county of Astarac, Les Quatre Vallées or the Four Valleys (of Magnoac, Neste, Aure, and Barousse), and Le Nebouzan, all in Haut or Blanc (Upper or White) Armagnac. These districts were comprehended in the province of Gascogne. [GUYENNE AND GASCOGNE.] Bigorre was included in the duchy of Aquitaine or Guienne, as established by the treaty of Bretigny (A.D. 1360), and its strongholds were held by the English for several years. It afterwards came to the kings of Navarre, and, on the accession of Henri IV., was united to the crown of France.

PYRE'NE'ES ORIENTALES, a department of France, situated, as its name implies, at the eatsern extremity of the Pyrenees. It is bounded on the north by the department of Aude, on the north-west by that of Arriège, on the west and south by the province of Catalonia in Spain (from which it is for the most part separated by the Pyrenees), and on the east by the Mediterranean. Its form approximates to that of a wedge or triangle, having its sides respectively facing the north-north-west and the south; the shore of the Mediterranean representing the back or base, and the upper extremity of the valley of Carrol the point: the side toward the north-north-west is about seventy miles long, the side towards the south seventy-five miles; the length of the back or base is little more than twenty-nine miles. The area is estimated at 1594 square miles, about two-thirds of the average area of the French departments; rather greater than the area of the English county of Kent, but rather less than that of Hampshire. The population, in 1831, was 157,052; in 1836, it as 164,325, showing an increase in five years of 7273, or more than 4·5 per cent.; and giving 103 inhabitants to a square mile. Both in amount and density of population it is far below the average of France; in amount little more than two-fifths, and in density less than two-thirds of the average. Its population is about half that of Hampshire, and one-third that of Kent. Perpignan, the capital, is 425 miles in a straight line south of Paris, or 569 miles by the road through Orléans, Limoges, Cahors, Montauban, Toulouse, Carcassonne, and Narbonne; in 42° 42′ N. lat. and 2° 54′ E. long.

The coast runs from the northern boundary to the neighbourhood of Collioure, about twenty-one or twenty-two miles due south, in an almost direct line: it is throughout all this extent skirted by a low alluvial tract overspread with marshes, whose exhalations would be seriously injurious to health if it were not for the corrective influence of the keen north-west wind, called, from its blowing across the Corbières, a branch of the Pyrenees, the 'Tramontane.' In the northern part of this line of coast, partly in this department and partly in that of Aude, is the étang (pool or lagoon) of Leucate, and south of this are the smaller lagoons of St. Nazaire and St. Cyprien, all belonging to that line of étangs which characterises the French part of the Mediterranean coast. From the neighbourhood of Collioure the coast turns to the south-east, and its loftier character and more broken outline indicate its vicinity to the Pyrenees. The French portion of it terminates at Cape Serbères or Cervère, about eight or nine miles from Collioure.

The greater part of the department is of very mountainous character. The Pyrenees commence on the east coast and run westward, their principal ridge forming the frontier of the department toward Spain, and throwing off two subordinate lateral ranges in a north-east direction; one of which, not distinguished by any particular name, but remarkable for one of its mountains, Le Canigou, separates the valley of the Tech from that of the Tet or Teta; the other, the Corbières, separates the valley of the Teta from that of the Aude. From the Col de la Couillade, south of the fortress and town of Montlouis, the principal ridge lies within the boundary of the department, which includes the valley of Carrol or Carol and the other valleys drained by the upper waters of the Sègre on the southern slope. A branch of the Pyrenees forms the western boundary of the valley of Carrol. The peaks of Le Canigou in the branch range which separates the valleys of the Tech and the Tet; Peyrie or Prigue, at the head of the valley of the Teta; Lanoux, at the head of the valleys of the Arriège and of Carrol; and Pedrous, near Lanoux, all exceed 9000 feet in height, and the last rises to about 9500 feet. [PYRENEES.] The mountain of Mosset, one of the Corbières, has an elevation of 7828 feet; and Roc Blanc, at the separation of the Pyrenees and the Corbières, at the head of the valley of the Aude, of 8246 feet. The principal valleys are those of the Tech, between the branch to which Mount Canigou belongs and the main ridge of the Pyrenees; of the Tet, between this same branch and the Corbières; of the Gly, between the branches of the Corbières; and the valley of Carol (the stream from which joins the Sègre at Puycerda in Catalonia), and the other valleys drained by the upper waters of the Sègre. The principal depressions or passes are the Col de Pertus, through which runs the main road from Perpignan to Figueras in Spain; the Col de la Perche, through which passes the road from Montlouis to Puycerda and Urgel in Catalonia; the Col de la Marguerite, between the valley of the Teta and that of the Aude; and the Col de la Couillade, at the head of the valley of the Sègre. The bridge of Céret, a small town in the valley of the Tech, is 317 feet above the level of the sea; the town of Arles 899 feet, the village of Montfleret 2540 feet (both these are in the same valley), and the town of Montlouis 5206 feet.

The Pyrenees are in this part composed almost entirely of granitic rocks, as also is that part of the Corbières which lies nearest to the Pyrenees. Not only the peaks, but the intervening valleys are in great part occupied by these formations. This is the case with all that part of the valley of the Aude which lies in this department, with the valley of the Teta or Tet nearly down to the town of Millas, except just about Villefranche, and with the valley of the Tech to the village of Le Fort between Arles and Céret, except in the vicinity of the fortress of Prats-de-Mollo and the village of Le Tech. The mountains which bound the valley of the Aude on the western side, and occupy the extremity of the department toward the west, are composed of mica-slate, which is not found anywhere else in this department. The transition rocks are found near the base of the granitic mountains, except where their continuity is interrupted by the tertiary or alluvial beds. In the valley of the Tech above Céret, and extending northward across the extremity of that small branch mountain-range to which Le Canigou belongs, these transition rocks consist of clay-slate and transition limestone. A mass of similar formations occupies the upper part of the valley of the Tech, in the vicinity of Prats-de-Mollo and Le Tech. About Villefranche, in the valley of the Tet, is found a mass of compact grey limestone, enclosing beds of grey marble veined with red and green, probably belonging to the transition series. The localities occupied by these two masses of transition rocks are isolated in the district of the granitic formations. The valley of the Gly from Estagel upwards, and that part of the Corbières which lies at the head of the valley, are formed of transition rocks, which skirt the granitic district on the north side, and extend northward and westward into the department of Aude: the predominant rock is compact grey limestone. The valley of Carol and the valleys watered by the tributaries of the Sègre are, in this department, occupied by the transition rocks. A small portion of the department to the north of Estagel is occupied by the Alpine and Jura limestone, which formations extend northward into the department of Aude, where they overspread a large district. All the eastern side of the department, comprehending the sea-coast, the plain which extends for some miles inland from the coast, and the valleys of the Gly, the Tet, and the Tech, to near Estagel, Millas, and Céret respectively, are occupied by tertiary or alluvial formations, chiefly consisting of vast beds of sand or gravel. The mineral treasures of the department are inconsiderable. There are twenty establishments, each comprehending a single forge, for the manufacture of wrought-iron. Charcoal is the only fuel employed.

The department has no large rivers: three small portions, all near the western end of the department, belong to the basins of the Garonne, the Ebro, and the Aude. These portions are drained respectively by the Arriège, the Sègre, and the Aude, all of which have their rise and a small part of their course in this department. The Aude receives two small mountain-streams, the Balcerre and the Galba; the Sègre receives the Carrol or Carol from the valley of Carol, the Err, and the Vanera. The Tech rises in the Pyrenees on or near the southern boundary of the department, and flows about 40 to 45 miles east-north-east past Prats-de-Mollo, Arles, Céret, and Elne, into the Mediterranean. The Tet or Teta rises in the Pyrenees near the junction of the Corbières, and flows about 12 miles south-east to Montlouis, and from thence east-north-east about 50 to 55 miles, making its whole course 62 to 67 miles, past Olette, Villefranche, Prades, Vinçac, Ille, Millas, and Pepignan, into the Mediterranean. Between Ille and Pepignan, it is divided into two arms, enclosing between them a large island: the northern and principal arm retains the name of Tet; the southern, which passes by Thuir, is called the 'Canals.' The Tet receives below Montlouis the Carensa, the Lantilla, and the Boules on the right bank; the Cabrils and the Castellanne on the left. The Gly rises in the department of Aude, and flows about 40 miles, first south-east and then east, past St. Paul-de-Fenouillet, La Tour-de-France, Estagel, and Rivesaltes, into the Mediterranean; receiving on the left bank the Verdouble and the Robouls. Its course is mostly in this department. The Cantarana has its course parallel to and between the Tech and the Tet, and flows into the étang of St. Nazaire: it receives the Reart. There are some small lakes in the mountains, and the étangs of St. Cyprien, St. Nazaire, and Leucate on the coast. None of the rivers are navigable, neither are there any navigable canals.

There are in the department seven Routes Royales or government roads, having an aggregate length of 202 miles, viz. 103 miles in repair, 9 miles out of repair, and 90 miles unfinished. (1 Jan., 1837.) The principal road is that from Paris to Perpignan, which enters the department on the north side, close to the western bank of the étang of Leucate, and runs south to Perpignan; from whence it continues through Le Boulou and the fortress of Bellegarde, by the Col de Pertus into Spain. From Perpignan a road runs south-east through Elne, Argelès, Collioure, and Port Vendres into Spain. Another road from Perpignan follows the valley of the Tet by Ille, Vinçac, Prades, Villefranche, Olette, Montlouis, and Livia, by the Col de la Perche, to Puycerda and Urgel in Spain. Another road from Perpignan runs north-west to the valley of the Gly, and passes through Estagel, St. Paul de Fenouillet, and Caudies to Quillan in the valley of the Aude, forming part of a road which crosses France on the northern side of the Pyrenees from Perpignan to Bayonne. From Le Boulou, on the main road into Spain, between Perpignan and Bellegarde, a road runs up the valley of the Tech by Céret and Arles to Prats de Mollo. A road from Carcassonne, Limoux, and Quillan, in the valley of the Aude, runs up the valley, and crosses the mountains at its head to Montlouis, in the valley of the Tet. The aggregate length of the Routes Departmentales is 81 miles, viz. 27½ miles in good repair, 8½ miles out of repair, and 45 miles unfinished. The bye-roads and paths have an aggregate length of nearly 2000 miles.

The climate of the department is generally mild and temperate. The soil of the plain and of the valleys of the Tech and the Tet is remarkable for its fertility. Of the whole area of the department, which is estimated at about 1,000,000 acres in round numbers, about 230,000 acres, or less than one-fourth, are under the plough. The quantity of grassland is small, comprehending little more than 24,000 acres; but the heaths and open pasture grounds are extensive, amounting to nearly half the area of the department. The number of cattle is small; but sheep, including Merinos, are numerous, and the Cashmere or Thibet goat has been naturalised. Mules are reared in considerable numbers; and the breed of horses, already in good repute, is improving. The slopes of the mountains and other uncultivated lands are covered with thyme, rosemary, lavender, and various odoriferous shrubs or herbs, which furnish nourishment to swarms of bees, whose honey and wax form an important article of produce. The vineyards occupy from 90,000 to 100,000 acres: the produce is considerable, and about two-fifths of it are exported. The wines of the first quality are those of Rivesaltes, Salces, and Collioure. Part of the wines are liqueur wines. Orchards are not numerous, occupying only about 3000 acres; but the quantity of fruit grown is very considerable; among the kinds cultivated are the olive, the orange, the citron, the mulberry, and the melon; oil is made and raw silk produced. The woodlands amount to about 110,000 acres.

The department is divided into three arrondissements, as follows:—

Name.	Situation.	Area in sq. miles.	No. of Communes.	Population in 1831.	Population in 1836.
Perpignan	N. and N.E.	531	85	72,814	76,134
Céret .	S. and S.E.	358	41	35,421	37,539
Prades .	W.	705	100	48,817	50,652
		1594	226	157,052	164,325

There are seventeen cantons, or districts, each under a justice of the peace.

In the arrondissement of Perpignan are—Perpignan (pop. in 1831, 16,272 town, 17,114 whole commune; in 1836, 17,618 commune) [PERPIGNAN], and Millas (pop. 1881 town, 1970 whole commune), on the Tet; Thuir (pop. 2069 town, 2197 whole commune), on the Canals; Elne (pop. 1921 town, 2093 whole commune), on the Tech; Caudiés, St. Paul de Fenouillet (pop. 1665 town, 1743 whole commune), La Tour de France, Estagel (pop. 2003), and Rivesaltes (pop. 3208), on the Gly.

At Thuir, paper is manufactured from straw and leather. A battle was fought near this town in 1793, between the French and Spanish armies. Elne is of great antiquity; it was known to the Romans by the name of Illiberis, and subsequently of Helena, from the mother of the emperor Constantine, who rebuilt it and gave it her own name. Hannibal encamped under its walls. (Livy, lib. xxi., c. 24.) It was formerly an episcopal city, and a place of strength, but has been ruined by successive sieges. The see was transferred to Perpignan in 1604; but the antient cathedral is still standing. At St. Paul de Fenouillet some trade is carried on in Spanish wool. Rivesaltes is in a fertile plain surrounded by vine-clad hills. Part of the town is within the walls, and part without; the latter is the better built. The townsmen trade in the excellent liqueur wines produced in the neighbourhood and in brandy.

In the department of Céret are—Céret (pop. in 1831, 2651 town, 3251 whole commune; in 1836, 3302 commune), Prats de Mollo (pop. 3484), Arles (pop. 1792 town, 2166 whole commune), and Le Boulou, all on the Tech; St. Laurens or Laurent (pop. 3119 town, 3207 whole commune), on a feeder of the Tech; Bellegarde, on the Col de Pertus in the Pyrenees; and Argelès, Collioure, and Port Vendre, on or near the coast. Céret has a bridge of one arch over the Tech, on the right bank of which river the town is built. It has a court of justice and a high school. The town is surrounded by lofty antient walls. Prats de Mollo was fortified in 1100, and again in 1679 with the addition of fort La Garde, after the plans of Vauban. It was unsuccessfully besieged by the Spaniards in 1793. There is a stone bridge over the Tech, an hospital, and barracks. Coarse woollen cloth, blankets, and hosiery are manufactured; and considerable trade in these articles is carried on. There are mineral waters at Arles. Cork is prepared at Le Boulou. Bellegarde was regularly fortified by Louis XIV., and is a place of strength, and of importance from its position. It was taken by the Spaniards in 1793, and retaken in 1794 by the French under Dugommier. Collioure is defended by an old wall, and by a castle and three forts built on the neighbouring heights. The streets are narrow. The church is built on the sea-shore. There is a school of navigation, and there are two ropewalks. The townsmen carry on some trade with Spain, and are engaged in the pilchard fishery. Port Vendre has a safe harbour capable of containing 500 vessels; the entrance is defended by four batteries, in one of which is a lighthouse: on the land side the town is protected by Fort St. Elme on the west, and by another fort on the south. The townsmen (who amount to 2000 or more) carry on trade in corn, wine, brandy, woollen stuffs, and hardwares. Port Vendres which was previously of no importance, owes its prosperity to the Maréchal de Mailly, who repaired its harbour. Both this town and Collioure were taken by the Spaniards in 1794, and retaken the same year by the French.

In the arrondissement of Prades are—Prades (population in 1831, 2708 town, 2836 whole commune; in 1836, 3013 commune), Montlouis, Olette, Villefranche, Vinçac or Vinça (population, 1883 town, 2004 whole commune), and Ille (population, 2914 town, 3102 whole commune), all on the Tet; Mosset, near the foot of the Corbières, on a feeder of the Tet; Sournia, on the Desix, a feeder of the Gly; and Livia, in French Cerdagne, on the Sègre. Prades is a small ill-built town, but very clean, in a valley on the right bank of the Tet. It has a court of justice, one or two fiscal government offices, a seminary for the priesthood, and a high school. The townsmen manufacture coarse woollen cloth, woollen hosiery, and paper, and carry on trade in wine, wool, hemp, pulse, and iron. A great number of sheep, whose wool is of excellent quality, are fed in the neighbourhood. Prades was taken by the Spaniards in 1793, and retaken the same year. Montlouis has the most elevated site of any town in France, and indeed in all Europe. It was fortified by Vauban, by order of Louis XIV. It has a quadrangular citadel. The town is well laid out, with eight streets and several places or squares, of regular form: the esplanade is extensive and well arranged. The works are chiefly built of granite. There are a military hospital and very fine barracks. Olette has warm mineral springs, but they are of little note. Villefranche has two stone bridges over the Tet. The town, which is very small, having but two streets, is defended by a wall flanked at the angles with bastions, and also by a strong castle, built by order of Louis XIV. There are barracks and a military hospital. Marble and variegated breccia are quarried in the neighbourhood. Vinçac or Vinça is surrounded by an old wall, and has two suburbs larger and handsomer than the town itself, which is ill laid out and ill built; there are fountains of excellent water in the street. There is an hospital or almshouse. Iron-ore is obtained in the neighbourhood. Ille is surrounded by walls flanked by towers; it is a well-built town, with three churches and an hospital. Considerable trade is carried on in the fruit produced in the surrounding district, and there are two yearly fairs for cattle and agricultural produce. Livia has an antient parish church and the ruins of an old castle. The townsmen manufacture hosiery. The possession of this little town, which is in French Cerdagne, close upon the frontier, is by some of our authorities assigned to Spain.

The department constitutes the diocese of Perpignan, the bishop of which is a suffragan of the archbishop of Alby; it is in the jurisdiction of the Cour Royale and in the circuit of the Académie Universitaire of Montpellier, and in the tenth military division, the head-quarters of which are at Toulouse. The department sends three members to the Chamber of Deputies. In respect of education it is below the average of the departments: of the young men enrolled in the military census of 1828-29, thirty-one in every hundred could read and write, the average of the departments of France being more than thirty-nine.

In antient times this department constituted the territory of the Sardones; perhaps some parts of the northern boundary may have been within the limits of the Atacini (the people who dwelt about the Atax or Aude), who were, as well as the Sardones, a Celtic, or possibly a Ligurian people. These nations were early subdued by the Romans, who possessed the whole of the Mediterranean coast before the proconsulship of Cæsar in Gaul; they were consequently included in the 'Provincia' of that writer, afterwards distinguished as the Provincia Narbonensis; and on the subdivision of that province they were included in Narbonensis Prima. The Tet was the Telis of the Romans; the Tech, the Tichis; the Verdoubre, or Verdouble, a feeder of the Gly, and perhaps the lower part of the Gly itself, was the Vernodubrum of Pliny; and the Aude, the Atax. Several Roman towns or posts were within the limits of the department. Ruscino is mentioned by Polybius and Livy, in describing the march of Hannibal. The Gallic chieftains of the district assembled here, on the approach of the Carthaginian army, to deliberate on the part they should take. (Livy, lib. xxi., c. 24.) The name is variously written by antient authors. All that now remains of it is an old tower, two miles from Perpignan, called La Tour de Roussillon, which province obtained its name by a corruption of the antient Ruscino, which in the middle ages was called Rosciliona. Perpignan grew out of the ruin of Ruscino, which was ruined by the Normans.

The Combusta of the 'Itinerary' of Antoninus was north of Ruscino; the Salsulae of Mela may be identified with the modern Salces, on the west side of the Etang de Leucate, not only by the name, but by the occurrence of a phenomenon mentioned by the Roman geographer, viz. the occurrence of springs producing water salter than the sea. The Ad Stabulum of Antoninus has left a fragment of its name in Le Boulou, on the Tet; the Ad Centuriones of Antoninus (the Ad Centenarium of the Peutinger Table) was probably near it; and the Summus Pyrenaeus, which is marked by Antoninus on the route from Narbo and Ruscino into Spain, may be identified with the Col de Pertus, at the fortress of Bellegarde. The Portus Veneris of Mela and the Fanum Veneris of Strabo, Pliny, and Ptolemy, are easily recognizable in Port Vendre; and Illiberis, afterwards Helena (as already noticed), is the modern Elne. The Etang de Leucate is mentioned by Festus Avienus under the name of Stagnum Fordicen, or, according to the correction of Isaac Vossius, Sordicen. The same writer (Festus Avienus) applies the term Cyneticum Littus to the coast near the foot of the Pyrenees.

On the downfal of the Roman empire this territory came into the hands of the Visigoths, and was for several centuries attached to their monarchy; it was taken from them by the Moors, and from the Moors by the Franks. In the middle ages it was known as the province of Roussillon, and was alternately possessed by France and by Aragon (subsequently by Spain) until 1640, when it was finally incorporated with France.

PYRE'NE'ES SUPE'RIEURES, referred to by oversight instead of PYRENEES, HAUTES.

PYRENESTES, Mr. Swainson's name for a subgenus of *Coccothraustes*. [FRINGILLIDÆ.]

PYRGI'TA. [SPARROW.]

PYRGO, a genus of microscopic FORAMINIFERA.

PYRGO'MA. [CIRRIPEDA, vol. vii., p. 209.]

PYRGO'TELES, the most eminent engraver of gems of his age. He was a native of Greece, but the place of his birth is not recorded. He was contemporary with the most distinguished artists who were living in the last period of fine art in Greece, and after whom that which is termed the *high* style deteriorated. The leading sculptors of the time were Lysippus, Scopas, and their followers; Apelles and Protogenes were the chief painters; and Pyrgoteles ranked in his own art equally with those celebrated names. Alexander the Great conferred the same honour upon Pyrgoteles that was extended to Lysippus and Apelles, who had the exclusive privilege of representing him in their respective arts. In like manner he forbade any artist to engrave gems of him but Pyrgoteles. 'Idem hic Imperator edixit ne quis ipsum alius quàm Apelles pingeret; quàm Pyrgoteles sculperet; quàm Lysippus ex ære duceret.' (Plin., *Hist. Nat.*, vii. 37.) Again, '—— edictum Alexandri Magni quo vetuit in gemmâ se ab alio sculpi quàm à Pyrgotele.' (xxxvii. 1.)

No well-authenticated work of Pyrgoteles has reached our times. Some writers have supposed that two gems might be attributed to him (Bracci, *Memor.*, tab. 98, 99), but this opinion has been successfully disputed, and is no longer entertained by antiquaries.

PYRI'TES, COPPER. [COPPER—*Ores*.]

PYRI'TES, IRON. [IRON—*Ores*.]

PYRMONT is a county belonging to the Prince of Waldeck, about 35 square miles in extent, with 6000 inhabitants, the majority of whom are Protestants, whose chief occupations are agriculture and the breeding of cattle. It is very mountainous and wooded. It yields the prince a revenue of about 8500*l*. per annum, of which the mineral springs alone produce nearly 2000*l*.

PYRMONT, the capital, is a well-built open town, at the northern extremity of a romantic valley on the banks of the river Emmer. The principal street, shaded on both sides by lofty lime-trees, leads to the great avenue and to the celebrated mineral springs, of which there are four. The principal spring, called in former times the Holy Spring, rises at the upper end of the great avenue. The water is as clear as crystal, and has a refreshing taste. With respect to strength and salutary effect on the human body, it has preserved for some centuries the advantage over all other known chalybeate springs. It never freezes. Above 350,000 bottles are annually exported to all parts of the world. The Brodel Brunnen is used only for bathing, the water not being quite clear. The great avenue, 500 paces long and 40 broad, and planted with four rows of fine lime-trees, is the chief place of resort of the visitors, who are very numerous, being about 2000 in a year, and in some years 2500 and more, besides the country-people. On the two sides of the avenue are the coffee-house, the theatre, the assembly-rooms, and a great number of shops. Near it is the great bathing-house, which contains 140 apartments, tastefully fitted up, and handsome spacious baths. There is likewise a salt spring at which other baths have been fitted up. A few hundred paces from the great avenue stands the palace of Pyrmont, which has been the residence of the Prince of Waldeck ever since 1806. In a valley near Pyrmont there is a colony of Quakers, called Friedensthal. (Menke, *Pyrmont und seine Umgebungen*; Pittmann, *Pyrmont*.)

PYROCHLORE occurs in octohedral crystals. Primary form a cube. Cleavage parallel to the faces of a regular octohedron, but very difficultly obtainable. Fracture conchoidal, with a lustre between vitreous and resinous. Hardness 5·0. Colour reddish brown or black. Streak pale. Translucent, opaque. Specific gravity 4·206 to 4·216.

Infusible by the blowpipe; becomes greenish-yellow by calcination. Found at Fredrichswärn in Norway, and in Siberia.

Analysis by Wöhler:—Titanic acid, 62·75; lime, 12·85; oxide of cerium, 6·80; oxide of uranium, 6·18; oxide of manganese, 2·75; oxide of iron, 2·16; oxide of tin, 0·61; water, 4 20.

PYROLIGNEOUS ACID. [Acetic Acid.]

PYROLUSITE. [Manganese.]

PYRO'METER (literally, 'fire-measurer,' from πῦρ, 'fire,' and μέτρον, 'a measure'). No fluid has hitherto been found applicable to the construction of thermometers capable of indicating higher temperatures than that of boiling mercury (about 650° Fahr.). The term pyrometer was first employed by Musschenbroek to designate an instrument invented by him for measuring the effects produced in the dimensions of solid bodies by the application of heat; but the signification of the term has since been extended so as to include those instruments the object of which is to measure all gradations of temperature above those which can be indicated by the mercurial thermometer.

Musschenbroek's pyrometer consisted of a metallic bar, about six inches in length, one extremity of which was fixed, while the other was left free to advance as the metal elongated from the effect of several spirit-lamps placed beneath, which, at each experiment, were charged with the same quantity of highly rectified spirit of wine. The advance of the moveable extremity gave motion to a pinion and wheel, the latter of which drove an index over a graduated circle, each degree of which corresponded to a linear expansion of 12,500th of an inch. The instrument, as it was originally constructed, is described in the second part of Musschenbroek's translation of the 'Saggi di Naturali Esperienze fatte nell' Academia del Cimento,' Leyden, 1731; and as improved by Desaguliers (who substituted fine cords and friction-rollers for the wheel and pinion), in the first volume of his 'Experimental Philosophy,' p. 444.

To Musschenbroek's pyrometer succeeded those of Ellicott (described in the 'Philosophical Transactions' for 1736, p. 297, and 1751, p. 485), Graham ('Phil. Trans.,' 1754, p. 598), Smeaton, Ferguson ('Lectures,' vol. i., pp. 14 and 301), &c., which, like those that have since been constructed, with few exceptions, down to the present time, evince but little originality in the principle upon which they rest. A bar of metal is in most cases subjected to the direct action of flame, or immersed in a fluid of convenient temperature. The minute resulting expansion is multiplied, and thereby rendered appreciable by the intervention of a succession of levers or a system of wheels and pulleys. Supposing this intervening machinery to perform with theoretical accuracy, and that the same quantity of heat is successively communicated to different substances, the indications of such an instrument would give the relative expansions of those substances under the same circumstances. But where wheels, pinions, levers, &c. are employed, there must be considerable liability to error, arising from flexure, obliquity of action, and other causes, the magnitude of which it would be difficult to estimate, and which, even if it be supposed small in the first instance, will be magnified almost in the same proportion as the delicacy of the instrument is increased. Moreover the substance itself, if its nature be such as to be softened by heat, is very liable at high temperatures to undergo compression in giving motion to the machinery. Even therefore as measures of expansion they cannot be considered as deserving of much confidence. A similar remark is applicable, though in a less degree, to the contrivance employed by Lavoisier and Laplace, in which the expansion of the metal deflected a telescope from the position that it had at the commencement of the experiment, and the absolute expansion was deduced from the extent of this deflexion, which was read off upon a graduated scale placed at a considerable distance in front of the telescope. See a description of the apparatus employed in Biot's 'Physique Experimentale,' tome i., pp. 207-9, where also is given a table of the expansions of the several substances experimented on between the temperatures of 32° and 212° Fahr. Troughton, in 1794, constructed an instrument which bore some resemblance to the preceding, the principal difference consisting in the employment of a spirit-level, the deviations of which from the horizontal determined the expansion of the metal.

The 'Phil. Trans.' for 1777 contain a description of the method employed by De Luc in the construction of his compensating pendulums, in order to determine the length of one metal whose expansion is equal to a given length of another metal. For this purpose he suspended the bar of known length from an arm, projecting horizontally from an upright deal plank. To the lower extremity of this bar was adjusted a small horizontal platform, upon which a bar of the other metal rested in a vertical position. Upon raising the temperatures of both bars, every point on the surface of the second bar would obviously become subjected to two motions tending to move it in opposite directions; it would be depressed by the expansion of the first bar, and elevated by the expansion of the second. One point would therefore remain stationary, and this point, being ascertained by raising or lowering a microscope adjusted to the edge of the plank, determined the portion of the second bar, measured from its lower extremity, whose expansion was equal to the whole of the first bar.

The rods employed by Borda in measuring the base-line of the great French Survey consisted of a rule of brass laid upon a somewhat longer rule of platinum and attached at one extremity. The portion of the platinum rule not covered by the one of brass was divided into millionths of the entire length of the rule, and further subdivided by means of a vernier and microscope adjusted to the extremity of the brass rule. The value of each of these divisions having been previously ascertained by first surrounding the compound rule with melting ice, and then immersing it in boiling water, it was only necessary to observe the indications of the vernier in order to apply the requisite correction for reducing the length of the rod to the standard temperature.

For low temperatures, the contrivance of Ramsden, described in the 'Philosophical Transactions' for 1785, and employed by General Roy in determining the expansion of the rods used in measuring the base on Hounslow Heath for the Trigonometrical Survey, was perhaps unexceptionable. The rod was immersed in a trough of water, and over each extremity was placed a microscope, to which a slow motion could be given in the direction of the length of the rod by means of a fine micrometer screw. The lines of collimation of the microscopes being thereby adjusted at the commencement of the experiment so as to accurately coincide with two points near the extremities of the rod, the temperature of the water was gradually raised, till a thermometer placed in the trough indicated an advance of 10°, 20°, 30°, or any required number of degrees. The consequent elongation of the rod destroyed the coincidence of its extremities with the lines of collimation of the microscopes, which was re-established by turning the micrometer screws, and carefully noting the number of turns and fraction of a turn necessary for that purpose; when, the value in parts of an inch of each turn being previously known, a direct measure of the expansion was obtained, free from the errors of a system of levers or of a train of wheels and pinions.

The property of alumina whereby it undergoes a diminution of bulk when heated, was employed by Wedgwood as a measure of high temperatures. His pyrometer consisted of cylinders of fine white clay, and an apparatus for accurately measuring their length. This apparatus consisted of a metallic plate, upon which were fixed two brass rules slightly inclined to each other. The rules used by Wedgwood were 24 inches long, and divided into 240 equal parts. The distance between the rules at one extremity was three-tenths and at the other five-tenths of an inch; consequently the difference between their distances at any two consecutive divisions was the 1200th part of an inch. But it is obvious that these numbers are quite arbitrary; and that by increasing the length of the rules and diminishing their inclination, the difference between their distances at any two consecutive divisions may be made as small as we please. The clay cylinders were first baked at a red heat, estimated at 947° Fahr., and then reduced to exactly five-tenths of an inch in length, so as to fit the first division of the scale. When afterwards exposed to a greater heat, they underwent contraction, and the amount of this contraction was determined by observing the division of the scale corresponding to their diminished length. If we then assume, with Wedgwood, that the contraction is proportional to the temperature at which it took place, the latter will likewise be determined; but independently of the difficulty of procuring pieces of clay of uniform composition, from which it resulted that two cylinders of equal length when exposed to the same heat seldom underwent the same degree of contraction, it has been found that the duration of the experiment has considerable influence upon the contraction, the longer continuance of a low temperature producing the same contraction as a higher degree of heat continued for a shorter time. As a measure of temperature therefore this method cannot be relied on, though as a direct measure of expansion we doubt if it has been surpassed either in the simplicity of its principle or in the minuteness of the indications of which it is susceptible. A description of the instrument and of the experiments made with it will be found in the *Philosophical Transactions* of 1782, 1784, and 1786.

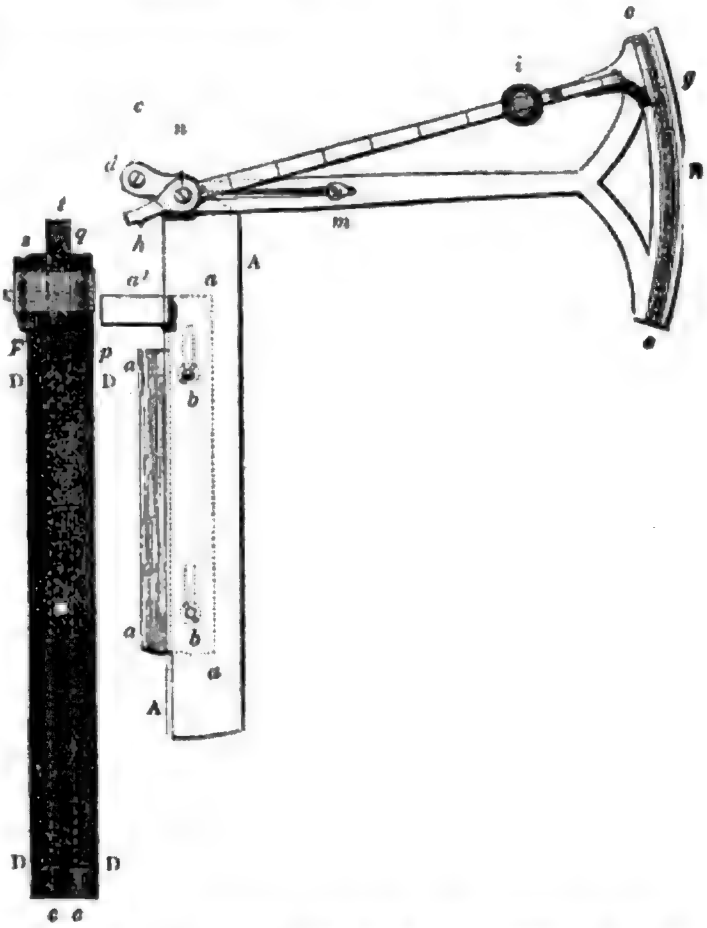
A pyrometer was constructed by Achard, similar in form and principle to the common thermometer, but intended to indicate much higher degrees of heat. It consisted of a bulb and graduated tube of semi-transparent porcelain highly baked, and containing a very fusible alloy, composed of bismuth, lead, and tin, which became liquid at about 212°, and indicated higher temperatures by its expansion, which was visible through the semi-transparent tube.

Dulong and Petit employed a very direct mode of measuring the absolute, not linear, expansions of various substances. By observing the difference of altitude at which mercury of different temperatures stood in the two arms of an inverted glass siphon, they determined the absolute expansion of the mercury, and by comparing this with the apparent expansion of mercury in a glass tube, they deduced the absolute expansion of the glass. A cylinder of the metal whose expansion was sought was then placed within a glass tube, closed at one extremity and terminating at the other in a capillary opening, and the rest of the tube occupied with mercury. Upon the whole being heated, a portion of the mercury was expelled equal to the excess of the absolute expansions of the mercury and metal above that of the glass; and as the expansions of the mercury and glass were previously known, the weight of the expelled mercury determined the expansion of the metal.

Dr. Brewster has proposed to measure expansions by the number and intensity of the polarized tints produced by the inflexion of a plate of glass against which the expanding substance is made to press. The reader will find some account of this in Brewster's 'Cyclopædia' under the articles 'Pyrometer' and 'Optics.'

Guyton's pyrometer, which was exhibited before the National Institute in 1803, and described in the 'Annales de Chimie,' xlvi., p. 276, and in Nicholson's 'Philosophical Journal,' vi., p. 89, consisted of a bar of platinum nearly two inches in length, placed in a groove of porcelain. One extremity of the bar rested against the solid end of the groove, while the other pressed upon the short arm of a lever, the longer arm of which carried a vernier over a graduated circular arc. The whole was constructed of platinum, and a spring was made to press upon the vernier to prevent its displacement while in the act of withdrawing the instrument from the furnace. The indications of the vernier at the commencement and termination of the experiment were the data from which the expansion was subsequently computed. 'The defect of this instrument,' observes Mr. Daniell, 'arose from the nature of platinum, which at a red heat becomes soft and ductile, so that the lever would be liable to bend, and thereby frustrate the experiment; and this is supposed to have been the reason why the inventor never extended his experiments to temperatures higher than that of the melting point of antimony.

As early as 1821, the last-named gentleman, Mr. Daniell, the present Professor of Chemistry at King's College, London, had invented an instrument which, he states, 'afforded correct determinations connected in an unexceptionable manner with the scale of the mercurial thermometer;' but it was only suited to the experimental furnace of the chemist, so that, he continues, 'the great desideratum still remained of a pyrometer which might be universally applied to the higher degrees of heat, as the thermometer had long been to the lower, and which, in addition to its use in delicate researches, might effect for the potter, the smelter, the enameller, and others, in the routine of their business, what the latter daily performs for the brewer, the distiller, the sugar-refiner, and the chemist.' The annexed diagram represents the second pyrometer invented by Mr. Daniell, for which the Rumford medal was awarded to him by the Royal Society. A description of it is given in the 'Philosophical Transactions' for 1830, and an account of the experiments made with it is inserted in the 'Transactions' of that and the following years.



It consists of two distinct parts, the register and the scale. The register is a solid bar of black-lead earthenware, DDDD, eight inches long and seven-tenths of an inch wide and thick, cut out of a common black-lead crucible. In this a hole is drilled three-tenths of an inch in diameter, and seven inches and a half in depth. At *pp* the upper end of this bar, and on one of its sides about six-tenths of an inch in length of its substance, are cut away to the depth of half the diameter of the bore. When a bar of any metal six inches and a half long is dropped into this cavity, it rests againsts its solid end; and a cylindrical piece of porcelain, *q*, about one inch and a half long, called the index, is placed on the top of it, which, projecting into and beyond the open part, is firmly confined to its place by a strap of platinum, *r*, which passing round the black-lead bar and over the piece of porcelain, is made to press upon the latter with any required degree of tension by means of a small wedge *s* of porcelain inserted between the bar and the strap. When the register is exposed to the heat of a furnace, it is evident that, the expansion of the metallic bar exceeding that of the black-lead, the porcelain index will be forced forward; and when the register is afterwards cooled, the tension of the strap will retain the index at the point of greatest elongation.

The object of the scale is the accurate measurement of the distance through which the index has advanced. It consists of a frame *aaaa* composed of two rectangular plates of brass joined at right angles by their edges, and fitting square upon two sides of the register. At one extremity of this frame is a small plate of brass *a'*, which, when the two former plates are applied to the register, is brought down upon the shoulder formed by cutting away the black-lead at *p*, and the whole may be thus firmly adjusted, when required, to the black-lead bar by three planes of contact. To the outside of this frame is firmly attached, by means of the screws *bb*, a brass plate AA, the extremity of which *d* projects so that a point *c* near to it may be immediately opposite to the cavity in the black-lead bar when the latter is adjusted to the frame. About *c* as a centre, turns an arm *dn*B slightly bent at *n*, carrying at its extremity a graduated circular arc *ee*. The radius of this arc is five inches, and its moveable centre *n* is distant from the fixed centre *c* exactly half an inch. About *n* turns a straight and lighter arm *hg*, five inches and a half in length, the distance from *h* to *n* being half an inch. The extremity *g* of this arm carries a vernier, by which the divisions of the graduated arc are subdivided into minutes, and also an eye-glass *i* to assist the reading. The other extremity terminates in a steel point *h*, or, as the instrument is now constructed, a knife-edge, which, when the register is adjusted to the frame, is inserted in a small cavity *t*, formed for its reception at the extremity of the porcelain index. A small steel spring let into the larger arm at *m* is made to press upon the lighter arm, whereby the latter has a constant tendency to move towards the commencement of the graduation.

When the instrument is used, the metallic bar to be experimented on is placed in the cavity of the register, and the index pressed down upon it and firmly fixed in its place by the platinum strap and porcelain wedge. The scale is then applied by carefully adjusting the frame to the register and fixing it by pressing *a'* upon the shoulder. Holding the whole together steadily in the left hand, the lighter arm is so placed that the steel point *h* may rest upon the edge of the index, against which it will be pressed by the spring: then by slightly turning the larger arm, the point will move along the surface of the index till it drops into the cavity *t*. The indications of the vernier being then read off, the register is detached from the scale, placed in the furnace, and after it is removed and cooled, it is again applied to the scale in the same manner as before, and the second indication of the vernier noted. From the two readings of the vernier may be deduced the excess of the expansion of the metallic bar above that of the black-lead, though a correct formula for this purpose has not, to the writer's knowledge, been hitherto given.

The one employed by Mr. Daniell, though probably sufficiently correct for all practical purposes, gives the expansions one per cent. too great without exception, and in many cases much more, so that more than the first *significant* figure can seldom be depended upon in those published by him in the 'Philosophical Transactions' of 1830-31. The error thus introduced is perhaps within the limits of the error to which the instrument itself is liable; but should this not be the case, it might be desirable to employ the correct formula, for which reason we subjoin its investigation.

Let *cn*B, *hng*, represent the positions of the two arms of the scale relative to the register, before the expansion has taken place, and *cn'*B', *h'n'g'*, their positions after the expansion; *h* and *h'* the two positions of the steel point, the line joining which passes through the fixed centre *c*; *e* and *e'* the two positions of the zero of the graduated arc. Put the angle $cn\mathrm{B} = cn'\mathrm{B}' = \alpha$; $en\mathrm{B} = e'n'\mathrm{B}' = \beta$; eng (the first reading of the vernier) $= \phi$; $e'n'g'$ (the second reading) $= \phi'$; also $cn = cn' = nh = n'h' = r$; and $hh' = \epsilon$, the excess of the expansion of the metal above that of the black lead: then

$$\epsilon = \frac{\sin hnn' - \sin h'n'n}{\sin h'hn - \sin hh'n'} \times \text{chord } nn';$$

B
$$\begin{aligned} hnn' &= 270^\circ - \alpha + \beta - \tfrac{1}{4}(3\phi + \phi'); \\ h'n'n &= -90^\circ + \alpha - \beta + \tfrac{1}{4}(3\phi' + \phi); \\ h'hn &= \tfrac{1}{2}(\alpha - \beta + \phi); \\ hh'n' &= 180^\circ - \tfrac{1}{2}(\alpha - \beta + \phi'); \\ \text{chord } nn' &= 2r \sin \tfrac{1}{2}(\phi' - \phi); \\ &= \sin \tfrac{1}{2}(\phi' - \phi), \text{ since } r = \tfrac{1}{2} \end{aligned}$$

∴ substituting and reducing by means of the formula

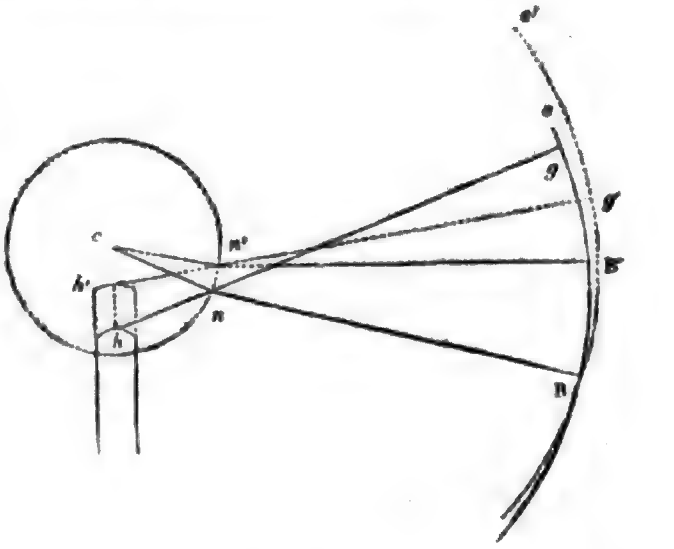
$$\sin \mathrm{A} - \sin \mathrm{B} = 2 \cos \frac{\mathrm{A} + \mathrm{B}}{2} \sin \frac{\mathrm{A} - \mathrm{B}}{2}, \text{ there results}$$

$$\epsilon = 2 \sin \tfrac{1}{2}(\phi' - \phi) \sin \{\tfrac{1}{2}(\alpha - \beta) - \tfrac{1}{2}(\phi' + \phi)\}$$

If $\alpha = 180^\circ$ and $\beta = 15^\circ$, as is nearly the case, this reduces to

$$\epsilon = 2 \sin \tfrac{1}{2}(\phi' - \phi) \cos \{7^\circ\, 30' + \tfrac{1}{2}(\phi' + \phi)\}.$$

where the unit of measurement is one inch.



The formula used by Mr. Daniell is $\epsilon = \sin \tfrac{1}{2}(\phi' - \phi)$, or its equivalent, since $\phi' - \phi$ is generally a small angle, $\epsilon = 2 \sin \tfrac{1}{2}(\phi' - \phi)$; from which it appears that all the expansions given by him should be diminished in the ratio of $1 : \cos \{7^\circ\, 30' + \tfrac{1}{2}(\phi' + \phi)\}$; but as he has recorded only the difference $\phi' - \phi$ of the readings of the vernier, and not the readings themselves, this correction can only be made by a repetition of the whole of the experiments. The error is inconsiderable so long as ϕ and ϕ' are both small, but it increases with the increase of either of those angles.

The excess of the expansion of the metal above that of the black-lead being thus obtained, and increased by the expansion of the latter (the determination of which is less direct and conclusive), the expansion of the metal becomes known. In order that the instrument may then be employed as a measure of temperature as well as of expansion, the doubtful assumption is introduced that equal increments of length are the effects of equal increments of temperature, and thence, having determined the expansion between any two known points on the thermometric scale, say the temperatures of melting ice and boiling mercury, a mere proportion will of course give the temperature at which any other observed expansion took place.

It remains to notice a paper communicated to the Royal Society by the late Mr. Prinsep, the assay-master of the Mint at Benares, 'On the Measurement of high Temperatures,' and published in their 'Transactions' for 1828. 'The fusing-points of pure metals,' observes that gentleman, 'are determinate and unchangeable; they also comprehend nearly the whole range of temperature; the unoxidable or noble metals alone embrace a range from the low melting-point of silver to the high ignition of platina. There are it is true only three fixed points in this scale, but as many intermediate links may be made as are required, by alloying the three metals together in different proportions. When such a series has been once prepared, the heat of any furnace may be expressed by the alloy of least fusibility which it is capable of melting.' As the melting-points of silver and gold are comparatively near to each other, Mr. Prinsep assumed only ten intermediate gradations of heat, the lowest of which corresponded to the fusing-point of pure silver, and the others to the fusing-points of silver alloyed with 10, 20, 30, &c. per cent. of gold. From the melting-point of gold to that of platina, he assumed one hundred gradations of heat, which were the melting-points of pure gold and of gold alloyed with 1, 2, 3, &c. per cent. of platina. Among the advantages of this mode of identifying temperatures are:—the smallness of the requisite apparatus, nothing more being needed than a small cupel, containing in separate cells eight or ten pyrometric alloys, each of the size of a pin's head; the indestructibility of the specimens, since those melted in one experiment need only to be flattened under a hammer, when they will be again ready for use; and the facility of notation, since two letters and the decimal of alloy will express the maximum heat: thus S ·3 G expresses the temperature of the fusing-point of silver when alloyed with gold in the proportion of 7 to 3; and G ·23 P expresses the fusing-point of gold when alloyed with platina in the proportion of 77 to 23. For a more particular account of this mode of determining temperatures we refer the reader to the memoir cited.

Several suggestions have been made for employing the pansion of air, on the principle of the differential thermometer, as a measure of high temperatures. It is proposed that one-half of the instrument be composed of platinum, so as to fit it for exposure to a great heat, and the other part of glass. The suggestion, we believe, is originally due to Mr. Schmidt (Nicholson's *Journal*, xi., p. 141); but was brought forward under another form by Mr. Nicholas Mill, in the 'Monthly Medico-Chirurgical Review and Chemico-Philosophical Magazine,' vol. i., Lond., 1824; again by Dr. Ure, in his 'Dictionary of Chemistry;' and lastly by Mr. Prinsep. The instrument, we believe, has been constructed upon each of the plans proposed. That of Mr. Prinsep appears the most complete (see a drawing of the apparatus in full operation at page 87 of his Memoir above referred to), and was employed by him to connect the fusing-points of his alloys with the thermometric scale; but the principle upon which they all rest involves the assumption that the increase of temperature is proportional to the expansion of the air.

A valuable table of the expansions of different substances, collected from various sources by Mr. Francis Baily, is given in the first volume of the 'Transactions of the Astronomical Society,' p. 416.

(Biot's *Physique Experimentale*; *Philosophical Transactions*; Thomson's *Chemistry*; Brewster's *Cyclopædia*; *Encyclopædia Britannica*; and the works cited.)

PYROMORPHITE. [LEAD—*Ores*.]

PYROPHYLLITE (*Radiated Talc*) occurs in fibrous radiating masses and small prisms of indeterminate form. Hardness 1·5. Colour light green. Lustre pearly, transparent in thin laminæ. Specific gravity 2·8.

Before the blowpipe, exfoliates into white leaves, but does not fuse. With borax, gives a green glass, which becomes colourless when cold; with soda, gives a transparent yellow glass. Occurs near Beresof, in the Uralian Mountains, Siberia.

Analysis by Hermann:—Silica, 59·79; alumina, 29·46; magnesia, 4·00; oxide of iron, 1·80; water, 5·62.

PYRORTHITE occurs imbedded in granite or quartz, in single or aggregated slender columnar masses. Fracture conchoidal, uneven, earthy. Hardness 2·5. Colour blackish brown. Lustre resinous. Opaque. Specific gravity 2·19.

When cautiously heated by the blowpipe it takes fire and burns without either flame or smoke; it afterwards becomes white, and eventually fuses into a black enamel. With borax it gives a transparent glass. Dissolves in acids when heated, except a black powder. It is found near Fahlun in Sweden.

Analysis by Berzelius:—Silica, 10·43; oxide of cerium, 13·92; oxide of iron, 6·08; yttria, 4·87; alumina, 3·59; lime, 1·81; oxide of manganese, 1·39; water, 26·50; carbon and loss, 31·41.

PYROSMALITE occurs crystallized in hexagonal prisms. Primary form a rhomboid. Cleavage distinct, perpendicular to the axis; indistinct, parallel to the planes of the prism. Fracture uneven, conchoidal. Hardness 4·0 to 4·5. Colour greyish yellow. Streak pale. Lustre vitreous, pearly on the cleavage faces. Translucent, opaque. Specific gravity 3·08. When heated in a tube, yields water. Heated with borax, dissolves readily, and exhibits the characteristic colours of iron.

It is found at Nordmark in Sweden.

Analysis by Hisinger:—Silica, 35·850; muriatic acid, 14·095; protoxide of iron, 21·810; protoxide of manganese, 21·140; lime, 1·210; water, 5·985.

PYROSO'MA. [SALPACEA.]

PYROXENE. This mineral has received various names, probably because it has been found in different countries, and under slightly varying circumstances and properties: the different names by which it has been known are *Alalite*, *Augite*, *Baikalite*, *Coccolite*, *Diopside*, *Fassaite*, *Jeffersonite*, *Malacolite*, *Mussite*, *Pyrgom*, and *Sahlite*.

Primary form an oblique rhombic prism. Cleavage parallel to the lateral planes and both diagonals. Fracture uneven, conchoidal. Hardness 5·0 to 6·0. Colourless, grey, black, brown, yellow, green of many shades. Streak paler. Lustre vitreous and vitreo-resinous. Transparent to opaque. Specific gravity 3·23 to 3·35.

Massive Varieties, amorphous. Structure granular, columnar, parallel, and radiating, laminar.

Found in lava and basaltic rocks, and the older rocks in most parts of the earth.

Analysis of the variety called Augite, from Etna, by Vauquelin:—Silica, 52; lime, 13·20; magnesia, 10; peroxide of iron, 14·66; alumina, 3·33; oxide of manganese, 2.

The results of the analysis of the different varieties vary considerably, especially in the proportion of oxide of iron, lime, and magnesia.

PYROXYLIC SPIRIT. This substance was discovered by Mr. Philip Taylor in 1812, but not described by him till 1822, when he gave an account of it in the 'Philosophical Magazine' for that year, under the name of *pyroligneous æther*: its present appellation was given to it by Macaire and Marcet.

When wood is distilled for the purpose of preparing pyroligneous or impure acetic acid, pyroxylic spirit is also formed, and found in the liquid distilled: when this is subjected to rectification, the first tenth part of the product contains the spirit in question. It is purified by repeated rectifications, the last being made over lime, by which a quantity of ammonia is set free that had existed in the state of acetate. Dr. Kane purified it by rectification with chloride of calcium.

The properties of this substance are, that when pure it is colourless, has a peculiar penetrating smell, partaking both of alcohol and æther, and its taste is pungent: its specific gravity at 68° is 0·798, and that of its vapour at 212° is 1·120, that of the vapour of water = 1. It boils at about 150° Fahr. It does not become coloured by exposure to light and air, mixes with water without being rendered turbid, has no action upon vegetable colours, and does not form a black precipitate with protonitrate of mercury. It is an extremely inflammable liquid, and burns without residue; and being cheaper than spirit of wine, it is advantageously substituted for it in spirit-lamps, and for the purpose of dissolving resins in rendering certain manufactures water-proof; it is especially employed for this purpose in hat-making. Pyroxylic spirit is similar to alcohol in many of its properties: in density, volatility, inflammability, the solution of resins, and miscibility in all proportions with water: they differ however in one very remarkable circumstance, which is, that pyroxylic spirit yields no æther by the action of acids.

This spirit has been analyzed by Kane, and by Dumas and Peligot, with results which very nearly agree:—

	Kane.	Dumas and Peligot.		
Hydrogen . .	12·39	12·46	or 2 eqs.	12·5
Carbon . .	37·15	37·22	„ 1 eq.	37·5
Oxygen . .	50·46	50·32	„ 1 eq.	50
	100·	100·		100·

Dumas and Peligot consider pyroxylic spirit as containing a peculiar carburetted hydrogen, which they call *methylen*, and which is in fact a dicarburet of hydrogen, similar in composition to light carburetted hydrogen gas. It is capable of combining with chlorine, iodine, and other elementary bodies; it unites also with acids to form various compounds, and pyroxylic spirit is an oxide of this carburetted hydrogen.

PYRRHO, a Greek philosopher, and founder of the Pyrrhonian or first Sceptic school, was the son of Pleistarchus, or Pleistocrates, and a native of Elis, a town of Peloponnesus. He lived about the time of Philip and Alexander of Macedonia, and was originally a poor painter; but after having learned the elements of science from Dryson, he followed Alexander the Great in his eastern expedition, and thus became acquainted with the doctrines of the Indian gymnosophists and the Persian magi. (Diog. Laert., ix. 11, 2.) He was also an ardent admirer of Democritus. During the greater part of his life he lived in quiet retirement, abstaining from pronouncing any decided opinion upon anything, and endeavouring to preserve the greatest calmness and composure in whatever circumstances he was placed, so that neither pain nor pleasure affected him. Notwithstanding this apparently inactive and indolent mode of life, he was highly honoured by his countrymen, who not only made him their high-priest, but, for his sake, decreed that all philosophers should be exempt from the payment of taxes. (Diog. Laert., ix. 11, 5.) Pausanias (vi. 24, 4) saw his statue in a portico at Elis, and a monument erected in honour of him at a little distance from the town. The Athenians honoured him with the franchise of their city, though the motive which Diogenes Laertius gives for it is a mere fable. He died at the advanced age of ninety.

An undisturbed peace of mind (ἀπαθία) appeared to him the highest object of philosophy; and thinking that this peace of mind was disturbed by the dogmatic systems and the disputes of all other philosophic schools, he was led to scepticism, which he carried to such a degree, that he considered a real knowledge of things to be altogether impossible, and virtue to be the only thing worth striving after. (Cic., *De Fin.*, iv. 16.) On all occasions therefore he answered his opponents, 'What you say may be true, but I cannot decide.' This and other similar expressions drew upon him the ridicule of his adversaries; and most of the absurd anecdotes respecting his conduct in the common occurrences of life, which Diogenes repeats with all the credulity of a gossip, are probably the fabrications of his opponents, made for the purpose of ridiculing Pyrrho. He had many distinguished followers and disciples, who are called Pyrrhonii, or simply Sceptics: some of them are mentioned and characterised by Diogenes Laertius (ix., c. 7, &c., and c. 12; comp. *Gellius*, xi. 5: and Cic., *De Orat.*, iii. 17). Their doctrines and mode of reasoning are seen clearest in the works of Sextus Empiricus: their object was rather to overthrow all other systems than to establish a new one; hence we can scarcely speak of a school of Pyrrhonists, inasmuch as they opposed every school. The whole philosophy of Pyrrho and his followers is called Pyrrhonism, a name which, in subsequent times, has been applied to any kind of scepticism, though the Pyrrhonian philosophy in reality is only one particular and an elementary form of scepticism. Cicero, in several passages, speaks of the philosophy of Pyrrho as long exploded and extinct. Pyrrho himself is said by some antient authors to have left no works behind him; the tropes, or epochs, or fundamental principles of his philosophy, being justly ascribed to one or more of his followers. But Sextus Empiricus (*Adv. Math.*, i. 282) says that he wrote a poem addressed to Alexander the Great, for which he was richly rewarded: and Athenæus (x., p. 419) quotes a passage from a work of Pyrrho, the character of which is entirely unknown. The first writer on the scepticism of Pyrrho is said to have been Timon, his friend and disciple, whose life is written by Diogenes Laertius.

PYRRHOCERAS. [Corvidæ, vol. viii., p. 72.]

PY'RRHOCORAX. [Corvidæ, vol. viii., p. 72.]

PYRRHO'DES. [Psittacidæ.] Mr. Swainson's generic character is as follows:—

Bill and general structure as in *Lorius*. Tail cuneated, very long; the feathers narrow and pointed; the two middle pairs greatly exceeding the others.

Locality.—Indian Islands.

Example, *Pyrrhodes Papuensis*, Le Vaill., i., pl. 77.

PY'RRHULA. [Bullfinch.]

PYRRHULI'NÆ, Mr. Swainson's name for a subfamily of *Fringillidæ*, comprising the genera *Pyrrhulauda*, Smith; *Pyrrhula*, with subgenera *Crithagra* and *Spermophila*; *Psittirostra*; *Corythus*; *Hæmorhous*, Sw.; and *Loxia*, Linn.

PYRRHULAUDA. The following is the generic character:—

Bill short; the sides much compressed; the tip entire; the culmen arched; commissure straight. Nostrils concealed by the frontal feathers. Wings moderate; the first quill very small and spurious; the three next equal, and longest. Tail moderate, slightly forked. Feet black. Tarsi moderate. Toes very small. Lateral toes equal. Hinder claws lengthened, slightly curved. Smith. (Sw.)

Example, *Pyrrhulauda leucotis*, 'Pl. Col.' 269, f. 2.

PY'RRHUS, king of Epirus, born about the year 318 B.C., was the son of Aeacides and Phthia, daughter of Meno the Thessalian, who distinguished himself in the Lamian war. The fabulous genealogies of his family traced his origin back to Neoptolemus, whose father Achilles is said to have been honoured as a god by the Epirotæ under the name of Aspetus. Aeacides, who had come to the throne after the death of Alexander the Molossian, excited discontent among his subjects by his constant wars against the Macedonians, and was in the end driven out of his kingdom. (Justin, xvii. 3.) His only son Pyrrhus, then two years old, would have been put to death but for the care of a few friends, who, with the greatest difficulty, saved the child's life. Pyrrhus was carried to Glaucias, king of the Illyrians, whose wife belonged to the family of the Aeacidæ, and who received the infant prince, and had him educated with his own children. Great offers were made to Glaucias to induce him to surrender the child, but in vain. In his house Pyrrhus remained until his twelfth year. Aeacides, who had in the meanwhile returned to his country, fell in a battle against Cassander; and Glaucias now, with an armed force, led Pyrrhus back to Epirus, and the Epirotæ gladly received the young prince as their king. (Plut., *Pyrrh.*, 3; Justin, xvii. 3.) A regency was appointed, who governed the kingdom in his name. When Demetrius, the chief adversary of Cassander, was obliged to withdraw his forces from Europe to Asia, Cassander contrived to induce the Molossians to expel their king again. Pyrrhus, now seventeen years of age, joined Demetrius, who had married his sister Deidamia. In the battle of Ipsus (301 B.C.), which terminated so unhappily for Demetrius and his father, Pyrrhus gave the first proofs of his impetuous courage. After the battle he went over from Asia to Greece, and exerted himself to save the remains of the forces of Demetrius; and when Ptolemæus, king of Egypt, made peace with him, Pyrrhus went as a hostage to Alexandria. Here he soon won the affections and the esteem of Berenice, the king's favourite wife, who gave him her daughter Antigone, by her first husband Philip, in marriage, and seems to have prevailed upon Ptolemæus to provide her new son-in-law with a fleet and money, and to send him back to his kingdom. Pyrrhus, on his arrival, reconciled himself with Neoptolemus, whom the Molossians, during his absence, had raised to the throne, and agreed to share the government with him. Neoptolemus was of a savage and cruel temper; and he soon conceived such a jealousy and hatred of his colleague, that he even attempted the life of Pyrrhus, who, to secure himself, put Neoptolemus to death, 295 B.C. (Plut., *Pyrrh.*, 5.) From this time Velleius Paterculus (i. 14) dates the commencement of the reign of Pyrrhus. Soon after this event, Alexander, the younger son of Cassander, who had been expelled from Macedonia by his brother Antipater, sought the aid of Pyrrhus, which was granted on condition that Alexander should give up Tymphaea and Parauaea (Niebuhr, *Hist. of Rome*, iii., p. 536), together with Ambracia, Acarnania, and Amphilochia. Pyrrhus at the same time formed an alliance with the Ætolians, and was thus enabled to resist Demetrius, who, after having murdered Alexander, had become king of Macedonia (294 B.C.). Secret jealousy had long existed between Demetrius and Pyrrhus. After the death of Deidamia, Demetrius carried off Lanassa, the second wife of Pyrrhus, who brought to her new husband the island of Corcyra, which her father, Agathocles of Syracuse, had conquered. Upon this open war broke out between the two kings. Demetrius invaded Ætolia, where he made some conquests; but leaving Pantauchus behind with a considerable force, he directed his march against Pyrrhus, who at the same time was setting out to protect his allies. The two kings, having taken different roads, passed each other without being aware of it; and Pyrrhus entered Ætolia, while Demetrius ravaged Epirus. Pyrrhus met Pantauchus, and a great battle ensued. Pantauchus, who was by far the ablest general of Demetrius, challenged Pyrrhus to single combat, in which the Macedonian, after receiving two severe wounds, was conquered, but not killed, being snatched away by his friends. The Epirotæ, encouraged by the news of the victory which their heroic king had gained, slaughtered many of the Macedonians, made five thousand prisoners, and chased the rest out of their country.

Pyrrhus now invaded Macedonia, where he penetrated as far as Edessa, and was joyfully received by many Macedonians, who joined his army. Lysimachus at the same time made an attack on Macedonia from Thrace. The mild conduct of Pyrrhus during this expedition induced nearly the whole of the Macedonian army to desert Demetrius, and to salute Pyrrhus as king of Macedonia (287 B.C.). Demetrius fled into Asia, where he was defeated by the son of Lysimachus, and surrendered himself prisoner to Seleucus

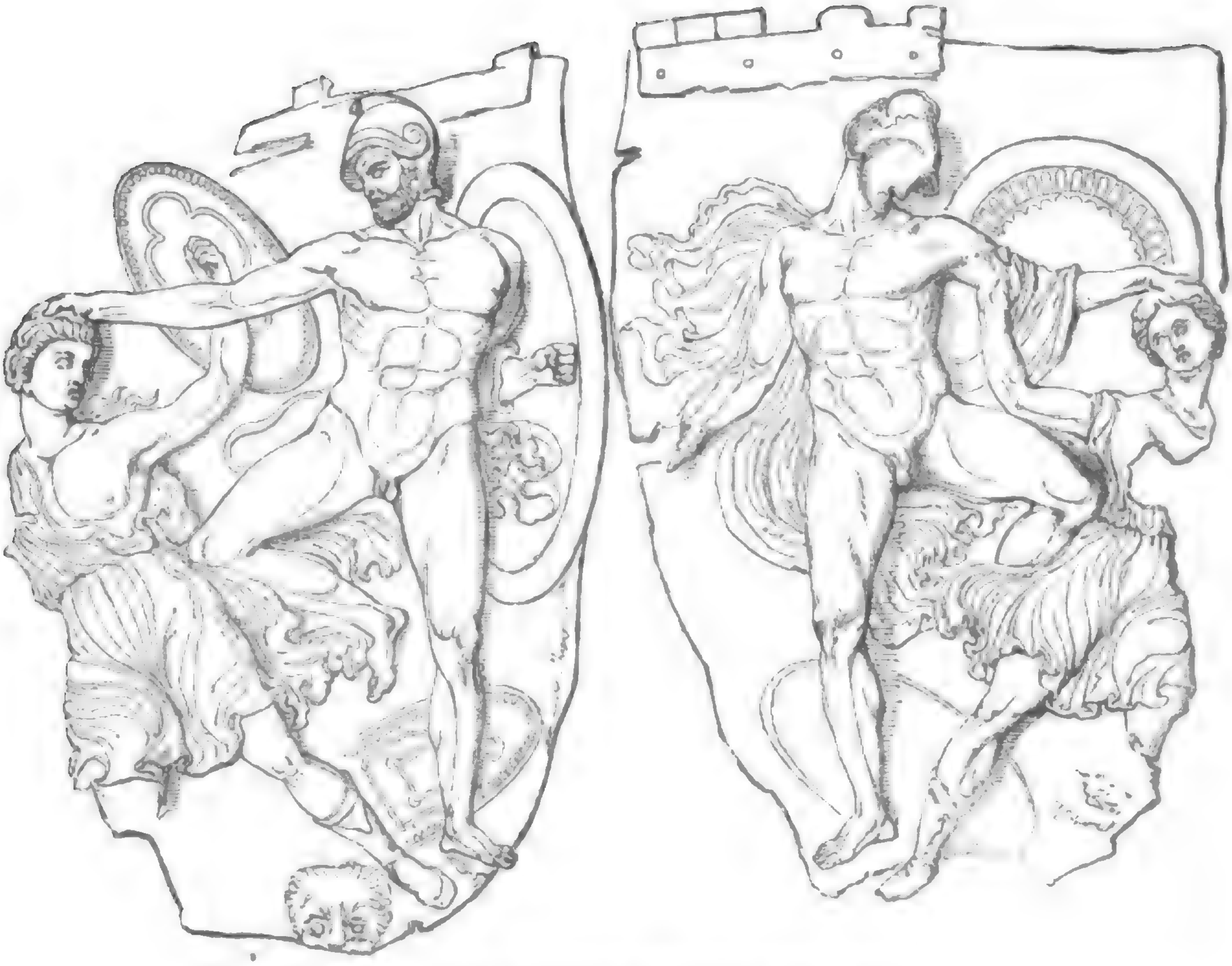
Lysimachus now claimed to share the conquest; and Pyrrhus, who did not think it safe to enter into a new contest with the aged general of Alexander, consented to divide Macedonia between himself and Lysimachus. But this division only gave rise to fresh disputes. Lysimachus soon began to feel that Pyrrhus was an obstacle to his ambition. (Plut., *Pyrrh.*, 12.) The consequence was, that a few years after the division of Macedonia, when Demetrius was defeated in Syria, Lysimachus, having now no other enemy to fear, attacked Pyrrhus in his portion of Macedonia. The Macedonians, perhaps bearing a grudge against Pyrrhus for having consented to the division of their country, were easily persuaded to abandon the king of Epirus, who, without offering any resistance, withdrew his forces from the kingdom of Macedonia about 283 B.C. (Niebuhr, *Hist. of Rome*, iii., note, 813.)

Pyrrhus now enjoyed a few years of peace and happiness; but in 281 B.C. he was requested by the Tarentines to give them his assistance against the Romans. The Tarentines declared that they merely wanted a skilful general, that a sufficient number of soldiers would be raised in Italian Greece, as the Lucanians, Messapians, the Samnites, and they themselves, would furnish an army of 20,000 horse and 350,000 foot. These promises, and the hope of adding Italy and Sicily to his dominions, excited among the Epirotæ, no less than in Pyrrhus himself, so great a desire to enter this new field of action, that neither the wise remarks of the eloquent Cineas, nor the unfavourable season of the year, could prevent him from immediately setting out. Cineas was sent first with 3000 soldiers, and the king followed in Tarentine vessels of transport with an army of 3000 horse, 2000 foot, 2000 bowmen, 500 slingers, and 20 elephants. (Plut., *Pyrrh.*, 15.) His son Ptolemæus, by Antigone, then fifteen years of age, was left behind as guardian of the kingdom. (Justin., xviii. 1.) When the transports had reached the open sea, a tremendous storm arose. The king himself reached the Italian coast; but many of the ships were wrecked, and others effected their landing with great difficulty. Only a few horsemen escaped, and 2000 foot and two elephants were lost. With the remnant of his army Pyrrhus entered Tarentum. He soon discovered that the objects of these frivolous Greeks could not be attained, unless he assumed dictatorial power. He therefore shut up all their places of amusement, compelled all the men capable of bearing arms to serve as soldiers, and the younger to submit to regular military training in the gymnasia. The effeminate Greeks, who had not expected this, left their city in great numbers. The troops which had been promised by their allies did not arrive: the Lucanians and Samnites however were prevented from joining Pyrrhus by the Roman consuls. When the consul Lævinus entered Lucania with a numerous army, Pyrrhus provided for the security of Tarentum, and went out to meet the enemy. As he however wished to defer a decisive battle until the arrival of his Greek allies, he offered to act as mediator between the Greeks and Romans; but the haughty answer of Lævinus put a stop to all negotiation, and Pyrrhus pitched his camp on the north bank of the small river Siris, in the plain between Pandosia and Heraclea. The Romans, who were encamped on the south bank, were anxious to offer battle. The consul sent his horse across the river to attack the enemy's rear; but Pyrrhus discovered the movement, and, leading his own cavalry against them, the battle commenced. The king displayed the greatest activity, and was always in the midst of danger. His brilliant armour rendering him too conspicuous, he exchanged it for that of his friend Megacles, who, being taken for the king, was slain by a Roman. His armour was carried to Lævinus, who thought that the king himself had fallen. The battle lasted the whole day, and the Romans advanced and retreated seven times. The elephants were of great advantage to the Greeks; for as soon as the Roman cavalry perceived the huge animals advancing and opening the way for the Thessalian horse that formed part of the army of Pyrrhus, they fled back across the river. The infantry was involved in their flight, and the whole of the Roman army would perhaps have been destroyed, had not one elephant, growing faint from his wounds, stopped the pursuit. The remnants of the Roman army thus escaped in the darkness of the night, and the victors took possession of their camp. Pyrrhus, on the next day, visited the field of battle, buried the bodies of the slain enemies, amounting to 7000, as well as those of his own soldiers, and proposed to the Roman captives to serve in his army. They all refused; and Pyrrhus honoured their fidelity by sending 200 of them back to Rome (Niebuhr, *Hist. of Rome*, iii., p. 559; Justin., xviii. 1.) Pyrrhus purchased this success with the flower of his own army, and he said that another such victory would compel him to return to Epirus.

The field of battle on the river Siris has latterly become a subject of great interest. In the year 1820 two bronzes of the most exquisite workmanship were found not far from the river, and near the site of the old town of Grumentum (now Saponara in the province of Basilicata), and within the enclosure of a ruin which has perhaps been a small temple. These bronzes, called the Bronzes of Siris, which were originally gilt, are each a little more than seven English inches in length. On each of them is represented in very high relief a hero fighting with an Amazon. They are now in the British Museum, and may at first sight be recognised as fragments of a magnificent cuirass. The character and the beautiful style of the work render it certain that they belonged to the school, or at least to the period, of Lysippus. They were in all probability brought over to the spot where they were found, by some one in the army of Pyrrhus, and may perhaps have formed part of the armour of the king himself or of one of his generals, though there is no evidence to prove this supposition. (Bröndsted, *The Bronzes of Siris*, an archæological essay, London, 1836.)

After the battle on the Siris, Pyrrhus advanced to within 300 stadia of Rome, and was joined by the Lucanians and Samnites. The Romans, undaunted by their defeat, and deserted by many of their allies, raised new troops and determined to try their strength again. It was not the intention of Pyrrhus to conquer or destroy Rome, but to conclude an honourable peace, and accordingly he sent his friend Cineas to Rome to negotiate while he assembled his Italian allies. The conditions which he proposed were, according to the most probable account of Appian (iii. 10, 1), that peace should be concluded with himself and the Tarentines, that all Italian Greeks should be free, and that all conquests which the Romans had made in Lucania, Samnium, Daunia, and Bruttium, should be given up. At the same time he offered to deliver all the Roman captives without ransom. The senate of Rome hesitated, until Appius Claudius, the blind, threw all his influence into the scale, and persuaded his fellow-citizens to send Cineas out of the city and to break off all negotiations. Pyrrhus, seeing that there was no hope of peace with the Romans, advanced with his army as far as Anagnia, and seems even to have taken possession of Præneste. (Flor., i. 18, 24; Eutrop., ii. 7.) He had ravaged all the country through which he had passed, and his soldiers, laden with booty, began to show great want of discipline. The Romans had now concluded a peace with the Etruscans; and the season of the year was too advanced to begin a new campaign: these circumstances combined to induce Pyrrhus to lead his troops back to Campania, where he found Lævinus with a numerous army. But neither of the two parties was anxious for battle, and Pyrrhus took up his winter-quarters at Tarentum. During the winter the Romans sent an embassy headed by C. Fabricius to negotiate for an exchange of prisoners. Pyrrhus refused the proposal, unless peace was concluded on the terms proposed by Cineas; but in order to show his esteem for the enemy, he allowed the prisoners to go to Rome for the purpose of celebrating the Saturnalia, on condition that if their fellow-citizens should not be willing to conclude peace, they should return after the festival. The senate would not hear of peace, and, after the festival was over, they sent the captives back to Pyrrhus. (Appian, iii. 10, 5; comp. Niebuhr, *Hist. of Rome*, iii., p. 586, &c.)

In 279 B.C., Pyrrhus began his new campaign, and in the neighbourhood of Asculum in Apulia he met the Roman consuls P. Sulpicius and P. Decius. The king compelled the Romans to come forward into the open field by sending his elephants with a division of light-armed troops to attack their flank. The Romans endeavoured in vain to break through the phalanx; Pyrrhus was irresistible, and the elephants dispersed and routed the Roman horse. The Romans, after having lost 6000 men, took refuge in their camp; Pyrrhus lost 3500 of his soldiers, and among them the flower of his army (Plut., *Pyrrh.*, 21; comp Niebuhr's *Hist. of Rome*, iii., p. 589, &c.), and although he had gained the day, he retreated to Tarentum. He is said to have exclaimed, 'One more such battle, and we are lost.



The Bronzes of Siris, drawn from the originals in the British Museum.

He had discovered how little he could rely on the discipline of his Italian allies; to draw reinforcements from Epirus was impracticable, as an insurrection had broken out among the Molossians (Appian, iii. 11, 1), while the northern part of Epirus was threatened with an invasion of the Gauls. The Romans, on the other hand, who seemed to gain new strength after every defeat, had formed a close defensive alliance with Carthage (Polyb., iii. 25), which immediately sent out a fleet to co-operate with the Romans against Pyrrhus. The Romans however declined this aid, and Mago, the Carthaginian admiral, sailed to Pyrrhus, who had already directed his attention to Sicily, to sound his intentions. In the meanwhile however an occurrence is said to have taken place which afforded to the Romans as well as to Pyrrhus a favourable opportunity to put a stop to hostilities. In the year 278 B.C., when the consuls C Fabricius and Q. Papus had taken the field against Pyrrhus, a traitor belonging to the retinue of the king proposed to the consuls to destroy his master by poison. The Romans are said to have apprised the king of his danger (Niebuhr, *Hist. of Rome*, iii., p. 594, &c.), who, as a reward for their honesty, ordered Cineas to lead all the Roman prisoners back, without ransom, and laden with rich presents. Cineas was also authorised to make peace. The generosity of the king rendered the Roman senate more flexible than before, and although peace was refused unless the king would consent to quit Italy, yet the Tarentine prisoners and other allies of Pyrrhus were sent back, and a truce was concluded (Appian, iii. 12, 1), which enabled the king to cross over to Sicily with his army. The garrison in Tarentum and other places remained, and Alexander, son of Pyrrhus by Lanassa, was entrusted with the command at Locri. (Justin, xviii. 2.) Pyrrhus had been invited by the inhabitants of Agrigentum, Syracuse, and Leontini to lend his aid against some Sicilian tyrants and the Carthaginians, who had already taken possession of many towns in the island and were besieging Syracuse by land and by sea. Pyrrhus willingly complied with their wish, hoping that it would not be difficult to make himself master of the island, and thus more effectually to support his Italian allies.

After having spent two years and four months in Italy (Diodor., *Fragm.*, lib. xxii. 11), Pyrrhus landed with his army in Sicily. The Carthaginians withdrew their forces from Syracuse. Almost all the towns of Sicily threw open their gates to him; Eryx was besieged and soon reduced. The Mamertines, who held several towns in subjugation and exacted heavy tributes, were likewise subdued. The Carthaginians were at last driven from Sicily, with the exception of Lilybæum, where they fortified themselves, and were besieged by Pyrrhus. They were willing to give up the whole island, with the exception of this last stronghold, and even offered money if Pyrrhus would conclude peace on these terms. But Pyrrhus, urged by the chief Sicilians, whom nothing short of an entire evacuation of their island by the Carthaginians would satisfy, declared that he could enter into no negotiation unless they would withdraw all their forces from Sicily. (Diodor., *Fragm.*, lib. xxii., 14.) After a long and useless siege of Lilybæum, the king determined to man his fleet and make a landing on the coast of Africa. But his severity in compelling the Sicilian Greeks to man his vessels, and his mistrust of them, roused their discontent. The two leading men among them, Thynion and Sosistratus, incurred his suspicions, and one of them was put to death. This act suddenly called forth the hatred of the Sicilians, and some of them threw themselves again under the protection of the Carthaginians, while others called the Mamertines to their assistance. While this dangerous spirit was spreading in Sicily, Pyrrhus received information that the Tarentines and Samnites were no longer able to hold out against the Romans, and he gladly seized this opportunity of quitting the island, and hastened to Italy.

In his passage through the straits he was attacked by the Carthaginian fleet, and lost seventy of his ships, and he reached the coast of Italy with only twelve which were in sailing condition (276 B.C.). On arriving at Locri, he found himself in great difficulties, not being able to pay his soldiers. To satisfy their wants, he took the sacred treasures from the temple of Proserpine. When the treasures were embarked, a storm arose, in which some of the ships were lost; the others, laden with the treasures, were cast back on the coast of Locri.

Pyrrhus, whose mind seems to have lost its former energy and self-possession, fancied that he had incurred the anger of the goddess, and not only restored all the treasures to the temple, but endeavoured to atone for his crime by offering rich sacrifices; and as the signs appeared to be inauspicious, he put to death all those who had advised or consented to the sacrilegious act. (Appian, iii. 12.) On his march towards Tarentum, his army was attacked and harassed from the mountainous districts by numbers of Mamertines, who had come over from Sicily before him. Pyrrhus here again evinced his usual courage. A huge barbarian challenged the king to single combat, and Pyrrhus, though already wounded, hurried forward, and cut the man in two with his sword. This proof of his undaunted spirit put an end to the attacks of the barbarians, and he reached Tarentum in safety.

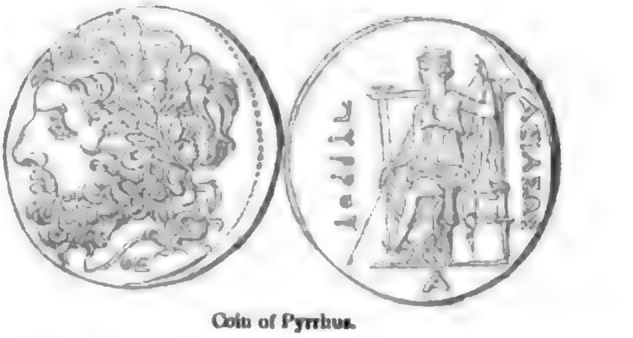
Having here reinforced himself, he set out against the Romans, and pitched his camp in Samnium. The Romans sent out two consular armies, under Manius Curius, who marched into Samnium to meet Pyrrhus, and L. Cornelius Lentulus, who took up his position in Lucania (275 B.C.). The Samnites sent a contingent to his army, but it was small, as they bore some ill-will towards him. Pyrrhus sent a part of his army to Lucania, to prevent Lentulus joining his colleague. Curius had taken his position, and fortified himself on the hills near Beneventum, wishing to avoid battle until the arrival of Lentulus. It was the intention of Pyrrhus to attack the Roman camp by surprise before daybreak, but in order to reach the summit of the hill above the Roman camp, he had to lead his army a long and fatiguing way through the forests, and when he descended upon the Roman camp it was broad day-light. Curius turned round to attack the enemy, who after some resistance took to flight. This success emboldened Curius to direct his attack against the main army of the king in the plain. The elephants, frightened and infuriated by burning arrows, which the Romans showered on them, put the king's army into disorder, and were thus the cause of a complete defeat. The king's camp fell into the hands of the Romans. Two elephants were killed and eight taken; Pyrrhus himself, with only a few horsemen, escaped to Tarentum. He nevertheless did not despair, but sent letters to several kings, requesting them to supply him with men and money. (Paus., i. 13.) Antiochus promised to comply with his wish, but Antigonus refused. A report of advancing auxiliaries for the king kept the Romans at a distance, and enabled Pyrrhus to set sail for Epirus with the greater part of his troops. Milo however was left behind, with the command of the garrison at Tarentum, and his son Helenus.

On arriving in his kingdom, Pyrrhus found himself unable to provide for the wants of his small band, and after some Galatians had joined him, he invaded Macedonia in order to gain by plunder the means of maintaining his troops. Fortune once more favoured him, and he soon made himself master of nearly the whole of Macedonia. Thinking that a more glorious field was now opening to him, he gave up all intention of returning to Italy, and recalled Milo and his son Helenus. Antigonus, who had assembled an army of Galatian mercenaries, was defeated by a son of Pyrrhus, and fled from his kingdom.

Before Pyrrhus had firmly established himself in Macedonia, he was invited by Cleonymus, a worthless Spartan, to assist him against the king Areus. Pyrrhus advanced to Sparta with a numerous army, ravaging and plundering the neighbourhood. Though king Areus was absent, Pyrrhus met with a most determined resistance from the women as well as the men of Sparta, and his son Ptolemæus, who had made his way into the city, was nearly killed. Pyrrhus himself had a severe contest at the gates of the city, which was interrupted by night, and recommenced the next morning. He succeeded in forcing his way into the city, but the united exertions of the Spartan men and women drove him from it. At the same time king Areus arrived from Crete, and auxiliaries from Corinth were on their march to Sparta, and Pyrrhus therefore gave up the contest, and contented himself with ravaging the country. He intended to take up his winter-quarters in Laconia, but another opportunity for action offered itself. Argos was distracted by two factions; one was headed by Aristeas, who called Pyrrhus to his assistance, while Aristippus, his adversary, sought the protection of Antigonus. The king immediately marched towards Argos. On his road he was attacked by Areus, who lay in ambush and cut off the rear of his army. Pyrrhus left Ptolemæus behind to oppose Areus, and proceeded on his road. His son fell in a fierce battle, and Pyrrhus, turning back to avenge his death, slew with his own hand Eualcus, who had killed his son.

In the meanwhile Antigonus had occupied the hills near Nauplia, and Pyrrhus pitched his camp in the plain. The Argives, dreading the issue of a battle, promised that their city should not be hostile to either party, if they would not attack it. Antigonus consented, and gave his son as a hostage. Pyrrhus likewise promised to keep peace, but gave no pledge of his intentions. In the ensuing night Aristeas opened one of the gates to him, through which Pyrrhus with his Galatians entered, and took possession of the market-place. The Argives, roused from their sleep by the noise, sent to Antigonus, who immediately advanced with his forces. Areus at the same time arrived with a select body of Cretans and Spartans. The darkness of the night and the narrowness of the streets produced the greatest confusion among the combatants. At daybreak, Pyrrhus, discovering that all the fortified parts of the city were occupied by armed troops, wished to get out of Argos. While he was making this attempt, assisted by one of his sons, he was killed by an old woman, who, seeing her son fighting with the king, threw a tile upon his head from the roof of her house.

Pyrrhus died in the year 273 B.C. (Niebuhr, *Hist. of Rome*, iii., note, 928.) All the antients agree that he was one of the greatest generals; and Hannibal himself declared him to be the first. But great as he was in battle, he did not know how to make the best use of a victory. His ambition was rather to acquire than to preserve, and he generally soon lost the advantages which he had gained. He was grateful towards his subjects, and owned that he was indebted to them for all that he possessed. As a man, he stands pre-eminent among the kings of his time; for while they were surrounded by worthless flatterers, Pyrrhus had friends such as few kings have ever possessed. In his family he was an affectionate father and husband. A change seems to have taken place in his character from the time when he embarked for Sicily, and no blame can be attached to his conduct previous to that event. The death of Neoptolemus was a mere act of self-defence, but his conduct towards Sparta has left a stain upon his character. Pyrrhus also attempted to distinguish himself as an author (Cic., *Ad Famil.*, ix. 25; Plut., *Pyrrh.*, 21); but we have no means of judging of his merits in this respect, as no part of his work remains. The Life of Pyrrhus by Plutarch is one of the most exquisite specimens of biography.



Coin of Pyrrhus.

British Museum. Actual size. Silver. The head is probably that of Jupiter.

PY'RULA. [SIPHONOSTOMATA.]

PYRUS, the Latin word for 'pear-tree,' is a name now given by botanists to a considerable number of Rosaceous plants, whose collective character is to bear a fruit resembling in all essential circumstances that of the apple or pear; that is to say, inferior, fleshy, with a cartilaginous lining to the cells, which are simple, and contain from 1 to 2 seeds in each. But the similarity in the fruit is by no means accompanied by an equal degree of resemblance in the foliage and manner of growth of the species, some of them being trees with the aspect of the apple and pear, while others have pinnated leaves which have caused them to be vulgarly regarded as species of ash, and many are dwarfish shrubs, with quite a peculiar appearance.

In consequence of such differences the genus is divided into several sections, the most important of which are,—1, the Apples and Pears, with oval simple leaves, and the stature of trees; 2, the Beam-trees, with coarsely toothed leaves white with down beneath; 3, the Mountain Ashes, with pinnated or pinnatifid leaves; and 4, the Dwarf Crabs, with oval simple leaves, and the stature of bushes. Upon each of these it is necessary to state something.

To the section of apples and pears belong not only the well-known fruits so called [Apple; Pear] and all their many varieties, but also several species whose fruit is less valuable. On Mount Sinai grows a species called *P. Sinaica*, whose fruit is hard, gritty, and austere, and whose leaves are grey with down; in Germany a similar kind, the *P. nivalis*, is by no means uncommon, with a considerable resemblance to the last; Siberia and Persia produce another, called *P. salicifolia*, with very narrow hoary leaves; and in the former country are found the Siberian crab, *P. prunifolia*, and the berry-fruited crab, *P. baccata*, whose fruit is too small for ordinary consumption, but is often seen in the form of a sweetmeat. Besides these, the Chinese crab, *P. spectabilis*, and also *P. coronaria*, are cultivated for their flowers.

The Beam-trees derive their name from the use that has been made of their tough wood for beams, axletrees, and similar purposes, where great strength is required. It is especially for the cogs in the wheels of machinery that it was used, till superseded by iron. The common Beam-tree is *Pyrus Aria*, and inhabits the rocks of the west and north of England, where it forms an ornamental object with its dark-green foliage shifting to silvery-white when disturbed by the wind. To this section may be referred without inconvenience the true Service, *Pyrus domestica*, a tree now not uncommon in England, but originally from the south of Europe, with a large pyramidal head, coarsely serrated leaves, and a green austere fruit, which however blets like the medlar, when it becomes tolerably eatable, though very indigestible. Its wood is very compact, and is said to be the hardest and heaviest of any indigenous in Europe.

The mountain ash, *P. aucuparia*, is a well-known ornamental tree, with a graceful habit, fragrant clusters of white flowers, and loose bunches of scarlet berries. It is found wild all over Europe and in the north of Asia; a variety occurs with yellow berries. In North America it is represented by a nearly allied species, *P. Americana*, with large copper-coloured berries, and a third kind, *P. microcarpa*, with very small scarlet fruit. The mountain ash is the rowen-tree of the Scotch, whose boughs were supposed to be a protection against witchcraft. It forms a hardy and good stock on which to graft the pear-tree, when it is desired to dwarf that species.

The dwarf crabs are small bushes with dense clusters of white flowers succeeded by black or red fruit very like that of the mountain ash. All are North American, except a Swiss species, *P. chamæmespilus*, and are scarcely cultivated except as objects of curiosity.

(See Loudon's *Arboretum Britannicum*, vol. ii., p. 917, &c., for very copious information concerning this genus.)

PYTHA'GORAS, the son of Mnesarchus, was born about the year 570 B.C., in the island of Samos. By his mother's side he was connected with the most distinguished families of the island: his father, according to most accounts, was not of pure Greek blood, but either a Phœnician or a Tyrrhenian of Lemnos or Imbros. The history of Pythagoras is obscured and disfigured by a cloud of fables, through which we are unable to discover anything beyond the most general outline of the chief events of his life and his character. He is said to have been a disciple of Pherecydes of Syros; and if we could give credit to the various other traditions respecting his masters, he would appear to have been connected with almost all the philosophers of the age, from Thales and Anaximander down to the obscure Creophilus and Hermodamas. (Porphyr., *De Vit. Pythag.*, 2; Diog. Laert., viii. 2.) But the information which he derived from his countrymen did not satisfy his inquisitive mind, and, like many other illustrious Greeks, he travelled into various countries. He first visited Egypt, where he was introduced to King Amasis by letters from Polycrates. From Egypt he went to Asia, where he is said to have made himself acquainted with the science of the Chaldæans and the Magi: some traditions even state that he visited India and the Gymnosophists. But though these traditions may have some historical foundation, thus much is certain, that his philosophical system was not derived from any foreign source, or even materially influenced by anything that he saw and learned in the countries which he visited. All that he derived from foreign countries cannot have been more than general impressions which their political and religious institutions made upon him, and which may in some measure have decided the natural bias of his mind. His whole philosophy bears the impress of genuine Greek growth, and there is scarcely anything in it which may not be traced to some native source. On his return from his travels, he seems to have conceived the plan which he afterwards endeavoured to realize; but finding that the tyranny which Polycrates had established in his native island would be an insurmountable obstacle to his views, he set out in search of a new home. After having travelled through several parts of Greece, partly to strengthen himself in his opinions, for which purpose he perhaps visited Crete and Sparta; partly to form useful connections, as at Olympia and Delphi; partly also to sound the minds of the people, and to discover how far they might be disposed to carry his designs into effect, he finally settled at Croton in Southern Italy. The aristocratical government and the state of parties in this city seem to have been particularly favourable to the realization of his political and philosophical schemes, and the place was therefore certainly not chosen by the philosopher without due consideration. The fame of his wisdom and of his travels had probably gone before him to the Italian Greeks. The aristocratical party at Croton, who were in possession of all the political power, had excited discontent among the people; and though still strong enough to maintain their position against the commonalty, they must have hailed the arrival of a stranger, who, being supposed to be endowed with supernatural powers, commanded the veneration of the multitude, and was willing to serve the oligarchs on condition that they would allow him some degree of influence in their political measures.

From the moment of his favourable reception by the senate of Croton, whose object seems to have been to use him as an instrument for their own ends, a new æra in the life of Pythagoras commences; but before we proceed to consider the manner in which he endeavoured to put his theory into practice, we shall attempt to give a brief outline of his philosophical principles, which will serve to throw some light upon his institution, which we shall describe hereafter. The philosophic school of which Pythagoras was the founder, is sometimes called the Italian or the Doric school. The latter name seems to have been given to it, not so much because it was peculiar to the Doric race, or because its object was to establish the ideal of a Dorian state (Müller, *Dor.*, iii. 9, § 15), but because it was neither connected with the Ionian nor the Attic school; though, on the other hand, it must be admitted that the institutions which Pythagoras established at Croton, in many respects bore great analogy to the Doric institutions which he had seen in Crete and Sparta. It is the more difficult to give a clear idea of the philosophy of Pythagoras, as it is almost certain that he himself never committed it to writing, and that it has been disfigured by the fantastic dreams and chimæras of later Pythagoreans. In modern times great light has been thrown upon the subject by the careful examination and analysis of the fragments of Philolaus by Boeckh (*Philolaus des Pythagoreers Lehren nebst den Bruchstücken seines Werkes*, Berlin, 1819). Philolaus of Tarentum, a disciple of Pythagoras himself, was in all probability the first Pythagorean who wrote an exposition of the system of his master, and his fragments must therefore be considered as the most genuine source of information. The results at which Boeckh arrived, are on the whole the same as those which Ritter, in his 'Geschichte der Pythagorischen Philosophie' (Hamb., 1826) subsequently reached, though by a different mode of inquiry. Pythagoras considered numbers as the essence and the principle of all things, and attributed to them a real and distinct existence, so that in his view they were the elements out of which the universe was constructed. How he conceived this process, has never yet been satisfactorily explained; but he was probably led to the supposition by observing that the periodical occurrences in nature, and almost all institutions and religious regulations and observances in Greece, were founded on numerical relations. Pythagoras thus traced the various forms and phenomena of the world to numbers as their basis and essence. But he did not stop here: he ascended still further to the principles of numbers themselves: these principles he conceived in the form of contrasting pairs, such as straight and curve, limited and unlimited, one and many, odd and even, and others. (Aristot., *Metaph.*, i. 5.) Further, he traced these contrasts to one first principle and element, the unit (μονάς), which included both the even and the odd, &c., and thus the even was odd. This unit he considered as the formal as well as material basis of all things, and as identical with the one supreme being, or God. The decad and tetractys or the quadrate, are likewise described as perfect numbers and first principles; the triad was called the number of the whole, because it had a beginning, middle, and end. Pythagoras conceived the vital process of the world as a process of breathing, and the first principle was therefore likewise a breathing being, which inhaled the infinite atmosphere of the world (*ἄπειρον πνεῦμα*), and thus partook of its infinity and became capable of developing itself into a multiplicity of numbers or things. The perfect development of the original unit is represented in our actual world, which consists of small and large wholes in the greatest variety. The special principle of every single whole or organization is again a unit, or a point separating itself from the rest; and as it is a living germ, it develops itself by breathing the *ἄπειρον πνεῦμα* into a distinct body of peculiar form and properties. Every abstract idea was thus in reality a number, and physical objects were symbolical representations of numbers. In the world which had thus arisen out of a union between the even and odd, &c., the Pythagoreans distinguished five elements,—fire, air, water, earth, and the so-called fifth element (*τὸ πέμπτον στοιχεῖον*), which was probably the æther. In the centre of the universe they placed the central fire (*ἱστία τοῦ παντός*, as it were, the altar of the universe), the principle of life in the world. The central fire is surrounded by the earth, the moon, the sun, the five planets, and the firmament, all of which were either gods themselves or inhabited by gods inferior to the supreme God who ruled the whole. The universe was divided, according to Philolaus, into three regions (*διάκοσμοι*). The first was the sublunary region, between the earth and the moon, the scene of change and passing events, where beings come into existence and perish again; it was called the heaven (*οὐρανός*). The second region was the region from the moon upwards to the firmament, and bore the name of kosmos (*κόσμος*). The third, or the firmament itself, called Olympus, was probably, in accordance with the national and traditional belief of the Greeks, considered as the abode of the gods. The heavenly bodies, together with the gods themselves, were conceived as performing a choral dance round the central fire, whence the music or the harmony of the spheres.

Advancing from the consideration of the universe to man, the Pythagoreans represented the souls of men as light particles of the universal soul diffused through the whole world (Cic., *De Nat. Deor.*, i. 11); the souls of the gods were considered as proceeding directly from the central fire, which was on this account designated 'mother of the gods,' while the souls of men proceeded from the sun, which was a mere reflex of the central fire. The soul of man was divided into three parts, *νοῦς*, *φρένες*, and *ϑυμός*: the two former were considered as the rational half of the soul, and had their seat in the brain; the last, or *ϑυμός*, was the animal half, and its seat was in the heart. (Diog. Laert., viii. 19, 30; Plut., *De Plac. Phil.*, iv. 5.)

The doctrine of the transmigration of souls does not seem to have originated among the antient Greeks, for they describe the souls of the departed as dwelling in the lower world, from which there was generally no return. Pythagoras may have derived it from some of the mysteries, for he is said to have been initiated in all the existing mysteries both of Greece and other countries. He and his followers considered the transmigration of souls as a kind of purifying process. The souls, previous to their entering into human bodies, floated in the air, from whence they were inhaled by the process of breathing at the moment of birth. At the moment of death, they descended into the lower world, where they were probably supposed to dwell a certain number of years, after which they again rose into the upper world, and floated in the air, until they entered into new bodies. When by this process their purification had become complete, the souls were raised to higher regions, where they continued to exist, and to enjoy the presence and company of the gods.

The Pythagoreans, according to Aristotle (*Eth. Magn.*, i. 1), were the first who determined anything in moral philosophy. Their ethics are of the loftiest and most spiritual description. Virtue was with them a harmony, unity, and an endeavour to resemble the deity. The whole life of man should be an attempt to represent on earth the beauty and harmony displayed in the order of the universe. The mind should have the body and the passions under perfect control; the gods should be worshipped by simple purifications, offerings, and, above all, by sincerity and purity of the heart. Besides the works of Ritter and Boeckh referred to above, compare Ritter's 'History of Antient Philosophy,' i., p. 327, 420, Engl. transl.

After this brief sketch of the philosophy of Pythagoras, we shall proceed to consider the manner in which he endeavoured to apply it, or at least its ethical part, to the affairs of ordinary life, which will at the same time show the one-sidedness of a view which might be derived from a statement of Cicero and Diogenes Laertius. Both of these authors say that Pythagoras was the first Greek who assumed the title of philosopher, and that he compared his vocation to that of a spectator at the public games. The definition implied in this comparison is only applicable to a small portion of the philosophy of Pythagoras, for he manifestly did not consider mere contemplation as the sole and highest object of man, but it was his doctrine that by action as well as by thought the individual as well as the state should represent in themselves an image of the order and harmony by which the world was sustained and regulated.

The precise objects of his institutions at Croton are not quite clear, though we cannot suppose that they were either exclusively philosophical, religious, or political. The perfect state of society, such as he conceived it, depended as much on sound religious and philosophical, as on political principles. It was not his intention to bring about his reforms at once by force or by the introduction of a new code of laws, but by gradually diffusing his enlightened ideas. He seems never to have filled any public office at Croton, and perhaps he may have declined such places in order that he might not be checked in his designs by any of the existing institutions, which he could only have overthrown by force. His scheme, though in its objects similar to some of modern times, was not near so visionary and as extravagant; for that it was by no means impossible to give a new form to society is clear from the reforms wrought by Lycurgus at Sparta, of Zaleucus at Locri, and of Charondas at Catana. Pythagoras established at Croton a society or an order, of which he himself was the head, and which was to be the centre from whence his reforms were to emanate. It consisted of three hundred young men, selected from the most distinguished families of Croton and other Italian cities. The society was, as a modern historian expresses it, 'at once a philosophical school, a religious brotherhood, and a political association.' The earnestness and honesty with which Pythagoras went to work are apparent from the fact that he admitted none but the ablest men into his society, and that he bestowed the most anxious care on the cultivation of their minds and hearts, in order to render them alive to the highest objects that can engage the human mind, and to make them clearly understand the place which they occupied in the world. The proceedings of the society were transacted in the greatest secrecy, but perhaps more on account of the religious doctrines there inculcated than on account of either philosophical or political principles. Religion indeed seems to have been the foundation of the society, and that his religious principles greatly differed from those generally received is clear from the tenour of his system, and it is expressly stated that he censured Homer and Hesiod for their profane descriptions of the gods. (Diog. Laert., viii. 19.) Outwardly however he showed great respect for the objects of the popular worship—a prudence which, together with his dignified and priestly appearance, was well calculated to win the affections and the admiration of the people, while the purer doctrines which he imparted to his disciples secured their most perfect submission. He instituted among his disciples a secret worship, or mysteries, which are sometimes called Pythagorean orgies, and the science of numbers, geometry, and music; and even medicine and gymnastics, including dancing, were closely connected with the sacred rites. Women seem also to have been admitted, if not into the society, at least to some of the lessons of the philosopher. (Diog. Laert., viii. 21.)

As to the political character of the institution, from which we must derive our conclusions respecting his political views in general, it is expressly stated that it was aristocratical, but in the original sense of the term, in which it means the government of the wisest and the best. His object was to establish a rational supremacy of minds enlightened by philosophy and purified by religion; and as such a state of things did not exist in Greece, we can scarcely say that he preferred any one form of government to another for its intrinsic merits, but only in as far as he thought the one a more suitable basis for his own institutions than another. That an aristocracy probably in this point of view appeared to him preferable, is apparent from the fact that he is said to have thrown his influence into the scale in order to restore this form of government in some Italian cities, where it had given way to tyranny or democracy. The three hundred members of the society were the model of an aristocratical senate, such as he would perhaps have wished to establish in every republic. We have no ground for believing that they possessed any legal authority at Croton, or superseded the old senate of the Thousand, as Niebuhr seems to think (*Hist. of Rome*, i., p. 160), for the Three Hundred included many who were not even citizens of Croton.

Those who wished to become members of the society underwent an examination by Pythagoras himself, who is said to have been skilful in judging of persons by their physiognomy. (Gellius, i. 9.) Those whom he thought fit to be received were then submitted to a period of regular probation and discipline. For a time, at least for two years, they were forbidden to speak. During this first stage of their noviciate they bore the name of Acoustici (hearers). During the second period they were allowed to ask questions, and to make objections to what they heard, as well as to write about what they had learnt during the first period. They were now called Mathematici, or scholars, for their instruction was not confined to what we call mathematics, but included music and gymnastics, in short everything which could be learnt. In the third stage, when they received the name Physici, they were admitted to the last secrets in religion as well as in philosophy and politics. Another division of his disciples which is frequently mentioned, was that of Esoteric and Exoteric, and it can scarcely be doubted that the former of these names had reference to the three hundred, from whom no kind of knowledge which their master could impart was kept secret, while the name Exoteric was either applied to those who were passing through the first stages of their noviciate, or, what is more probable, to a much greater number of persons, who were not initiated into all the secrets which the master had to unfold, and perhaps received no instruction of a purely religious nature. The real character of some other divisions mentioned by the antients—for instance, Pythagorici, Pythagorei, and Pythagoristae, or Sebastici, Politici, and Mathematici—is matter of great difficulty, though it is not improbable that they may have been expressive of gradations similar to those described above. All candidates on entering upon their noviciate had to exchange their former mode of life for one which was regulated even to the most minute details by Pythagoras himself. Their diet seems to have been a subject of his especial attention, though the extant accounts of the restrictions under which he is said to have placed them are contradictory and incredible. The doctrine of the transmigration of souls may however have led him to enjoin abstinence from animal food. Many of these regulations respecting the diet and the whole mode of life of his disciples had probably a symbolical meaning, and were intended to impress upon their minds certain philosophical or religious principles. In its external arrangements the society of Pythagoras presents some analogy to the institutions which he had seen in Crete and Sparta. The members lived and took their meals together, and the union and attachment among them are said to have been so strong as to excite the jealousy of their relations. Conscientiousness and uprightness in all the affairs of life were points on which the philosopher laid great stress. (Iambl., *De Vit. Pyth.*, 144.)

The overwhelming influence which Pythagoras and his order had gradually acquired in Croton and other Italian towns where branch institutions of that at Croton seem to have been established, at first induced the aristocratical party of Croton to avail themselves of his services (Valer. Max., viii. 15, Ext. 1), but at the same time could not fail in the end to excite their jealousy. If on the other hand we consider that his interference in the affairs of the government must at all times have been viewed with dissatisfaction by the popular party, we see at once the weak basis on which his institution rested, and one great shock was sufficient to overthrow it. This shock arose out of a contest between the popular and aristocratical parties in the neighbouring town of Sybaris. Several exiles belonging to the latter party had taken refuge at Croton, and when the Sybarites required them to be surrendered, Pythagoras and his associates prevailed on the senate to reject the demand. A war broke out, which ended in the total destruction of Sybaris, 510 B.C. The senate of Croton and the Pythagoreans seem to have been elated by this victory, and refused to share the spoil and the conquered land with the people (Iambl., *De Vit. Pyth.*, 255), and it may have been about this time that the Pythagoreans, with overweening confidence in their own strength and that of the aristocracy, made the attempt to abolish the popular assembly. Such proceedings however, instead of intimidating the people, roused their indignation. A tumult broke out, in which the house of Milo, where the Pythagoreans were assembled, was burnt: many of them perished in the flames, and the rest saved their lives only by going into exile. Pythagoras himself seems to have been absent from Croton during this insurrection, and is supposed to have died a short time after at Metapontum (about 504 B.C.). Similar insurrections soon followed in several other towns of Italy, where branches of the Pythagorean society had been established. Some Pythagoreans, such as Philolaus, fled to Greece, where they taught their doctrines and had considerable influence on the philosophy of Plato. The Pythagorean system was revived at a later period, and in the second century of our æra it appeared mixed up with the doctrines of the New Platonists. (Krische, *De Societatis à Pythagora in urbe Crotoniatarum conditae Scopo Politico*, Göttingen, 1831.)

Various discoveries in mathematics, music, and astronomy are ascribed to Pythagoras, but it would be difficult to establish the truth of these traditions by historical evidence. We have not thought it worth while to repeat the monstrous mass of fables and miracles which are interwoven in the biographies of Diogenes Laertius, Porphyrius, and Iamblichus. It may safely be said that the history of no antient sage is so obscured by fables as that of Pythagoras. He himself may, by his own priestly appearance and conduct, and by the secret proceedings of his society, have given rise to them, and may even have encouraged the general opinion that he was endowed with supernatural powers; but on the whole these are mere symptoms of the mighty impression which he made on his contemporaries, as well as on subsequent ages, for such an impression is the most fruitful source of marvellous stories of every description.

PY'THEAS, a celebrated navigator, was a native of the Greek colony of Massilia. He flourished, according to some authors (Bougainville, *Mémoires de l'Acad. des Inscript.*, tom. xix.), before Aristotle; but according to others, in the reign of Ptolemæus Philadelphus. Respecting the circumstances of his life nothing is known. Polybius, who disbelieved the accounts of his voyages, calls him a poor man, who could not possibly have undertaken such long journeys by land and voyages by sea. (Polyb., *Reliq.*, lib. xxxiv., 5.) From the same source we learn that he is said to have made two voyages. In the first he sailed round the western coast of Europe and through the English Channel as far as Thule, which is generally supposed to be Iceland. This voyage he described in a work called a 'Description of the Ocean' (περὶ Ὠκεάνου), where, among other things, he stated that he had landed in Britain and travelled through it, as far as it was accessible, and that its circumference amounted to upwards of 40,000 stadia. Respecting the land of Thule, he said that there was neither land, nor sea, nor air, but something composed of all of them, and in substance like that of the mollusca, in which the earth, the sea, and the whole universe were suspended. This substance, which he had seen himself, was, as he had been told, a connecting link of the universe, and it was impossible to penetrate into it either by land or by sea. (Strabo, ii. 5, p. 181, ed. Tauchnitz.) This fabulous account of Thule may be easily explained; and that he advanced at least as far as Iceland seems to be clear from his statement that during the summer solstice in Thule the sun never disappeared from the horizon. (Plin., *Hist. Nat.*, ii. 75.) He places Thule six days' sail from Britain. Some time after his return, he set out on a second voyage, in which he sailed along the whole western coast of Europe, from Cadiz into the Baltic as far as a river which he called Tanais, on the banks of which amber was found. (Plin., *Hist. Nat.*, xxxvii. 2.) What river the Tanais may have been is uncertain. D'Anville and Gosselin denied the second voyage of Pytheas altogether, though the words of Polybius admit of no doubt that there was in his time a report of such a voyage, probably founded on the assertion of Pytheas himself. It is said to have been described in a work called Periodus or Periplus.

The motives for his undertaking such long voyages are entirely unknown, but it is generally supposed that the Massilians, a flourishing commercial republic, wishing to extend their mercantile connections, sent him out to explore the unknown regions of the north. In this case however the epithet *poor*, which Polybius gives to Pytheas, would be ill applied, as his personal poverty would have been no obstacle to his entering upon such bold enterprises. Pytheas also distinguished himself as a mathematician and an astronomer, and among other discoveries ascribed to him, he is said to have been the first who determined the meridian altitude of the sun at the summer solstice at Massilia, by means of a gnomon. (Hipparchus ap. Strab., ii. 5, p. 182, ed. Tauchnitz.)

His merits have been differently judged of by the antients, for while Eratosthenes and others adopted his statements in preference to those of others, Polybius (*Reliq.*, lib. xxxiv., 10), and especially Strabo (in many passages of lib. i. and ii.), treat him with the utmost contempt, though the latter does not despise his accounts of the manners and productions of the countries which he visited. Modern geographers however have discovered reasons for judging more favourably of Pytheas, and have ascertained that he is right in several points for which he is censured by Strabo.

The few fragments of his works were collected and edited in 1824, by Andr. Arw. Arwedson, Upsala. Compare Brückner, 'Historia Reipublicæ Massiliensium,' Göttingen, 1826, p. 64, &c.; 'Pytheas de Marseille et la Géographie de son Temps; ouvrage publié par Jos. Straszewicz, orné de trois Cartes géographiques,' Paris, 1836 (this work has been translated into German by S. F. W. Hoffmann, Leipzig, 1838). See also Ukert, *Bemerkungen über Pytheas, Geographie der Griechen und Römer.*

PYTHIA. [Delphi.]

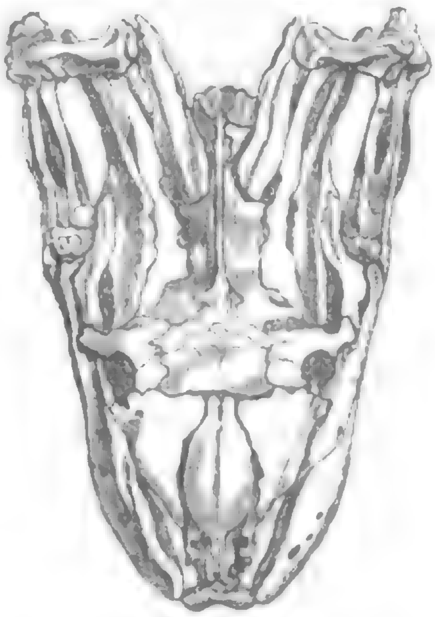
PYTHIAN GAMES (*Pythia*, or *Pythici Ludi*), one of the four great national festivals of the Greeks, were celebrated near Delphi, in honour of Apollo, originally every ninth year, and afterwards every fifth year, in the autumn of the third year of each Olympiad, in the second or third month of the year, according to Clinton. Corsini and others, followed by Boeckh, place them in the spring, in the month Munychion, the tenth of the year. Their origin is assigned by some to Amphictyon, the son of Deucalion, or to the Amphictyonic council; by others to Agamemnon; by Pausanias to Diomed; by Strabo to the Delphians, after the Crissæan war; but most commonly to Apollo, after he had vanquished the serpent Python. (Ovid, *Met.*, i. 445.) There is an account that the gods and heroes contended in the first celebration of these games, when Castor conquered in the horse-race, Pollux in boxing, Calais in the foot-race, Zetes in fighting in armour, Peleus in throwing the quoit, Telamon in wrestling, and Hercules in the pancratium. But the fact seems to be, as stated by Pausanias (x. 7, 2) and Strabo (ix., p. 421), that the contest was originally in music: the songs (πυθικοὶ νόμοι) were in honour of Apollo, celebrating his victory over the Python; and the instrument used was the lyre. In the third year of the 48th Olympiad (B.C. 586), at the close of the Cirrhæan war, the Amphictyons added a contest on the flute, which was afterwards discontinued, as the music of the flute was considered too mournful for a joyous festival. In the same year the Amphictyons also introduced athletic contests and races (but not with four-horsed chariots), the foot-race being confined to boys; and the games, according to Strabo, were then for the first time called *Pythia*; at all events the subsequent Pythia are computed from this year by Pausanias and the Parian marble, though the scholiast on Pindar, and Eusebius, date them from the second celebration, in Ol. 49, 3: Boeckh and Clinton prefer the former date. Chariot-races were added in the time of Cleisthenes, the tyrant of Sicyon. The prize in the Pythian games was originally of silver or gold, or something else of intrinsic value: but afterwards a crown of laurel, or (according to Ovid, *Met.*, i. 449-50) at first, of the bay-oak or beech-tree (*æsculus*), for which the laurel was afterwards substituted. The ceremonies observed at these games, in common with the three other great festivals, are described under Olympian Games.

(Pausanias, x. 7; Strabo, ix., p. 421; Potter's *Archæologia Græca*, vol. i., c. 25; Wachsmuth, *Hellenische Alterthumsk.*, i. 110; ii. 379; Clinton, *Fasti Hellen.*, i., p. 228; ii., p. 195; iii., p. 296, 612.)

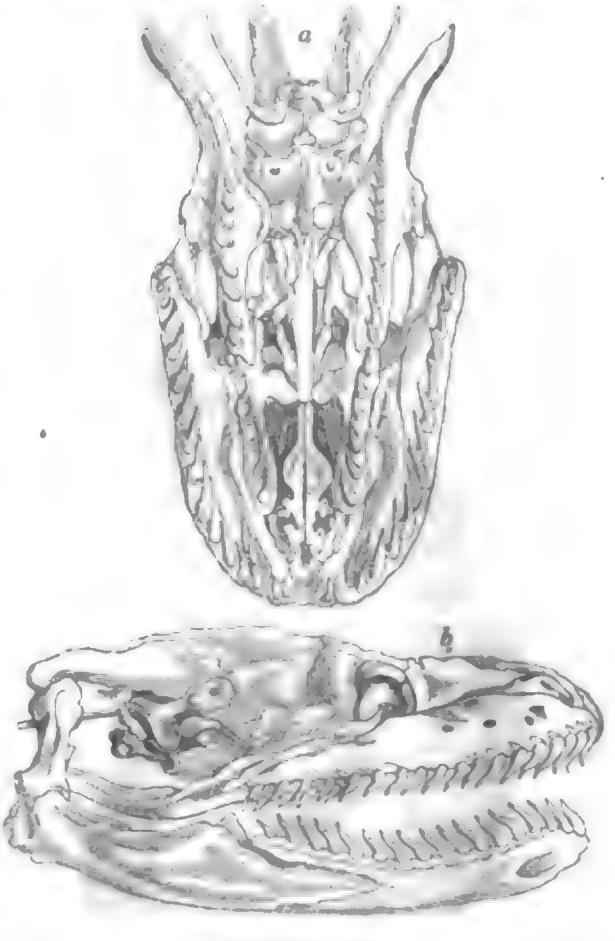
PYTHON, M. Daudin's name for the great constricting serpents of the Old World.

In the article *Boa* will be found much relating to *Python*: the organization of both is so similar, that a repetition becomes needless. Like the *Boæ*, the *Pythons* have processes or hooks near the anus, and narrow ventral plates, and indeed the latter can hardly be said to differ from the former except in the double plates beneath the tail. Their head has plates on the end of the muzzle, and there are fossets on their lips.

The powerful dental machinery by which a firm hold is gained as a fulcrum for the constriction; and the adaptation of the bones of the head to the dilatation necessary for swallowing the disproportioned prey, are shown in the following cuts.



Head of the great Python of Java, seen from above.



Head of the same.
a, upper part of the head, seen from below; b, the skull, seen in profile.

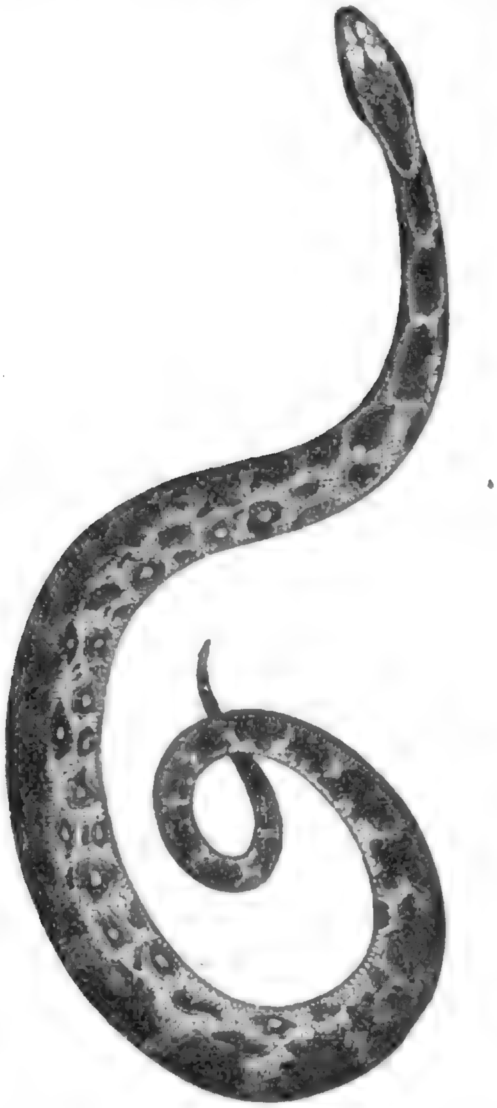
In the Museum of the Royal College of Surgeons the preparation, No. 282 D (*Physiological series*), is a portion of the vertebral column, with the ribs attached, of a *Python tigris*. The ribs are articulated to the transverse processes of the vertebræ by shallow ginglymoid joints, which admit of their being moved forwards and backwards on an axis passing through the joints. The ligaments, independent of the articular capsule, are so disposed as to limit the motions of the ribs to these directions: they are two in number,—one situated below the joint, which passes from the head of the rib to the transverse process, and thence is continued to the capsule of the intervertebral articulation; the other strengthens the upper part of the joint, and connects the neck of the rib to the transverse process. (*Cat. Mus. Coll. Chir.*) This illustrates the structure for creeping noticed in the article Boa.

No. 508 A of the same series is the stomach, with part of the œsophagus and intestine injected and inverted, of a large African Snake (Python). The œsophagus, as in all the Ophidian reptiles, is very capacious, smooth internally, and thin in its coats. The commencement of the stomach may be detected by the more vascular and rugous character of its lining membrane. The larger wrinkles are longitudinal, the interspaces reticulate. The stomach gradually diminishes in size, and there is a constriction, like a pylorus, about one inch and a half from the intestine. A narrow canal of uniform diameter, analogous to that in the shark, conducts to the intestine, which suddenly becomes wider, and is beset internally with small flattened scale-like processes. (*Mus. Cat. Coll. Chir.*)

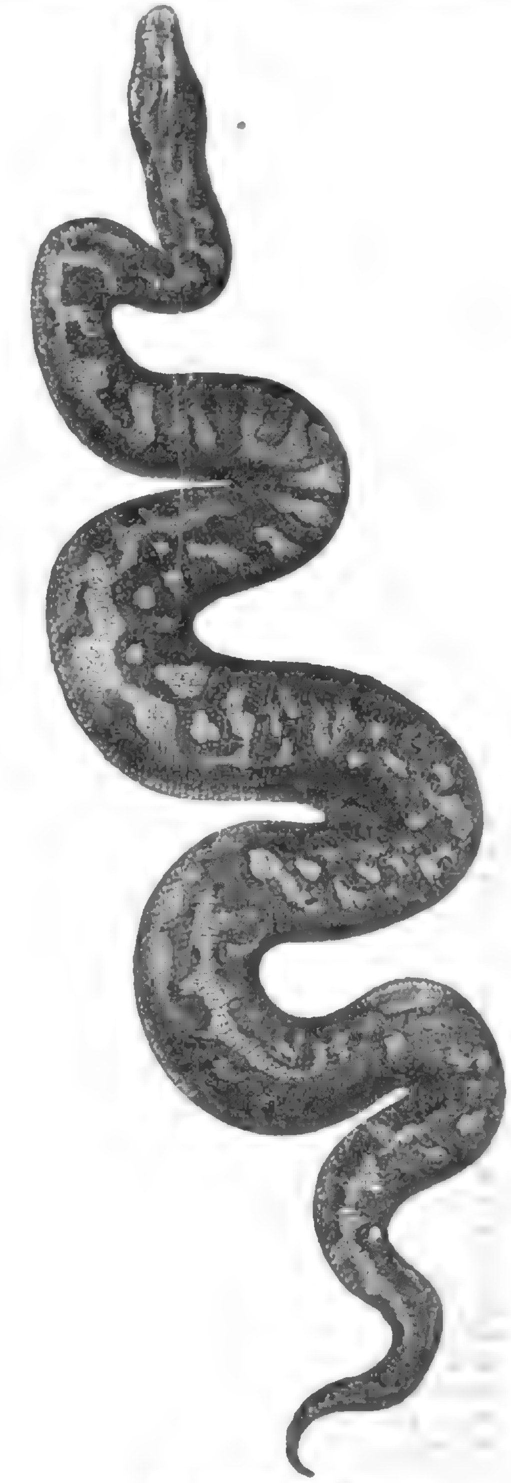
With reference to the observations in the article Boa, relating to the mode of its taking its prey, the gradual deglutition of the victim, and the breathing of the serpent during the operation, No. 1093 A of the same series becomes a very interesting preparation. This exhibits the lungs of a *Python Tigris*. They have been minutely injected, and are laid open to show the extent of the vascular respiratory portion, which is nearly the same in both, but the right lung is principally prolonged to form the reservoir. A part of the trachea, the two pulmonary arteries, and single pulmonary vein, are also preserved in this beautiful preparation by Mr. Owen. (*Cat. Mus. Coll. Chir.*)

The size to which the *Pythons* grow is fully equal to that attained by the *Boæ*, if it does not exceed it. Thus the *Ular-Sawa*, or Great Python of the Sunda Isles, is said to increase till it is more than thirty feet in length, and stout in proportion. The powers of such a gigantic reptile must be enormous, and it is said that the serpent is able to manage a buffalo. Nor are there wanting horrible instances of man himself having fallen a prey to these monsters, in modern times. The story goes that a Malay prow was anchored for the night under the island of Celebes. One of the crew had gone on shore to search for betel-nut, and is supposed to have fallen asleep upon the beach from weariness on his return. In the dead of the night his companions on board were roused by dreadful screams: they immediately went ashore, but they came too late, the cries had ceased, and the wretched man had breathed his last in the folds of an enormous serpent, which they killed. They cut off the head of the snake and carried it, together with the lifeless body of their comrade, to the vessel. The right wrist of the corpse bore the marks of the serpent's teeth, and the disfigured body showed that the man had been crushed by the constriction of the reptile round the head, neck, breast, and thigh. The picture by Daniell, representing a man seized by one of these monsters, will be familiar to many of our readers.

Dr. Andrew Smith, in his valuable *Illustrations of South Africa*, now in course of publication under the authority of the Lords Commissioners of the Treasury, gives a very beau-



Python Tigris.

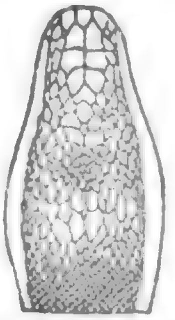


Python Natalensis. (Smith.)

tiful figure of *Python Natalensis;* and he states that this snake, or at least one resembling it in size, was formerly an inhabitant of the districts now within the Cape colony, and that the traditions of the older Hottentots abound with instances of its miraculous powers. At present, he says, it is not to be found within hundreds of miles of the boundaries of the colony, and few specimens have been obtained nearer than Port Natal. He informs us that it occasionally attains a very large size, and, according to the natives, individuals have been seen whose circumference was equal to that of the body of a stout man: Dr. Smith himself saw a skin which measured twenty-five feet, though a portion of the tail part was deficient. 'It feeds,' continues the Dr., 'upon quadrupeds, and for some days after swallowing food, it remains in a torpid state, and may then be easily destroyed. The South Africans however seldom avail themselves of ridding themselves of a reptile they view with horror, as they believe that it has a certain influence over their destinies; and affirm that no person has ever been known to maltreat it without, sooner or later, paying for his audacity.'

The following remarks by the same author are well worthy the attention of those who are interested in the natural history of serpents and their geographical distribution.

'Owing to the difficulty of discriminating between certain species of *Python*, we are not prepared to maintain this reptile to be distinct from the Indian species (*Python bivittatus*, Schlegel). The characters which have been assumed as indicative of specific differences do not appear to us to have been of sufficient value; the modifications to which they are liable in different specimens, of whose specific identity no doubt can exist, show that some other characters must be discovered before certainty can be attained. The Indian species is doubtless an inhabitant of Africa, and there are several specimens of it both from India and Western Africa, in the museum at Fort Pitt, Chatham, which are precisely similar. Between these however and *Python Natalensis* there are several well-marked differences. The scales of *Python Natalensis* are proportionally smaller than in the individuals above mentioned; their form is also different. The labial *fossæ* are more numerous in young specimens from Western Africa and India, than in those of a similar age from South Africa; in the latter they are two upon each side, in the others, four or five; the plates on the head, also, are differently shaped and differently disposed. The pattern of the markings, when viewed in detail, is also distinctly different, though there is a sort of general resemblance. Persons who have opportunities of examining species of *Python* would do well to ascertain if the labial *fossæ* vary in number in different individuals of the same species and of the same size; also whether their number diminishes as age advances.'


Head of Python Natalensis.

PYXACANTHA of the Antients. [LYCIUM.]

PYXIS NAU'TICA (the Mariner's Compass), a southern constellation of Lacaille, placed in Argo. Its principal stars are as follows:—

Character.	No. in Catalogue of		Magnitude.
	(Piazzi.) Lacaille, C.	Astron. Society	
ε	(7)	1115	6
θ	(63)	1138	5
λ	(75)	1142	5½
η	(133)	1053	6
ζ	(140)	1059	6
β	(145)	1061	5
α	(162)	1070	4½
γ	(193)	1085	6
δ	(220)	1095	6
	(265)	1112	5½
	800 C	1084	6

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Q.

Q is a superfluous letter of the alphabet, having the same sound as *k*, though limited to words where a *u* follows. This letter furnishes evidence that the alphabetical characters were originally of syllabic power. Thus the Hebrew koph and the Greek koppa appear to have been used only in those words where the sound of *o* follows, as in Cos, Corinth, and Syracosii, &c. Indeed the name of the letter implies as much. The Greek alphabet probably stopped at one period, like the Hebrew, at τ, so as to have no *u*. On the other hand, the Etruscan alphabet had a *u*, but no *o*. Hence in Italy, the *q*, which, by position in the alphabet, corresponds to the Greek koppa, was limited to words where a *u* followed. In the same way the kaph of the Hebrew and kappa of the Greek were probably at first limited to those words where an *a* follows, as we know was the case in Latin; and as the modern name of the letter, *ka*, denotes, for it would otherwise have been called *ke* or *ek*. This view becomes more complete if it be called to mind that the name of χ connects it with the vowel ι; and that the η or H of the Greek alphabet was originally a guttural aspirate, sounded perhaps as χη, and thus was adopted to denote either a guttural consonant or a long *e*. For the various forms of the symbol *q* see ALPHABET, and for the changes to which the letter is liable see C and K.

QUA BIRD. [NYCTICORAX, vol. xvi., p. 376.]

QUADI, an antient people of Germany, who inhabited the country north of the Danube, between that river, the mountains of Bohemia, and the river March. Towards the north they bordered on the Marcomanni, in connection with whom they are frequently mentioned by the Roman writers as allies. Tacitus (*German.*, 42) mentions the Quadi, the Marcomanni, and the Narisci as being in the foremost rank among the German nations towards the borders of the Roman empire, the Danube forming the line of demarcation between the power of Rome and German independence. At a later period the Quadi joined a great confederacy of German nations against Rome, which occasioned much alarm to the empire, and which twice obliged the emperor Marcus Aurelius Antoninus to repair to Germany at the head of his legions. In the first of these wars, A.D. 174, Aurelius is said to have been unwarily drawn into an ambuscade of the Quadi, and to have been in great danger, when a violent shower of rain afforded a seasonable relief to the Roman army. [AURELIUS, MARCUS.] The second expedition of Aurelius against the Quadi and their allies the Marcomanni, Hermonduri, and Sarmatians, lasted three years, A.D. 178-80, with no decisive result. Capitolinus, in his 'Life of Aurelius,' merely says that if the emperor had lived another year he would have made those countries provinces of the empire. Aurelius however died at Vindobona, in the midst of his campaign, and the Quadi remained unsubdued. They are afterwards mentioned by Eutropius as having invaded Pannonia in the reign of Gallienus.

QUADRA, Island. [NORTH-WESTERN TERRITORY.]

QUADRANGLE and **QUADRILATERAL** (four-angled and four-sided). These terms are indiscriminately used to denote a figure with four sides in the same plane. [PARALLELOGRAM; RECTANGLE; SQUARE; TRAPEZIUM; RHOMBUS.]

QUADRANT (*quadrans*) originally meant simply the fourth part, but is now in universal use for the fourth part of a circle.

QUADRANT. As an astronomical instrument, the quadrant has within a few years been so completely superseded by the entire circle, that it will not be worth while to describe particularly its construction or adjustments. Still so much of the very groundwork of modern astronomy depends on data furnished by the quadrant, that it cannot be properly passed over without some notice.

We have already said [CIRCLE] that the earliest form of instrument for measuring celestial altitudes was also the best, viz. the solstitial or meridian circle described by Ptolemy. After showing how the proportion which the arc between the tropics bears to the whole circumference was to be determined by this instrument, Ptolemy proceeds to say (*Almagest*, book i., chap. 10), 'We have made this sort of observation more conveniently by using, instead of circles, a stout quadrangular block of wood or stone, having one side plane and smooth. Upon this side we described a fourth part of a circle from a centre near one of the angles, and having drawn from the centre two radii including a right angle, we divided the circumference into ninety degrees with subdivisions. We then inserted two perfectly equal cylinders at the extremities of the vertical radius, so as to be exactly concentric with the centre and extreme point, and set the block vertical by a plumb-line passing over the cylinders, and also in the plane of the meridian by a north and south line described on the horizontal plane. We observed at noon the shadow of the central cylinder, having applied something to the divided arc to show the place more clearly, and, marking the middle point, we took the corresponding division of the quadrant as showing the elevation of the sun on the meridian.' It would seem that on the revival of learning, when Ptolemy was thought infallible, the quadrant came into use on this authority, to the exclusion of the circle. In the *Astronomiæ Instauratæ Mechanica* of Tycho Brahé, figures and descriptions will be found of quadrants and sextants of various forms and sizes. We do not think justice is done at the present day to the merits of Tycho, who is better known as the perplexer of the Copernican hypothesis, than as the first great practical astronomer after Hipparchus. Among his numerous instruments Tycho had a large quadrant fixed on a wall, which he calls a *mural* quadrant, with which he observed meridian altitudes, noting the time of transit by a clock. There are several other quadrants figured and described, which revolve on a vertical axis, and some have a horizontal circle by which the azimuth was observed at the same time with the altitude. These may be considered as the precursors of the modern astronomical quadrant, and still more perfect altitude and azimuth instrument, just as his mural quadrant led to the mural arch of Flamstead, the mural quadrants of Bird and Ramsden, and finally to the mural circle of Troughton. The imperfection of his clocks (for the pendulum was not applied till nearly a century later) compelled Tycho to adopt an instrument which has long been out of use. This was his astronomical *sextant*, which was stronger, more convenient, and lighter than the quadrant. It was supported at the centre of gravity on a ball and hemispherical cup, and could consequently be easily placed in the plane passing through two stars, and so used for measuring their distance from each other. To verify the value of the arc, and to test the powers of his sextants and quadrants, the distances of a chain of stars near the equator were taken, and their declinations also observed, when it was found that the sum of the angles at the pole which resulted from observation was 360° very nearly. (Tycho Brahé, *Astronomiæ Instauratæ Progymnasmata*, pp. 138, 145.)

Hevelius has described his quadrants and sextants in the first volume of his *Machina Cœlestis*, a work which is not uncommon; the second volume, containing his observations, was burnt soon after it was printed, with the exception of a few copies, and is one of the scarcest and dearest astronomical books in existence. In the convenience of his instruments, and perhaps in the accuracy of their graduation, he surpassed Tycho, but he never could understand the advantage of telescopic over plain sights, though one of the best practical opticians and industrious star-gazers of his time. This unfortunate prejudice not only rendered the labour of his long life labour in vain, but embittered his latter years to a painful degree by involving him in a dispute with Hooke.

Picart, aided, as it is said, by Auzout, first applied telescopic sights to graduated instruments. In his measure of the earth, executed in 1669 and 1670, he used a quadrant for his terrestrial angles. This he has described, with figures, in a special work, printed at the Louvre, which became so rare that the *Académie Royale des Sciences* reprinted it in their Memoirs (vol. vii., part i., p. 133). The quadrant was of 38 inches radius, with one telescope fixed in the direction of one radius, and the other moveable about the centre: the arc of the instrument was divided by transversals, and the angle read off by the index of the moveable telescope was equal to the angle subtended at the quadrant by the objects bisected by the cross-wires of the two telescopes. The instrument could be fixed on its stand with the plane vertical when used for altitudes, and by an additional piece, a *genou*, was moveable into any other plane, when it was wanted for surveying. The whole turned on a vertical axis, like Tycho's azimuthal quadrants, but without an azimuth circle. Quadrants like Picart's continued to be made by the French artists and used by their astronomers (with some improvements, of course) up to the latter end of the last century, when they were superseded by the repeating circle of Borda. The verification of the arc and of the graduation was performed in Tycho's manner, only employing well defined objects in the horizon instead of stars.

For a fixed observatory Picart and Roëmer recommended a large quadrant permanently fixed, that is, a copy of Tycho's mural quadrant, with the changes which telescopic sights required. Lemmonier, in the preface to his *Histoire Céleste*, says that La Hire had one erected in the Royal Observatory of Paris, in 1683, and that it was described in the first edition of La Hire's tables. This description he repeats at page xlii. of his own work.

Flamstead made his earlier observations at Greenwich with a sector, the plan of which may be understood by conceiving one of Tycho's sextants with telescopes, instead of plain sights, to be mounted on a polar axis. (*Historia Cœlestis*, vol. iii., p. 103.) This instrument was designed for measuring the distances of stars from each other. But in pursuing his primary object, that of settling the places of the fixed stars with accuracy, Flamstead found that he required a *meridian* instrument. Some unlucky trials at constructing a quadrant were made by the person employed by the Royal Society, and Flamstead finally constructed, at his own expense, and by Abraham Sharp's hands, the mural arc with which he observed from 1689 to his death.[*] (See the description and figure, *Historia Cœlestis*, vol. iii., p. 108.) This differed from other mural arcs chiefly in this, that it contained 140° or 150°, so that all stars were observable with it, from Polaris, below the pole, to the south horizon. The arc was placed as nearly in the meridian as might be, and the errors in its plane detected by comparing the observed time of the sun's passage over the middle wire of the instrument, with the true time of his meridian passage, as deduced from corresponding altitudes with a quadrant. The pendulum clock, though as yet not a very perfect instrument, had by this time entirely done away with the necessity of observing the mutual distances of the stars.

When Halley succeeded Flamstead at Greenwich, the observatory appears to have been dismantled. Halley saw the great superiority of Roëmer's *transit* over every other instrument for ascertaining right ascensions, and accordingly introduced it; but he seems not to have perceived the advantages which Roëmer's *circulus meridionalis* possessed over any segment of a circle. In 1725 a mural quadrant was erected by Graham, which was superior to any previous instrument of this construction; it had however one grievous imperfection, the radii being of iron and the arc of brass, every variation of temperature altered the value of the total arc. In 1750, this quadrant, which was subsequently known by the name of the iron or north quadrant, was removed to the other side of the pier, and the celebrated quadrant by Bird set up in its place. Of Bird's method of dividing we have given some account in the article Graduation. His reputation, which was a good deal based on this quadrant, introduced similar instruments by himself or Ramsden into almost every observatory of note. Bird received 500*l.* from the commissioners of longitude for his *Method of dividing Astronomical Instruments*, and the work was published by their order in 1767. We are not aware that a more perfect quadrant than the Greenwich *brass* or *south* quadrant was ever constructed. It was with this instrument Bradley made his invaluable observations, which have been reduced with consummate skill by Bessel. (*Fundamenta Astronomiæ deducta ex Observationibus viri incomparabilis James Bradley, autore F. W. Bessel, Regiomonti*, 1818.) There is in this work a careful examination of the errors to which the two quadrants were liable.

When the portable quadrant was wanted for astronomical purposes, the plane was fixed vertically, and it is then usually called an astronomical quadrant. A great many instruments of this construction were made by Bird, Ramsden, and the Troughtons, in the latter half of the last century, and in careful hands a great deal of work may be done with such a quadrant.[*] Thus observations of the sun or stars at the same altitude on each side of the meridian will furnish an excellent determination of the time, and zenith distances of stars near the zenith in reversed positions of the instrument (the excess arc, as it is called, affords the means) will yield a good latitude. Observations of northern stars combined with southern stars at similar altitudes will give a very close approximation to the latitude when the true places of the stars are taken from a good catalogue. For the mode of adjusting and using the quadrant we must refer to the older books or encyclopædias which treat of astronomical instruments. The inferiority of the quadrant to the entire circle is such that there is no probability of its ever returning into fashion, and we believe there is not a single public observatory in which it is now in use. The single advantage of the quadrant is that the divisions are larger and consequently more easily read and subdivided than in a circle with the same telescope. But this trifling superiority is much more than compensated by the power of reading off the circle at several points and taking the mean. On the other hand it is impossible in the quadrant to secure the exactness of the total arc, or the concentricity of the centre of motion and the centre of the divisions, while the necessity of leaving some liberty of motion to the axis carrying the telescope allows of a little wandering of the centre-work, which is perpetually shifting its place. Thus it was found that in the celebrated Greenwich quadrant, though the error of division was probably not more than 1″, the uncertainty arising from other causes might easily be 3″ or even more. Again, in the mural quadrant it seems difficult so to support it as to resist the long continued effort of gravity in altering its form, without at the same time rendering it unstable. The Greenwich quadrant was found to have sensibly altered its shape, *i.e.* it had become flattened about 45°, and pulled out at the two extreme radii, which was shown by the errors in the places of stars observed by it when compared with their places by circular instruments, and also by an actual measurement of the several radii and chords. For more minute information the reader is referred to Lalande's *Astronomie*, § 2311, &c. 3me. edition; Vince's *Practical Astronomy*, chapter v.

QUADRANT. Hadley's quadrant is the name sometimes applied to the octant of reflexion which measures an angle of 90°. The principle is that of the Sextant.

QUADRANTAL, a name formerly given to spherical triangles, one side of which is a quadrant.

QUADRATIC, BIQUADRATIC (*quadratum*, a square), names given to algebraic expressions, the highest powers of which are the square, and the square of the square, or fourth power, of the letter with reference to which the expressions are considered. [Theory of Equations.]

QUADRA'TRIX, a name given to curves which may be made useful in the Quadrature of other curves. There is one known by the name of Dinostratus, the equation of which is—

$$y=(a-x)\sin\left(\frac{x}{a}\,90^\circ\right),$$

which curve being given, the ordinate, when $x=a$, determines the length of the circle whose radius is a, as follows Make a rectangle on this ordinate equal to the square of the diameter, and the other side of that rectangle is the circumference of the circle.

The quadratrix of Tschirnhausen has for its equation—

$$y=a\sin\left(\frac{x}{a}\,90^\circ\right),$$

and this curve being given, and also the method of drawing a tangent to it, the circumference of a circle may be thus found: Draw a tangent at the origin, and draw a right-angled triangle with a part of this tangent for the hypothenuse, and a part of the axis for a base: the other side is then the quadrant of a circle which has the base for a radius.

Various other modes might be found of making either of these curves square the circle; but the fact is, that the description of the curves themselves assumes the point which their use is to determine.

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[*] Among the *real* injuries which Flamstead received, we consider the translation of his preface into indifferent Latin one of the greatest, though committed with a friendly intention.

[*] A very perfect specimen of the astronomical quadrant is described in Pearson's 'Astronomical Instruments,' vol. ii., p. 554.

QUADRATURE. By the quadrature of a curve is meant the finding of a square equal to the content enclosed by the curve; but as every rectilinear figure can be immediately converted into a square of equal magnitude, the object is gained as soon as any rectilinear figure is found of the same content as the curve. This is the geometrical quadrature of a curve. The arithmetical quadrature is the determination of the area enclosed by the curve in terms of a given square unit, as a square foot; and if this be done with any required amount of accuracy, the quadrature, thus done sufficiently for practical purposes, is spoken of as an absolute quadrature. The two following articles will in various places illustrate the preceding description of the meaning of the simple word.

QUADRATURE OF THE CIRCLE. The speculative part of this question might be passed over with a slight description of the means of finding a square equal to a given circle, or of expressing a circle by means of the square on its radius, if it were not that it is connected with one of those propensities, the love of the marvellous, which, carried to an undue extent, tend more than others to throw the mind off its balance, and destroy the comfort of the individual. When it is considered that there are still persons who spend their time, means, and energies in the attempt to overcome a difficulty of which they do not even know the character, it is worth while to enter a little more at length upon this celebrated question of the quadrature of the circle than its mathematical importance would seem to require.

It is a proposition not very difficult of proof, that if a right-angled triangle have the radius of a circle for its base, and a line equal to the circumference for its altitude, the triangle is equiareal with the circle. Hence the quadrature is reduced to the finding a line equal in length to the circumference, either geometrically or arithmetically; or to finding an answer to one or other of the following questions:—

Given a, the diameter of a circle in units of a given kind, required a number or fraction π, such that a multiplied by π may be the number of those same units in the circumference. It is easily shown that this number π must be the same for all circles.

Given the diameter of a circle, required *geometrically* a method of drawing a straight line equal in length to the circumference.

Those who first proposed these questions, found their progress arrested by the insufficiency of their arithmetic and the limitations of their geometry. The former question has long been settled, and it has been shown that the ratio of the circumference to the diameter is Incommensurable. The latter question cannot be called finally settled, since there is no proof in which all agree that the geometrical quadrature is impossible, though there are considerations which render it in the highest degree unlikely, and there are also asserted proofs of the impossibility which some admit, and which make even those who do not absolutely admit them think their conclusion all but proved. But the mistake of those who produce pretended quadratures often lies in this, that they do not know what is meant by the word *geometrical*. They imagine that anything is geometrical which deals in notions about space, and deduces that which is not obvious from that which is. But geometry, in the technical sense, is that which results from the use of Euclid's postulates [Axiom], which permit nothing but the junction of two points by a straight line, the indefinite production of that joining line, and the description of a circle with a given centre, and the line joining that centre with another given point as a radius. These limitations make the whole difficulty; otherwise nothing would be more easy than to determine a circle by the Quadratrix, if that were allowed to be drawn, or to suppose a circle to roll on a straight line till the point which first touched the straight line touches it again, in which case the line rolled over is the length of the circumference. When therefore any one imagines, as is often the case, that he has found a method of squaring the circle, it generally happens that he only announces the not very new nor surprising fact, that a difficulty which exists under certain circumstances may be no difficulty at all under others. But in like manner as no one would be held likely to answer the question 'required the way of building a house without the use of iron,' who should first demand a hammer and nails, so the greater number of persons who attempt to square the circle must not be supposed to meet the geometrical difficulty, by assuming powers of which geometry expressly requires the use to be abandoned, until it can be shown to be given in allowing the simple postulates above mentioned.

Aristophanes introduces into his comedy of the 'Birds,' a geometer who is going to make a square circle; Plutarch asserts that Anaxagoras employed himself upon this problem in prison. Hippocrates of Chios actually found the way to make a rectilinear space equal to certain circular spaces, and is reported to have attempted the general problem. There is evidence enough that it acquired an early celebrity, and it may be doubted whether the researches of Euclid in incommensurables [Irrational Quantities] had not some reference to a supposition that the circle and its diameter might possibly be discovered to belong to a particular class of these quantities. Archimedes, in his book on the mensuration of the circle, is the first who made any approach even to a practical determination of the question; by inscribing and circumscribing a polygon of 96 sides in and about the circle, he demonstrates that the excess of the circumference over three times the diameter must be less than 10-70ths of the diameter, and greater than 10-71st parts. His result is perfectly correct, and even tolerably accurate. According to him a circle of 4970 feet diameter would have a circumference lying between 15,610 and 15,620 feet, the truth being that such a circle would have a circumference of 15,613¾ feet very nearly. This measure of Archimedes gives 3·14286 for the approximate value of π, the ratio of the circumference to the diameter; several of the Greeks are said to have made further approximation, but their results are not preserved.

Among the Hindus [Viga Ganita] are found the ratios of 3927 to 1250, and also that of the square root of 10 to 1. The first gives $\pi = 3{\cdot}1416$ exactly, and is considerably more correct than that of Archimedes: the second gives 3·1623, and is much less exact. The date of the first result is not known; but all agree that the writings in which it is found are anterior to any European improvement on the measure of Archimedes. The ratio given by Ptolemy, in the Syntaxis, is 3·141552, not quite so correct as 3·1416, but so near to it that those who doubt of the antiquity of Hindu science will probably suppose the 3·1416 above mentioned to be a version of Ptolemy's measure.

This subject began to be reconsidered in the fifteenth century, in the middle of which were calculated the tables of Rheticus, the celebrated Copernican, from which the value of π might easily have been calculated to eight decimals, but it does not appear that this was done. Purbach used the ratio of 377 to 120, or 3·141667, not so exact as Ptolemy's. Regiomontanus slightly corrected the limits of Archimedes, but Peter Metius, father of Adrian (to whom it is often attributed), and of James (to whom the invention of the telescope has been given), made a decided improvement. He gives the ratio of 355 to 113, or 3·14159292, which is correct to the sixth decimal inclusive. Nothing more precise could be desired for practical purposes, insomuch that a circle of 113 in diameter may be reckoned as one of 355 in circumference, which, though a little too great, does not give the circumference wrongly by so much as one foot in 1900 miles. Metius lived in the latter half of the sixteenth century, as also did Vieta, who gave a still more accurate though not so elegant a measure. He was the first who exhibited a series of arithmetical operations, by which a mere calculator might carry on the process to any extent, and gave the following result: The circle whose diameter is ten thousand million of parts, has a circumference greater than 31,415,926,535 of those parts, and less than 31,415,926,537. Other approximations rapidly followed: Adrianus Romanus calculated the perimeter of an inscribed polygon of 1073741824 sides, by means of which he found for the ratio 3·141592653589793; but his contemporary Ludolph van Ceulen, by calculating the chords of successive arcs, each of which is the half of the preceding, found the perimeter of a polygon of 36893488147419103232 sides, and obtained 36 figures of the ratio 3·14159, &c., presently given to a still greater length. So far the method of calculating by means of inscribed polygons had received no material simplification. This was given by Snell, who found some propositions (afterwards demonstrated by Huyghens) which very much abridge the labour. He found a result as correct as that of Archimedes, by means of a simple hexagon; making the 96-sided polygon of Archimedes give seven decimals correctly, instead of three. He also calculated the ratio to 55 decimal places, and by means of a polygon of only 5242880 sides.

Huyghens introduced some new theorems of the same species as those of Snell.

The invention and cultivation of the differential calculus led to many new views and new methods, into which it is not our purpose to enter, as we intend the present article not for mathematicians, but for those who have just enough of the science to think it possible that the solution of the problem is reserved for them. The continued product of Wallis, the continued fraction of Brounker, the series of Mercator, Gregory, Newton, &c., were so many new algebraical expressions of a result which, one might imagine, would be considered as carried far enough by the arithmetician. Nevertheless the ratio was consecutively carried to 75 places by Abraham Sharp, to 100 by Machin, and to 128 places by De Lagny, and at the end of the last century to 140 places by Vega. And Baron Zach informed Montucla that he had seen a manuscript in the Radcliffe Library at Oxford, in which it was carried to 154 places.

Vega's result, which, as far as it goes, is confirmed by those of Machin and De Lagny, is as follows:—

3· 14159 26535 89793 23846 26433 83279 50288 41971 69399 37510
58209 74944 59230 78164 06286 20899 86280 34825 34211 70679
82148 08651 32823 06647 09384 46095 50582 26136

But the Oxford manuscript gives us the ending (according to Montucla)—

46095 50582 23172 53594 08128 4802

So far as these agree, there is no doubt of their correctness, so that the approximation has been carried to 135 decimals certain. There is only one use in this extent of accuracy, which far exceeds all that is necessary, namely, that the more rational class of solvers of the problem are steadied by it, and are prevented from presenting results which do not agree with the known truth.

The never-ending character of these numerals, so far as they were tried, led to an early suspicion that the ratio must be really incommensurable. This was actually proved by Lambert (*Mém. Acad. Berlin* for 1761), and the demonstration has been given in an abridged form by Legendre, in the notes to his work on geometry. This demonstration is perfectly complete, and leaves no manner of doubt on the subject. Those who persist in asserting that they can assign two numbers which are in the ratio of the circumference to the diameter, should first learn geometry and algebra enough to refute this proof, for they may depend upon it that no mathematician will lend them a moment's attention until this preliminary step has been taken. Buffon, and Panckouke, the editor of the 'Encyclopédie Méthodique,' have attempted to give metaphysical reasons for this incommensurability, apparently in order that the squarers of the circle might not have all the nonsense on their side of the question.

The *geometrical* quadrature, as above described, was attempted to be shown to be impossible by James Gregory, in 1668; and Montucla seems to admit the proof at last,[*] though he only said that it was *very like demonstration* in the first edition of his work on the history of this problem. The objections made by Huyghens to this proof, and the controversy which ensued, obliged the latter to admit that Gregory had succeeded in proving the impossibility of what is called the indefinite quadrature of the circle, by which is meant the finding of a method of squaring any given sector of the circle whatsoever. But since it is well known that there are curves, particular portions of which may be squared, this may happen in the case of the circle. Thus it might be possible to give a geometrical rule for squaring the whole circle, even though the rule would not apply to any given sector. The proposition which Gregory imagines himself to prove, is that no sector of a circle can have to the circumscribed polygon a ratio expressible by a finite number of algebraical terms. The consequence of this, if established, must be drawn as follows:—Since geometry allows the use of nothing but definite circles and straight lines, a straight line equal to the circle in length (which being found, the whole difficulty is overcome) must be ascertained, if at all, by a construction in which points are successively determined by the intersections of straight lines or circles, or a straight line and a circle. The most complicated construction in Euclid may, if we begin from the first principles, be reduced to the determination of a succession of points in this manner. Now, in the most complicated case, the intersection of two circles of given or found radii and centres, the points of intersection may be determined by formulæ derived from the roots of an equation not exceeding the fourth degree, the roots of which can be expressed in a finite form: the two ends of the line equal to the circle could therefore be assigned in a finite form, and hence the length itself. And the area of any polygon (whose arcs are obtained by continual bisection) described about a given circle could also be expressed in a finite form, from which (the area of the circle being expressible by means of its circumference) the ratio of the area to that of the circumscribed polygon would also be expressible. But if Gregory's proposition be true, this area cannot be expressed in a finite form; neither then can any construction allowable in geometry attain the circumference of a circle.

The indefinite quadrature was shown to be impossible by Newton (*Principia*, book i., lemma 28), in a manner which lies open to solid objections; we shall not therefore produce this proof. In fact, it seems as difficult to induce geometers to agree in any proof of the impossibility of the indefinite quadrature, as others to leave off trying their powers upon what geometers themselves have ceased to attempt.

Montucla has given a tolerable list of those who have signalised themselves by attempting this problem without the requisite preliminary of studying geometry; if preliminary that may be called, which would have made them give up the attempt. 'Only prove to me that it is impossible,' said some one, 'and I will set about it immediately,' and such seems to have been the general feeling of the quadrators, as Montucla calls them. They existed in crowds in the time of Archimedes; and the race is not yet extinct. One Bryso, a Greek, heads the list: he made the circle a mean proportional between the inscribed and circumscribed squares, which happens to be the content of the inscribed octagon. Next we have Cardinal Cusa, Orontius Fineus, and one Simon van Eyk (or Duchesne). At the time when the problem really was of practical importance, every quadrator raised up an opposing mathematician; and the quadrature was sometimes so ingenious, and so near the truth, that it could only be opposed by new approximations to the truth. Thus Cusa was met by Regiomontanus, Orontius by Buteo and Nonius, and Van Eyk by Peter Metius, who was compelled to discover the very close approximation we have given under his name by that of Archimedes being insufficient to expose Van Eyk. Such quadrators were of use, and if some of them would now arise, no one would object to fallacies so ingenious that new truths must be discovered to oppose them. The celebrated Joseph Scaliger, a mere tyro in geometry, tried his hand on this and other problems in 1592, and was met by Vieta, Adrianus Romanus, and Clavius. Longomontanus, the astronomer (refuted by Pell), J. B. Porta, and Hobbes (refuted by Wallis), are three names well known in other pursuits who must go down to posterity as having had distinguished success in false quadrature. The works of the last against geometry and geometers were the consequence of the mortification he felt at not having been admitted to have succeeded in his attempt. Before his time however, Gregory of St. Vincent, an acute mathematician (to whom is due the discovery of the connection between the hyperbolic area and logarithms), had made the most elaborate attempt which ever was published, in his work on the quadrature of the circle (Antwerp, 1647). Such a challenger raised up Des Cartes, Roberval, Huyghens, and Léotaud, who soon dispatched him.

As yet we have mentioned only mathematicians, or men of eminence in something: but we have also the Spaniard Falcon (1587), who dialogues with the circle in his preface; Gephirauder and Alphonso de Molina, who attribute their discovery to inspiration; the latter overturns Euclid, and found another who was willing to admit his discoveries and translate them into Latin. A merchant in Rochelle, De la Leu, not only found out the problem by inspiration, but showed that the conversion of Jews, Turks, and Pagans depended upon it. Montucla gives some account of several other visionaries, the chief of whom is one Cluver, who found that the problem depended upon another, namely, 'Construere mundum divinæ menti analogum,' which, if it be translateable, is, 'to make a world analogous to the divine mind.' He also mentions Richard White, an English Jesuit, who stands out among the solvers of the pro blem as the only one who ever was convinced of his error. The writer of this article once pointed out the example of White to another Roman Catholic clergyman, who had come from South America to England, to publish a quadrature of the circle. The party addressed seemed struck by the instance, and promised to study more geometry before he proceeded further; in a little while however he relapsed, and his work was advertised, and, we believe, published.

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[*] The following was the addition left by him, and printed by the editor of the second edition: 'Après avoir réfléchi encore plus attentivement sur les raisonnement de Gregory, il me paraît avoir eu raison d'en déduire l'impossibilité de quadrature même définie du cercle.'

After the time of Newton, and the abundant means which were then introduced to complete the quadrature, if such a thing were possible, persons versed in mathematics seem to have dropped the attempt, and the reign of the quadrators by instinct commences. It is true that a serious diversion was made by the theory of gravitation, which drew off against itself many of those who should have been quadrators; but enough remained to furnish a tolerable list.

That of Montucla contains principally Frenchmen, though had the history of mathematics been written by an Englishman, he could have produced as great a number in this country. One Mathulon, in 1728, promised in print 1000 crowns to any one who should convict his solution of error, and was actually sentenced by the courts to pay the sum to the Hôtel Dieu at Lyon, to which charity Nicole, the exposer, made over his claim. One Sullamar (as Montucla spells it), an Englishman, solved the problem by means of the number of the beast, 666, in the year 1750; a M. de Causans, in 1753, found it by cutting a piece of turf, and deduced from it the doctrines of original sin and of the Trinity. He offered to bet three hundred thousand francs on the correctness of his process, and deposited ten thousand, which were claimed by several persons, and among others by a young lady, who brought an action for them: but the bet was declared void by the courts. Many more cases might be added; it is however enough to say that this problem is now never attempted (in print at least), except by those who are either altogether ignorant of mathematics, or add a most undue opinion of themselves to an acquaintance with only the elements. Since 1755, the Academy of Sciences has refused to examine any pretended solution; and the Royal Society in this country came to the same resolution a few years afterwards.

A few words may serve to prevent some one from making an attempt upon this enchanted castle, as it is supposed to be. When the difficulty first began to be noticed, the circle stood alone among curves; and so remarkable a distinction between this, the only curve then considered, and rectilinear figures, the only other figures then considered, could not but excite curiosity. Our position is now changed; not only does the now well recognised distinction of commensurable and incommensurable prevent the circle from presenting anything peculiar to itself, but the curve is only one among an infinitely great number, many of which have been investigated and their properties examined. Consequently, with reference to the present state of mathematics, the problem analogous to that of squaring the circle is, 'Given any curve whatsoever, to find its area.' Now if the ingenuity which is guided by the love of investigating hidden things, should desire a field for its exertions, let it leave that of the circle, which has been cropped until it will yield no more, and, first acquiring sufficient mathematical knowledge, let it spend its force upon some one of the many real difficulties which abound, both in the pure and mixed sciences: let it investigate the meaning of divergent series for example, in all their varieties, or endeavour to extend the theory of discontinuous expressions, or solve the equations of motion of the solar system by some other method than that of series. For one point that should strike the lover of the marvellous in the quadrature of the circle, there are hundreds in the above-named subjects which surprise the mathematician, however little he may possess that quality. Moreover, in like manner as the quadrature of the circle was at one time, in the hands of Wallis, Newton, &c., a road to results which, though they did not attain their end, yet answered many other purposes; so the efforts of the inquisitive on the actual difficulties of our own day may also end in the promotion of science of every kind, if begun in knowledge and directed by system. We owe the binomial theorem, now one of the most important results of algebra, indirectly to the learned attempts of Wallis upon the quadrature of the circle, at a time when such attempts were in season; and we might reasonably hope for collateral successes something like those resulting from the labours of Wallis, if those (not a few) whose minds compel them to inquiry into the curious, would but furnish themselves with a guide before they set out on their travels.

QUADRATURES, METHOD OF. The method of quadratures derives its name from its earliest application, that of finding the areas of curves, which was always called their quadrature, as being the arithmetical process by which, when exact, squares equal to them might be found. And since the AREA of a curve can always be found when $\int y dx$ can be found, this term has also been applied to the determination of the definite values of integrals by approximation. Any integral [INTEGRATION] can be found approximately by a summation, the limit of which is the exact value: thus we could determine $\int y dx$ from $x=a$ to $x=a+h$ by dividing h into a large number, n, of equal parts, and actually summing

$$a\cdot\frac{h}{n}+\left(a+\frac{h}{n}\right)\frac{h}{n}+\left(a+2\frac{h}{n}\right)\frac{h}{n}+\ldots+\left(a+n\frac{h}{n}\right)\frac{h}{n}.$$

but the special object of that which is called *the* method of quadratures is the perfection of this method of quadratures (which is either very inexact or very tedious), by subsequent corrections, which are most readily derived from such mathematical considerations of the error committed as are described in the article OPERATION. The theorem on which it is founded may be seen in p. 313 of the 'Differential Calculus,' in the 'Library of Useful Knowledge:' exhibited in the best form for practical use, it is as follows:—

Let $\int y dx$ be required to be found from $x=a$ to $x=a+h$: divide h into n equal parts, and let $A_0, A_1, A_2 \ldots\ldots A_n$ be the values of y corresponding to the following values of x, namely $a,\ a+\frac{h}{n},\ a+2\frac{h}{n}, \ldots a+n\frac{h}{n}$ (or $a+h$). Compute

$$S=(A_0+A_1+A_2+\ldots+A_n)\frac{h}{n}$$

And, writing down A_0, A_1, &c., as below, take their differences. [DIFFERENCE.]

$$\begin{array}{cccccccc} A_0 & A_1 & A_2 & A_3 \ldots\ldots\ldots & A_{n-3} & A_{n-2} & A_{n-1} & A_n \\ & \Delta A_0 & \Delta A_1 & \Delta A_2 \ldots\ldots\ldots & \Delta A_{n-3} & \Delta A_{n-2} & \Delta A_{n-1} & \\ & & \Delta^2 A_0 & \Delta^2 A_1 \ldots\ldots\ldots & \Delta^2 A_{n-3} & \Delta^2 A_{n-2} & & \\ & & & \Delta^3 A_0 \ldots\ldots\ldots & \Delta^3 A_{n-3} & & & \end{array}$$

up to the fifth differences, which will be generally sufficient Then the value of $\int y dx$ from $x=a$ to $x=a+h$ is as follows, very nearly:—

$$S-\frac{1}{2}\frac{h}{n}(A_n+A_0)-\frac{1}{12}\frac{h}{n}(\Delta A_{n-1}-\Delta A_0)-$$
$$\frac{1}{24}\frac{h}{n}(\Delta^2 A_{n-2}+\Delta^2 A_0)-\frac{19}{720}\frac{h}{n}(\Delta^3 A_{n-3}-\Delta^3 A_0)-$$
$$\frac{3}{160}\frac{h}{n}(\Delta^4 A_{n-4}+\Delta^4 A_0)-\frac{863}{60480}\frac{h}{n}(\Delta^5 A_{n-5}-\Delta^5 A_0)$$

For example, let the integral required be $\int\frac{dx}{x}$ from $x=9$ to $x=13$ (we take purposely a case in which verification is easy). Here $a=9$, $h=4$, $y=1:x$. Divide the interval 4 into ten equal parts, so that $h:n=\cdot 4$. We have then 9, 9·4, 9·8, ... 12·6, 13, for the eleven values of x, and writing down their reciprocals, and taking their differences, we have

	$A=$	$\Delta A=-\cdot 00$	$\Delta^2 A=+\cdot 000$	$\Delta^3 A=-\cdot 0000$	$\Delta^4 A=+\cdot 00000$	$\Delta^5 A=-\cdot 00000$
0	·11111111	472813	38597	4541	685	122
1	10638298	434216	34056	3856	563	103
2	10204082	400160	30200	3293	460	076
3	09803922	369960	26907	2833	384	061
4	09433962	343053	24074	2449	323	054
5	09090909	318979	21625	2126	269	041
6	08771930	297354	19499	1857	228	
7	08474576	277855	17642	1629		
8	08196721	260213	16013			
9	07936508	244200				
10	07692308					

S 1·01354327 × ·4 = ·40541731

$$\begin{array}{rcl|ccc}
A_{10} + A_0 & = & \cdot 18803419 & \times \frac{1}{2} & \times \cdot 4 = & \cdot 03760684 \\
\Delta A_9 - \Delta A_0 & = & \cdot 00228613 & \times \frac{1}{12} & \times \cdot 4 = & \cdot 00007620 \\
\Delta^2 A_8 + \Delta^2 A_0 & = & \cdot 00054610 & \times \frac{1}{24} & \times \cdot 4 = & \cdot 00000910 \\
\Delta^3 A_7 - \Delta^3 A_0 & = & \cdot 00002912 & \times \frac{19}{720} & \times \cdot 4 = & \cdot 00000031 \\
\Delta^4 A_6 + \Delta^4 A_0 & = & \cdot 00000913 & \times \frac{3}{160} & \times \cdot 4 = & \cdot 00000007
\end{array}$$

$$\begin{array}{r}
\hline
\cdot 03769252 \\
\cdot 40541731 \\
\hline
\end{array}$$

$$\text{Approx. value of } \int_9^{13} \frac{dx}{x} \quad = \quad \cdot 36772479$$

This same result, found by common methods, is hyp. log 13 − hyp. log 9, or 2·56494936 − 2·19722458, or ·36772478: so that the preceding method is in this case more than correct to seven figures by use of four differences.

This method of quadratures is the mathematician's last resource when all others fail or are still longer. In most of the cases in which it is absolutely requisite, the calculation of the values of y is the most tedious part of the operation. When the limits are very different, it is generally requisite to divide their interval into several parts, and to make the integrations through the several parts separately. For an inverse process see SUMMATION.

QUA'DRIO, FRANCESCO SAVE'RIO, a learned Jesuit of the eighteenth century, a native of Valtellina, wrote an historical and descriptive work on his own country, which he dedicated to Pope Benedict XIV. 'Dissertazioni Critico-Storiche intorno alla Rezia di quà dalle Alpi oggi detta Valtellina,' 3 vols. 4to., Milan, 1755. It is the best account which we have of that secluded region. The author occasionally exhibits a want of critical fairness, as where he attempts to excuse the massacre of the Protestants which took place in 1620, and was attended by circumstances of great atrocity. But the principal work of Quadrio, and that on which his reputation as a writer chiefly rests, is his general history of poetry in all ages and countries: 'Storia e Ragione d'ogni Poesia,' 7 vols. 4to., Bologna and Milan, 1741-52, a laborious work containing a vast deal of information not found collected in any other compilation. The author treats at length of every branch of poetry, antient and modern. He divides poetry into melic or lyric, scenic or dramatic, and epic and didactic, each subdivided into numerous departments. Under the head of scenic poetry, besides the various sorts of tragedy and comedy, he treats of the numerous class of mimi and pantomimi, of the satirical drama, the Atellanæ, the rustic pastoral, maritime, piscatoriæ, sylvestres, and other fabulæ, and lastly of the musical drama or opera. He also treats at length of the rhapsody, the parody, the burlesque poetry of various kinds with which Italian literature abounds, of dialect, macaronic, and pedantic poetry; he quotes an immense number of writers, many of whom are little known; and he gives extracts from them. Quadrio's work, notwithstanding several mistakes and imperfections, is a very useful library book, and the composition of it occupied the author a considerable part of his life. Quadrio was of an infirm and susceptible temper, which involved him in sundry broils and disappointments, in consequence of which he sought and obtained leave to quit the order of the Jesuits, and assume the garb of a secular priest or abbé. He died at Milan in 1756.

QUADRU'MANA, Cuvier's name for his second order of mammiferous animals, an order which must be always viewed by the zoologist with great interest, inasmuch as it contains those forms among which will be found the nearest approach—though the distance is still great—to Man. [CHIMPANZEE; ORANG-UTAN.]

The order *Primates* of Linnæus consisted of the genera *Homo*, *Simia*, *Lemur*, and *Vespertilio*. [PRIMATES.]

Cuvier placed *Homo* aloof in his order *Bimana*, of which it is the only genus. His order *Quadrumana* embraced the *Singes* (*Simia*, Linn., including the Orangs) and the *Makis* (*Lemur*, Linn.); between these two extremes came the *Ouistitis* or *Arctopitheci*. [JACCHUS.]

Of his *Quadrumana*, Cuvier remarks that, independently of the anatomical details which distinguish them from man, they differ from him in the very striking character arising from their hind-feet having free thumbs, which are opposable to the other fingers, whilst those fingers are long and flexible, like those of the hand. They therefore climb trees with facility; but they do not hold themselves or walk erect except with difficulty, their foot in such case not resting on the sole, but on its external edge, and their narrow pelvis not favouring equilibrium in that posture. Their intestines, he observes, are sufficiently similar to ours, their eyes are directed forward, they have mammæ on the breast et penem pendentem. The cerebrum has three lobes on each side, the posterior of which covers the cerebellum, and the temporal fossa is separated from the orbit by a bony partition; but for the rest, they recede gradually from the form of man, assuming a more elongated muzzle, a tail, and a progression more and more exclusively quadruped. Nevertheless, adds Cuvier, the liberty of their fore-arms and the complication of their hands permit among them all many actions and gestures similar to those of man.

Illiger's first order, *Erecta*, like Cuvier's *Bimana*, included man alone. His second order, *Pollicata*, consisted of the *Quadrumana*, the *Prosimii*, the *Macrotarsi*, the *Leptodactyla*, and the *Marsupialia*.

The *Quadrumana* embraced the Orangs and *Simiæ* generally, including *Hapale* (the *Jacchus*).

Mr. Gray divides the *Primates* into the *Anthropomorphous* and *Quadrupedoid*.

The first family of the first division, *Hominidæ*, is thus subdivided:—

†

Tail none.

1. Hominina, *Homo*. 2. Simiina, *Troglodytes*, Geoff.; *Simia*, Linn.; *Hylobates*, Ill.

††

Tail long or short.

3. Presbytina. *Presbytes*, Esch.; 4. Cercopithecina, *Lasiopyga*, Ill.; *Cercopithecus*, Linn.; *Cercocebus*, Geoff.; *Macacus*; 5. Cynocephalina, *Cynocephalus*, Briss.; *Papio*, Briss.

The second family, *Sariguidæ*, is thus subdivided:—

†

Tail end naked.

1. Mycetina, *Mycetes*, Ill.; 2. Atelina, *Ateles*, Geoff.; *Brachyteles*, Spix; *Gastromargus*, Spix; *Lagothrix*, Geoff.

††

Tail end hairy.

3. Callithricina, *Cebus*, Erxl.; 4. Saguinina, *Saguinus*, Lacép.; *Nyctipithecus*, Spix; *Pithecia*, Geoff.; *Brachypus* Spix; 5. Harpalina (Hapalina?), *Jacchus*, Geoff.

Under the *Quadrupedoid* division, Mr. Gray arranges the *Lemuridæ*, the *Galeopithecidæ*, and the *Vespertilionidæ*.

Under the *Quadrumana*, or *Tetracheirs* (his second order), M. Lesson arranges the *Simiæ* and *Lemuridæ* generally, together with *Loris*, *Nycticebus*, *Galago*, *Tarsius*, *Cheiromys*, and *Cheirogaleus*.

His first order, *Bimana*, includes man only.

The *Quadrumana* form the first order of the system of Mr. Swainson, who excludes man from the zoological circle. His *Quadrumana* consist of the following families and genera:—

1. Simiadæ.

Simia (including *Troglodytes*, *Hylobates*, *Presbytes*, and *Pithecus*, as subgenera).

Cercopithecus (including *Lasiopyga*, *Semnopithecus*, *Colobus*, *Cercopithecus*, *Cercocebus*, and *Nasalis*, as subgenera).

Inuus.

Macacus.

Papio (including *Papio* and *Cyanocephalus* (Cynocephalus?) as subgenera).

2. Cebidæ.

Mycetes, *Lagothrix*, *Ateles*, *Cebus*, *Callithrix*, *Hapales* (including *Midas* as a subgenus), and *Pithecia*.

3. Lemuridæ.

and

4. Vespertilionidæ.

Under the article CHEIROPODA will be found a notice of Mr. Ogilby's views regarding the *Quadrumana*, as far as they had then gone. Those views have since been carried out by that gentleman in the 'Natural History of Monkeys, Opossums, and Lemurs,' being the third volume of 'The Menageries,' in the 'Library of Entertaining Knowledge.' The following table exhibits the respective groups and families, with their relations in a regular and connected series:—

- CHEIROPEDS … (*Mammals with opposable thumbs*)
  - I. BIMANA … (*on the fore hands only*)
    - Homo.
  - II. QUADRUMANA … (*on both fore and hind hands*)
    - SIMIÆ … (*and anthropoid teeth*)
      - Troglodytes.
      - Satyrus.
      - Hylobates.
      - Semnopithecus.
      - Colobus.
      - Cercopithecus.
      - Papio.
      - Cynocephalus.
    - LEMURIDÆ … (*and abnormal teeth*)
      - Lichanotus.
      - Propithecus.
      - Lemur.
      - Otolicnus.
      - Cheirogaleus.
      - Stenops.
      - Tarsius.
      - Cheiromys.
      - Galeopithecus.
  - III. PEDIMANA … (*on the hind hands only*)
    - SIMIADÆ … (*and anthropoid teeth*)
      - Cebus.
      - Ateles.
      - Mycetes.
      - Lagothrix.
      - Callithrix.
      - Aotus.
      - Pithecia.
      - Hapale.
    - DIDELPHIDÆ … (*and abnormal teeth*)
      - Phascolarctos.
      - Phalangista.
      - Petaurus.
      - Didelphys.
      - Cheironectes.
      - Dasyurus.
      - Phascogale.

The leading forms of the *Quadrumana*, and indeed most of the genera, will be found under their respective titles in this work.

QUAESTOR (from *quaero*: '*qui conquireret publicas pecunias et maleficia*,' Varro, *De Ling. Lat.*, iv. 14) is a name which was common to two distinct classes of officers at Rome, who were only distinguished from each other by different attributes: the name of one class was *quaestores parricidii*; that of the other, *quaestores classici*. As the former class of these officers ceased to exist about the time of the Licinian law, and as the characteristic epithet was not always added by the earlier writers, the two offices were frequently confounded by subsequent authors, such as Tacitus and Ulpian.

The origin of the *quaestores parricidii* was traced by some writers back to the earliest period of Roman history, and it is said that the office of *quaestores parricidii* existed even in the reigns of Romulus and Numa. Livy (i. 26) and Tacitus (*Annal.*, xi. 22) think that they were appointed by the kings; but it is more probable that the kings only proposed the candidates, and that they were appointed by the populus. (Ulpian, 'De offic. Quaest.,' *Dig.*, i. 13.) That the office existed in the reign of Tullus Hostilius is certain, and the general opinion among the Romans was that it was instituted by that king. After the establishment of the republic, the two quaestores parricidii continued to be elected in the comitia of the curies, on the presentation of the consuls, as they were before on that of the kings; but they were now regularly elected every year, whereas before they had only been appointed in cases of emergency. After the decemvirate, they were elected by the centuries. At the time of the Licinian law one part of their functions was swallowed up by the office of the triumviri capitales, while the rest were embodied in the offices of the curule aediles and the tribunes.

The *quaestores parricidii*, according to Niebuhr, were the same as the *duumviri perduellionis*, but Walter (*Gesch. des Röm. Rechts*, p. 855) has adduced a number of passages which seem clearly to prove that the *quaestores parricidii* must be distinguished from the *duumviri perduellionis*, who continued to be elected to the end of the republic, and were real judges in cases of perduellio. The former, on the other hand, were a kind of public accusers, who conducted the accusation and carried the sentence into execution. (Festus, s. v. 'Parici;' Dionys. Hal., viii. 78.) They had also to assemble the comitia of the centuries to sit in judgment on any criminal accused of a capital offence (Varro, *De Ling. Lat.*, v. 9), for which purpose they sent a trumpeter, who proclaimed the day of meeting from the Capitol, at the gates of the city, and at the house of the accused.

The *Quaestores classici* had the superintendence of the public treasury, and are said to have been instituted by Valerius Publicola, who gave the right of electing them to the populus. At first they were only two in number, but in the year 421 B.C. their number was doubled (Liv., iv. 43), and part of them were to be plebeians, but this was not the case until ten years afterwards, when three out of the four quaestores were plebeians. (Livy, iv. 43, 54.) From the time that four quaestores were elected, two accompanied the consuls into the field, while the two others remained in the city (quaestores urbani). After the Romans had made themselves masters of all Italy (489 B.C.), the number of quaestores was again doubled, so that there were now eight of them (Liv., *Epit.*, lib. xv.), for the administration of the financial affairs in the city, in the army, in Italy, and the province of Sicily. One of them, who resided at Ostia, had also to provide the city with corn. (Cic., *pro Sext.*, 17.) Sulla in his dictatorship raised their number to twenty, and Cæsar to forty. (Tacit., *Annal.*, l. c.; Dion Cass., xliii. 47, 51.) During the time of the emperors their number varied. The two quaestores urbani, down to the time of Julius Cæsar, had the administration of the public treasury; they registered the revenue and expenditure of the republic (Ascon. Ped. on Cic., *in Verr.*, ii. 1, p. 158, ed. Orelli; Plut., *Cat. Min.*, 17, 18), received the money due to the state, and made the payments sanctioned by the senate. They had also to receive and take under their especial protection all foreign ambassadors, and those strangers who were connected with the state by ties of public hospitality; finally they had the care of the funerals and monuments which the senate decreed as distinctions for men of great merit (Plut., *Quaest. Rom.*, 43; Val. Max., v. 1, 1; Cic., *pro Flacco*, 18): they kept in the treasury the books in which the senatus consulta were copied, until Augustus also entrusted them with the keeping of the original documents. (Dion Cass., liv., 36.) Julius Cæsar transferred the administration of the treasury from the quaestores to two aediles. (Dion Cass., xliii. 47.)

The military quaestores who accompanied the consuls into the field (Cic., *in Verr.*, ii., 1, 15) had the charge of the money with which the war was carried on, distributed among the soldiers their provisions and pay, and superintended the sale of the booty, the produce of which was either divided among the soldiers or lodged in the public treasury. (Livy, iv. 53.) They had however to give in an account of all their proceedings to the treasury. Cic., *in Verr.*, ii. 1, 14; and Ascon. Ped., p. 167, ed. Orelli.)

With the extension of the Roman empire, a greater number of quaestores was required for the financial administration of the conquered countries and the provinces, and it was chiefly owing to this that their number increased in proportion as the empire became greater. The praetor was therefore usually accompanied in his province by a quaestor who had the whole financial department under his control, but was, like the other quaestores, accountable to the treasury; in case of his death, the praetor appointed a proquaestor in his stead. (Cic., *in Verr.*, ii. 1, 15.) When the praetor was absent from his province, the quaestor usually supplied his place, and was then attended by lictors. (Cic., *ad Fam.*, ii. 15; *pro Planc.*, 41.) In the consulship of Decimus Drusus and Porcina, the senate decreed that it should be decided by lot which of the quaestors were to be sent into the provinces. (Ulpian, *Dig.*, l. c.) This law was, with very few exceptions, observed until the end of the republic. There seems to be no doubt that the quaestors at all times, after the year of their office was over, had a right to take their seats in the senate; of Sulla it is expressly said that he raised their number to twenty, for the purpose of filling up the vacancies in the senate.

In the time of the emperors we have mention of some quaestors who bore the title of Candidati principis, and who were not sent into provinces, but had only to read in the senate the communications which the emperor had to make to that assembly. From the time of the emperor Claudius it became customary for quaestores, on entering upon their office, to give gladiatorial spectacles to the people, and accordingly none but the wealthiest Romans could aspire to the office.

The quaestores, in the provinces of the Populus Romanus, had the jurisdictio of the Curule aediles, and consequently the right of promulgating edicts. No edicts were promulgated in the provinces of the Caesar. (Gaius, i. 6.)

QUA'GLIO, DOMENI'CO, who has been called the German Canaletto, was of a family that has produced several generations of artists, and whose place of origin was Luino or Luvino, near the Lake of Como. Their ancestor, Julio Quaglio, was a fresco-painter of some note, who followed the school of Tintoretto, in which his father is said to have been educated, and who executed many altar-pieces and other works at Vienna, Salzburg, and Laybach. Lorenzo Quaglio, who was born at Luino, July 25, 1730, accompanied his father, Giovanni Maria, to Vienna, where the latter was engaged as engineer and architect in the imperial service, and where Lorenzo himself was brought up to the latter profession. He erected the theatre at Mannheim, and that at Frankfort, besides many other buildings, which are esteemed for their superior taste: he died at Munich, May 7, 1804. This Lorenzo left a son, named Giovanni Maria (born 1772), who was a distinguished architectural and scene painter. Domenico, the brother of Lorenzo, who was himself an historical painter, had two sons, Julius, an admirable scene-painter at Munich (died January 28, 1800), and an elder son, Joseph (born 1747, died at Munich, January 23, 1828), who was even more eminent than his brother, both as a scene-painter and in decoration generally. Joseph had four sons, Angelo, Domenico (the subject of this article), Lorenzo (born December 19, 1793), and Simon (born October 23, 1795). Angelo, who died April 2, 1815, at the age of thirty-seven, was also a scene-painter of extraordinary genius, and some of his productions are described as having had a most astonishing effect, particularly one representing the illumination of St. Peter's at Rome, after studies made by him on the spot.

Domenico was born at Munich, January 1, 1786, and began at a very early age to manifest a fondness for art, especially for perspective and architectural painting. With his father for his instructor, and with his own instinctive feeling to urge him on, he not only made rapid proficiency in the above-mentioned studies, but devoted his leisure to drawing from the life model, to landscape and sketches from nature, and to etching and engraving. In fact he was in some danger of aiming at excellence in too many departments of art, had he not, by the advice of his brother Angelo, determined to devote himself more especially to one. Having imbibed a strong taste for the architecture of the middle ages from Angelo's own drawings of the cathedral of Cologne (made for Sulpice Boisserée's splendid work), he resolved to make the buildings of that period the chief subjects of his pencil. With this view he made an architectural tour to Freising and other places, studying their interesting monuments of Gothic architecture. These furnished him with a stock of subjects for paintings on his return, and among the rest for his picture of Regensburg cathedral, which was purchased by Maximilian, the late king of Bavaria, who exhorted the artist to confine himself to the new branch which he had so successfully commenced. Following this advice, which was seconded by that of many other able judges, Quaglio resigned, in 1819, his situation and salary as scene-painter at the Munich theatre, and thenceforth applied himself solely to architectural painting, in which branch of art he gradually established a reputation throughout Europe, and at the same time was not a little instrumental in promoting by his works that taste for the architecture and arts of the middle ages which has of late years taken root in Germany. Independently of their value as portraits of some of the finest productions of German-Gothic architecture, his works are marked by striking picturesque effect. Besides his pictures, which are very numerous, he executed many etchings and lithographic views, and among the latter a series of thirty subjects, entitled 'Denkwürdige Gebäude des Deutschen Mittelalters.' In 1829 he accompanied Mr. Gally Knight in a tour to Italy as his architectural draftsman. He died at Hohenschwangau (where he was employed in restoring and improving the castle), of an apoplectic attack, April 9, 1837.

QUAIL. [PERDICIDÆ, vol. xvii., p. 438.]

QUAINI, FRANCESCO, was born in 1611, at Bologna, and studied under Agostino Mitelli, by whose instruction he acquired great skill in perspective and in painting architectural views. The public edifices at Bologna contain several of his works, the most admired of which are the representations of ornamental architecture in the Sala Farnese in the Palazzo Publico.

QUAINI, LODOVICO, the son of Francesco, was born at Bologna, in 1643. After having acquired the rudiments of the art and a knowledge of perspective from his father, he became a disciple first of Guercino, and afterwards of his relation Carlo Cignani, in whose school he was contemporary with Marc Antonio Franceschini. His improvement was so great, that in a few years he was employed, as well as Franceschini, to assist Cignani in the execution of some of his great works. Their method of handling and colouring was so similar, that it was difficult to determine what part of any work was executed by either of them. In Cignani's principal works however it seems that Quaini painted the landscape, the architecture, and other ornaments, and Franceschini the figures. After Cignani's death the two artists continued to work together. They were employed at Bologna, Modena, Piacenza, Genoa, and Rome, where they painted the cartoons for a cupola in St. Peter's, which has since been executed in mosaic.

Quaini also painted many historical subjects from his own compositions, which were entirely finished by himself. In the church of St. Joseph at Bologna there is a picture of the Visitation; in La Carità, the dead Christ supported by the Virgin; and in the church of St. Nicholas the principal altar-piece is by Quaini—it represents that saint in prison visited by the Virgin and an angel, and is favourably spoken of by Lanzi. He died in 1717, aged 74.

QUAKERS, the name first given 'in scorn,' and since habitually, to the sect of Christians who call themselves the 'Society of Friends.' [FOX, GEORGE, vol. x., p. 396.]

Origin.—The founder, or rather the first member of this Society was George Fox, who towards the middle of the seventeenth century, after long wanderings about the country and much spiritual conflict and inquiry into the merits of the sects then raging against each other in England, separated himself from all, feeling that 'none could speak to his condition.' By degrees his religious opinions assumed a distinct form, and in the year 1647, when he was 23 years of age, he commenced his ministry by preaching at Dukinfield near Manchester. In a short time the number of believers in his doctrines increased; in 1648 large meetings attended his ministry in Nottinghamshire, and, notwithstanding cruel persecution, the Society spread from the poor and uninstructed to many of the more opulent and educated classes.

It is not our intention to describe the process by which George Fox was led to adopt his peculiar opinions, or the course of conduct which these induced him, whilst yet a very young man, to pursue. Such a narrative might cast on the sect an air of extravagance, which belongs less to this body in particular than to the period of religious excitement in which it had its rise. Notwithstanding instances of indiscretion or enthusiasm in some of its first members, the early history of the Society is full of examples of undaunted courage in passive and ultimately successful resistance to oppression.

Tenets.—The Society of Friends have no articles or creed, subscription to which is required of their members. Their principal tenets may however be gathered from the writings of George Fox, William Penn, and Robert Barclay, and their other approved authors, and from the minutes and epistles issued by their yearly meeting in London to the subordinate meetings.

They believe that it is the prerogative of God alone to declare himself to man; and therefore they prefer expressing their religious opinions in the language of Holy Scripture. In full accordance with these sacred writings, they have ever believed that there is one God and Father of all, of whom are all things; that there is one Lord Jesus Christ, by whom all things were made, who was glorified with the Father before the world was, who is over all, God blessed for ever; that there is one Holy Spirit, the promise of the Father and the Son, the Leader, Sanctifier, and Comforter of his people: and that these three are one God. Whilst objecting to scholastic terms and distinctions, and to all attempts to be wise in the deep things of God, beyond what He has plainly revealed, they have ever professed their belief in the real manhood as well as the true deity of our Lord and Saviour Jesus Christ; that the Word which was in the beginning with God, and was God, was made flesh and dwelt amongst men. They maintain that man in the fall is separated and alienated in his nature from God; that all have sinned and come short of the glory of God, and are therefore exposed to divine wrath; and that it is solely through the mercy of God in Christ Jesus that any are brought into reconciliation with him; receiving remission of sins through faith in the one propitiatory offering of the Lamb of God, and sanctification of heart through the influences of the Holy Spirit. They believe the Holy Scriptures to be given by inspiration of God, and to be profitable for doctrine, for reproof, for correction, for instruction in righteousness; and they have always professed their entire readiness that their tenets and practices should be tried thereby.

But that which may be regarded as the doctrine mainly distinguishing them from other Christians, is what they apprehend to be a fuller recognition both of the universality and of the teaching of the Holy Spirit. They believe that the light of the spirit of Christ does in measure enlighten every man that cometh into the world; that the effects of the death of Christ are coextensive with those of Adam's transgression, according to the declaration of the apostle, 'As in Adam all die, even so in Christ shall all be made alive;' and, as a consequence hereof, that even those who have not the outward knowledge of the Gospel history may, by giving heed to their measure of this light, become partakers of that salvation which comes by Jesus Christ.

They moreover believe that the guidance of the Holy Spirit is to be experienced by every sincere believer in Christ, in reference both to his religious duties and to his daily walk in life,—that to be guided by the Spirit is the practical application of the Christian religion. They also maintain that this manifestation of the Spirit, given to every man to profit withal, is the only essential qualification of the Christian for service in the church, and is independent of human choice or appointment. They hold it to be the prerogative of Christ to call and qualify by the Holy Spirit his servants to minister in word and doctrine, and that, as in the earliest period of the Christian church, this Spirit was poured upon servants and upon handmaidens, so he continues to call from *women* as well as from men, from the young and from the old, from the unlearned and from the poor, from the wise and from the rich, those whom he commissions to declare unto others the way of salvation. As such have freely received the gift of the ministry, so are they freely to give without hire or bargaining, far less to use it as a trade to get money by. Hence they refuse the payment of tithes and all other ecclesiastical imposts. They believe that the true worship of God is offered in the inward and immediate moving and drawing of his own Spirit; and that all other worship, beginning and ending in man's pleasure, ought to be rejected. Hence they abstain from the use of all prescribed forms of prayer, and refuse to observe appointed days of thanksgiving, or of fasting and humiliation. They believe that as all the types and shadows and ordinances of the law were fulfilled in Christ, so he established no new ordinances to be administered or to be observed in his church, that his baptism is that of the Holy Ghost and of fire, that he himself is the bread of life, and that the communion of his body and blood is inward and spiritual, and that in thus partaking of the substance, the figures are no longer needed. They assert that as God hath assumed to himself the dominion of conscience, all punishment for conscience sake is therefore contrary to the truth; provided that no man under the pretence of conscience prejudice his neighbour. They believe that true religion delivers man from the spirit and vain conversation of this world, and leads him to inward communion with God; and that hence all foolish and superstitious formalities and all frivolous recreations ought to be rejected: thus all public rejoicings are disapproved of.

Friends deem the taking of all oaths unlawful, and much of their sufferings arose from the firmness with which in former days they refused the oaths often wantonly tendered to them. They believe too that all wars and fightings are inconsistent with pure Christianity, and they refuse all participation directly or indirectly in them. They believe marriage to be a divine ordinance, but in their marriages they do not use the intervention of a minister, for whose interference they allege that there is no Scripture warrant. When any of the Society intend to marry, they acquaint their respective men's and women's meetings of their intentions, and the necessary inquiries having been made as to the consent of parents, the freedom of the parties from all previous engagements, and, if the woman is a widow with children, as to the security of a due provision for these, the parties in a public meeting for worship solemnly take each other in marriage, and a certificate of the fact is given to them. Friends abstain from all pomp in the burial of their dead and from the use of mourning apparel or of grave-stones. They do not use the heathen names of the days or months, but designate them by their numbers; and they object to address an individual in the plural number, or by his title of courtesy, or by any designation which they consider as either inconsistent with Christian truthfulness, or as irreverent or merely complimentary; but they have no scruple against the use of the simple names of dignity or office.

Discipline.—The discipline of the Society was at least indicated and to a great extent established by George Fox with much foresight; for notwithstanding the great increase of the body and the altered circumstances of the times, the system has been found adequate to the protection and the government of the Society.

The members of one or more congregations (according to their size) hold monthly meetings for looking to the orderly conversation of the members, for taking care of their poor (a duty which the Society rigidly fulfils to the superseding of all parochial relief), for regulating the proceedings in relation to marriage, and for other matters affecting the well-being of the body.

There are quarterly meetings throughout the nation, to which representatives are sent from the subordinate monthly meetings. There are also monthly and quarterly meetings of women Friends similarly constituted.

There are meetings for worship on Sunday, and in the forenoon of one other day in the week. The epistle from the yearly meeting in 1675 exhorts Friends not to decline, forsake, or remove their public assemblies because of times of suffering; for such practices are not consistent with the nobility of truth.

Finally, there is a yearly meeting of representatives from all churches of the Society throughout Great Britain and Ireland. This meeting is held in London on the Wednesday after the third Sunday in May, and remains sitting many days It receives reports of the state of the particular churches, and it issues to them a general epistle. A similar representative body or yearly meeting of women Friends is held at the same time for the general supervision of the religious state of those of their own sex, but they have no power to make rules for the government of the body. During the intervals of the yearly meeting, the general business of the Society is conducted by a meeting termed the Meeting for Sufferings, which is a carefully selected standing committee of the yearly meeting. There is a general fund belonging to the Society, called the national stock; it is formed by the voluntary contributions of members, and it is applied to the publication of religious works, the expenses attending applications for legislative relief in cases of suffering, the payment of the expenses of ministers travelling in foreign parts out of the limits of any meeting, and other public objects of the Society.

Whilst it is the duty of the individual members of the Society generally to watch over one another in love, this duty is more especially confided to certain officers of each sex in the respective meetings, who are called overseers, and who, whenever any case of delinquency comes to their knowledge, visit the individual privately, and labour with him in tenderness with a view to his restoration; but if these efforts prove unavailing, they are to bring the case to the monthly meeting, which appoints a committee to exercise further care in reference to it; and if all attempts at reclaiming the offender should fail, he is disowned as a member of the Society by a document issued by the monthly meeting and signed by its clerk.

There are many wise provisions made by the Society for exercising care over those who believe themselves called to the work of the ministry. This care is more especially entrusted to the elders, who are persons chosen for their spiritual discernment, and from having given evidence by their fruits of the soundness of their faith. The eventual recognition or acknowledgment of ministers as such rests however with the monthly meeting at large, including all the men and women members of the congregation. Monthly meetings are cautioned not hastily to give certificates of competence to those who desire to travel in the ministry; but to take care that these are well approved at home, are of sound doctrine, of good conversation, and in unity with their own meetings.

This notice of the Society of Friends ought not to be closed without honourable mention of their constant efforts in the cause of humanity. George Fox recommended the establishment of two schools, one for boys at Waltham and one for girls at Shacklewell, 'for instructing them in whatsoever things were civil and useful in the creation;' and a care on this head has been maintained and extended of later time, there being at present several large schools supported by the Society for the children of Friends and those connected with the body in different parts of England and Ireland. Some of these are intended only for elementary learning and religious instruction, others embrace the higher branches of education, and some are connected with agricultural pursuits. The Lancasterian system of instruction has found among Friends some of its most zealous supporters. The minutes of the yearly meetings from 1727 to the present time abound in exhortations to repress the slave-trade and slavery. In 1761 members engaged in the slave-trade were disowned; and the Society, as a body and individually, have been unremitting in their labours to remove this stain from the nation.

(*Rules of Discipline for the Religious Society of Friends*, London, 1834; Sewel's *History of the People called Quakers*, London, 1834; Barclay's *Apology* (the edition used for this article is that of 1701, London); and *Memoir of the Life of George Fox*, 1839; also the articles FOX; BARCLAY; PENN.)

QUAKING GRASS is the name given to the various species of graminaceous plants belonging to the genus Briza of botanists. They derive their name from their spikelets being always in a state of tremulous motion in consequence of the weakness of the footstalks by which they are supported.

QUALITY (from the Latin *qualis*), in the common acceptation, comprises all attributes that can be given to a thing, with the exception of those of magnitude and quantity, and it matters not whether the attributes are essential to the thing or merely accidental. But in speaking of the qualities of things, we chiefly consider those by which they are distinct from other and similar things. This circumstance accounts for some expressions, such as 'a man or a person of quality,' in which the word quality is used synonymous with rank, as *the* quality by which in aristocratical countries one class of men is distinguished from all others.

Among the ten categories or fundamental notions of the philosophy of Aristotle, quality is the third; but Kant, who has reduced the ten categories of Aristotle to four, makes quality the second; and according to him it comprises the notions of existence, non-existence, and limitation, or of reality, negation, and limitation; that is to say, all things which come within the sphere of man's thought are, in the category of quality, either something or nothing, or something of which he can only say what it is not.

QUAMASH is the North American name of an eatable bulb, found in the plains of the Missouri, and called Camassia esculenta by botanists. It is a plant of the Liliaceous order, and is nearly allied to the European squill.

QUAMOCLIT, a genus of climbing ornamental plants of the natural family of Convolvulaceæ, chiefly found in the hot parts of America, but species are indigenous both in India and China. The genus is characterised by having a 5-leaved calyx. Corol somewhat salver-shaped, plicate, and 5-lobed. Stamens 5, inserted into the base of the corolla. Ovary 4-celled. Cells with single ovules. Style simple. Stigma capitate and bilobed. Capsule 4-celled, 4-valved. Seeds 4, erect. Climbing plants with the leaves alternate, cordate, entire, lobed, or pinnatifid; peduncles axillary; one or many flowers of a red colour. Q. vulgaris is common in every part of India, and, being a beautiful plant, has been cultivated in this country as a tender annual. The name of the genus has been taken from that of this species, which was Ipomœa Quamoclit, the latter name signifying dwarf-bean, because, though smaller, it resembles the kidney-bean in its habit.

QUANTITY. There is little here to add to what has been said in the article MAGNITUDE. The quantity of anything is the answer to *quantus?* (how much?) and the considerations under RATIO are necessary to the precise answer. Mr. Mill, in his 'Elements of the Human Mind,' has invented the word *tantity*, since *quantus* (how much) is answered by *tantus* (so much); and he therefore uses quantity and tantity as correlative, or, as he terms them, connotative words. But in truth the meaning of *quantity*, as generally received, does not refer to the question, but to the answer: so that the word *tantity*, if introduced, could only mean the same thing as quantity, unless the meaning of the latter word were changed. If any one were to propose that quantity should signify what it does at present, with the addition of a reference to seeking, requiring, or asking, and that tantity should involve the same notion, its object being considered as found, given, or determined, undoubtedly the proposition would be a good one, considered apart from the difficulty of altering established meanings. The word quantuplicity, as distinguished from quantity, means the answer to how many times, as distinguished from how much. [RATIO.]

QUANTITY OF MATTER. [MASS.]

QUANTITY OF MOTION. [MOMENTUM.]

QUARANTINE. Quarantine regulations are regulations, chiefly of a restrictive nature, for the purpose of preventing the communication from one country to another of contagious diseases, by means of men, animals, goods, or letters. The origin of the term *quarantine* (which originally signified a period of forty days during which a person was subject to the regulations in question) is explained in the article LAZARETTO. The period of forty days during which a widow entitled to dower can remain in her husband's mansion-house after his death is also called, in our law, the widow's quarantine. (Blackstone's *Commentaries*, vol. ii., p. 135.)

Quarantine regulations consist in the interruption of intercourse with the country in which a contagious disease is supposed to prevail, and in the employment of certain precautionary measures respecting men, animals, goods, and letters coming from or otherwise communicating with it. Men and animals are subjected to a probationary confinement, and goods and letters to a process of depuration, in order to ascertain that the contagious poison is not latent in the former; and to expel it, if it be present, in the latter. Quarantine regulations respecting *men* and *animals* are therefore founded on the assumption that the contagious poison, after having been taken into the constitution of a man or an animal, may remain dormant in it for a certain time, and that a seclusion of a certain duration is necessary, in order to allow the disease time to show itself, or to afford a certainty that the disease is not there. Quarantine regulations respecting *goods* and *letters* are founded on the assumption that the contagious poison may be contained in goods and letters, and transmitted from them so as to communicate the disease to men.

The country from which the introduction of a contagious disease is apprehended, may either be conterminous with the country which establishes the quarantine regulations, or may be divided from it by the sea. Accordingly quarantine lines may either be drawn round a coast, as is the case in France, Italy, and Greece, with respect to the Levant, or they may be drawn along a land frontier, as on the frontier between Austria and Servia and Wallachia.

The contagious diseases which quarantine regulations are intended to guard against are plague and yellow-fever, and latterly cholera. We are not aware whether small-pox has ever been made a subject of quarantine regulations; but this question is now of no practical moment, since vaccination has supplied a preventive of small-pox far more efficacious than any quarantine regulations could be.

The most important disease, with reference to quarantine regulations, is the *plague of the Levant;* and in practice quarantine regulations are of little importance except with respect to the intercourse by land and sea with Turkey, Asia Minor, and Egypt, and some other of the Mohammedan countries bordering on the Mediterranean.

In the article PESTILENCE there is an explanation of the nature of the disease styled plague, which, although formerly prevalent over the whole of Europe, is now nearly confined to the Levant; and it is there stated that its symptoms, morbid changes, history, and mode of propagation, bear so close a resemblance to those of the malignant typhus of this country, that it is difficult to regard them otherwise than as different types of the same disease. [Vol. xviii., p. 15.] It is also shown in the same article that the plague of the Levant appears to be generated by the same causes which generate typhus in this country, namely filthy, crowded, and ill-ventilated dwellings, want of personal cleanliness, defective drainage, and insufficient or unwholesome food (Report of Dr. Arnott and Dr. Kay, in the Appendix to the *Fourth Annual Report of the Poor-Law Commissioners*, p. 103), and that when the disease has been thus generated, it may, particularly under the influence of any of the causes which originally produced it, be communicated from one person to another. It appears likewise that its communication from one person to another is promoted not only by filth, want of ventilation, and the other usual accompaniments of squalid poverty, but also by certain atmospheric causes, such as a certain state of heat, moisture, &c., respecting which we are as yet imperfectly informed. [Vol. xviii., p. 16.] The plague therefore is both epidemic and contagious; that is to say, it may either be generated by local causes, which simultaneously affect a large number of the inhabitants of a country, or it may be communicated directly from one person to another. Where a disease is both epidemic and contagious, it is difficult to determine what proportion of the cases of it are due to local causes and what proportion to contagion. The analogy of typhus in this country would lead us to believe that the number of cases of plague in the plague countries produced by contagion is small as compared with the number produced by local causes. The invisible nature of the ordinary causes of plague and other epidemic diseases, and the simultaneous seizure of many persons in the same district, the same street, or the same house, have naturally led to the belief that the disease is in every case communicated from one person to another; according to the fallacy ingeniously exposed by Dr. Radcliffe, who, on being asked his opinion respecting the contagiousness of epidemic diseases, answered: 'If you and I are exposed to the rain, we shall both get wet; but it does not follow that we shall wet one another.'

This view of the ordinary causes of plague is likewise confirmed by the undoubted fact which is adverted to in the article PESTILENCE, that the poor are the chief sufferers by it, and that it prevails most in the filthiest and worst quarters of towns. Since this fact is of much importance, we will cite the excellent testimony of Dr. Patrick Russell, in addition to what is said in the article PESTILENCE. Speaking of the plague at Aleppo in 1762, he makes the following remarks:—'The villages appeared to suffer in a singular degree, owing perhaps to the structure of the huts and cottages, which are small, with few or no windows, and stand crowded together. In this they resemble the Keisarias within the city, which are inhabited by the lower class of people, and in which the contagion spreads also with great fury. The inhabitants of the city of the same class, but who live in districts where the houses are less connected, suffered more than the middling class possessing more airy habitations, but less than the Keisarias. The people of rank, or in higher offices, *notwithstanding the promiscuous crowds frequenting their palaces*, suffered least of all. Neither the governors of the city, the cadi, nor the nakeeb, and very few of the agas of superior rank, were themselves infected, though the plague had penetrated into most of their harems, and many of the pages and other attendants without doors were carried off by it. In these great harems however the contagion seldom spreads much; of perhaps about forty females, not more than four or five being infected. . . . Of all people, the Jews appear to have the strongest dread of the plague, a circumstance in one light rather fortunate, no place being more favourable to its propagation than the habitations of the lower class of that nation. The houses are small, or, if large, the different apartments are crowded with different families. Many of the houses are more than a story below the level of the street, in a condition half ruinous, dirty in the extreme, damp, and badly aired, from the nature of the situation; and the wretched inhabitants are clothed in rags. When one of them is taken ill, and known to have the plague, he is immediately abandoned to the care of an attendant, and the rest of the family seek refuge, if possible, at some distance. The families lodged in the other apartments, all not having it in their power to fly, are obliged to remain, but avoid approaching the chamber of the sick, and restrain their children from going into the court-yard. Thus pent up, they suffer all the inconveniences of the hot season in the midst of perpetual dread, till at length, what often happens, they also are attacked with the distemper. It was not without horror I descended into these dreary mansions.' (Russell's *Historical Journal of the Plague*, pp. 61-64.)

From the fact of the plague prevailing principally among the poor, and rarely attacking the rich, it may be inferred either that the plague is produced exclusively by the filth, crowding, and bad food to which the poor are subject; or that, if it be contagious, the contagion does not in general take effect upon the inhabitants of spacious and cleanly houses, who are clean in their persons, orderly in their habits, and have a sufficient supply of wholesome food. We see that diseases which appear to be contagious under nearly all circumstances, prevail equally among the rich and poor, and that none of the physical advantages possessed by the latter afford any security against it. Thus, before the introduction of vaccination, small-pox was equally destructive to persons of all ranks in society; and the contagious diseases which attack children, as measles and hooping-cough, make no distinction between the children of the rich and the poor.

There seems to us to be no reasonable doubt that the plague is contagious—in other words, that it can be communicated directly from one person to another—provided there be circumstances favourable to its transmission. A quarantine for men may therefore be expedient for countries where the spread of the plague, supposing it to be introduced, is not improbable. The duration of this quarantine ought to depend upon the time during which the disease may be latent in a person who has taken it by contagion or otherwise.

Since the plague is a peculiarly malignant and destructive fever, and runs its course with a rapidity far greater than typhus, there seems a fair ground for concluding that its poison would not be long latent in the human body. The answers of the protomedico of Malta respecting the plague in Malta of 1813, state that 'the periods at which the disease made its appearance in different individuals after communication were various. It was generally from the third to the sixth day; sometimes longer, even to the fourteenth day, but not later.' (Dr. Maclean, *On Epidemic and Pestilential Diseases*, vol. ii., p. 29.) M. Ségur Dupeyron, the secretary of the Council of Health in France, states, in his Report on Quarantine to the Minister of Commerce (May, 1834), that 'the physicians who have made a close study of the plague are pretty generally of opinion that its poison cannot be latent in the human body more than fifteen days; and the cases of plague introduced into the lazarettoes confirm this opinion' (p. 48). We believe that the cases of plague which have of late years occurred in the lazarettoes of Valletta, Marseille, and Leghorn have broken out either at sea or shortly after the ship's arrival. When the line of French steamers was first established, in 1837, between Marseille and the Levant, it was arranged that the steamers coming from the Levant should perform their quarantine at Marseille. But in consequence of several cases of plague having broken out on board the steamers before they could reach Marseille, the French government decided that they should perform their quarantine at the nearest practicable station, namely Malta.

It is commonly assumed that actual or nearly actual contact is necessary in order to communicate the plague. 'All measures against the plague (says M. de Ségur Dupeyron) are founded on the opinion that, except within a very small distance from the body, contact alone can give the disease. Consequently goods taken from ships with different bills of health are often placed in the same warehouse; and physicians who have visited plague patients, without having touched them, are not put in quarantine, and are permitted to go about immediately after their visit' (p. 76). We believe the idea that actual contact is necessary for the communication of the plague to be utterly erroneous; and we entertain no doubt that under circumstances favourable to its communication, such as filth, crowding, and want of ventilation, the poison of the plague might be introduced into the human body by inspiration through the lungs. We account for the escape of the physicians, guardians, and others, who come within a short distance of the plague-patients in lazarettoes, by the supposition that in the isolation, cleanliness, and good ventilation of a well managed lazaretto, the contagion of the plague is exceedingly feeble.

With respect to the quarantine of animals, it may be remarked that, according to the belief commonly received in the Mediterranean, all living animals are capable of communicating the plague. Accordingly horses, asses, cattle, and sheep are placed in quarantine upon their importation. There is, we believe, an idea among the Franks resident in the plague countries, that the horse cannot communicate the poison of the plague, but that it is frequently communicated by other animals, especially by cats. (See Maclean, vol. i., p. 202.) We suspect that there is no foundation for the notion that plague can be communicated by means of animals.

Goods carried in ships or by land are subject to quarantine, according as they belong to the class of susceptible or nonsusceptible goods. Goods which are supposed to be capable of containing and transmitting the poison of the plague are called *susceptible.* Goods which are supposed to be incapable of containing and transmitting the poison of the plague are called *nonsusceptible.* All animal substances, such as wool, silk, and leather, and many vegetable substances, such as cotton, linen, and paper, are deemed susceptible. On the other hand, wood, metals, and fruits are deemed nonsusceptible. In Venice an intermediate class, subject to a half quarantine, is introduced between susceptible and nonsusceptible goods (Ségur Dupeyron, p. 70); but this classification appears to be peculiar to the Austrian dominions. All susceptible goods are unladen in the lazaretto, and are there exposed to the air, in order to undergo a process of supposed depuration.

The grounds of the received distinction between susceptible and nonsusceptible articles must, we conceive, be altogether fanciful; since we cannot discover any evidence that the plague has ever been communicated by merchandise. Whenever the plague has been introduced into the lazarettoes of the Mediterranean, it has always been introduced by passengers or their clothes. (Ségur Dupeyron, p. 45-48.) It may be added, that the persons employed in the process of depurating susceptible goods have never been known to catch the plague, which could scarcely have failed to be sometimes the case if the poison of the plague could be transmitted through goods. (See answer 28 of the Maltese Protomedico, in Maclean, vol. ii., p. 31.) It seems to be likewise supposed that some substances are not only nonsusceptible, but can even nullify the poison of the plague in susceptible articles. 'At Trieste (says M. de Ségur Dupeyron), the juice of dried grapes is considered as a purifier; and consequently currants in susceptible wrappers are allowed to pass without the wrappers being subjected to any quarantine' (p. 72).

There appears however to be conclusive evidence that the clothes and bedding of plague patients have transmitted the plague. (Dupeyron, p. 32-71.) We believe the danger of its transmission in this manner to be equal to the danger of its transmission by passengers.

We are not aware of any well authenticated example of the transmission of plague by means of letters. Nevertheless, as paper is considered susceptible, letters coming from and passing through the plague countries, are opened and fumigated at the lazarettoes, a process which is often productive of mistakes, delays, and other inconveniences.

Every ship is furnished by the consul or other sanitary authority at the last port where it touched, with an instrument, styled a bill of health, declaring the state of health in that country. If the ship brings a clean bill of health, the passengers and goods are not subject to any quarantine. If she brings a foul bill, they are subject to quarantines of different durations, according as the plague is known or only suspected to have existed in the country at the ship's departure. On account of the prevalence of plague in the countries upon the Levant, they are considered as permanently in a state of suspicion, and no ship sailing from any of them is considered to bring a clean bill. The periods of quarantine vary from two or three to forty days; the usual periods are from ten to twenty days.

For a description of the buildings in which passengers usually perform their quarantine, and in which goods are depurated, see **Lazaretto**. The most spacious and best appointed lazarettoes in the Mediterranean are those at Malta and Marseille. To the statements contained in the article just referred to, we add the following curious description of a quarantine station on a land frontier, quoted from a MS. journal in Murray's 'Handbook for Southern Germany,' p. 457. 'Outside Orsova, by the waterside, and near the ferry over the Danube, stands the Parlatorium, a wooden shed in which the market (skela) is held three times a week. On account of the quarantine regulations, the inhabitants of Servia and Wallachia are prevented coming in contact with the subjects of Austria, and dare not cross the frontier without an escort. The Austrian quarantine is five days for those who come out of Wallachia, and ten for those from Servia, increased to forty days in time of plague. The Wallachians again have a quarantine of five days against the Servians; so that none of the three parties can intermix for the purpose of buying or selling, nor can they touch each other's goods. On this account the building where the market is held is divided by three partitions, breast high, behind which the dealers of the three nations are congregated. In an open space in the centre is a table, by the side of which the Austrian quarantine officers take their stand, aided and supported by a guard of soldiers with fire-arms and fixed bayonets to enforce order and obedience. Whenever a bargain is made, the money to be paid is handed to one of the attendants, who receives it in a long ladle, transfers it to a basin of vinegar, and after washing it, passes it on to the opposite side. The goods to be purchased are placed within sight, and are immersed in a tub of water, or fumigated, when they happen to change owners. It is an amusing sight to see the process of bargaining thus carried on by three parties at the distance of several yards from each other, attended by the vociferation and gesticulation inseparable from such business. When the bartering is transacted, the Wallachians are escorted back to their own territory, as they had previously been in coming to the spot, by a guard of soldiers, and the Servians recross the river in their boats.'

The institution of quarantine originated at Venice, in which city the expediency of some precautions against the introduction of the plague was suggested by its extensive commercial relations with the Levant. A separate hospital for persons attacked by the plague was established in an island near Venice, in 1403; and the system of isolating passengers and depurating goods appears to have been introduced there about 1485. The system thus established in Venice gradually spread to the other Christian countries in the Mediterranean, and has been adopted, to a greater or less extent, over all the civilised world.

It is much to be desired that the plan of an inquiry, by competent medical authority, into the grounds of the existing quarantine regulations in the Mediterranean, to be conducted under the direction of the chief European powers (which has been suggested by M. de Ségur Dupeyron, Dr. Bowring, and others), should be adopted. It cannot be expected that the causes of plague and the mode of its communication will receive any light from the semi-barbarians who inhabit the Mohammedan countries of the Levant. Moreover, quarantine regulations cannot be changed without the consent of the different nations which are concerned in their enforcement. The reason why it is necessary for a nation to adapt its quarantine regulations to the received opinions upon the subject, is explained in the following extract from a paper respecting quarantine regulations in the Mediterranean, which was printed in the Malta 'Government Gazette' of the 19th December, 1838:—'The quarantine regulations of the English colonies in the Mediterranean cannot be changed by the simple will of the English government without producing inconveniences far greater than those arising from the existing system. If the English government should change the quarantine regulations of Malta and its other colonies in the Mediterranean without previously obtaining the approbation of the sanitary authorities of the neighbouring countries, the pratique granted in those colonies would not be received elsewhere; and all vessels coming from any of those colonies would be subjected to a quarantine of observation (from eight to fifteen days). The latter liability would attach to ships of the royal navy as well as to merchant vessels; so that no ship of war sailing from Malta could communicate with any part of France, Italy, or Austria, without being previously subjected to a quarantine of observation. Malta, in particular, would suffer most severely by being unable to give an effectual pratique to ships performing quarantine in the harbour of Valletta, and by subjecting all ships clearing out of that harbour to a quarantine of observation. Not only would its transit trade be almost completely destroyed, but it would lose its importance as a quarantine station. Its importance as a quarantine station is now daily growing, on account of the establishment of the French steamers to the Levant, and the use of the overland journey to India. It would however cease to be a quarantine station if its pratique was not received by the Board of Health at Marseille, and by the other sanitary authorities of the Mediterranean. In order therefore that the quarantine regulations of the English colonies in the Mediterranean might be safely altered, it would be necessary that the alterations should be made in concert with the governments of the neighbouring European countries.'

The small states of Italy are suspected (and, we fear, with justice) of abusing quarantine regulations for the purpose of preventing commercial intercourse, and also for the sake of the profit to be made by farming out the quarantine dues.

But in Trieste, Marseille, and Malta the system is, we believe, perfectly free from all taint of corruption, and is maintained with the full concurrence of public opinion among the inhabitants of those towns. Indeed, it may be said that the popular jealousy is rather lest the restrictions should not be severe enough, than lest they should be too severe. It is therefore manifest that the system cannot be improved until the opinions upon which it is founded have undergone a thorough investigation.

The heads of the English law respecting quarantine are contained in the 6 Geo. IV., c. 78. This Act also confers upon the king in council extensive powers for making quarantine regulations. A full official abstract of the regulations established by this statute, and of the orders in council made under it, may be seen in M'Culloch's *Commercial Dictionary*, article 'Quarantine.'

QUARE I'MPEDIT. When an ecclesiastical benefice becomes vacant by the death, cession, &c. of the incumbent, unless the patron [ADVOWSON] present his clerk, that is, a clergyman, to the bishop of the diocese for institution, within six calendar months, the right will lapse to the bishop, who may collate to the vacant benefice. But if a presentation be made by the patron within the six months, and that presentation is rendered ineffectual by the bishop's refusal to institute the clerk presented, the patron may obtain redress for this interference with his right of patronage in an action of Quare impedit, a proceeding so called because the writ by which the action is commenced requires the defendant to state Quare impedit (why he hinders) the plaintiff from exercising his right of presenting to the vacant benefice. If the bishop be the sole disturber of the right, as is the case when he rejects the clerk upon an unfounded allegation of personal incapacity, as illiterature, immorality, &c., the action of Quare impedit is brought against the bishop alone. Where the bishop has instituted a clerk upon the presentation of a party wrongfully claiming to be patron, the action is usually brought against the bishop, the patron so claiming, and his clerk jointly; for unless the bishop be made a party to the suit, a title to present by lapse will accrue to him if the suit remain undetermined at the end of six calendar months from the death, &c. of the last incumbent, and the benefice remain vacant, and the clerk instituted is, in consequence of the want of title in his patron, shown to be an intruder. If the patron be omitted, the proceeding is void, inasmuch as the validity of the title under which he has presented, as opposed to that set up by the plaintiff, is the subject to be inquired into. If the clerk be omitted, there can be no process (in a suit to which he is no party) to remove him from the benefice in case he has been instituted, and is ultimately found to have been presented on an insufficient title; and the consequence will be that the plaintiff must lose his right of presenting to the benefice for the present turn.

The writ of Quare impedit commands the defendants to permit the plaintiff to present a fit and proper person (without specifying any particular clerk) to the vacant church, vicarage, or other benefice of which he claims the patronage, and which the defendants, as it is alleged, obstruct; and unless they do so, then they are required to appear in the Court of Common Pleas, to show the reason why they hinder him. The defendants having been summoned, by delivering to them a copy of this writ, and having entered an appearance in the court, the plaintiff states his complaint more fully by his declaration, in which he must set out some former presentation to the same benefice, and if that presentation was not by himself, he must formally deduce a title to himself, by descent or purchase, from the party by whom the presentation on some former vacancy is alleged to have been made. The declaration must also show a disturbance before the bringing of the action. Upon this the bishop and the clerk usually disclaim all title, save only, the one, as ordinary, to admit and institute, and the other as presentee of the patron, who is left to defend his own right. But if the bishop has done more than he was bound to do as ordinary, especially where he has wrongfully collated the benefice, the plaintiff may, in his replication, allege special disturbance in the bishop for the purpose of making him a substantial defendant. If the plaintiff fail in making out his own title, the defendant is put upon the proof of his, in order to obtain judgment for himself if needful. But if the right be found for the plaintiff on the trial, the jury who try the cause are to inquire of three other points: 1st, Whether the church, &c. is full, and if full, of whose presentation; for if it be of the defendant's presentation, then the clerk is removeable, provided the writ has been brought in due time; 2nd, What the value of the living is, and this with a view to the assessment of damages, which are directed to be given by the statute (13 Ed. I.); 3rd, In case of plenarty (that is, of the benefice being full), upon a usurpation (wrongful presentation), whether six calendar months have passed between the avoidance (the occurrence of the vacancy) and the time of bringing the action; because the statute which permits a usurpation to be devested by a Quare impedit, does so only when the action is brought within the six months, and at common law plenarty was a bar to the action of Quare impedit, however early the action might have been commenced. If the jury find that the plaintiff had the right to present, and that his action was commenced within the six months, he has judgment to recover this presentation; and if the church, &c. be full by institution of any clerk, process issues to remove him, unless whilst the action was depending, the bishop (not having been made a party to the suit) has collated by lapse; in which case the plaintiff loses the present presentation, but is entitled to recover the full amount of the income of the benefice for two years from the defendant, the pseudo-patron, as a satisfaction for the turn lost by his disturbance; and in case of inability to pay, the defendant is liable to imprisonment for two years. But if at the termination of the suit the church still remains void, the party to whom the presentation is found to belong, whether plaintiff or defendant, may sue out a writ 'ad admittendum clericum,' by which, after reciting the judgment of the court in the action of Quare impedit, the bishop is commanded to admit and institute the clerk of the successful party. If, upon this writ, the clerk be not admitted, the patron may recover satisfaction in damages against the bishop in an action for such refusal.

The patron only, and not the clerk, can maintain an action against the disturber. But under several statutes passed in the reigns of James I., William and Mary, and Anne, which took away the right of presentation from Roman Catholic patrons, the clerks presented are empowered to take certain proceedings in support of their interests. The right of presenting to benefices belonging to Roman Catholic patrons is vested by those statutes in the universities of Oxford and Cambridge, according to a distribution of counties given in the act of James I.; most of the counties in the south and west of England being for this purpose annexed to Oxford, and those in the north and east to Cambridge. The 12 Anne, st. ii., c. 14, provides (s. 4) that besides the writs of Quare impedit which the universities as patrons are entitled to bring, they or their clerks may file a bill in equity against any person presenting to such livings and disturbing their right of patronage, in order to compel a discovery of any secret trusts for the benefit of Roman Catholics in evasion of these statutes: and also (by 11 Geo. II., c. 17) to compel a discovery whether grants or conveyances of such advowsons were made *bonâ fide* to a Protestant purchaser for the benefit of Protestants and for a full consideration; without which requisites every such grant and conveyance of any advowson is declared to be void. This is the only case in which the clerk is at liberty to interfere with the recovery of a presentation of which he is afterwards to have the advantage.

The statutes giving to the universities the right to present to benefices belonging to Roman Catholic patrons do not affect the exercise of the right of patronage in any other class. Dissenters, and even Jews and pagans, may exercise this right. When the disability was first created, persons professing the Roman Catholic religion were the only class from whom any danger in a political or religious point of view was apprehended; and the circumstance that persons who have been admitted to holy orders in the Church of Rome are capable of holding benefices in the Church of England, may perhaps have increased the jealousy with which Roman Catholic patrons were regarded by the legislature.

It has lately been held that these statutes do not transfer any right of presentation to the universities where the patronage of a vacant benefice is vested in several parties, unless all of them be persons professing the Roman Catholic religion. If there be two patrons, one a Protestant and the other a Roman Catholic, the entire right of presentation vests in the former. (6 Bingham's *New Cases*, 146.)

By 3 & 4 Will. IV., c. 27, § 30, it is enacted that no person shall bring any Quare impedit or other action, or any suit to enforce a right to present to or bestow any church, vicarage, or other ecclesiastical benefice, as the patron thereof, after the expiration of the period during which three clerks in succession shall have held the same, all of whom shall have obtained possession thereof adversely to the right of presentation or gift of such person, or of some person through whom he claims, if the times of such incumbencies taken together shall amount to the full period of sixty years; and if the time of such incumbencies shall not together amount to the full period of sixty years, then after the expiration of such further time as with the times of such incumbencies will make up the full period of sixty years.

QUARENGHI, IL CAV. GIACOMO, was born at Bergamo, September 20, 1744. He received a liberal education, and early displayed a turn for poetical composition, besides a taste for the fine arts, among which last he may be said to have been domesticated from his infancy, both his father and grandfather being painters. He was accordingly destined for the same profession, and when sufficiently advanced, was sent to pursue his studies at Rome, where he became a pupil of Mengs, and afterwards of Stefano Pozzi. But he subsequently abandoned painting for architecture, for his attainments in which he appears to have been more indebted to his own application and love of the study than to the instruction of those under whom he successively placed himself for instruction. According to the biographical memoir by his son Giulio, prefixed to the folio volume of his designs (entitled 'Fabbriche e Disegni,' &c., Milano, 1821), he soon became known in his profession, and obtained a great many (moltissime) commissions while he continued at Rome, but none of them are further specified; neither is the precise time stated when he left Italy for St. Petersburg, whither he had been expressly invited by the empress Catharine II. Consequently, for want of that and other dates, the memoir is strangely imperfect, since it gives no chronology of his professional life; neither is it always very clear what designs in the collection have been executed, and what are merely projects. In fact, neither the time of his return to Italy nor even that of his death is stated in the memoir by his son, nor are we able to supply such singular omission any further than in regard to the last event, which happened in 1817.

Though Quarenghi obtained a very high reputation in Russia, his published designs afford very little evidence of superior taste or ability, or even of novelty in invention. Judged from them, he appears to have been a great mannerist, and to have bestowed very little study on his details, which, besides being nearly the same on all occasions, are meagre and poor, even to insipidity. In comparison with many of his countrymen, he may be said to have been pure in his style of composition, but his merits are little more than negative; for if there is nothing glaringly offensive in his productions, neither are they stamped by any particular beauties and merits. Like that of James Wyatt, his purity is for the most part only poverty, his simplicity only the mere antithetical fault to excessive redundancy of ornament. The grandeur of his buildings consists chiefly in their size, and in their being kept in bold masses; but if not broken up, neither are they finished. They have insulated columns and ample prostyles, porticos Ionic or Corinthian, but frequently attached to buildings which are in other respects quite in a state of nudity—bare walls with holes in them for windows. Among his principal works are the Theatre of the Hermitage, the manége or riding-house of the imperial guards in the Isaac's Place, at St. Petersburg, the convent of Demoiselles Nobles, Prince Gagarin's palace, and the triumphal arch in honour of the emperor Alexander, designed by Quarenghi, but not executed in stone till after his death.

QUARLES, FRANCIS, was born in 1592, of a good family in Essex, educated at Christ College, Cambridge, and Lincoln's Inn. Before the Irish rebellion, in 1641, he was Usher's secretary, but at that time he was forced to fly to England, where he met with persecution from the parliamentary party for his attachment to king Charles. Among other things, they plundered him of his books, which is reported to have hastened his death on September 8th, 1644.

His works are now neglected, with one exception, that of his 'Emblems,' which have been many times reprinted, and are sought after by some for their quaintness, by others for their piety. His other works are fifteen at least in number, many of them on scriptural subjects. Quarles had eighteen children, of whom one inherited somewhat of his father's poetical genius, shared the royal fortunes, and died of the plague in 1665.

The quaint conceits of the divines who lived after the Reformation found in Quarle's writings their poetical vehicle. There is much fine feeling, sincerity, and humility shown in many of his compositions, but these qualities do not make up poetry, unless accompanied by a creative power, which is not very traceable in Quarles.

There is a great tendency now-a-days to weigh poetry in the scales of theology, a procedure which implies want of appreciation of the true nature of the art. That our noblest aspirations take the form of religious thought cannot be doubted, but the expression of doctrines, themselves often metaphorical, by coarse corporeal figures conveyed in wood-cuts, is a very different thing from indulging in feelings the very existence of which exalt the character of man. (Chambers's *Biogr. Dictionary;* Quarles's *Poems.*)

QUARRY, an excavation in the ground from whence are extracted marble, stone, or chalk, for the purposes chiefly of sculpture and architecture. The name appears to have been applied to such excavations from the circumstance that the materials obtained from them are there quadrated or formed into rectangular blocks.

Egypt abounds with rocks of calcareous stone, sandstone, and granite [EGYPT]; and all these materials have been employed in the formation of the massive works which yet remain to attest the magnificence of the antient people of that country. The walls of most of the temples were constructed of sandstone, which appears to have been chiefly obtained from the quarries stretching along the banks of the Nile, in the mountains of Silsileh; but the obelisks and statues which adorned those temples are formed of Syenite, or Oriental granite, drawn from the quarries in the islands of Philæ and Elephantine, and particularly from those vast excavations in the mountain terraces about Syene. (On this subject, see 'Egypt. Antiq.,' *Library of Entertaining Knowledge.*) The stone which has served for the pyramid of Cheops is a carbonate of lime, of a light grey colour, and the same kind of stone forms the interior mass of the pyramid of Mycerinus, but the latter is covered with red granite. The monolith at Sais, in the Delta, was formed of a single block of granite, which was floated down the Nile on a raft, from the quarry in Elephantine. (Herod., ii. 175.)

The master-pieces of Grecian sculpture were executed in the rich white marbles of Attica and the islands of the Archipelago. The quarries of Mount Pentelicus near Athens supplied the materials for the Parthenon and the temple of Theseus in that city, and for the temple of Ceres and Proserpine at Eleusis; and both in Greece and Asia Minor an abundance of stone of a greenish white was dug from the earth for the ordinary purposes of architecture. The marble of Pentelicus, which lies on the surface of the rocky mountain, was obtained by cutting the side of the hill into vertical cliffs; and about the foot of the escarpment there still remain some of the blocks of marble partly cut in forms for the shafts of columns. The quarries at Ephesus are said to have constituted an immense labyrinth; and that in the hill Epipolæ, with the stone from which the edifices of Syracuse were constructed, appears to have been of vast extent, since it was capacious enough to contain the 7000 Greek soldiers who had been taken prisoners when the army of Nicias retreated from that city. (Thucyd., vii. 86.) The quarries of the Greeks and Romans were worked by slaves, and as the labour was of a severe kind, we find frequent allusions to the practice of sending unruly slaves to work in the quarries as a punishment.

We learn from Vitruvius (lib. ii., cap. 7) that the buildings of antient Italy were constructed with stones of several different kinds. This writer states that the quarries of Alba and Fidenæ (*Albano* and *Castel Jubileo*) produced a red and soft stone which soon decayed; and that the stone obtained from those of Tibur (*Tivoli*), Amiternum (*Vitorino*), and Mount Soracte, was moderately hard. The Tiburtine or Travertine stone is a calcareous rock; and it appears that it was employed in constructing most of the buildings of antient Rome. The quarries in Umbria and Picenum furnished a white stone which could be cut with a saw, and would stand well in situations where it was sheltered from the weather, but was liable to be destroyed by rain or frost. On the other hand, the red stone obtained from the quarries about the Vulsinian Lake (*Bolsena*) on the borders of Tarquinii would stand both frost and fire, and would last for ages; on which account it was generally employed for sculptured works. After the destruction of Rome by fire, in the time of Nero, the houses are said to have been rebuilt of the Alban and Gabian stone, which has the property of resisting the action of that element. The quarries of Carrara, on the north-western slope of the Apennines, have long been celebrated for the fine white marble which is so much employed in the north of Europe for statuary.

The British Isles abound with stone of nearly every different kind that can be employed with advantage in architecture. The quarries of Aberdeenshire are said to supply London annually with 12,000 tons of the best granite, which is employed in that city for bridges, river walls, and every work where strength and durability are most required. The Peterhead granite from the same county takes a beautiful polish, and is frequently employed for columns, chimney-pieces, and other ornamental works. The Grampian Hills in Scotland, the quarries in the county of Dublin, and those of Newry in the county of Down, in Ireland, also produce several varieties of the like material. In England granite is obtained chiefly, and in great abundance, from the quarries in Cornwall, where that material is usually designated Moor-stone. Granite from Aberdeen, from Cornwall, and Devonshire was employed in the construction of the present embankment along the Thames above Westminster-bridge.

Sandstone, both red and white, is obtained in large quantities for the purposes of building, from Yorkshire, Lancashire, and Derbyshire; and the principal edifices in Shrewsbury have been constructed chiefly of the white kind which is furnished by the quarries near Grinshill in Shropshire. A millstone-grit, which is now much used in England, is suppled from Bramley and Hedon in Yorkshire. The red-sandstone is dug from the quarries at Barra, Tranent, and other places in Lothian; from those at Kingudie in Perthshire, and also from Arbroath in Forfarshire. In Ireland it is obtained from the quarries in Tipperary and the county of Cork.

A slate-stone for covering buildings and other purposes is excavated from the Denyhall quarries near Camelford in Cornwall, and from those on the Berwyn range of mountains in Denbighshire. Large slate-quarries have been opened near Bangor in Caernarvonshire, and in the Cumbrian Mountains. Slate-stone is also obtained from excavations near Horsham in Sussex; and there are some quarries of this stone in the counties of Donegal and Kerry.

The stone which may be considered as the most extensively diffused over England and Ireland is that which is denominated limestone, and which, from the facility it affords for working it, is most generally called freestone. It is quarried to some extent in Gloucestershire, Shropshire, Derbyshire, and Oxfordshire, and a grey species is obtained in Yorkshire and Northamptonshire; but the principal quarries of this material are in Dorsetshire and in the country about Bath. Those in Dorsetshire are situated about Kingston in the Isle of Portland, and at Swanwich, or Swanage, in the Isle of Purbeck. The most extensive quarries about Bath are at Combe Down, where the ground has been undermined for several miles. More than 30,000 tons of Portland stone are said to be exported annually to London, where it has been very generally employed from the time that Inigo Jones used it in the construction of the Banqueting-house at Whitehall. It was also extensively used by Sir Christopher Wren in the building of St. Paul's cathedral, the Monument, and most of the public edifices in the city after the great fire which occurred in 1666. It is said however to be not so much used at present as formerly. The stone obtained from Purbeck is of various kinds; some of it, which is capable of taking a good polish, has been used for the pillars of Salisbury and Canterbury cathedrals. It is of a darker colour than Portland stone, and in general it is not so good; the blocks raised from the quarries are also smaller. The material is frequently used as a flag-stone for the steps of buildings and for paving the streets. The hills containing the stone lie in a direction nearly east and west; the beds have a considerable dip or inclination to the horizon, and being covered by a large mass of earth, the men work in quarries under ground. About 40,000 tons of this stone are said to be exported annually.

The stone of Portland and Purbeck constitutes the upper oolite formation of the geologists; and in the former district the quarries are cut through several different beds. The first, or that immediately below the vegetable earth, consists of a cream-coloured limestone, three or four feet deep; and next to it is the *cap-stone*, which is of the same colour, very hard, and about ten feet thick. Below these is a species of rock composed of fragments of oyster-shells cemented together, and still lower is a bed, 5 feet thick, of good white stone. This is followed by a quantity of flint about six feet deep, a second bed of good stone five feet deep, and a thin layer of stones of small value. The best building-stone lies still deeper, and the beds of it vary in thickness from seven to fourteen feet. Underneath all these are masses of flints, extending to the depth of fifty or sixty feet. The best oolite of Purbeck is obtained from the quarry of Wardspit in that district.

The quarries near Bath furnish the stone which bears the name of that town, and which is considered by geologists as belonging to the lower oolite formation. It occurs generally in three beds, of variable thicknesses and different qualities. That in the middle is far superior to those which are above and below it. The depth of the middle bed is in some places as much as thirty feet, and the stone when first taken from the quarry is soft, but it becomes hard after having been for a time exposed to the air. The depth of the upper bed varies from twenty to above fifty feet, and the material is either shelly or argillaceous; that of the former kind appears to have been employed by the Romans for the edifices which they constructed in this part of the country, and it is said to be very durable.

The marble and limestone quarries which were opened near Plymouth in 1812 furnished the material which was used in the formation of the Breakwater at that place; and the stone is stated to have been raised from thence in blocks weighing from one to above five tons. The material selected for the construction of the houses of parliament, now in the course of being built, is an excellent magnesian limestone which abounds in all the tract of country from Durham to Northampton; and that which is actually employed is obtained from several different quarries, principally those near Norfall and Anston in Yorkshire, and near Bolsover in Derbyshire.

Limestone is found in Scotland, where it is occasionally employed for architectural purposes. It is also plentiful in many parts of Ireland; and quarries of this material, of a rich kind, have been opened in Queen's County, and in the counties of Dublin, Meath, and Cork. The limestone district of Kilkenny is famous for its quarries of black marble so much used for ornamental purposes, and good flagstones for paving are obtained at Shawhill in the same county.

The quarries in the Cotswold Hills in Gloucestershire afford in abundance a blue claystone for building; and the best stones for pavements are obtained from those at Ealand or Eland near Halifax in Yorkshire. The quarries near Maidstone, on the south bank of the Medway, produce much of what is called ragstone, a material which is occasionally used in Kent for building, but chiefly in the construction of sea-walls and for paving the roads. Lastly, about Ryegate and Godstone in Surrey is found a soft stone which has the property of withstanding the action of fire, and which, on that account, is much used for chimneys, ovens, and furnaces, but it is scarcely fit for any other purpose.

A valuable table of the principal quarries of sandstone and limestone in England accompanies the 'Report concerning the Qualities of Stone with reference to the New Houses of Parliament' (1839).

QUARRYING, the operation of extracting from the ground, or detaching from the sides of rocks, marble, stone, or other minerals, in considerable masses; generally also this operation is accompanied by a reduction of the masses to rectangular forms.

When the material to be excavated lies vertically below the surface of the ground, the work commences by removing the earth to a depth sufficient to lay that material bare, in order that it may be separated into blocks, and removed; but when the stone, &c. is in the interior, and near the side of a mountain or hill, the workmen proceed as in the operation of mining, running galleries into the ground, and leaving pillars of the material for the support of the mass above them.

A quarry of small extent is opened by sinking vertically in the ground a shaft, into which the men descend by ladders; and the blocks of stone, being separated from the mass, are drawn up by means of cranes, which are worked by a windlass or other machine. In working the larger quarries, the vegetable mould forming the upper surface is removed by the spade; and the beds immediately underneath, generally consisting of rag, or stone of an inferior quality, are broken up by gunpowder or otherwise, and conveyed to a distance. The stones intended for sale, and which are generally in beds much below the surface, are sometimes also detached from the mass by blasting [MINING]; but as by this process the blocks are broken irregularly and the stone wasted, a different method is generally employed. The large mass of stone, as it exists in the quarry, consists of strata contiguous to one another, and the surfaces in contact form planes of *cleavage;* in lines parallel to which the stones being more easily divided than in any other direction, these lines constitute what is called the *cleaving* grain of the material. In order therefore to separate a large block from the mass, a series of iron wedges, placed in line a few inches asunder, on the natural face of the rock and in the direction of the cleaving grain, are driven into the stone till a part is loosened: a channel is then cut in the direction of the length of the intended block, and at a distance from the natural edge of the stone equal to its required breadth; and wedges being planted in the channel, they are driven by repeated strokes till the stone is split in that direction also. In the hardest stones, the wedges are placed not in the channels, but in what are called *pool* holes sunk in the direction in which the block is to be severed from the mass. A similar operation is then performed in the direction of the breadth of the block; and thus a large portion is detached from the original mass. (Gwilt, *Rudiments of Architecture.*)

The natural strata of the stone in different quarries are in different positions; frequently they are horizontal, but generally they are inclined to that plane, and sometimes they are vertical: occasionally also both the first and last of these positions are assumed by the stone in the same quarry. It is evident that the separation of the blocks from a mass must be most easily effected when the natural strata are in vertical positions; cutting the stone in directions perpendicular to the line of the grain is always a work of difficulty, and the operations are attended with some danger to the quarry-men when the latter are obliged to work in galleries under ground.

After the blocks have been severed from the mass, they are reduced as nearly as possible to a rectangular form; and this is done by means of a tool called a *kevel*, pointed at one end and flat at the other, with which the irregular parts are knocked off. The blocks are then usually, by means of cranes which are capable of being moved from place to place, raised upon trucks or low carriages; and these are drawn, generally on iron railways, to the quays or wharfs where the stone is put on ship-board. At the slate-quarries in Caernarvonshire the slabs are placed on sledges, which, by an engine, are drawn up an inclined plane; and, from the summit of this plane, the stone is drawn by horses to the Menai.

Vitruvius (lib. x., cap. 6) mentions with approbation the following contrivance, which he says was invented by Metagenes, for conveying from the quarry the shafts of the columns and the stones intended to be employed for the architrave in the portico of the temple of Diana at Ephesus. The ground between the quarry and the temple being too soft to allow such masses of stone to be brought up by ordinary wheel-carriages, the architect or engineer covered each extremity of the block of stone with a frame of timber, from the middle of which projected a short axle of iron; this being received in a gudgeon at the centre of a broad cylinder or wheel placed at each end of the frame containing the stone, and oxen being harnessed to the frame, the stone was thus drawn up to the building. Vitruvius also describes an unsuccessful attempt which was made by an engineer named Paconius to bring from a quarry a mass of stone containing about 576 cubic feet. For this purpose, two broad cylinders of wood, 15 feet in diameter, were constructed; and the stone, being raised from the ground, was made to rest between them, the line of its length being in a horizontal position in the direction of their common axis; then a rope being wound round the circumference of the united cylinders in the middle of the length of the latter, and one end of it being made fast to the harness of the oxen, it was intended that, by the motion of the animals, the cylinder should revolve on the ground, and the stone be brought up to its place. The contrivance appears to have failed, but had the oxen been attached to the two ends of the cylinder instead of its middle, there is no reason to doubt that it would have succeeded.

It is right to observe that builders generally consider it advantageous to dispose the stones in the lower part of an edifice in the same position as they had when lying in the quarry; it being understood that they are then best capable of supporting the weight of the superstructure.

QUART, the same word as quarter, but always used (in our language) for the quarter of a gallon. [GALLON.]

QUARTER, the fourth part of anything. The frequency of division into four parts has caused the word to be used sometimes in the sense of a part or portion allotted. Thus the portion of a camp or barrack allotted to one soldier is called his *quarters.*

QUARTER-SQUARES. A table of the fourth part of the squares of numbers may be substituted for one of logarithms in multiplication. For since

$$\frac{(a+b)^2}{4} - \frac{(a-b)^2}{4} = ab,$$

a table which gives the squares of the halves of numbers will, by the addition of the squares of the halves or quarter-squares, give the product. Such a table has been published in France, and is introduced to a certain extent in the late Professor Leslie's 'Philosophy of Arithmetic.'

QUARTER. [HERALDRY.]

QUARTILE, a term of astrology and antient astronomy. Two bodies are said to have a quartile aspect when their longitudes differ by 90 degrees, or one quarter of the whole great circle.

QUARTZ, the mineralogical name of numerous varieties of rock crystal, the native oxide of silicium [SILICIUM], called also siliceous or flint earth, and silicic acid. It is remarked by Mr. Brooke (*Ency. Metrop.*, 'Mineralogy'), that 'the differences of structure, hardness, specific gravity, mixture with foreign matter, and other characters belonging to this species, are so numerous as to render any single description inapplicable to all its varieties.' Some of the varieties of quartz have been already described; these we shall presently refer to.

Quartz occurs crystallized and massive, and in both states it is widely diffused throughout nature, and is especially one of the constituents of granitic and the older rocks. The primary form of the crystal is a rhomboid, but this is of rare occurrence; it is generally met with in hexagonal prisms terminated by hexagonal pyramids, and when the prism is entirely wanting and both pyramids are present, the crystal is a dodecahedron with triangular planes. Cleavage parallel to the planes and pyramids of the ordinary crystal. Fracture conchoidal. Hardness 7·0. Scratches glass readily, and gives fire with steel. Becomes positively electrical by friction, and two pieces, when rubbed together, become luminous in the dark. Transparent, translucent, opaque. Lustre vitreous, resinous. Specific gravity 2·69 to 2·81. Colourless when pure, but exhibiting a vast variety of colours, of which those mentioned below are the more remarkable.

Quartz is infusible, insoluble in acids in general, but acted on by hydrofluoric acid. It combines by fusion with the alkalis potash and soda, and thus with them acts the part of an acid, and also in many natural compounds; the acid is termed *silicic acid*, and its compounds *silicates.*

The finest specimens of crystallized quartz occur in Dauphiné, Madagascar, &c.; they are found also in Cornwall and near Bristol, of great brilliancy, and are known by the name of Cornish and Bristol diamonds. To enumerate the different places in which this substance occurs would be almost endless. Quartz is composed of one equivalent of silicium = 8, and one equivalent of oxygen = 8; its equivalent is therefore 16.

Hornstone and *Chert* are varieties of compact quartz. Cavernous quartz is termed *Spongiform quartz* or *Swimming stone*, and other scarlet varieties have also been described.

Quartz possessing different colours has received various names; some of these we shall briefly notice.

Brown or *Smoky Quartz.* This occurs in fine crystals near Cairngorm in Aberdeenshire. It is used for seals and ornaments when cut and polished. The nature of the colouring matter is not known, but is probably carbonaceous matter.

Purple Quartz, or *Amethyst*, is found both crystallized and massive. It is of every shade of purplish violet, and the colour in the perfect amethyst is pretty equal throughout the crystal or mass; frequently however the summits of the crystals only are coloured. It is used for ornaments.

According to Rose, amethyst consists of

Silica	97·50
Alumina	0·25
Oxide of iron	0·75
	98·50

Amethysts of the finest quality are found in India, Ceylon, Persia, and Siberia. Amethystine quartz of inferior quality is met with in most countries. In Cornwall it occurs in some tin-mines.

Blue Quartz, Siderite, occurs crystallized and massive. It is compact, of a greyish or greenish blue colour. Lustre resinous, waxy. Translucent on the edges. Found near Salzburg.

Green Quartz, found in Peru, in translucent hexagonal prisms. Opaque massive green quartz is called *prase;* the colour appears to be owing to actinodite. It is found in Saxony. *Chrysoprase* is light-green amorphous quartz; it is coloured by oxide of nickel. Found in Silesia and North America.

Yellow Quartz. Transparent. Is of various shades of yellow. Found in Cornwall, Scotland, Bohemia, &c. It is probably coloured by oxide of iron. It has been called Scottish and Bohemian topaz.

Yellow Quartz. Opaque. Ferruginous quartz. Occurs of various shades of yellow and reddish yellow. According to Bucholz, contains 5 per cent. of oxide of iron, to which its colour is owing. Found near Bristol, in Scotland, &c.

Red Quartz, Compostella Hyacinthine Quartz. Colour yellowish or reddish brown. Found in Spain and North America.

Amorphous Quartz. The following varieties of quartz, some of which are intermixed with other substances, have been already mentioned under their respective letters:—AGATE, AVANTURINE, FLINT, FLINTY SLATE, and OPAL. There remain to be noticed

Chalcedony and its varieties. This form of quartz occurs amorphous, botryoidal, stalactitical, reniform, and nodular, but never crystallized: it is frequently met with coating quartz, and occasionally in pseudomorphous cubes. It is of various shades of white, grey, yellow, brown, green, and blue, and the colour is for the most part uniform. It is commonly semi-transparent. Fracture even, sometimes flat-conchoidal. Infusible. Harder than flint. Specific gravity about 2·6.

Chalcedony occurs in most parts of the earth, especially in Iceland and the Faröe Islands, in Ceylon, India, Siberia, Hungary, &c. Trevascus mine in Cornwall has yielded splendid stalactitic specimens; and Pednanrae mine, in the same county, has furnished it of a blue colour.

The following substances have been considered as varieties of chalcedony:—

Heliotrope. Of a dark green colour, spotted with red (Bloodstone). The specific gravity is 2·6. It is found in Silesia, Iceland, &c.; also in the Isle of Rum, Scotland.

Onyx is composed of flat layers or bands of chalcedony of different colours, more especially brown and white. It is the variety especially used for cameos.

Plasma is of a dark green colour, with yellow and whitish dots; it is transparent, and has a glistening lustre. Its specific gravity is 2·04. It is said to occur in Hungary and in Moravia.

Sard is of a brownish yellow colour. Said to be found in Sardinia.

Sardonyx consists of sard and alternate layers of onyx or white chalcedony.

In addition to these, which may be considered as among the purer varieties of quartz, it occurs mixed with variously coloured clays and other extraneous matter, forming different kinds of

Jasper. This occurs opaque, which constitutes one of the most prominent differences between it and agate. Its colours are green, yellow, and red of various shades, rarely blue; these colours are occasionally mixed in spots and irregular veins. Jasper is massive, has often a resinous lustre, but is sometimes dull. It is found on many parts of the Continent, in Cornwall, and in Scotland.

Striped or *Ribbon Jasper* presents green, yellow, and red colours of various shades, sometimes in spots; but the most beautiful variety is composed of equal and parallel stripes of these colours. It occurs in Siberia, the Harz, and Saxony.

Egyptian Jasper, or *Egyptian Pebble.* This occurs in rough roundish masses, and is generally of a brown colour. Internally it is usually of a light colour. It found on the surface to the eastward of Grand Cairo, and on the borders of the Red Sea.

It is well known that siliceous earth assumes other forms besides that of quartz and the varieties of it which have now been described; one of the most useful of these is common sand; and for the important purposes to which silica in its various states is applied we refer to SILICIUM.

QUA'SSIA, a name formed in remembrance of a negro named Quassy, who first made known the medicinal virtues of one of the species, is a genus of plants belonging to the Simarubaceous order. Linnæus referred to it several other species, but the most recent botanical writers confine the genus to one, the original source of the bitter drug now commonly sold in Europe. For general purposes it will be most convenient to consider the genus in the same way as Linnæus.

It consists then of trees inhabiting the tropical parts of South America, particularly Surinam and the adjoining countries. They have leaves pinnated like those of the common ash, flowers with a small 5-parted calyx, 5 petals, a definite number of hypogynous stamens, and a fruit consisting of five dry or fleshy drupes.

Quassia amara, the true Quassia of modern botanists, is a small tree, with its leaflets in two pairs, with an odd one, and a winged jointed leafstalk. Its flowers are scarlet, large like those of the red American Horsechesnut, and arranged in narrow racemes. It inhabits the woods of Surinam, Demerara, and probably the greater part of Central America. The wood of the root of this plant was formerly in great repute as a stomachic and as a remedy for the malignant endemic fevers of Surinam. The flowers also were and still are, in that country, infused in wine or spirits, and form a bitter beverage, but the wood is out of use, in consequence partly of its being less easily procured than that of the next species, and partly from an opinion being entertained of some bad properties existing in connection with the intense bitter.

Quassia excelsa, the *Picræna excelsa* of Lindley, is a large tree inhabiting Jamaica. It has oblong, acuminate, obtuse leaflets, in from four to eight pairs, and panicled, corymbose, small pale yellowish-green flowers. This tree yields the Quassia *chips* now so extensively employed in Europe as a bitter substance. The wood is imported from Jamaica in billets of various sizes, is white, scentless, but most intensely bitter. It is one of the ingredients employed by fraudulent brewers in adulterating beer.

Quassia Simaruba, the *Simaruba amara* of Aublet, is the plant which furnishes the *bark* called Simarouba, which comes from Jamaica in bales, and is used as a tonic, although it also appears to act as an emetic. It is a large tree, found in the West India Islands and on the mainland of America. Its leaflets are two to nine on each side, oval, smooth, firm, and sharp-pointed. The flowers are very small, whitish, and arranged in branching scattered panicles.

The three genera, *Quassia*, *Picræna*, and *Simaruba*, may be distinguished thus:—

Quassia. Petals forming a tube. Stamens 10. Flowers hermaphrodite. Ovaries 5.

Picræna. Petals quite distinct. Stamens 5. Flowers polygamous. Ovaries 3.

Simaruba. Petals quite distinct. Stamens 10. Flowers unisexual. Ovaries 5.

QUA'SSIA. The wood of two different trees is known in commerce by this name: one, formerly very common, but now extremely rare, is obtained from the Quassia amara (Linn., f. supp. 235, and Woodv., t. 77), a native of Surinam, Guayana, &c.; the other, Picræna excelsa, Lindley (Quassia excelsa, Swartz), is a native of Jamaica. Both kinds are imported in billets, sometimes a foot in diameter and several feet long; but before being used for medicinal purposes, they are cut into chips, which are of a light grey colour, or, by long exposure to the air, of a yellow or brownish hue. The physical characters of the two sorts are so similar, that it is difficult to distinguish them; but a watery infusion of the Surinam Quassia by permuriate of iron is only rendered turbid, with greyish flocculent pieces floating in it, while that of the Jamaica Quassia is rendered black by the same re-agent. Both are devoid of odour, but possess an intensely bitter taste, which is stronger but more disagreeable in the Jamaica Quassia. This property at once distinguishes Quassia from any other wood which may be substituted for it. The active principle seems to be *quassite*, a neutral body, which crystallizes in white prisms, and is readily soluble in alcohol. It has a poisonous influence over many of the lower animals, and perhaps even over very susceptible individuals of a higher grade.

Quassia is regarded as a pure and simple bitter, possessing tonic properties of a very marked kind; and hence it is useful in many forms of debility, particularly of the stomach and muscular system. It is generally given in the form of infusion, which serves as a convenient vehicle for some of the preparations of iron, especially the protosulphate and the phosphate. The Jamaica Quassia ought not to be employed as a vehicle for the permuriate of iron, as an inky fluid, instead of a clear transparent one, is the result. The want of aroma may be obviated by adding to the infusion a portion of the compound tincture of Quassia (*Pharm. Edin.*), which renders it more grateful and more beneficial.

Infusion of Quassia, sweetened with sugar, is useful to destroy flies, and is much safer than the fly-waters made of king's yellow or orpiment, a poisonous compound of arsenic; for should children or others drink the infusion, improved appetite would be the only result, whereas death is the frequent consequence of drinking the arsenical fly-water.

QUATRE VALLE'ES, LES, a district in the department of Hautes Pyrénées, comprehending the four valleys (whence the name) of Aure, Barousse, Magnoac, and Neste. The air of the district is cold but healthy; the land is chiefly pasturage or woodland. The woods yield timber for the builder and shipwright. Castelnau de Magnoac was accounted the chief place. The district antiently belonged to the county of Armagnac, a subdivision of Gascogne. [Armagnac; Guyenne and Gascogne.]

QUEBEC, the capital city and seat of government of the province[*] of Lower Canada, is situated on the river St. Lawrence, about 400 miles from its mouth, in 46° 49′ N. lat. and 71° 12′ W. long. The population is 27,562.

Jacques Cartier touched at Quebec in 1534, and found an Indian village there. The country was neglected by the French for more than half a century, and it was not until the year 1608 that Samuel de Champlain founded the city of Quebec. An English force under Sir David Kirke captured the place in 1629, but it was restored to France in 1632.

In 1759 a squadron under Admiral Saunders conveyed 8000 troops commanded by General Wolfe to besiege Quebec. They landed on the island of Orleans near Quebec, on the 27th of June, and commenced their attacks on the French lines on the side of Montmorenci: but the dispositions of the French troops made by the Marquis de Montcalm were so skilful that all their efforts proved unavailing, and Wolfe in his dispatches expressed a doubt whether he could reduce the place in that campaign. He resolved however to endeavour to effect a landing above Quebec, which was performed in the night, and on the 13th of September the British army appeared drawn up on the plains of Abraham. The French sallied forth to meet them, and after a bloody battle, in which both armies lost their commanders, the English were victorious. Quebec capitulated on the 18th, and, with the rest of the French possessions in North America, was finally ceded to Great Britain at the peace of Paris in 1763. In 1775, during the American revolutionary war, Generals Montgomery and Arnold attempted to carry Quebec by assault on the night of the 31st of December, but were repulsed, and Montgomery fell.

Quebec is situated on a promontory formed by the confluence of the river St. Charles with the St. Lawrence, at the north-east extremity of an elevated but narrow tableland, which for about eight miles forms the left bank of the St. Lawrence. Cape Diamond presents a nearly precipitous face to the St. Lawrence; the descent to the St. Charles is more gradual. The height of the platform of the citadel of Quebec, which stands on Cape Diamond, is 333 feet 3 inches above the St. Lawrence. The distance from one river to the other across the ridge is rather more than a mile. The St. Lawrence abreast of the town is only 1314 yards wide below the point, the basin is above 1½ miles in width, and the tide rises 25 feet. Quebec is situated at that part of the river where the St. Lawrence suddenly contracts in breadth, and is said to take its name from the Indian word *kebec*, which signifies 'narrow.'

Quebec is divided into the upper and lower towns: the lower town, which is the seat of commerce, is built round the base of the promontory, where in many places the rock has been removed to make way for the houses, which are ill built and irregular, and the streets narrow and badly paved. The Custom-house and Exchange reading-room, where all newspapers and periodicals are taken in, and which possesses an extensive library, are in the lower town. The ascent to the upper town is either by a narrow and steep winding street, or by a flight of steps. The upper town has a northerly aspect, and is well ventilated; the streets are rather narrow, but tolerably well paved. All public buildings and many private houses are roofed with tin or iron, which retain their brightness many years, and produce a very striking effect. The citadel which crowns the summit of Cape Diamond is strongly fortified, and covers about 40 acres of ground. A wall, mounted with heavy ordnance surrounds the upper town, which has five gates strongly defended. The citadel contains a very extensive armoury. The Château of St. Louis, the residence of the governor-general, was accidentally burnt during the winter of 1834-5. The Protestant cathedral is a plain modern edifice with a spire; the court-house is close to it. The parliament-house, which was formerly the palace of the bishops of Quebec stands over the gate leading from the lower town; it is the only public building which has any pretensions to elegance. The Catholic cathedral is a large building with a heavy dome and spire. In the market-place stands the Jesuits' college, now a barrack, a very spacious building, said to be capable of accommodating 2000 soldiers. There are three nunneries, the Ursuline, Hôtel Dieu, and Hôpital Général. The Quebec library contains above 6000 volumes of valuable and standard works. The garrison also possesses a good library. There are a Literary and Historical Society, incorporated by royal charter in 1829; there are also a Committee of Trade, benevolent and friendly societies, a Royal institution, a classical school instituted in 1836, Bible and Missionary societies, and a Mechanics' Institute established in 1830.

In 1832 there were 78 free schools in Lower Canada under the Board of Royal Institution, incorporated for the advancement of learning by the Provincial Act, 4 Geo. III., c. 17, of which board the bishop is the principal. To this board the legislature made an annual grant for the support of these schools. The act providing for the support of these schools, not having been renewed by the provincial legislature, expired May 1, 1836, and the schools have consequently ceased for want of funds. There is a grammar-school at Quebec supported by an annual allowance of 200*l.*, and 90*l* for a house, from the revenues of the Jesuits' estates. This is under the same board. The mode of instruction is that followed in the grammar-schools in England. The Lancasterian method has been adopted in a few schools There are several Roman Catholic schools.

Quebec is the seat of a Protestant and a Roman Catholic bishop. The cathedral, which is used likewise as a parish church, will contain about 1600 persons; there is a chapel within the walls, also one in St. John's suburb, one in St. Roche, and one in Wolfe's Cove. There are two Scotch churches and two Dissenting chapels in Quebec. The clergy are supported by salaries from the Society for the Propagation of the Gospel in foreign parts, and one-seventh of the lands in the townships. The Catholic church is richly endowed with lands and tithes. There are a chief justice and three judges of the Court of Queen's Bench, from whence an appeal lies to a court composed of the governor, executive council, chief justice, or any five of them, excluding the judge from whose judgment appeal is made.

The corporation of the Trinity House was established by act of the Provincial Parliament. (45 Geo. III., c. 12.) The following are the rates of pilotage between Bic and Quebec, a distance of 160 miles, for every foot of water which the vessel draws:—

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[*] By the Act 3 & 4 Vic., c. 35, the two provinces of Upper and Lower Canada are reunited.

	Bic to Quebec, per foot. £	s.	d.	Quebec to Bic, per foot. £	s.	d.
From April 2 to 30	1	0	6	0	18	3
„ May 1 to November 10	0	18	0	0	15	9
„ November 11 to 18	1	3	0	1	0	9
„ November 19 to March 1	1	8	0	1	5	9

The winter lasts from November to May; during December, January, and February, the thermometer usually ranges from freezing-point to −25° Farenheit. The river is frozen across at Quebec about once in ten years. During summer the range of the thermometer is from 60° to 90°, and the mean of the summer is about 68°.

The following newspapers are published at Quebec:—'The Quebec Gazette' (by authority), weekly, in English and French; 'Neilson's Quebec Gazette,' daily, alternately English and French; 'Quebec Mercury,' three times a week, English; 'Le Canadien,' three times a week, French.

Accounts are kept in Halifax currency, four dollars being equal to one pound. To change currency (Halifax) into sterling, deduct one-tenth.

Value of gold and silver coins current at Quebec, in currency:—

Gold.

	£	s.	d.
Sovereign	1	2	2¼
Moidore	1	10	0
Johannes	4	0	0
Doubloon	3	14	6
*Eagle	2	10	0
Louis d'or	1	4	8
Pistole	0	18	3
40-franc piece	1	16	2

Silver.

	s.	d.
Crown	5	6
Shilling	1	1
Dollar	5	0
French crown	5	6
Six-franc piece	5	6
Pistareen	0	10

The chief circulating medium is in notes of the colonial banks; there is no colonial currency, the coin in circulation being that of the United States, France, and Spain, rated above its real value. The banks established in Quebec are, the Quebec bank, which has notes in circulation to the amount of near 70,000*l.*; a branch of the Montreal bank; a branch of the bank of British North America; and the Quebec savings' bank, established in 1831.

The old English and French weights and measures are in use. Troy weight is used for gold and silver, precious stones, and drugs; avoirdupois for all other articles. The Canada minot, used for all grain, is about one-twentieth larger than the imperial bushel. The English yard is used for all cloths, stuffs, &c., and the Paris foot for measurements of land or length, unless otherwise specially agreed upon.

The gaol of Quebec is capable of containing 54 prisoners in separate cells; and 158 when more than one prisoner is confined in the same cell: the greatest number of prisoners at one time, in 1837, was,—

	Males.	Females.
Whites	113	66
Blacks and Coloured	1	1
	114	67

Number of emigrants landed at Quebec between the years 1830 and 1840:—

Years.	Number.	Years.	Number.
1831	50,254	1836	27,728
1832	51,746	1837	22,343
1833	21,752	1838	3,239
1834	30,935	1839	7,439
1835	12,527		

The emigrants in 1839 were specified as follows:—Males, 3,136; females, 2,332; children under 14 years of age, 1,971.

From whence emigrants came, 1839,—

	Males.
England	1,586
Ireland	5,113
Scotland	485
Newfoundland, West Indies, &c.	255
	7,439

In 1759 Quebec contained between 8000 and 9000 inhabitants. The following table gives the population at a later period:—

	1826. Houses.	Population.	1831.
Upper Town	480	4,163	4,498
Lower Town	549	3,935	4,933
Suburb, St. Roche	1,120	6,273	7,983
„ St. John	843	6,025	6,918
„ St. Lewis	120		1,583
	3,120	20,396	25,916

Value of imports and exports, 1837:—

Imports.

Whence.	Value. £.	s.	d.
Great Britain and Ireland	212,146	3	3
British Colonies—West Indies	93,331	1	1
„ North America	35,251	6	5
„ elsewhere	40,190	13	10
United States, America	7,105	3	3
	388,024	8	2

Exports.

Whither.	Value. £.	s.	d.
Great Britain	686,817	18	4
British Colonies—West Indies	35,385	17	4
„ North America	84,082	3	7
Foreign States	705	0	0
	806,990	19	3

Ships, port of Quebec, 1837:—

Inwards.

Country.	Number.	Tons.	Men.
Great Britain	787	269,319	12,605
Colonies	120	15,704	
Foreign	30	8,245	
Total	937	293,268	12,605

Outwards.

Country.	Number.	Tons.	Men.
Great Britain	913	312,757	13,323
Colonies	136	9,767	
Foreign	1	353	16
Total	1050	322,877	13,339

Shipping, port of Quebec, from year 1832:—

Inwards.

Year.	Number.	Tons.	Men.
1832	947	261,916	11,414
1833	941	246,071	10,876
1834	1,091	296,550	12,828
1835	1,105	311,490	13,425
1836	1,146	344,206	14,445
1837	937	293,268	12,605

Outwards.

Year.	Number.	Tons.	Men.
1832	1007	262,845	11,832
1833	969	248,933	10,910
1834	1124	298,860	12,907
1835	1144	315,974	13,614
1836	1226	347,393	14,869
1837	1050	322,877	13,339

(M'Gregor's *British America*; *Parliamentary Papers relating to Affairs of Canada*; *Statistical Returns* made by Board of Trade.)

QUEDLINBURG was the territory of an antient abbey founded between 932 and 936, by the German king Henry I.; it was situated between Halberstadt and Anhalt, and was about 42 square miles in extent, with a population of 15,000 inhabitants. The abbess (after 1539, a Protestant) was an estate of the Empire, and had a seat and vote in the bench of prelates of the circle of the Rhine. The

* The eagle coined before 1834 is worth 2*l.* 15*s.*

abbess enjoyed the nominal sovereignty of the territory, yet most of the rights of sovereignty were exercised by the elector of Saxony, and then by the elector of Brandenburg, afterwards king of Prussia, who in 1697 bought of Saxony, for 300,000 dollars, the dignity of hereditary bailiff, and a claim to the bailiwicks of Lauenburg, Sevekenburg, and Gersdorf. He had a garrison in the town, had the excise and other taxes, received the oath of allegiance, and had a governor to attend to all these matters, who was immediately under the superior boards at Berlin. The abbess however had her exchequer, her consistory, &c. The last abbess, appointed in 1787, was Sophia Albertina, sister of Charles XIII., king of Sweden. On her decease, at the diet of the empire in 1802, the abbey with its territory was secularised, and assigned to the king of Prussia. In 1807 it was added to the kingdom of Westphalia; but in 1814 again taken possession of by Prussia, and annexed to the circle of Aschersleben, in the government of Magdeburg, in the province of Saxony.

QUEDLINBURG, the chief town, is situated on the river Bode, which divides it into two parts, the old and new town; besides these two parts, there are three suburbs. This town has a gymnasium, six hospitals, several schools, and eight churches. In the suburb Westendorf, upon a high rock, are the buildings of the antient abbey, with the handsome abbey church, built by Henry I., which contains a library, and the tombs of Henry I. and his queen Matilda. The population of Quedlinburg at the last census in 1837 was 12,903 inhabitants. They have woollen and linen manufactures, very great distilleries and breweries, and carry on a considerable trade in cattle, corn, garden fruit, as well in the products of their distilleries, breweries, &c. Quedlinburg is the birthplace of Klopstock, the author of 'The Messiah,' the 100th anniversary of whose birth was commemorated by a fête on the 2nd of July, 1824. The town is situated in 57° 48′ N. lat. and 11° 7′ E. long., 30 miles south-south-west of Magdeburg, and 10 miles south-south east of Halberstadt.

(Hassel; Stein; Fritsch, *Geschichte des Hochstifts und der Stadt Quedlinburg*, 2 vols., 1829.)

QUEEN. The Saxon cpen, which being used to denote *mulier*, *femina*, *conjux*, as well as the most distinguished of women and wives, to whom now it is only appropriated, we are guided at once to the original use of it as betokening the wife or consort of the king. The other use of it, as betokening a sovereign princess, one who reigns in her own right, and possesses all the rights and functions which belong to a male person who has succeeded to the kingly power in a state, is therefore an application of it which was not originally contemplated.

The king's consort has been regarded in all countries as a person of eminent dignity, and has been invested with privileges which have not been allowed to any other married woman. In England she can purchase lands, and take grants from the king her husband; she has separate courts and officers, including an attorney and a solicitor general; she may sue and be sued apart from her husband, have separate goods, and dispose of them by will. She pays no toll, is not subject to amercement, has a share in fines made to the king for certain privileges, which last is called queen's gold. Antiently manors belonging to the crown were assigned to her in dower, but now the provision for her is made by a parliamentary grant at the time of marriage. Again, there is thrown over her person a peculiar protection. It is as much treason to compass or imagine the death of the king's consort as of the king himself. To violate or defile her person is also treason, though she be consenting. It has been the usual practice to crown the queen with the same kind of solemnities as are used at the coronation of a king. In the case of Caroline, the consort of King George IV., who was living at the time apart from her husband, this was not done; but her right was most ably argued at the time by Mr. Brougham before the privy-council.

The chief distinction between a queen dowager and the widow of any other person of eminent rank lies in this, that though she marry with a commoner, she does not lose her rank; but no one can marry a queen dowager without special licence from the king.

A queen regnant, or princess who has inherited the sovereign power, differs in no respect from a king as to the political rights vested in the dignity.

QUEEN BEE. [Bee.]

QUEEN CHARLOTTE'S ISLANDS, also called the Archipelago of Santa Cruz, are a group of islands in the Pacific, north of the New Hebrides, between 10° and 12° S. lat. and 165° and 168° E. long. These islands were discovered in 1595 by Mandana, but were not visited until Carteret found them again in 1767. The archipelago consists of five or six islands of moderate extent, and a great number of smaller ones. Some of these islands are surrounded by extensive coral-reefs. The largest is the island of Santa Cruz, called by the natives Nitandi, which is above 20 miles long from east to west, and about half a mile wide. On the north-western shore of it is Travenion Lagoon, a fine round harbour, though small. The other islands are Guerta, Tubua, Lord Howe, Mallicolo, and Volcano: the last has an active volcano. The larger islands and some of the smaller are elevated, and apparently of volcanic origin, but most of the latter are low. They are well wooded, and very populous. They produce the cocoa-nut, the bread-fruit, and all the products of the Friendly Islands and New Hebrides. The inhabitants belong to the race of the Austral negroes, but are less savage than those of New Britain and Papua: they have large canoes. It would seem that there has been a mixture with Malays. They are very good-natured, but inclined to theft. They go almost entirely naked. It was on the island of Mallicolo, called by the French Wanicoro, that La Perouse was wrecked and lost with his crew. [Perouse.]

(Carteret's *Voyage round the World*; Dumont d' Urville, *Voyage autour du Monde*; Krusenstern, *Mémoires*.)

QUEEN CHARLOTTE'S SOUND is the long strait which separates the large island of Quadra and Vancouver from the continent of North America. It is supposed to be nearly 300 miles long, but the southern extremity towards Juan de Fucas strait is imperfectly known. The northern extremity, which was surveyed by Vancouver, lies between 51° and 52° N lat. and 127° and 128° W. long. The shores of this strait, which in many places is narrow, are high and rocky, and indented with numerous deep inlets: they are overgrown with tall forest-trees. (Vancouver's *Voyage of Discovery to the North Pacific Ocean*, &c.)

QUEEN CHARLOTTE TOWN. [Prince Edward's Island.]

QUEEN'S COLLEGE, CAMBRIDGE, was founded by Margaret of Anjou, consort of King Henry VI., in 1446; and refounded by Elizabeth Widville, consort of King Edward IV., in 1465. King Richard III. gave the college all the forfeited estates of John Vere, earl of Oxford, but the grant was annulled on the accession of King Henry VII., who restored the whole to the earl. The greatest benefactors to the college in later times have been Ferdinando Smythes, a fellow, who gave the sum of 1500*l.* for the use of three bachelors of arts till the time of taking their master's degree, and Mr. Hughes, a vice-president, who bequeathed the residue of his property, amounting to about 2000*l.*, to the college.

The president of Queen's College must be elected by a majority of the whole existing body of fellows on the eighth day after a vacancy, and must be at least a B.D. He must also be possessed of property to the amount of 20*l.* per annum, if he is not a fellow at the time of his election.

There are nineteen foundation fellowships in this college. All the fellows within four years from commencing B.A. must proceed to M.A.; those who are on the ecclesiastical foundation must within two years from M.A. be in holy orders, and within nine years from M.A. proceed to B.D. Only two fellows may remain laymen, who proceed to M.A. like the rest, and within twelve years from M.A. the one must proceed to LL.D. the other to M.D. The vice-president and the five seniors hold their fellowships with property; the others recede from the society when possessed of a real annual income stated in the oath before admission. The five senior divines may hold livings not exceeding 20*l.* per annum, and within twenty miles of Cambridge. On the petition of the society the crown has frequently dispensed with some of the above restrictions. A bye-fellowship was founded in 1694, by D. Edwards. This fellowship is perfectly open, may be held by a layman, and is tenable with any property or preferment, except ecclesiastical to a certain amount.

The scholarships of this college, which were consolidated some years ago, have been again consolidated and augmented by college grants; and it has been agreed by the president and fellows that there shall in future be fifteen scholarships tenable till B.A., two of which shall be 50*l.* a year, two of 40*l*., and eleven of 15*l*. They are in the appointment of the president and fellows present.

There are also two Stoke's scholarships, of 15*l*. per annum, to be given to chapel-clerks; two Sedgwick's scholarships, average 15*l*. per annum, capable of increase to 20*l*., but subject also to diminution; sons of poor clergymen to be preferred; and one Clarke's scholarship and librarianship of 15*l*. per annum. Sedgewick's and Clarke's scholarships are in the sole appointment of the president.

Among the eminent persons who have been educated at this society may be reckoned Sir Thomas Smith, afterwards provost of Eton, John Weever, author of the 'Funeral Monuments,' Dr. Thomas Fuller, Bishop Patrick, and Dr. John Wallis, the mathematician. Erasmus, who is said to have studied also at St. Mary Hall, in Oxford, resided for some time in this college. There is a portrait of him in the College Hall. [ERASMUS.]

The benefices in the patronage of this college consist of the rectories of Bowbrickhill, in Bucks; Eversden parva, and St. Botolph's Cambridge, in Cambridgeshire, Sandon, in Essex; Seagrave, in Leicestershire; Grimston, Rockland, and South Walsham, in Norfolk; Hickling, in Nottinghamshire; and Newton Toney, in Wilts; with the vicarage of Oakington, in Cambridgeshire.

The statutes have been printed for the use of the society. Copies in manuscript exist in the University library, MS. Baker xxxii., p. 241, and in the British Museum, MS. Cole, vol. xlvii., p. 357. Questions have sometimes arisen on the construction of the statutes of this college, and have been decided by the Lord Chancellor, acting on the behalf of the crown, as visitor. (Jacob's *Reports*, p. 1; Russell's *Reports*, vol. v., p. 64.)

The present number of members of this society is 341.

Queen's College is situated to the west of Catherine Hall, on the banks of the river Cam, and consists of two courts, built of brick. The chapel has been modernised.

(Lysons' *Mag. Brit. Cambr.*, pp. 117, 118; *Camb. Univ. Calendar*, 1840.)

QUEEN'S COLLEGE, OXFORD, was founded in 1340, by Robert Egglesfield, rector of Burgh or Brough, in Westmoreland, and confessor to Philippa, queen of Edward III., for a provost and twelve fellows (since increased to sixteen), to be chosen from the counties of Cumberland and Westmoreland. The founder was himself a native of Cumberland. The church of Brough was appropriated to the college by Pope Clement VI., in 1344. Egglesfield gave his foundation the name of Queen's College, probably implying that the queen had been instrumental in promoting his work, and had taken it under her protection. He died in June, 1349.

Eight fellowships and four scholarships, open to natives of any county or place, and four exhibitions confined to the province of Canterbury, have been since founded in this college, in pursuance of the will of John Michel, Esq., of Richmond, in Surrey, who bequeathed lands in Kent and Berkshire for that purpose.

The following exhibitions have been added by other benefactors:—Six of 60*l*. per annum, by Sir Francis Bridgman, for the counties of Lancaster, Chester, or Wilts; five of 100*l*. per annum, by Lady Elizabeth Hastings, for natives of any counties, coming from certain schools in Yorkshire, Westmoreland, and Cumberland; two of 20*l*. per annum, by Frederick Tylney, Esq., for natives of Hampshire; four of 10*l*. per annum, for natives of Wiltshire and Gloucestershire; two of 40*l*. per annum, founded by Dr. Thomas, bishop of Rochester, for the sons of clergymen of the diocese of Carlisle, and educated at the schools of Carlisle and St. Bees; one of 60*l*. per annum, for natives of Middlesex, by Keane Fitzgerald, Esq., a member of the college; and a few others of small value, appropriated to the probationary scholars.

Among a long series of benefactors to this house, who increased its revenues by money, lands, or church livings, we find the names of John de Hotham, one of the early provosts, Sir John Stanford, Thomas Beaufort duke of Exeter, Cardinal Bainbridge, Archbishop Grindal, the founder of St Bees School in Cumberland. In 1626, Charles I., at the request of his queen, gave the college three rectories and as many vicarages in the county of Southampton.

The patronage of this college upon the old foundation consists of the rectories of Sulhamstead Abbas and Sulhamstead Bannister, with the vicarage of Sparsholt, in Berks; the rectory of Holwell, in Dorsetshire; the vicarage of Chedworth, in Gloucestershire; the vicarage of Bramley, the rectory of Bramshot, the vicarage of Carisbrooke, the rectory of Enham, the curacy of Upton Grey, the vicarage of Godshill with Nighton rectory, the rectory of Hedleigh, the vicarage of Milford with Hurdle, the rectory of Newnham with the chapel of Mapledurwell, the rectory of Oakely, the curacy of Pambar, the vicarage of St. Cross, alias Holy Rood, Southampton, and the rectory of Wey Hill in Hampshire; the rectories of Bletchingdon, Charlton on Otmoor, Hampton Poyle, and South Weston, in Oxfordshire; the vicarage of Newbold Pacey, in Warwickshire; and the vicarage of Burgh or Brough, already named, in Westmoreland.

The patronage on Michel's, or the new foundation, consists of the vicarage of St. Wendron with the chapelry of Helston, in Cornwall; the rectory of Bicknor English, in Gloucestershire; the second portion of Pontesbury, in Shropshire; and the rectory of Upton Scudamore, in Wilts.

The visitor is the archbishop of York.

The present buildings of this college consist of two spacious courts, divided by the hall and chapel, and compose an oblong of three hundred feet in length and two hundred and twenty in breadth.

The foundation stone of the first or south quadrangle was laid by Dr. William Lancaster, then provost, on February 6, 1710; but it was not finished till 1759. In 1733 Queen Caroline gave 1000*l*. towards completing this quadrangle: the design is attributed both to Hawksmoor and Wren. [HAWKSMOOR.] Over the gate of entrance from the High Street, on the south side, is a statue of Queen Caroline, under a cupola supported by pillars.

The library, on the west side of the north court, was begun in 1692, and the outside finished in 1694. The present chapel, the foundation of which was laid in 1714, was dedicated on All Saints' Day, 1719; it is a hundred feet long by thirty. Besides several windows painted by Van Linge, in 1636, and four older windows, all brought from the former chapel, it has a representation of the Ascension on the ceiling, by Sir James Thornhill, and in the middle window, at the east end, the Holy Family, on glass, by Price.

Among the more eminent persons educated in this college have been Cardinal Beaufort, King Henry V., Bainbridge, cardinal and archbishop of York, Bernard Gilpin, Sir Thomas Overbury, Burton the antiquary, Compton bishop of London, Bishop Nicolson, Gibson bishop of London, Archbishop Potter, Tanner bishop of St. Asaph, Hyde the orientalist, Dr. John Hill, Edmund Halley, Addison, Tickel, Dr. John Hudson; Edward Thwaites and Christopher Rawlinson, the Saxon scholars; Shaw the traveller, the poet Collins, and Dr. Richard Burn, author of the well known works on 'The Office of a Justice of the Peace' and 'Ecclesiastical Law.'

The number of members upon the books of this college, December 31, 1839, was 292.

(Chalmers's *Colleges and Halls of Oxford*, vol. i., p. 88-106; *Oxford Univ. Calendar*, 1840.)

QUEEN'S COUNTY, a county of the province of Leinster in Ireland, bounded on the north-west and north by King's County, on the east by the county of Kildare and a detached portion of King's County, on the south-east by the county of Carlow, on the south by that of Kilkenny, and on the south-west by that of Tipperary. This county is comprehended between 52° 45′ and 53° 13′ N. lat., and between 6° 54′ and 7° 47′ W. long. Its greatest length is from east by south to west by north, from the bank of the river Barrow, opposite the town of Carlow (in Carlow county), to the neighbourhood of Roscrea (in the county of Tipperary), 37 English miles: its greatest breadth, at right angles to the length, is from the neighbourhood of Killeigh, a village in King's County, between Tullamore and Portarlington, to the junction of the three counties, Tipperary, Kilkenny, and Queen's, 33 miles. The area is estimated at 476,181 English acres, or 744 English square miles (*Population Returns*; and *Map of Ireland*, by the Society for the Diffusion of Useful Knowledge): it was given by Dr. Beaufort, in 1792 (*Memoir of a Map of Ireland*), at 378,023 acres, or about 590 square miles; and by Mr. Wakefield, in 1812 (*An Account of Ireland, Statistical and Political*), at 602 square miles. The population, in 1831, was 145,851, giving 196 inhabitants to a square mile, upon the statement of area given in the 'Population Returns.' Among the counties of

Leinster, it is the second in respect of size, the fifth in respect of number of inhabitants, and the eleventh for density of population, being inferior in this respect to all except Kildare. Indeed both in amount and density of population it is inferior to most Irish counties. Maryborough, the capital, is on the road from Dublin by Kildare to Limerick, about 49 or 50 miles in a direct line south-west of Dublin.

Surface, Geological Character, Hydrography, and Communications.—Two principal groups of hills traverse the county. The Slievh Bloom, or Bloom Mountains (part of the range of highlands which separates the basin of the Shannon from the basins of the Barrow and the Suir), occupy the north-western part of the county, and in one part separate it from King's County. Portions of this group, which has its greatest extension from south-west to north-east, are respectively known as Garrinbawn Mountain, the Glendine Mountains, and Capard Mountain. The northern slope of the Slievh Bloom is more fertile than the southern, which is chiefly waste, and covered with heath. These hills have sometimes been called 'the height of Ireland,' from an erroneous supposition that they were the loftiest in the island. They are traversed on the border of the county by a narrow defile, the pass of Glendine, which forms the only communication in this part between this and King's County. The Dysart Hills occupy the south-eastern part of the county, and separate the valley of the Barrow from that of its tributary the Nore. They are situated in the best wooded part of the county, to the picturesque appearance of which they much contribute: they do not form a continuous ridge, but consist chiefly of isolated hills. The rest of the county is flat, or varied only by gentle undulations.

The greater part of the county is included in the limestone district, which overspreads so large a part of Ireland. The Slievh Bloom are composed chiefly of sandstone, and a portion of the Dysart Hills is formed by the coal-measures. The coal-field extends from this county into the adjacent county of Kilkenny, and there are several coal-pits in each. The coal-field occupies a basin in the limestone formation, by which it is surrounded on every side. The coal burns with little flame; but it consumes slowly, and sends out a strong heat: it is excellent fuel for malting, and also for forges and other iron-works, but not well adapted for domestic use. Its price places it above the reach of the poor of the vicinity. Iron, copper, and manganese are found, but not worked: ochre, fullers' earth, and potters' clay are also met with; the last is employed in making tiles, garden-pots, and other coarse earthenware. Sandstone of a soft texture, suited for hearth-stones and chimney-pieces, and slates, are quarried. Limestone is quarried in almost every part, and marble in a few places.

The county is for the most part comprehended in the basin of the Barrow; but a small portion on the north and a yet smaller portion on the west side belong to the basin of the Shannon. The Barrow rises in the Slievh Bloom, and has a winding course, first north, and then east, to the border of the county, a little above Portarlington: it then continues its course eastward, forming the northern boundary of the county (which it separates from King's County and Kildare county) until it reaches Monasterevan in Kildare. From Monasterevan the course of the stream is southward, and it forms, except just about the town of Athey (in Kildare county), the eastern boundary to the neighbourhood of Carlow, just below which it quits the county. Its whole course in this county and on the border is about 55 miles: it is navigable from Athy, about 40 miles from its source. It receives several small tributaries on its right (or Queen's County) bank, also several on the left (or King's County, Kildare, and Carlow) bank.

The Nore does not fall into the Barrow till long after it has quitted this county: it rises in the adjacent county of Tipperary, enters Queen's County on the south-western side, not far from Burros-in-Ossory, and flows first north-eastward, then eastward, to Castletown. Below Castletown it turns to the south-east and flows to the border of the county, which, before finally quitting it, it separates for a short distance from Kilkenny county. That part of its course which belongs to this county may be estimated at 28 miles. It receives the Tonnet and several other small tributaries on the left bank.

The Lower or Little Brosna, or Brusna, which joins the Shannon below Banagher, rises just within the western boundary of the county; and the Clodagh, whose waters fall into the Brosna, which also joins the Shannon above Banagher, rises within the northern boundary.

The only lake is Lough Annagh, on the northern border of the county; it does not exceed a mile in length: a stream which flows from it at its south-western extremity joins the Shannon. Bogs are numerous in the central part of the county, between the Slievh Bloom and the Dysart Hills.

A branch of the Grand Canal enters the county at Monasterevan, at its north-eastern corner, and there divides into two branches, one of which runs westward about twelve miles to Mount Mellick; the other, known as the Athy Canal, runs twelve miles southward to Athy, just below which town it joins the Barrow: this latter branch is partly in Kildare county.

Two railways have been projected, which will have part of their course in this county; one from Dublin to Kilkenny, which will follow the right bank of the Barrow, and another from Dublin to Limerick, which will run nearly parallel to the present coach-road.

The principal roads are as follows:—the road from Dublin to Limerick by Kildare and Roscrea crosses the county from north-east to south-west, passing through Monasterevan (Kildare county), Ballybrittas or New Brittas, Maryborough, Mountrath, and Burros-in-Ossory. The road from Dublin by Athy and Cashel to Cork passes through Stradbally Ballyroan, and Abbeyleix. Other roads are numerous, but of less importance: those to the market-towns are generally well laid out, and in good condition; but some of the cross-roads and those in remote parts are bad.

Soil; Agriculture; State of the Peasantry.—Almost every kind of soil is found in the county, from a very stiff clay to a very light sandy but fertile loam. There are extensive tracts of bog, and a good deal of cold wet ground, especially near the mountains. Mr. MacCulloch, who gives the area of the county at 396,810 acres, states that 335,838 are in cultivation, and 60,972 are uncultivated mountain or bog. (*Statistical Account of the British Empire.*) Considerable part of the waste might be reclaimed with great advantage; but the poverty of the tenantry, and the absence of any material assistance from the landlords, prevent this improvement. The same causes prevent also the draining of a considerable quantity of land which, though under cultivation, is comparatively unproductive for want of this improvement, as well the building of farm-houses and other erections, and making fences and roads, the cost of which is generally left to the tenant. The consequence is, that the farm-houses and out-buildings are insufficient, and are usually out of repair, damp, dirty, and miserable. (*Appendix to first Report of Commissioners for inquiring into the Condition of the Poorer Classes in Ireland; Parliamentary Papers for* 1836, vol. xxxiii., p. 385.)

Some improvements have however been made by the more judicious proprietors. The demesne of one of these (in the barony of Portnehinch) 'exhibits some extremely interesting improvements in reclaiming bog-land, which have been effected under the directions of his steward. These improvements are in every stage of progress, from the cutting of the first ditch through the shaking and worthless bog, to its conversion into fine productive land. One field, which between four and five years ago was a quaking bog, in which no stock could be put, even in the driest weather, without danger of being mired, is now perfectly sound, and feeds heavy cattle. It produced this year a fine crop of hay. The first crop (turnips) which was taken after the draining was completed, paid the whole expense of the improvement. Another field, which was only drained three years ago, and was previously not worth one shilling per acre, has since produced fine crops of turnips and oats, and after giving this summer three tons of hay to the acre, is now, in October, carrying a large stock of fattening cattle and sheep. The bog-land is intersected at every 40 to 60 feet by deep drains made with stones, from six to ten inches in diameter. The cost of this is about 3*l.* 10*s.* or 4*l.* per acre, and it cost about 2*l.* more for the clay and other condensing materials which are spread upon and ploughed in with the surface-soil of the bog.' (*Report of Commissioners*, as above, p. 386.)

In the baronies of East and West Maryborough, comprehending, between them, considerably above 29,000 Irish plantation acres, or 37,000 English acres, only seventeen persons held farms of more than 100 Irish or 127 English acres: by far the greater number of holdings in the barony of West Maryborough were under 5 Irish or 6½ English acres. The principle of consolidating these small holdings has however been adopted by some of the landlords, and is gaining ground, but not very rapidly. In some other parts of the county (*e.g.* the barony of Portnehinch) the small holdings do not bear so great a proportion to the large ones. The smallest holdings are generally through the county occupied by tenants at will; but farms of 10 Irish (13 English) acres and upwards are usually held on leases which are granted for life or 21 years. The system of 'con-acres' (ground tilled and manured by the farmer, and let for the season to the labourers) is prevalent in the county, though not equally so in all parts of it.

The cottiers, especially those who hold under 'middlemen,' usually pay their rent in labour; but other small tenants usually pay in money, though a part is sometimes taken by the landlord in labour, such as carting, at busy times. The number of 'middle-men' (persons who take land of the proprietor and sub-let it) is diminishing: there are still however many of them, and to such an extent is the practice in some places carried, that frequently three or four 'middle-men' will intervene between the proprietor and the occupier of land. Rents are considered high, especially in the case of small farmers who hold under 'middlemen.'

The prevalent rotation of crops is, on the larger farms, as follows:—first year, potatoes with manure; second, wheat or barley, and third, oats; some persons then lay down the land to grass from two to five years. The small holders know little of rotation of crops; they raise potatoes and corn, either wheat, barley, or oats, alternately. The only artificial grasses cultivated by the small holders are clover and seeds. Some of the larger farmers grow clover, a few vetches, rye-grass, and trefoil: turnips and mangel-wurzel are grown, though not to a great extent, by some of the gentry and large farmers. The cultivation of potatoes has increased: peat or bog-stuff is commonly used as manure. The potatoes grown by the small farmers are 'lumpers,' a coarse but very productive variety.

The harvest is generally got in with care, except that the barley, and sometimes the other crops, are cut late, so as to occasion loss from shedding. It is commonly threshed as soon as cut, for the purpose of paying rent; and is usually sold by the sample: there are good corn-markets at Maryborough and Mount Mellick, at which last-named town much corn is ground into flour for the English and other markets.

Grazing-farms are not numerous, and are generally occupied by gentlemen farmers. The grazing-land is not commonly very good, and the quantity of it has rather decreased. There are no dairy-farms, but each of the large farmers keeps a few cows. The breed of cattle has been much improved, but the subject is not so well understood as in some of the neighbouring counties: the kinds most in request among the larger farmers are the short-horned or Durham, and the Ayrshire, but the small farmers think the native Irish breed is best, as being more accustomed to the food and climate of the country. The dairy cows most approved are either the native stock or a cross-breed between the native stock and the Durham or the Ayrshire. More cattle are fattened for exportation than formerly; the increase may be attributed to the introduction of steam-navigation as opening a means of communication with England, and to the improvements in rural economy. Little or no cheese is made at present, but a considerable quantity of butter. The increased intercourse with England has led to a great improvement in the making of the butter. The number of sheep kept is considerable, chiefly by the large farmers. This breed is generally large, and has been much improved within the last twenty years; it is a cross between the native Irish breed and the Leicester. The introduction of the Leicester sheep has led to improvement both in the quantity and quality of the fleece and the weight of the carcass. The horses are not kept in proper condition for working; nor is the breed of pigs so good as in some other counties of Leinster. Oxen are not much used for agricultural purposes.

The manures in general use are bog-stuff, animal manure, lime, marl or limestone gravel, and road scrapings. The small farmers have no knowledge of the advantage of stall-feeding over grazing considered as a source of manure. Lime is burned with culm, sometimes with turf; but is not used to the extent to which it might be used. Burning land is very little practised; the landlords generally consider it injurious.

The fences commonly consist of a bank with a ditch, and generally a hedge: but the hedge is usually irregular and insufficient, composed of whitethorn, briar, furze, or brambles, frequently with gaps of several yards in extent. Some of the gentry and large farmers have orchards, of which part of the fruit is sold. The farm-buildings and sheds are generally insufficient, and, among the smaller farmers, usually in bad repair. Modern improved agricultural implements are little used, except the light Scotch plough; threshing-mills, rollers, and winnowing-machines are found only in the yards of resident proprietors or large farmers.

A great number of persons have emigrated of late years, almost exclusively to the United States or to Canada. Many of them were Protestants, and possessed of some little property.

The labouring population very far exceeds the means of employment: of 3401 labourers in the three baronies of East and West Maryborough and Portnehinch, 1104 were constantly employed, 1857 occasionally employed, and 440, from illness, old age, or other causes, were seldom or never employed. Wages are very low; for constant labourers about 6*d.* a day with 'diet,' *i.e.* breakfast and dinner; 8*d.* or 10*d.* and in some cases 1*s.* a-day without diet. In hay-time and harvest the wages are occasionally as high as 1*s.* 6*d.* or even 2*s.* and 2*s.* 6*d.* In the colliery districts the colliers, according to the nature of their work, receive from 1*s.* 2*d.* to 2*s.* 2*d.* a-day. The 'diet' given by farmers to their labourers consists chiefly of potatoes and milk, sometimes 'stirabout,' or oatmeal porridge; some of the wealthier and more liberal occupiers add meat on Sundays and holidays. The labourers are not considered equal to the English in steadiness and skill; this inferiority may be partly ascribed to bad and insufficient food. Great distress prevails among the labourers from the beginning of June till harvest, so that the wretched peasantry are at times obliged to boil the charlock or wild mustard to eke out a miserable subsistence; and in years of scarcity or failure of the potato crop the distress extends upward to the small occupiers. The labourers live on the land of their employers, and usually have some land with their cabins: they pay their rent in labour: for a cabin alone they pay 1*l.* to 2*l.*; for a cabin which an acre of land (usually the worst on the whole farm) 3*l.* to 4*l.*: some proprietors allow their labourers more land (sometimes as much as six acres) for about the same rent that would have been charged to a farmer. The number of these 'cottiers,' or labourers who work regularly for a master under whom they rent their cabins, is in some parts of the county fast diminishing. The cabin is frequently built and almost always repaired by the labourer.

There is little employment for women or for children under the age for going out to service. What little work is done by women is chiefly by the labourers' grown up daughters or other unmarried women, or by married women who have no family. Children above 14 or 16 sometimes get employment at 5*d.* a-day without diet, or 3*d.* a-day with it. There is rather more employment for women at some busy seasons, as harvest and potato setting and digging. Most labourers' wives keep fowls, by which they earn a trifle. The labourer usually keeps a pig.

Potatoes form the principal food of the labourers, and those chiefly of the coarsest sort called 'lumpers.' Meat, eggs, and fish are rarely enjoyed even by the small farmers, by the labourers never. The cabins of the peasantry are generally of clay and straw; some have a foundation of stones, and a few are entirely of stones; most of them consist of two apartments, a living room occupying two-thirds of the cabin, and a small chamber. There is never an upper story, and the roof is of sod covered with thatch; they are altogether miserable habitations, except the few belonging to the gentry and larger farmers, and occupied by their labourers. Many have no windows; others have only an unglazed opening, blocked up in cold or wet weather with straw or by a shutter, and some have glazed windows of all sizes. The general fuel is turf. The dress of the peasantry is generally wretched; the children, especially the boys, are half-naked, and go barefoot; the women and elder girls, through the cheapness of materials, are enabled to dress a little better; and the wives and daughters of the more comfortable labourers wear shoes and stockings. The furniture of the cabins and the supply of bedding is commonly wretched, and in the poorer cabins the inmates sometimes sleep on straw, hay, or rushes. In some parts of the county the cabins are altogether more comfortable and better furnished. Those round Mountmelleck, inhabited by persons connected with the trading or manufacturing establishments of that town, are of superior character. Drinking is, or was lately, rather on the increase; the drunkards are chiefly of the class of small tradesmen.

Divisions, Towns, &c.—The county is divided into nine baronies, as follows:—

Name.	Situation.	Population in 1831.
Ballyadams	E.	8,954
Cullinagh	S.	15,447
Maryborough (East)	Central.	10,931
Maryborough (West)	do.	16,725
Portnehinch	N E.	15,382
Slieumargy	S.E.	15,804
Stradbally	E.	8,328
Tinnehinch	N.W.	17,113
Upper Ossory	W. & S.W.	37,167
		145,851

We have no authorities which give the areas of the respective baronies; but it may be stated that Upper Ossory is probably twice as large as any other; and that of the rest, Portnehinch, West Maryborough, Cullinagh, and Tinnehinch are the largest; Slieumargy has probably the most crowded population, a pre-eminence which may be ascribed to the mining district which is comprehended within it.

The assize town is Maryborough: there are one parliamentary borough, Portarlington; five market and post towns, viz. Abbeyleix, Ballinakill, Mountmellick, Mountrath, and Stradbally; and five post-towns which have no market, viz. Ballybrittas, Ballyroan, Burros-in-Ossory, Clonaslee, and Rothdowney. Graigue is a suburb of Carlow. The largest villages are Arles, Ballylinan, Castletown, and Emo.

Maryborough is in a central situation, in the barony of East Maryborough. It was constituted the assize on the formation of Queen's County, by an act of 3rd and 4th of Philip and Mary, and received its name of Maryborough in honour of that queen. The town consists of several streets, narrow, irregularly laid out, badly paved, and altogether inconvenient; the principal street is on the road from Dublin to Limerick. The number of houses in 1831 was 508, of which 484 were inhabited by 641 families, 10 were uninhabited, and 14 building. Above 200 of these were comfortable houses, the rest were miserable cabins. The principal public buildings are the new county gaol and the lunatic asylum, the last being for the district which comprehends four counties, King's, Queen's, Westmeath, and Longford; a court-house, and rooms adjacent for county business, formed out of part of the old gaol, an infirmary, a handsome range of infantry barracks, a parish church, a large and handsome Catholic chapel, three meeting houses for Protestants, and a nunnery adjacent to the Catholic chapel. There are some remains of a strong castle which existed at the time when the town was fixed upon for the county town; the remains comprehend a bastion and part of the walls. Near the town are the ruins of the antient church. The lunatic asylum stands in the midst of an enclosed area of above twenty-two acres, handsomely laid out and planted. The building has a front of hewn stone, 365 feet long, and will accommodate from 150 to 160 patients. It had 131 on the 1st of January, 1837. The county gaol is a spacious and well-arranged prison on the radiating plan; the management of it is well spoken of by the inspectors. (*Inspectors' Reports* for 1837.)

Maryborough was incorporated by charter of 12 Eliz. A.D. 1570). The limits of the borough extend to the distance of 8000 feet from the walls of the castle (which is in the centre of the town), and comprehend an extensive rural district; a new and more contracted boundary has been therefore recommended. (*Reports from Commissioners of Boundaries of Municipal Corporations in Ireland.*) The burgesses were in 1833 reduced to three. The burgomaster is a justice of the peace within the district; but petty-sessions are held weekly by the county magistrates. There is no corporation police, but from 15 to 30 of the county constabulary are usually quartered in the town.

The town has little trade. The market, which is on Thursday, has improved: wheat, which was formerly scarcely brought to it, is now sold in considerable quantity. A branch of the cotton-manufacture, but on a small scale, is carried on. Shoemaking is prosperous. There are eight yearly fairs. The population of the town, in 1831, was 3223: that of the whole parish of Borris, in which the town stands, was 5300. There is neither benefit society nor savings' bank nor house of industry in the parish; but there are forty spirit-shops and one pawnbroker's shop.

The living is a rectory and vicarage, united with the rectory and vicarage of Killcolemanbane and the vicarage of Straboe, all in the diocese of Leighlin, and comprehending altogether a population of about 8700, in 1831, of which about 1200 or 1300 belonged to the established church, while the rest were nearly all Catholics. There was a Roman Catholic chapel at Straboe, in the union, besides that of Maryborough. The net yearly value of the united benefice was returned at 525*l.* 6*s.* 2*d.* There were, according to the Parliamentary Returns for 1835, ten schools in Maryborough parish, and two in that of Killcolemanbane; twelve in all in the union, with 811 scholars, viz. 445 boys and 366 girls: of these schools, two, both at Maryborough, with 253 boys and 221 girls, were national schools; two were classical schools for boys, with 32 scholars; two were girls' schools of the better sort, with 25 children (four of them little boys); three were connected with religious or charitable societies, with 84 boys and 93 girls; and three were hedge-schools, with 72 boys and 31 girls.

The quarter-sessions for the division, at which the civil business of the borough is transacted, are held here twice a year; the county assizes are also held here, and it is the place of election for the county. Maryborough returned two members to the Irish parliament, but was disfranchised at the Union. It gives the title of baron to W. Wellesley Pole, brother of Marquis Wellesley and the duke of Wellington.

Portarlington is on the river Barrow, what separates in this part King's County and Queen's County, in each of which part of the town is situated. It is about forty-four miles west-south-west from Dublin, through Naas and Monasterevan, and about twelve miles north-north-east from Maryborough. The part which is in King's County is in the parish of Cloneborke, in the barony of Upper Philipstown; that which is in Queen's County is in Lea parish, in the barony of Portnehinch. The town took its rise in the the time of Charles II., who granted a large extent of country in this part of Ireland to Lord Arlington. The town consists of two principal streets, which meet in an area or square, the centre of which is occupied by one of the two churches or chapels. They are in some parts paved or flagged by private subscription, but are not lighted. Few towns in Ireland present so respectable an appearance, owing to its being the residence of an unusual number of private gentlemen. In 1831, there were in the town 505 houses, of which 486 were inhabited by 579 families, 16 uninhabited, and 3 building: a somewhat later return gives 580 houses, of which 300 are slated and the rest thatched; most of them built of lime and limestone. The population, in 1831, was 3091: a part of the inhabitants are descended from some French and German Protestant refugees settled here by Lord Arlington. There are two bridges and two churches (or more properly chapels), neither of them parochial; those of St. Michael and St. Paul, or, as they are sometimes called, the English and the French, from having been originally appropriated to the use respectively of the English and French settlers. Both the churches were erected by Rouvigny, earl of Galway, to whom the lordship originally held by Lord Arlington had come. The English church has a handsome spire. There is a handsome Roman Catholic chapel, with a spire 140 feet high, and a Methodist chapel. Over the market or town-house there are three rooms, the largest occasionally appropriated to assemblies. There are a small tobacco manufactory, a soap and candle manufactory, and a tan-yard: the rest of the trade of the town is retail. There is a corn and general market held on Wednesday, and a meat-market on Saturday: there are also eight yearly fairs for horned cattle, horses, sheep, and pigs. A branch of the Grand Canal passes near the town. The town was incorporated by charter, A.D. 1667. Courts leet and baron and a court of record are held under the lord of the manor, and petty-sessions are held by the county magistrates. From eight to ten of the county constabulary are generally stationed here. There are no public charities except schools but there is a very excellent savings'-bank. Public-houses and spirit-shops are very numerous.

Portarlington returns one member to parliament. Before the Union it returned two members to the Irish parliament, but at the Union was reduced to one. By the Irish Reform and Boundary Acts, the franchise was extended, and the limits of the borough defined. The number of voters on the register, in 1834-5, was 156. The living of Lea (in which parish the part of the town which belongs to Queen's County is situated) is a vicarage, of the clear yearly value of 272*l.* (including the value of the glebe), and a glebe-house. There is a small parish church at Lea, and there are the two churches, founded by Lord Galway, in the town of Portarlington. These places of worship have (by the Parliamentary Returns, 1835) congregations amounting in the aggregate to more than 1000 persons. The Roman Catholic chapel had a congregation of 1300, and the Wesleyan of 100. In the whole of the two parishes of Geashill (of which Clonehorke is a dependency) and Lea, there were, according to the returns made to parliament in 1835, thirty-five day-schools, containing 1108 boys and 872 girls; and an adult school of 29 scholars: giving a total of thirty-six schools, and of 2009 persons under daily instruction. Five of the schools were in connection with the National Education board; four were partly supported by the London Ladies' Society, or London Hibernian Society; one was connected with the Kildare-place Society; and six were partly supported by private subscription. Of the private schools, one was for adults, three were classical schools for boys, two were girls' schools of a superior kind, three were ordinary day-schools, and eleven were hedge-schools. A loan-fund and a mendicity society have been established. There were also in Geashill parish eleven Sunday-schools for religious instruction, ten of them for Roman Catholics. Portarlington gives the title of earl to the Dawson family.

Abbeyleix is 9 miles south-south-east of Maryborough and 60 south-west from Dublin. The parish is chiefly in the barony of Cullinagh, but partly in that of West Maryborough, and partly in that of Fassadining, in the county of Kilkenny; the town is wholly in Cullinagh. Abbeyleix took its origin and name from a Cistercian Abbey in the territory of Leix, now Queen's County. The town is neatly built, the late Lord de Vesci having caused the old town to be entirely razed, and laid out the present one on a more eligible site. The number of houses in 1831, was 141, viz. 126 inhabited by 178 families, 10 building, and 5 uninhabited. There are a good market-house, a sessions-house, where the quarter-sessions for the division are held twice in the year, and a new bridewell. The population, in 1831, was 1009 for the town, and for the entire parish 5990. A considerable woollen manufacture is carried on: about two hundred persons are employed in combing, spinning, and weaving. There is a weekly market (on Saturday) and six yearly fairs. Freestone, limestone for burning, and potters' earth are procured in the neighbourhood. Abbey Leix, the seat of Lord de Vesci, surrounded by a demesne of more than 1100 acres, and thriving plantations, is near the town. The area of the parish is 11,974 acres. There are in the parish two parish churches, one rarely used: the other, a handsome modern building of Gothic architecture, with a tall spire, has a congregation of five hundred: there are a Roman Catholic chapel, with a congregation of two thousand, and a Wesleyan meeting-house, with a congregation of seventy. The living is a vicarage: the net value of the benefice (including a small glebe) is about 138*l.* There were, by the returns of 1835, six day-schools, with 203 boys and 151 girls; together 354 children: two of the schools are private schools, three are partly or wholly supported by subscription, and one is partly supported by the London Hibernian School Society and by local subscription. There are some almshouses, and a dispensary and infirmary.

Ballinakill is in Dysart Gallen or Galon parish, in the barony of Cullinagh, 13 miles south-south-east of Maryborough, and 64 south-west from Dublin. The town is in a bye-situation, and in a declining state; the streets are neither paved nor lighted. The number of houses, in 1831, was 360, viz. 335 inhabited by 346 families, 4 building, and 21 uninhabited: the population was 1927 for the town, or 4014 for the entire parish. The manufacture of woollens, though declined from what it formerly was, is still carried on, and there is a brewery. Formerly two markets were held weekly, but the Wednesday market has been long disused, and the Saturday market has been injured within the last few years by the establishment of that of Abbeyleix on the same day. Ballinakill was incorporated by James I., and returned two members to the Irish parliament, but the franchise was lost at the Union, and the corporation has since fallen into disuse. Quarter-sessions and petty-sessions were once held here, but have been removed to Abbeyleix. A body of the county constabulary are posted in the town. The parish of Dysart Gallen, or Dysert Galon, contains 10,557 acres. The parish church, a small modern building with tower and spire, is in Ballinakill; it has a congregation of from 150 to 250 persons. There are two Roman Catholic chapels, one in the town, and another in the rural part of the parish; they have congregations of nearly 4000. There were in the parish, by the Returns of 1835, nine schools with 429 boys and 407 girls; together 836 children. Of the nine schools, the two largest (containing 594 children) were connected with the National Board of Education; two were partly supported by subscription or other extraneous sources; the other five were hedge-schools.

Mountmellick is on the Owenass, one of the feeders of the Barrow, 7 miles north by west of Maryborough, and 51 miles west-south-west of Dublin. It stands chiefly in the parish of Rosenallis, in the barony of Tinnehinch, but a small part of it is in the parish of Coolbanager, in the barony of Portnehinch. The whole town had, in 1831, 710 houses; of which 687 were inhabited by 805 families, 15 were uninhabited, and 8 were building. There is one principal street; several of the houses are very neat and even elegant, and the town may be regarded as the most important and prosperous in the county. Cotton-weaving and coarse woollen-weaving are carried on to a considerable extent, and furnish employment to from 3000 to 4000 people in and round the town. There are an iron and brass foundry for the manufacture of machinery, a tan-yard, breweries, soap-houses, potteries, a distillery, and a corn-mill. A branch from the Grand Canal at Monasterevan to the town has tended greatly to increase its trade in corn, butter, and general merchandise. There are two weekly markets, and ten yearly fairs. A body of the county constabulary are stationed in the town: the quarter-sessions for the division are held here twice in the year. There is a chapel-of-ease in the town, in the parish of Rosenallis, which has a congregation of 350 persons; the two parish churches of Rosenallis and Coolbanagher (or rather, of Ardea, a parish united with Coolbanagher) are at a distance from the town. There were in the two parishes, in 1835, four Roman Catholic chapels, with aggregate congregations of 4000; four meeting-houses or other places of worship for Wesleyans, with congregations amounting to 350 persons, and one Quakers' meeting-house with a congregation of 140: we know not which of these places are in the town. There were at the same time twenty-six day-schools; viz. seven in connection with the National Board; ten connected with the London Hibernian Society the London Ladies' Hibernian Society, the Kildare-place Society, or supported by subscription, or by Erasmus Smith's fund; a Quakers' boarding-school, five private day-schools, and three hedge-schools: in these schools there were 1627 children, viz. 930 boys and 697 girls. There were also in Rosenallis two large Sunday-schools, kept by the vicar and the curate.

Mountrath is in the parish of Clonenagh, in the barony of West Maryborough, 8 miles west-south-west of Maryborough, and 60 west-south-west of Dublin, on the great road to Limerick. The foundation of the town was laid early in the seventeenth century, by Sir Charles Coote, who, in 1628, obtained a grant of two fairs and two markets, and established a linen and fustian manufactory. The Rebellion of 1641 interrupted the rising prosperity of the town. In 1831 it contained 442 houses, of which 420 were inhabited by 448 families, 13 were uninhabited, and 9 were building. The population at the same time was 2593. There are a respectable market-house, and a court-house and bridewell lately erected. The church is a handsome building; and there are a large Roman Catholic chapel, a convent of the order of St. Patrick, and a Bridgetine nunnery. The Methodists and Quakers have also meeting-houses. Calico and stuffs are woven, and there are a large brewery, a malthouse, and an oil-mill. There is a considerable weekly market for corn and butter; there are six yearly fairs. The quarter-sessions for the division are held here twice in the year; and there are petty-sessions held weekly. Ballyfinn House, the splendid seat of Sir C. H. Coote, is in a beautiful and well-wooded desmesne near the town. There were in the whole parish in 1835, nineteen schools, viz. nine national schools, four schools partly supported by subscription, two convent schools, a classical day and boarding school, two private day-schools, and a hedge-school. The two convent schools are attached to the Bridgetine nunnery in the town of Mountrath; one is for the education of children of the higher order, the other for the poor: the classical school is superintended by monks of the order of St. Patrick, who have a convent in the town. There is a large school-house in the town, erected chiefly through the liberality of Sir C. H. Coote; but by which of the above-mentioned schools it is occupied does not appear. The total number of children in the schools at the time of the return was 1780, viz. 1037 males and 743 females. There is a dispensary in the town.

Stradbally is in the parish and barony of Stradbally, 7 miles east of Maryborough, and 48 south-west of Dublin, on the road by Athy and Cashel to Cork. Antiently there was a Franciscan monastery here. The town, which is on a small feeder of the Barrow, in a pleasant situation, had, in 1831, 306 houses, viz. 296 inhabited by 331 families, 8 uninhabited, and 2 building. The principal street is spacious, the houses well built, and there is a bridge of three arches over the stream. The church is a handsome building. Near the town are Stradbally Hall and Brockley park, two mansions with their demesnes. The market is on Saturday, and there are five yearly fairs. There is a station of the county constabulary in the town. The quarter-sessions for the division are held here twice in the year, in a neat court-house with a small bridewell attached; and there are petty sessions every fortnight. There are a dispensary, a savings' bank, and a large Catholic chapel. There were in 1835, in the parish, seven schools, viz. two boarding-schools, three day-schools, two of them on the system of the Kildare-place Society, a hedge-school, and a national school.

Ballybrittas is in Lea parish, in the barony of Portnehinch, 9 miles north-east from Maryborough, and 42 south-west of Dublin. It is a neat place, of pleasing appearance, containing 27 houses, inhabited by 31 families, and 1 house building. Three fairs are held in the year. A body of constabulary are posted here, and there are petty-sessions once a fortnight. Ballyroan is in Ballyroan parish, in the barony of Cullinagh; 58 miles from Dublin on the road by Athy and Cashel to Cork. The place had, in 1831, 132 houses inhabited by 133 families, forming a population of 714. There is a station of the constabulary. There are three fairs. There are a neat plain church, a spacious Roman Catholic chapel, and a good school-house for an endowed classical and English school on Alderman Preston's foundation. There were also in 1835, in the parish, two day-schools, partly supported by subscription, and two hedge-schools. Burros in Ossory, in the parish of Aghaboe, in the barony of Upper Ossory, was antiently of considerable importance as a military post, being on the river Nore, and on a site encompassed by bogs. It now consists of one long street, on the road from Dublin to Limerick, 67 or 68 miles from Dublin, and 16 from Maryborough; and comprehends 129 houses, viz. 124 inhabited by 147 families, and 5 uninhabited. There are several fairs in the year. Quarter-sessions for the division are held here twice in the year, and petty-sessions at irregular intervals; there are a bridewell, a station of the county constabulary, and a dispensary. Clonaslee is in the barony of Tinnehinch, remote from any great thoroughfare, 9 miles west-north-west of Mountmellick, on the bank of the Barradois or Clodagh, over which there is a good bridge. The village contained in 1831, 79 houses, viz. 78 inhabited by 94 families, and 1 building: the population was 514. There is a parish or district church, also a Roman Catholic chapel. Petty-sessions are held weekly, and there are two fairs in the year. There is a school on Erasmus Smith's foundation, and one if not two national schools. Rathdowney is in the barony of Upper Ossory, 19 miles south-west from Maryborough, remote from any great thoroughfare, on a small stream that flows into the Erkin, a feeder of the Nore. The town contained in 1831, 211 houses, viz. 195 inhabited by 240 families, 11 uninhabited, and 5 building. The population was 1214. The houses are generally ill built and neglected, and the streets are ill paved. Petty-sessions are held in the town weekly, and there are several yearly fairs. There are a parish church, a Roman Catholic chapel, and a Wesleyan meeting-house in the town. There is a parochial school, connected with the Kildare-place Society, and a national school in the town, and a second national school, and several other schools in different parts of the parish. There are in the parish the remains of three castles, of a church and burial-place, of a church and monastery, and of a very antient cross.

Graigue is in the parish of Killeshin, in the barony of Slieumargue. It is close upon the border of the county, and forms a suburb of the town of Carlow, with which it is connected by a bridge over the Barrow. It contained in 1831 324 houses; of which 305 were inhabited by 382 families, 13 were uninhabited, and 6 were building: the population was 1976. There are two tan-yards, a flour-mill, and a distillery. The parish church is a handsome building· there is a very large Roman Catholic chapel. There are a national school and a station of the county constabulary.

Arles or Arless is a neat village in the parish of Killeban and barony of Slieumargue, about 7 miles north-west of Carlow. It contains about 40 houses and 205 inhabitants. There is a small manufacture of linen and yarn carried on; the manufacture of tiles for roofing has been brought almost to nothing by the increased use of slates. Ballylinan is also in the parish of Killeban, but in the barony of Ballyadams. It has a police station, several fairs in the year, and petty-sessions weekly. It contained in 1831, 94 houses, viz. 89 inhabited by 103 families, 4 uninhabited, and 1 building the population was 533. There are the ruins of an old church in the village. Castletown, in the barony of Upper Ossory, about 2¼ miles from Mountrath, takes its name from an old castle on the banks of the Nore. The village is also on that river: it contained, in 1831, 59 houses, many of them good residences, with a Roman Catholic chapel, and is altogether a place of neat and respectable appearance. Of the houses 52 were inhabited by 60 families, 4 were uninhabited, and 3 were building: the population was 376. There are large flour and oatmeal mills. There is a yearly fair, and petty-sessions are held every fortnight. A body of the county constabulary are posted here. Emo, in the barony of Portnehinch, 7 miles north-north-east of Maryborough, and 3 or 4 south of Portarlington, had, in 1831, only 14 houses inhabited by 17 families, and a population of 102: but it has a neat Roman Catholic chapel, a public school, and a constabulary station. Adjacent to it is Emo park, the seat of the earl of Portarlington.

Divisions for Ecclesiastical and Legal Purposes.—This county was formed of portions of the districts previously known as Leix and Ossory; the latter comprehending all that part of the county which is to the south and west of the Nore; the former including all the rest. The county was formed at the same time that the adjacent district of Ofally was made shire-ground. The two were named respectively Queen's County and King's County, in honour of Mary and her husband Philip of Spain, and their capitals were named after the same royal personages, Maryborough and Philipstown.

The county is comprehended in the dioceses of Leighlin and Ossory (now united) and Kildare. The parishes in the six baronies of Ballyadams, Cullinagh, Maryborough (East and West), Stradbally, and Slieumargue, are in Leighlin, except one parish in Ballyadams barony, which is in the diocese of Dublin; those in the barony of Upper Ossory are in the diocese of Ossory, except one, which is in the diocese of Killaloe; those in the baronies of Portnehinch and Tinnehinch are in Kildare. All these dioceses are now in the ecclesiastical province of Dublin. Killaloe was in that of Cashel before the union of that province with the province of Dublin.

Queen's County is included in the home circuit: the assizes are held at Maryborough, and quarter-sessions for the divisions of the county are held at Maryborough, Mountmellick, Mountrath, Stradbally, Burros-in-Ossory, and Abbeyleix, twice in the year at each of these places. The number of persons committed for trial at the assizes and quarter-sessions in 1837 was 301; the number tried at petty-sessions and before magistrates, 418; together, 719: being considerably below the average of the counties of Ireland in the number of assize and quarter-sessions cases, as well as in the whole number of criminals, but exceeding the average in the number of cases disposed of at petty-sessions and before magistrates.

The county gaol is at Maryborough, and is well conducted, especially as it respects the male prisoners. There are three minor prisons, namely, at Abbeyleix, Burros-in-Ossory, and Stradbally, which are now remarkably well kept, clean, and regular. They are visited by the governor of the county gaol under the direction of the Board of Superintendence.

The county returns to parliament two members, who are elected at Maryborough. Portarlington returns one member. Before the Union the county sent altogether eight members to the Irish parliament, namely, two county members, and two each for the boroughs of Maryborough, Portarlington, and Ballinakill. At the Union, Maryborough and Ballinakill were quite disfranchised, and Portarlington lost one member. The number of county electors qualified in 1834-5 was 1692, of whom 1427 voted at the contested election of that time

On January 1, 1836, the constabulary force of the county included one magistrate, 4 chief constables or sub-inspectors of the first class, and 6 of the second class, 49 constables, and 274 sub-constables, with 15 horses. On January 1, 1838, this force comprehended one sub-inspector, 4 chief constables of the first rate and 4 of the second rate; 1 head constable of the first class and 9 of the second class; 37 constables; 230 sub-constables of the first class and 46 of the second. The whole expenditure on this force for the year preceding January 1, 1838, was 14,327*l.* 14*s.* 3*d.* The total amount of the grand-jury presentments for that year was 19,566*l.* 16*s.*, namely: for new roads, repairs, bridges and roads, 4638*l.* 4*s.* 1*d.*; for building, repairs, and rent of session-houses, 427*l.* 2*s.*; for building new gaol, 923*l.* 1*s.* 6½*d.*; for gaol and bridewell expenses, 2270*l.* 6*s.* 3*d.*; for public and county officers' salaries, 2123*l.* 15*s.* 6*d.*; for the police establishment, 4467*l.* 16*s.* 6½*d.*; for the administration of justice, 480*l.* 1*s.* 8*d.*; for deserted children and malicious injury to property, 388*l.* 13*s.* 7*d.*; for the infirmary and dispensaries, 1528*l.* 14*s.* 9*d.*; for building lunatic asylum, 462*l.* 5*s.* 6½*d.*; for the support of the lunatic asylum, 587*l.* 9*s.* 2*d.*; for miscellaneous, printing, &c., 1269*l.* 5*s.* 4½*d.* There are in the county a district lunatic asylum for Queen's County, King's County, Longford, and Westmeath; and an infirmary (both at Maryborough); a dispensary and fever hospital united; and eleven dispensaries.

The number of schools in the county connected with the National Board of Education in 1835 was 40, with 43 teachers and 5263 scholars.

History, Antiquities, &c.—Of the inhabitants of this county, in the earliest period of Irish history, nothing certain is known. At a somewhat later period the county was comprehended in the districts of Leix and Ossory. Ossory, which was originally a kingdom dependent on the greater kingdom of Leinster, was subjugated and annexed to Munster, still however preserving its separate organization as a kingdom. The chieftain or king of Ossory, one of the Macgillypatrick or Fitzpatrick race, stoutly resisted the Anglo-Norman invaders of Ireland in the twelfth century, and attacked Leix, which was then under Dermod, king of Leinster, who had called in the English. He subsequently however made his peace with the English, and managed to retain his independence. The adjacent district of Leix was included in the English pale, and was formed into a county palatine, which passed into the hands of the Mortimers, lords of Wigmore. In the reign of Edward II., O'More, an Irish chieftain, to whom Mortimer had entrusted the administration of his domain, became so powerful as to hold it in his own right, and to be a very troublesome opponent to the English in that part of the pale, and for two centuries the district was the seat of almost incessant war between the O'Mores and the English. It was either just previous to or during this unsettled period (in 1315, or rather 1316) that it was invaded by Edward Bruce and his confederates, who burned the castle of Ley near Portarlington, and a small burgh or town which had grown up under its protection. The district of Leix appears to have continued in a state of precarious independence till the reign of Henry VIII. Ossory also maintained at this time its independence, but its chiefs were usually in alliance with the English. In the reign of Henry VIII. this part of Ireland was again the scene of contest between the governors, Gerald, earl of Kildare (A.D. 1514), and afterwards Thomas Howard, earl of Surrey (A.D. 1521), and the sept or clan of O'More, but the struggle produced no decisive result. But on the death of Henry VIII., the O'Mores having again rebelled in conjunction with the O'Connors of Ofally (now King's County), were defeated by Sir Edward Bellingham, the lord deputy, who sent their chiefs prisoners to London (where O'More died), and re-annexed their territories to the English pale. A new rebellion in these two districts in the reign of Mary was quelled with a severity which threatened to extirpate the inhabitants, and the districts were, by act of parliament, converted into shires. In the latter part of the reign of Elizabeth, the O'Mores were again in rebellion, in consequence of which the county was invaded by the lord-deputy, the earl of Essex (A.D. 1599), who broke the power of the rebellious clan: their ruin was completed by Lord Mountjoy, the successor of Essex.

In the rebellion of 1641, Roger More, head of the now reduced sept of the O'Mores, acted a conspicuous part, and was in fact the mainspring of the rebellion. The insurgents attempted to seize several places in this county: Maryborough and the castle of Ballinakill fell into their hands, as well as Shane or Sion Castle near Coolbanagher, and other places of strength. They besieged the castle of Burros-in-Ossory, but the garrison, consisting of Protestants of Upper Ossory, held out until relieved by Sir Charles Coote (A.D. 1642), who had been detached by the duke of Ormond, then posted with the government army at Maryborough. Shane Castle was retaken by the same officer. On the retreat of Ormond, the insurgents under Preston again overran the county, and Ballinakill, which had been taken from them or given up by them, was again besieged by their troops, but relieved by Colonel Monk: in 1643, it was a third time besieged, and, after a vain attempt to relieve it, was forced to surrender. Burros-in-Ossory Castle was also again besieged by the insurgents in 1642, but with what success does not appear: they took however the castle of Lea, or Ley, near Portarlington. In 1646, the insurgent force from Ulster, under Owen Roe O'Nial or O'Neal, occupied Maryborough and several other strongholds; but the Parliamentarians maintained a strong garrison in the castle of Burros-in-Ossory, by a party of which, in 1647, the neighbouring fort of Ballaghmore, held by the insurgents, was taken. The victors, on their way back, were attacked by a party of insurgents, and lost several men. In 1649, Maryborough and some other places were taken from the insurgents under Owen Roe O'Nial, by the Royalists under Ormond, with whom a considerable part of the more moderate insurgents had by this time united themselves. Shortly afterwards these places were taken from the Royalists by the Parliamentarians under Colonels Hewson and Reynolds. In the war which ensued on the Revolution of 1688, some fighting took place in the county, in which the Jacobites were defeated by William's army.

(*Parliamentary Papers*; Lewis's *Topographical Dictionary of Ireland*; Cox's *History of Ireland*; Gordon's *History of Ireland*: *Map of Ireland*, by the Society for the Diffusion of Useful Knowledge.)

QUEENBOROUGH. [KENT.]

QUENTIN, ST., a town in France, capital of an arrondissement in the department of Aisne, situated on the right bank of the river Somme, very near the source of that river, 79 miles in a straight line north-north-east of Paris, or 86 miles by the road through Senlis, Compiègne, Noyon, and Ham; in 49° 51′ N. lat. and 3° 17′ E. long.

St. Quentin appears in the 'Itinerary' of Antoninus, and in the Peutinger Table, under the name of Augusta Veromanduorum, i.e. Augusta of the Veromandui, a nation of the great Belgic stock, inhabiting the country of Vermandois, to which they have given name. The oldest quarter of the town has retained down to modern times the name of Aouste. St. Quentin subsequently became the capital of the county of Vermandois in the government of Picardie. It was the seat of a bishopric, which in the sixth century was transferred to Noyon. In the sixteenth century it was a strongly fortified place, one of the bulwarks of France on the north-eastern frontier. In 1556 it was besieged by a Spanish army of 50,000 men, with an auxiliary corps of 8000 English, all under Emanuel Philibert, duke of Savoy. The small garrison under Coligny, admiral of France and governor of Picardie, made a brave defence, but was obliged to surrender after the complete defeat of a French army, which, under the constable Montmorency, had advanced to relieve the place. It was restored to France at the following peace of Cateau-Cambresis

The streets of the town are for the most part of good width, lined with well-built houses; the principal streets end in a large square in the middle of the town, in the centre of which square is a deep and very curious well. The town-house, an antient Gothic building, forms one side of the square, and near it is the cathedral, another fine Gothic building, remarkable for its elevation and the boldness of its architecture; the steeple may be seen in clear weather as far off as Laon, a distance of twenty-four miles. The antient fortifications have been converted into promenades and planted with trees. There are three faubourgs.

The population of the commune of St. Quentin in 1826, was 17,661; in 1831, it was 17,686, of whom 17,096 were in the town; in 1836 it was 20,570. The manufactures are the most important of the department. Cotton-weaving and the spinning of cotton-yarn (in which steam is employed) give employment to at least 6000 persons in the town and neighbourhood, one-fourth men, one-half women, and the rest children. The fabrics are of various kinds, dimities, calicoes, quiltings, muslins, gauzes, &c. The bleaching and finishing of the goods give employment to 700 persons more; there are also bleaching-establishments for linen, of which a considerable quantity is manufactured in this part of France; though this branch of industry is by no means equal to what it was before the Revolution. The dyeing of cotton has been introduced of late years; the goods were previously sent to Rouen for that purpose. Silk and Cashmere shawls are woven in the town; and table-linen, and light fancy-goods in silk, cotton, and wool are manufactured. In the manufactures of the district of which the town is the centre, it is computed that more than 100,000 workmen are employed in spinning or weaving; and 30,000 women and children in the auxiliary processes. (Dupin, *Forces Productives, &c. de la France.*) Soft soap, vitriolic acid, leather, and machinery are made. There are steam flour-mills and oil-presses. The commerce of the town is promoted by the good roads by which it is connected with the neighbouring towns; and by the canal of St. Quentin, which, with other canals, connects the navigation of the Somme, the Aisne, and the Schelde. There are fourteen fairs in the year; one of them lasts nine days.

There are a tribunal de commerce, a chamber of manufactures, a subordinate court of justice, and several fiscal government offices. There are a high school, a society of sciences and arts, a public library of 12,000 volumes, a theatre, a free drawing-school; a course of instruction in mechanics and geometry as applied to the arts has been instituted in compliance with the dying exhortation of the late General Foy. The Benedictine D'Achery, and the Jesuit Charlevoix, known by his histories of New France (Canada), St. Domingo, Japan, and Paraguay, were born at St. Quentin.

The arrondissement of St. Quentin is divided into seven cantons or districts, each under a justice of the peace, and 130 communes; it had, in 1826, a population of 106,285; and in 1831, of 110,770.

QUERCITRON BARK, the bark of the *Quercus tinctoria* or *Quercus nigra* of North America, deprived of its brown epidermis. It was first introduced into England by Dr. Bancroft, and is now one of the most important dyeing materials. This bark contains a yellow colouring matter, mixed with much tannin; the colouring principle amounts to about eight per cent., and may be extracted by water; and, according to Chevreul, this colouring matter may be obtained by gently concentrating the infusion of the bark. It is then deposited as a crystalline matter, which has a pearly appearance as long as it remains suspended in the liquor in which it is formed; Chevreul gives it the name *quercitrin*, but, according to Berzelius, it is not a pure immediate principle. It is stated by the former chemist that quercitrin is slightly acid, as is shown by its restoring the yellow colour of turmeric reddened by lime. It is slightly soluble in æther and more soluble in alcohol. Water dissolves it. The solution is rendered orange-yellow by alkalis; the acetates of lead and copper, and chloride of tin, precipitate it in yellow flocks; sulphate of iron renders it olive-brown, and then precipitates it. Sulphuric acid dissolves quercitrin, and the solution, which is of a greenish-orange colour, is rendered turbid by water. When submitted to dry distillation, quercitrin yields, among other products, a liquid which readily affords yellow crystals of quercitrin unchanged in properties.

The tannin which quercitrin contains is of that variety which gives a green colour with peroxide of iron. Its presence greatly deteriorates the beauty of the yellow colour, because it is precipitated by the same reagents as the colour itself, and gives it a brownish tint. In dye-works therefore the tannin is precipitated by adding a solution of glue to the decoction, in order to precipitate the tannin, and there is thus obtained a more delicate and brilliant yellow, which is afterwards precipitated in combination with alumina or oxide of tin. With the salts of iron quercitrin gives a great variety of olive and drab tints, dependent upon the presence of more or less tannin, and the strength of the decoction employed.

QUERCUS, the Latin word for an 'oak-tree,' which is of frequent occurrence in the Roman writers. It is now, as then, applied to the oak and all the other species associated with it by botanists in one common genus. Quercus differs essentially from Castanea, the chesnut, in having short obtuse stigmata, and from both it and Fagus, the beech, in the cells of its ovary containing two ovules instead of four. It is also distinguished by its acorn or nut being seated in a cup, and not in a close husk; but there are intermediate conditions of this part, technically called the cupule, which render it of less value as a mark of distinction than would at first sight appear. Many of the oaks of the hotter parts of Asia have the acorn completely enclosed within the cupule. Still however the prickly husk of the beech and the chesnut, splitting into valves, may in general be distinguished from the closed-up cup of the Indian oaks.

Oaks, like roses, are scarcely known in a wild state in the southern hemisphere; in the islands of the Indian Archipelago they reach their most southern limits, especially in Java; thence they pass upwards beyond the equinoctial line, and following the eastern parts of Asia, they spread to the westward along the Himalaya Mountains, and reaching Europe, are only arrested by the Atlantic Ocean. On the other hand they find their way to the eastward of their Asiatic origin, and overrun America from Canada and New Albion through California and Mexico, till their progress to the south is stopped by the Isthmus of Darien.

While however the genus is thus extensively distributed, the species are confined within comparatively narrow territorial limits. Many of the Javanese kinds appear to be peculiar to the Indian Archipelago, or only occur near the south-eastern angle of Asia. Those of the Himalayas are perfectly distinct from the oaks of the Trans-Himalayan regions, and have not even been found on the mountains of Persia. Several of the Oriental kinds are known nowhere else, and the American species are quite peculiar to that country.

On this account the species of oak are extremely numerous; probably not fewer than one hundred and fifty; and as always occurs in large genera, they are difficult of distinction by unskilful persons. Nevertheless the universal utility of their timber, and their striking beauty as ornaments of scenery, have caused them to be written upon by persons of little botanical knowledge, and the consequence has been such a confusion and entanglement of the history of even common and well known species, as can only be remedied by a long and patient examination of the genus by a botanist of great practical skill. On the present occasion we can pretend to nothing more than a brief account of those species which are best known, or to which it is most essential that attention should be directed. The reader will find a very elaborate account of the genus in Loudon's *Arboretum Britannicum*, vol. iv., where are wood-cuts of numerous species and an abundance of popular and amusing information.

Although a geographical arrangement of species is not a very scientific mode of treating the subject, we believe it to be the best that we can follow on the present occasion.

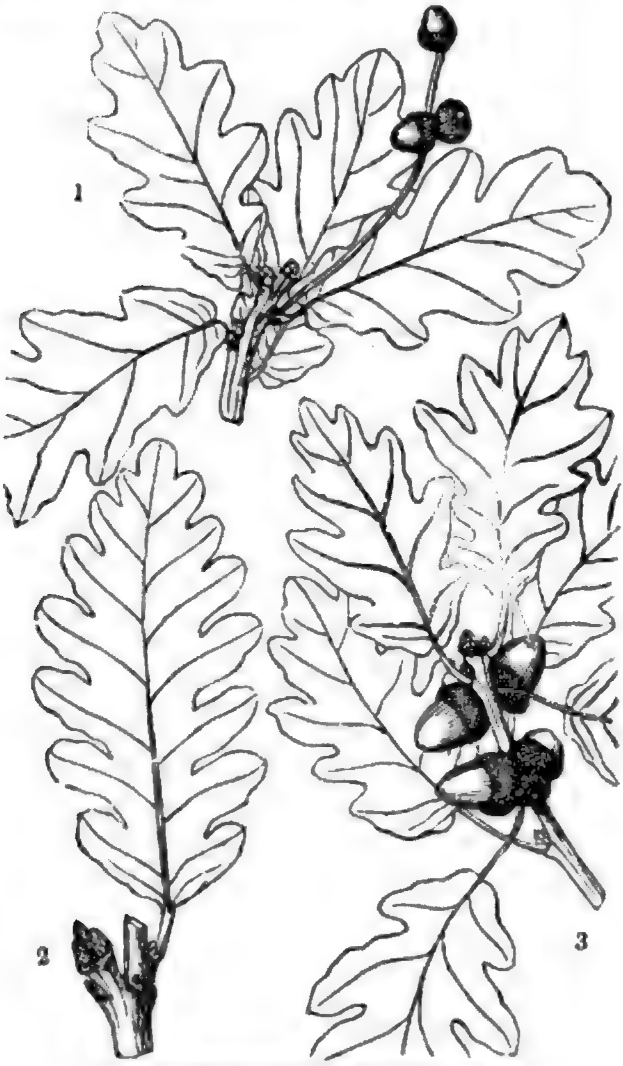
I. *Oaks of Europe, Northern Asia, and Barbary.*

Under this head we include all the more common species of the genus, the greater part of which exist in cultivation in this country. They may be divided into three groups: the *forest oaks*, or *Robora*; the *European oaks*, or *Ilices*; and the *Mossy-cupped oaks*, or *Cerres*.

a. The Forest Oaks (ROBORA).

The species comprehended under this head have deciduous thin leaves, whose lobes are never lengthened into a bristle, and whose acorns are seated in shallow cups, the scales of which are so short and closely pressed to the sides as not to form visible extensions. The wild oaks of England may be taken as the representatives of the others, which differ from them chiefly in the quantity of down upon their leaves, the size of the acorns, and the quality of their timber.

Q. Pedunculata, Common British Oak. Leaves sessile or nearly so, with numerous deep sinuosities and a thin texture, with but little polish on the upper side. Acorns arranged in long stalked spikes. This, which is our commonest oak in England at the present day, appears not to be confined to the colder parts of Europe, as has by some been supposed, for we have specimens before us both from Spain and Hungary, but it is certainly much more common in the north than in the south, where its place is usurped by the next species. It has the reputation of being the *true British oak*, whose timber is alone suited for naval purposes on account of its durability and hardness; but this is a mere fable, the wood of the next species being as suitable in all respects under equal circumstances. But the timber of the oak, like all other wood, is materially affected by the nature of the soil in which it grows, and this has probably given rise to the often repeated assertion that Sussex oak, which chiefly consists of *Q. pedunculata*, is the best kind that can be employed in shipbuilding. The species is readily known by its leaves having very short stalks, or none at all, while the acorns are placed on very long stalks. In consequence of the importance of distinguishing it from *Q. sessiliflora*, we have thought it desirable to introduce a wood-cut of the plant, common as it is.



1, Q. pedunculata; 2, Q. mannifera; 3, Q. sessiliflora.

The *Q. fastigiata* of the gardens is a singular variety, with the branches rising close to the stem, like those of a Lombardy poplar.

Q. sessiliflora, Sessile-cupped oak. Leaves on long yellowish stalks, with numerous sinuosities, and a firm texture; much polished on the upper side. Acorns either altogether sessile or arranged in very short stalked spikes. We have already stated that the timber of this has been supposed, although erroneously, to be inferior to that of *Q. pedunculata*. Experiments as to strength and toughness have shown that there is no material difference between the two in those respects, and the durability of the wood of the sessile-cupped oak is attested by the well known fact, that the roof of Westminster Hall is constructed of it, and not of chesnut, as has been sometimes said. It has been found to be the timber of some of the most antient buildings in this country and elsewhere; an immense beam in an old Shropshire building, now called Stone House, was *Q. sessiliflora*, and the oak usually obtained from bogs, where it must have lain for centuries, has often proved to be the same.

The wood may be easily known by its medullary rays, or silver grain, being so far apart that it cannot be rent, and this gives it quite a peculiar aspect. *Q. sessiliflora* is found all over England now, but nowhere in much quantity. It however is more abundant in the west than elsewhere, and constitutes the greater part of the oak of North Wales. It is a much handsomer plant than the last, and grows considerably faster, and therefore is by far the most advantageous kind for the planter. Its comparative scarcity at the present day may perhaps have arisen from its having been felled in preference as long as any of it remained in the antient forests, which its superiority in size to the other species would render probable, and not having been replaced, it would thus become gradually exterminated. It appears to be still common over all the south of Europe, where however it is not uncommonly mistaken for the last. The supposed species called *Q. apennina* and *Q. microcarpa* are probably varieties of it. What is called the Durmast oak, which has been regarded as a species by some botanists under the name of *Q. atrovirens*, or *intermedia*, seems to us a slight variety of *Q. sessiliflora*, with the leaves pubescent on the under side. It is here in all probability that the classical Esculus of Virgil belongs, for, according to Professor Tenore, a broad-leaved variety, which he calls *Q. robur Virgiliana*, answers in all respects to the language of the poet, and its acorns are sweet, and eaten like chesnuts at this day in Italy, where they are called *Quercia castagnara*. (*Osserv. sull. Flor. Virgiliana*, p. 12.)

Q. pubescens, a native of the southern parts of Europe, has most of the characters of Q. sessiflora, but its leaves are smaller, often quite woolly on the under side, and the lobes are themselves much sinuated. It has been injudiciously confounded with that species, to which it is said to be in all respects inferior in the quality of its timber. It forms a majestic tree, with much the habit of Q. Cerris.

The *Q. Esculus* of Loudon is, no doubt, the same as the last; but what the plant was to which Linnæus applied the name, and which has been supposed by some to be the Esculus of Virgil, is altogether doubtful. Another oak related to the sessile-cupped is the *Q. pyrenaica*, or *Tauzin*, a small scrubby tree inhabiting poor sandy soil in the south of France, and throwing up an abundance of suckers. Its wood is of little value except for the staves of casks. This species is readily known by its grey leaves, the hair of which is remarkably coarse.

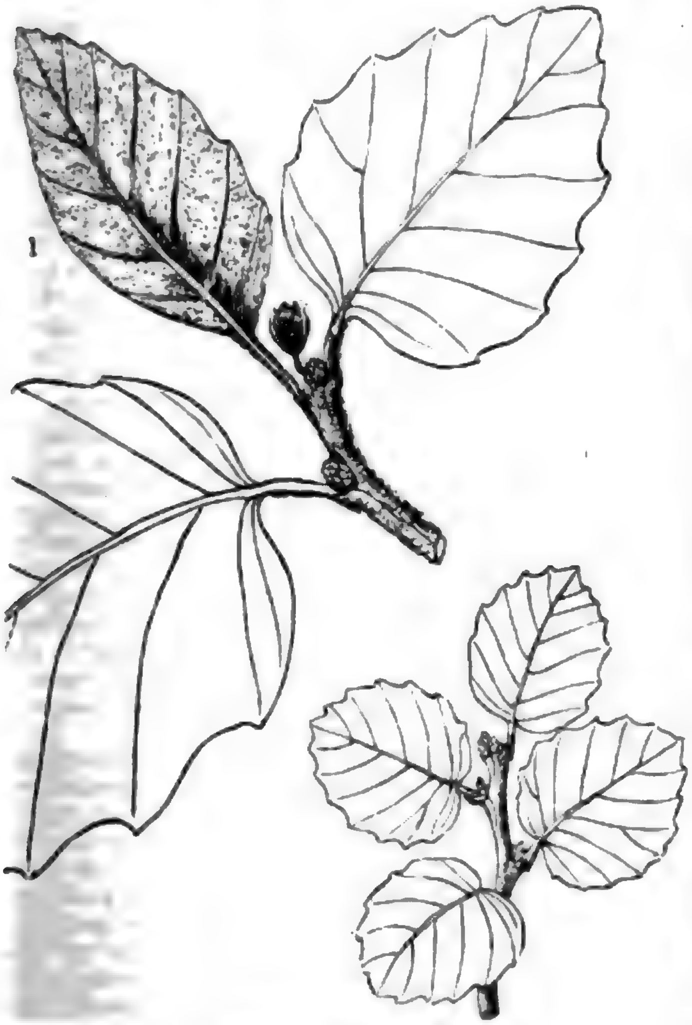
b. The Evergreen Oaks (Ilices).

All the European oaks with leaves truly evergreen belong to this section, which however in some respects approaches the mossy-cupped oaks when the latter acquire a semi-European habit. In such cases they are known by the scales of their cups being very short, and the toothings of the leaves not bristle-pointed.

Q. Ilex, Common Evergreen Oak, or Holm Oak. Leaves ovate-oblong, acute, coriaceous, entire, or serrated, hoary beneath. Bark even. Acorns ovate, on short stalks. A most variable plant, common all over the south of Europe, where it may be found with leaves varying from being as prickly as a holly to being as even at the edge as an olive, and from the size of a sloe-leaf to that of a beech. It loves the neighbourhood of the sea, and in its wild state generally grows singly or in small clusters, not forming forests. Its wood is very hard and heavy, tough, and in all respects of excellent quality, where its weight is not against it. Its acorns are bitter and unfit for food.

Q. Ballota, Sweet-acorn Oak. Leaves elliptical, coriaceous, entire or serrated, very obtuse, white, and downy beneath. Bark even. Acorns cylindrical, elongated. This evergreen oak, says Captain Cooke, is one of the leading vegetable features of nearly all Spain. The native woods are formed of it in a great measure. As a species, it is quite distinct from the Q. Ilex: the leaves are thicker, more rounded at the point, of a dull glaucous green, and the tree is altogether more compact and of a less graceful form. The great and essential difference however is in the acorns, which are eatable, and when in perfection are as good as or superior to a chesnut. To give this sweetness they must be kept, as at first they have a considerable taste of tannin, which however disappears in a few days. These are the edible acorns of the antients, which they believed fattened the tunny-fish on the passage from the ocean to the Mediterranean; a fable only proving that the species grew on the delicious shores and rocks of Andalusia, which unhappily is no longer the case. (Captain Cooke's *Sketches in Spain*, vol. ii., p. 245.) This author says that the name Ballota is from the Spanish *Bellotas*, which means acorns generally. But the Persians have an acorn which they describe under the name of *Shah-bulloot* and *Bulloot-ool-mulik*, and the acorns of Q. incana are sold in Indian bazaars as *Bulloot*, as we learn from Dr. Royle; therefore the name has probably an Eastern origin. This species is the *Q. gramuntia* of Linnæus, and is cultivated in England, but does not bear acorns. We have it also from Algiers. Captain Cooke calls it *Q. Hispanica*.

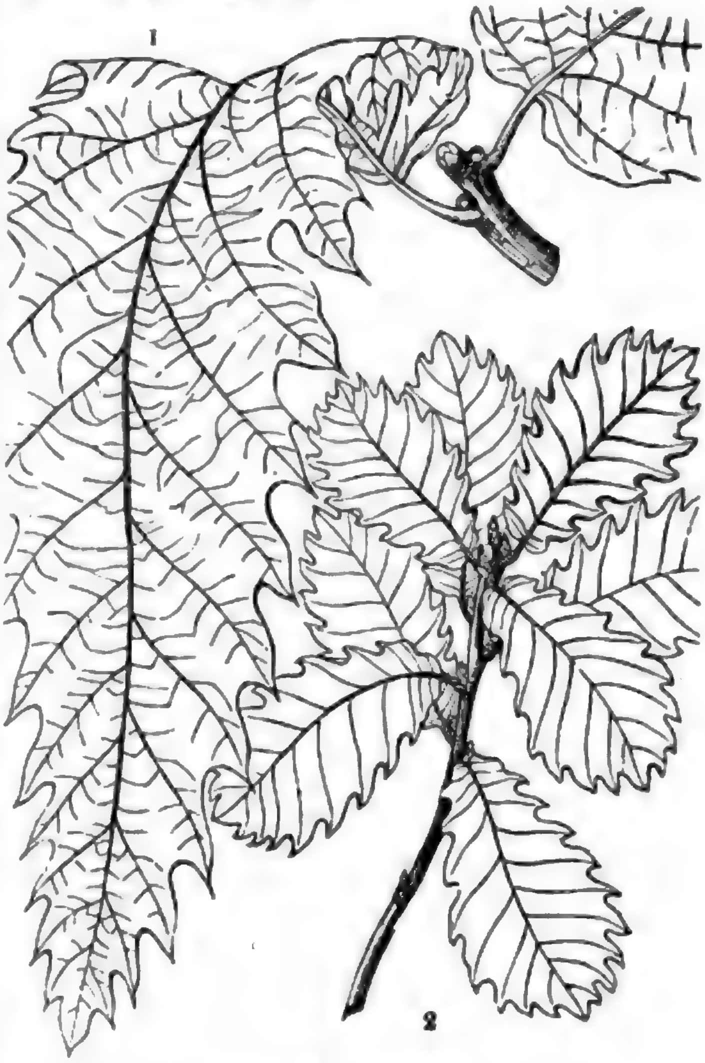
Q. rotundifolia, Round-leaved Oak. Leaves nearly orbicular, with spinous teeth, a little heart-shaped at the base, smoothish above, downy beneath. Very little is known of this plant, except that it is allied to Q. Ilex. Smith and others say it is a Spanish plant, and if so, they probably meant Q. Ballota; but we have before us a Turkish specimen, of which a cut is given, to which the name is very applicable, and which is quite different from that species.



1. Q. Brantii. 2. Q. rotundifolia.

Q. Suber, Cork-tree. Leaves ovate-oblong, bluntish, coriaceous, entire or sharply serrated, downy beneath. Bark cracked, fungous. The Cork-tree is spread through all the warm parts of Spain, but is most abundant in Catalonia and Valencia, whence the principal exports have been made. In the property of forming a spongy soft substance on its bark, it surpasses all other European trees, and hence is of the greatest value for corks and for similar purposes. The form of the tree is said to be much more beautiful than that of the common evergreen oak, and in the districts suited to it attains a great height. The species bears the climate of London, but acquires little of its natural beauty in this country.

Q. faginea, Beech Oak. Leaves on short stalks, obovate, with numerous uniform shallow lobes; downy beneath; when young somewhat heart-shaped and unequal at the base. Fruit sessile. Cup with downy, close-pressed, somewhat ciliated scales. Acorn conical or somewhat cylindrical. A native of Portugal, Spain, and Tangiers, and apparently unknown in our gardens. Mr. Barker Webb, however, who has studied some of the European species with great care, regards it as identical with Q. Turneri, or Q. australis, and if so, we possess it. The same learned botanist reduces to this the Aleppo gall-nut oak, Q. infectoria, and he is probably right.



1, Q. regia; 2, Q. faginea.

Q. coccifera, Kermes Oak. Leaves elliptic-oblong, rigid, smooth on both sides, with spreading, bristly, spinous teeth. Acorns ovate. Cup with spreading pointed scales. A native of the south-eastern parts of Europe, where it forms a small bush, resembling a dwarf holly. It is celebrated as being the haunt of the Kermes insect, which yields so brilliant and permanent a blood-red dye that the old Flemish tapestries, dyed with it two centuries ago, have lost none of their brilliancy. For the manner of collecting the Kermes, and for many particulars concerning it, see Loudon's *Arboretum Britannicum*, p. 1908.

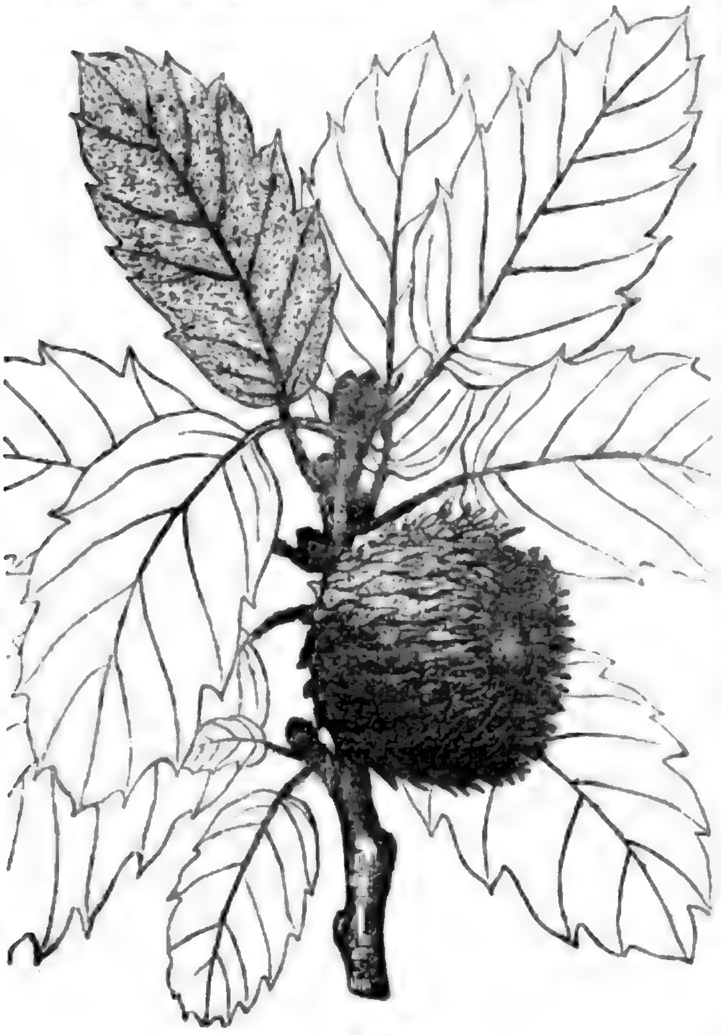
c. The Mossy-cupped Oaks (CERRES)

The species of this section are remarkable for their thin deeply pinnatifid leaves, the long narrow loose scales of their cup, and their equally long deciduous stipules. In this as in other parts of the genus, there is much confusion and uncertainty regarding both the limits of species and the quality of their timber

Q. Cerris, Turkey Oak. Leaves deciduous, on very short stalks, oblong, deeply and unequally pinnatifid; hairy beneath; lobes lanceolate, acute, somewhat angular. Stipules longer than the footstalks. Cup hemispherical, with long loose hairy scales. An exceedingly common plant all over the south-east of Europe, where it seems to form some of the finest specimens of oak. It has an open, straight, graceful mode of growth, very different from the gnarled and tortuous appearance of native British oaks, than which it also grows much faster. It would seem to be unknown in Spain, where its place appears to be taken by the Q. hispanica of Lamarck. The gardens contain numerous varieties, the most striking of which are the half-evergreen Lucombe oaks, said to have been produced between the cork-tree and the Turkey oak, about the year 1762, by Mr. Lucombe, nurseryman, Exeter. This is however a statement that is open to some doubt: see *Q. Hispanica*. The timber of the Turkey oak is beautifully mottled, in consequence of the abundance of its silver grain; and there is reason to believe that it is, under favourable circumstances, equal to that of any other species. At least the Sardinian oak, so much valued and employed for ship-building, has the appearance of being produced by it. It is also reported to be much used for such purposes in Turkey and France. It is however probable that the Adriatic oak, which has turned out so ill in our dockyards, is the produce of the same species in an unfavourable climate. But this is however a matter of probability only, and requires confirmation. It is however certain, that the wood is very handsome, and well suited for indoor ornamental work; this has been found to be the case with the wood grown in England. (*Hort. Transactions*, 2nd series, vol. i., p. 338.)

Q. hispanica, the Spanish Oak. Trunk corky. Branches rather erect. Leaves nearly evergreen, lanceolate, acute, with fine serratures or crenatures, which are sharp-pointed, coriaceous, deep green, glaucous, and downy on the under side. Cups top-shaped, somewhat sessile, with shaggy, prickly, spreading scales. According to Mr. Barker Webb, this plant grows in Spain and by the Algerine river Monchique, and he reduces to it as synonyms the Q. crenata of Lamarck, Pseudosuber of Desfontaines, Ægilopifolia of Persoon, and the Lucombe oak of the English nurseries. He states that its leaves, stiffer fastigiate habit, turbinate cup, much shorter scales, and corky bark, clearly distinguish it from Q. Cerris: as to whether it is evergreen or deciduous, that depends upon the degree of cold to which it is subjected in winter; and he declares that upon comparing the authentic specimens of Desfontaines, Q. pseudosuber, with others cut from the original Lucombe oak, he finds them identical. The latter plant however is stated to have been raised at Exeter from seed between Q. Suber and Q. Cerris, an origin that was impossible in Spain; where however common Q. Suber may be, Cerris is not found in a wild state. We cannot pretend to reconcile these contradictory statements.

Q. austriaca, the Austrian Oak. Leaves on longish stalks, ovate-oblong, slightly but copiously sinuated, downy and hoary beneath; lobes short, ovate, acute, entire. Stipules shorter than the footstalks. Cup hemispherical, bristly. Of this plant, which is found in Austria, Hungary, &c., the leaves are larger and more deeply sinuated than in Q. hispanica, and the acorns are considerably larger; otherwise it is very like that species. It also approaches nearly to Q Cerris, from which the shallow lobes of the leaves, and the stiffer and more bristly scales of its cups, seem to separate it. Hither is no doubt to be referred the Fulham oak of the English nurseries. That it is distinct from Q. Cerris there is no doubt, but it may be the same species as Q. hispanica.



Q. Ægilops.

Q. Ægilops, Great prickly-cupped Oak, or Valonia. Leaves ovate-oblong, with bristle-pointed tooth-like lobes, hoary beneath. Cup very large, hemispherical, with lanceolate, elongated, spreading scales. The Morea and adjacent countries produce this valuable tree, which yields the acorns called velani, or valonia, in commerce, of which nearly 150,000 cwt. are imported yearly for the use of tanners, and sold from 12*l*. to 15*l*. a ton. The tree is reported to be handsome in its own country; but with us, although it has long been cultivated, it is an inelegant tree, of a stunted mode of growth. What has been said of its elegant appearance and so forth, seems to belong to Q. Cerris.

II. *Oaks of the Levant.*

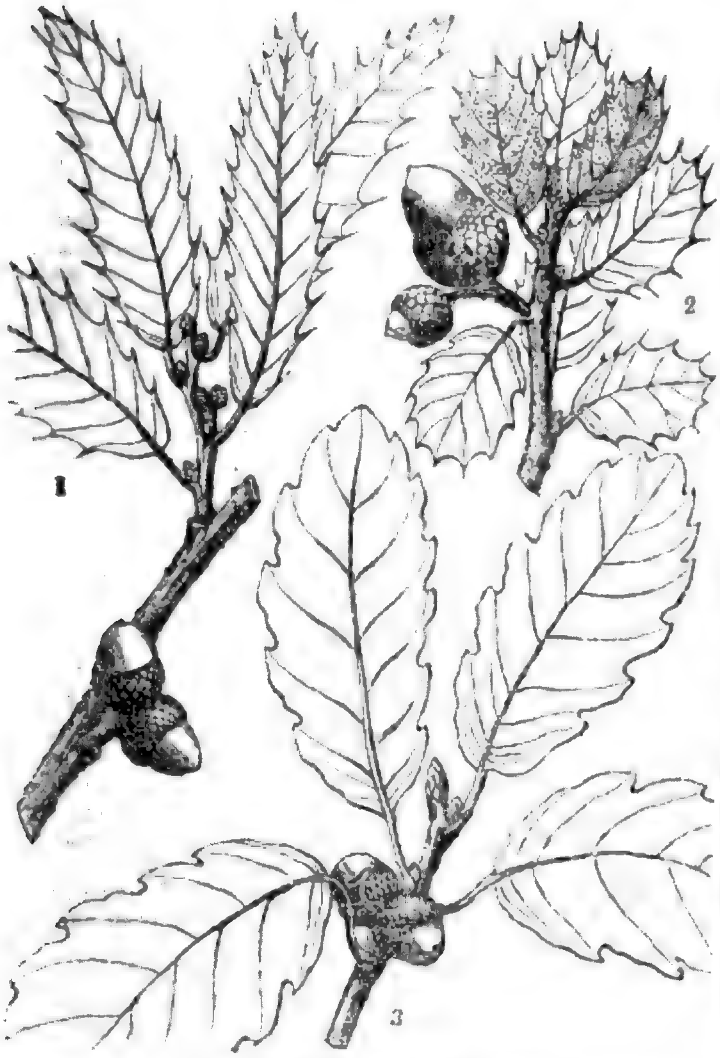
Little has hitherto been ascertained regarding the species of this part of the world. The French traveller Olivier brought home with him a plant very near Q. Cerris, the mossy-cupped oak, which he reported to be met with throughout great part of Asia Minor, and to furnish the wood employed in the arsenal of Constantinople. His specimens were examined by Lamarck, who called them Q. crinita, but little more is known about the species. Another plant, under the name of Q. rigida, has been published from Caramania, where the oaks are said to arrive at a great size and beauty; and the common gall-oak, Q. infectoria, has long been known. But there can be no doubt that the mountainous regions intervening between the Turkish empire and India produce oaks that require investigation, and three perfectly distinct species have in fact been lately sent from Koordistan. Of all that have yet been found in the countries of the East, we shall give a short account.

Q. crinita, Hairy-cupped Oak. Leaves on long stalks, oblong, deeply pinnatifid, downy beneath, lobes lanceolate, bluntish, nearly entire. Cup hemispherical, downy, bristly. A tree of Asia Minor, found by Olivier, and figured in his 'Travels,' t. 12, and said to be the same as an Armenian species met with by Tournefort, and after him called Q. Tourneforti; but this is doubtful. It is described as a large tree yielding excellent timber, employed extensively by the Turks in naval constructions. There is however very little in the accounts hitherto given of the plant to distinguish it from the common Turkey oak, Q. Cerris, with which Mr. Loudon combines it, but not upon satisfactory evidence.

Q. infectoria, Oriental Gall-oak. Leaves ovate-oblong, very smooth on both sides, deeply toothed, somewhat sinuated, deciduous. Fruit sessile. Cup tessellated. Acorn elongated, nearly cylindrical. A very common plant in Asia Minor, where its branches are attacked by an insect, the Cynips scriptorum, which punctures them, and causes the formation of the oak-galls so well known in commerce. It forms a scrubby bush rather than tree, and is of no value except for its galls. Its branches occasionally produce large brownish red tubercles, spongy within, which are by some supposed to be the apples of the Dead Sea, whose appearance was tempting, but which contained only dust and ashes.

Q. rigida, Stiff-leaved Oak. Leaves oblong, undivided, with spinous serratures, smooth, glaucous beneath, heart-shaped at the base. Footstalks bearded at the summit. Scales of the cup rigid, spreading. A native of Caramania, of Koordistan, and, according to Sibthorpe, of the Morea, but the last is doubtful. It is a handsome-looking plant, so far as can be judged from dried specimens, but nothing is known of its uses.

Q. Brantii, Mr. Brant's Oak. Branches, footstalks, and leaves underneath covered all over with thick short wool. Leaves heart-shaped, ovate, acute, with bristle-pointed teeth, ash-coloured, with starry down on the upper side. This is described in the 'Botanical Register' as being a most remarkable plant; the full-grown leaves being six inches long, including the footstalk, and three inches and a half across at the widest part, which is near the base. They are as downy as those of a young plane-tree. The species appears allied to Q. Ballota, a Spanish species.



1. Q. rigida; 2. Q. Ballota; 3. Q. infectoria.

Q. castaneæfolia, the Chesnut-leaved Oak. Leaves oblong-lanceolate, rather downy on the under side, coarsely serrated, with bristle-pointed lobes. Acorns nearly sessile, oblong, with the cups, when old, covered by reversed scales. A tree from the province of Mazanderan, reported to be very beautiful. The leaves are often from four to five inches long. Mr. Barker Webb states that it is the same as what has been called Q. Libani, and that it is remarkable for having large depressed fruit, with wide lozenge-shaped scales turned back at the point.

Q. regia, the Royal Oak. Leaves stalked, ovate-lanceolate, heart-shaped, wavy, with coarse sharp unequal serratures, on each side green, shining, and smooth. The lobes of the leaves terminated by a conspicuous bristle. From Koordistan. It is a noble species, with leaves as large as those of a Spanish chesnut, and very like them.

Q. mannifera, the Manna Oak. Leaves stalked, oblong, somewhat heart-shaped, cut; the lobes blunt, smooth above, downy beneath. Young acorns oval, stalkless, smooth. An inhabitant of the Koord Mountains, where it has lately been discovered by Mr. Brant, the British consul at Erzerum, who found that the Koords obtain a sweet mucilaginous substance from its branches and leaves by steeping them in boiling water at the hottest season of the year, and afterwards evaporating the water. This substance is made into cakes, and sold in the markets of the town of Van under the name of Ghiok-helvashée, 'the sweetmeat of heaven.' The species is very near Q. sessiliflora, especially a form of it which has been named Q. mongholica. See the *Botanical Register* for 1840, p. 39 of the miscellaneous matter.

Q. iberica, the Georgian Oak. Leaves ovate-oblong, downy beneath, sinuated, with short blunt somewhat emarginate lobes. Acorns nearly sessile. Cups hairy, with sharp-pointed scales. A native of Georgia. Bieberstein describes it as a tree with the appearance of Q. sessiliflora, of which he thinks it may be a downy variety. He distinguishes it from Q. pubescens by that species being smaller and more downy, and its young leaves and branches covered with woolliness.

III. *Oaks of the Himalayas, China, &c.*

Although a great deal of information has been collected by Indian botanists concerning the oaks of the cold provinces of India, China, and Japan, so far as the distinction of species is concerned, yet, as none of them have been yet introduced into general cultivation in Europe, although occasional specimens occur in the gardens of collectors of rare plants, and as we know little of the uses to which they are respectively applied, it will not be necessary to dwell upon them at much length. All travellers in the Himalayas testify to the abundance of oaks. The people employed by Dr. Wallich gathered a considerable number of species, and Dr Royle assures us that they are found from moderate elevations up to the limits of trees. Among these, all from the lower regions are, no doubt, too tender for cultivation in Great Britain; but of the Alpine species some may be expected to prove hardy. We shall only notice the following:—

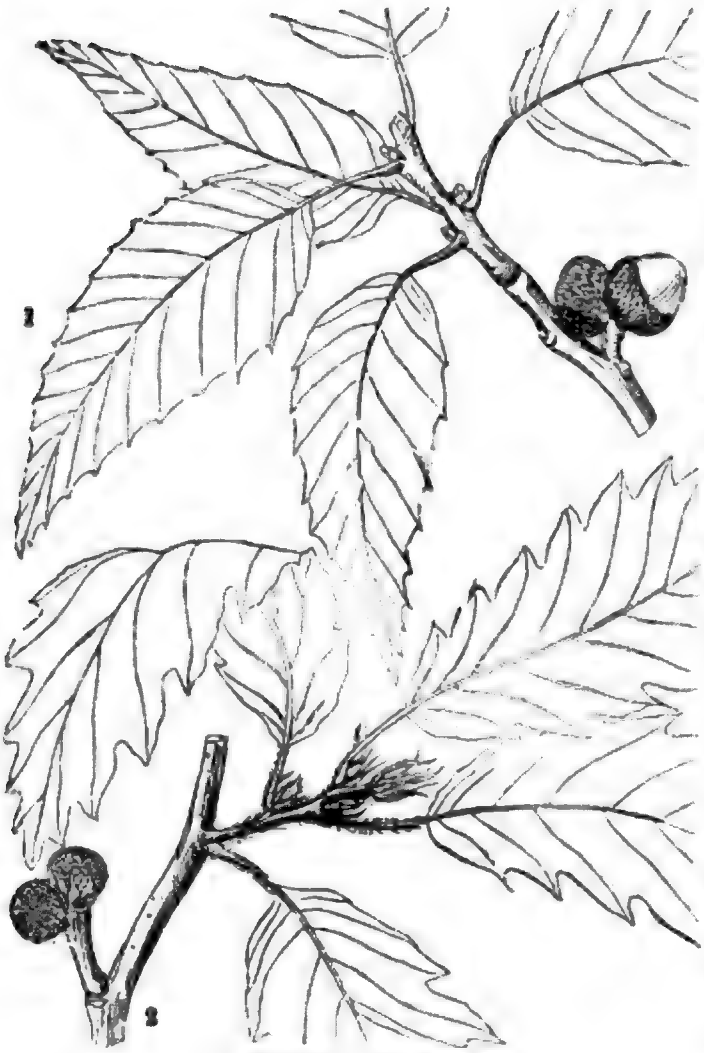
Q. semicarpifolia, Marking-nut leaved Oak. Leaves obovate, obtuse, coriaceous, entire; heart-shaped at the base; downy beneath; the young ones with spinous teeth. Acorns solitary or in pairs, on short downy stalks, depressed at the point, about twice as long as the shallow scaly cups. As this species occurs in the Himalayas at the upper limits of the forests, at even greater elevations than the Pines, it would, no doubt, suit the climate of England; and if so, its introduction would be very desirable, for it is stated to form a magnificent tree, whose timber is much esteemed by the natives. Dr. Wallich reports it to measure frequently 80 to 100 feet in height, with a girth of the trunk, at six feet above the ground, of fourteen to eighteen feet, and he says he has frequently met with individuals of far greater dimensions. See Wallich's *Plantæ Asiaticæ Rariores*, t. 174.

Q. incana, the Himalayan Ilex. Leaves coriaceous, ovate-lanceolate, shining and smooth on the upper side, densely downy beneath, with coarse serratures which are not bristle-pointed. Acorns solitary, sessile, acute, but little protruded beyond the hemispherical downy cup, the scales of which are small and closely pressed. A beautiful tree, very like the evergreen oak of Europe. Its leaves are much more woolly on the under side. Dr. Wallich found it in Kumaon, where the people called it *Munroo*; Dr. Royle states it to be the *Ban* of the hill people, where he saw it, and that it occurs at moderate elevations. It is therefore in all probability tender.

Q. lanata, Woolly-leaved Nepaul Oak. Leaves elliptic-oblong, deep green, sharply serrated, coriaceous; densely woolly beneath. Fruit in very short axillary solitary spikes. Cup scaly, without prickles. This is one of the handsomest oaks yet discovered, and it exists in a living state in the gardens of this country, but, as might be expected from its native localities, it is not hardy enough to bear the climate of London without protection. In the Himalaya Mountains, where it is found wild, it is one of the first species that appears as the mountains are ascended, and it is there associated, according to Dr. Royle, with the Tree Rhododendron. In his 'Arboretum Britannicum,' Mr. Loudon supposes this to be the same as Roxburgh's Q. incana, quite a different plant, not yet known in England in a living state.

Q. annulata, Ring-cupped Oak. Leaves obovate, taper-pointed, serrated in their upper half; somewhat glaucous and silky beneath. Acorns axillary, sessile, ovate, with the cup furrowed concentrically. Plants of this occur in our gardens; but they are too tender for the climate of London. In the Himalayas the species is said to form a very large tree, with excellent timber. The leaves are something like those of a sweet bay-tree, but more glaucous on the under side, and with a longer point. The Parbutties are said to call it *Phullaat*, whence Q. Phullata, one of its names. It may be as well to remark that the fig. 1805, of Loudon's 'Arboretum Britannicum,' p. 1922, given for this species, has no resemblance to it.

Q. chinensis, the Chinese Oak. Leaves ovate-lanceolate, taper-pointed, with bristly shallow serratures, and very long footstalks; slightly downy on the under side. Acorns globose, sessile, in pairs. Cups with hoary lanceolate scales, the exterior of which are reflexed, and longer than the acorn. A beautiful Chinese species, found (by the botanists attached to the Russian mission to Pekin) in mountainous places. It is said to have exactly the habit and appearance of a Spanish chesnut. We give a figure of it from specimens communicated by Dr. Bunge, its discoverer.



1, Q. chinensis; 2, Q. castaneæfolia.

IV. *Oaks of the United States of North America.*

In general these are cultivated in England, where they are found tolerably hardy. They however evidently suffer from want of summer heat, and are by no means of the same value to us as the species of the continent of Europe; and it may be doubted whether any of them are ever, in their own country such noble trees as the finest specimens of Q. pedunculata and sessiliflora. We shall only mention the kinds common in the plantations of Great Britain.

Q. alba, White Oak. Leaves oblong, deeply pinnatifid, glaucous beneath, lobes linear-oblong, obtuse, entire, dilated upwards. Fruit stalked. Cup depressed, warty. A very fine species, producing sweet acorns and excellent timber, and approaching nearer to the European forms than any other American species. Specimens of it in the American forests are often 70 or 80 feet high.

Q. Prinus, Chesnut-leaved White Oak. Leaves on longish stalks, obovate, acute, somewhat downy beneath, with nearly equal dilated, callous-tipped, tooth-like serratures. Cup contracted at the base. Acorn ovate. A tree of considerable beauty, varying considerably according to soil and situation, and hence divided by some writers into many species, called Q. palustris, montana, monticola, acuminata, Castanea, pumila, Chinquapin, prinoides, tomentosa, discolor, &c., under all which names it is propagated in the nurseries. The wood is porous, and not of very good quality, but the broad bright green foliage is handsome.

Q. coccinea, Scarlet Oak. Leaves smooth, oblong, deeply and widely sinuated, on long stalks, lobes divaricated, acute, sharply toothed, bristle-pointed. Cup turbinate, half as long as the acorn. The middle States of North America abound in this and the following species, which derive their name from their leaves becoming in the autumn of a rich crimson colour. It forms a large and graceful tree, but the head wants massiveness. The wood is of very little value, and perishable; it is only employed for fuel and for staves for casks intended to hold dry goods. It grows fast, and stands the climate of even the colder counties of England.

Q. rubra, Mountain Red Oak. Leaves smooth, oblong, sinuated, on long stalks, lobes acute, sharply toothed, bristle-pointed. Cup flat underneath. Acorn ovate. A specimen of this is said by Mr. Loudon to exist at Strathfieldsay 100 feet high; it is very like the last species, but its leaves become more purple in the autumn. Its wood is of bad quality.

Q. tinctoria, Dyer's Oak, Black Oak, or Quercitron. Leaves downy beneath, obovate-oblong, dilated, widely sinuated; lobes short, obtuse, slightly toothed, bristle-pointed. Cup flat underneath. Acorn globose. A native of Pennsylvania and of the mountains of the Carolinas and Georgia, where it becomes a very large tree, with a bark so dark-coloured as to have gained for it the name of black oak. The leaves are large and very handsome, becoming dull red or yellow in the autumn. Its wood is strong, but very coarse. The inner bark abounds in a yellow dye of great brilliancy, which is known in trade under the name of quercitron; large quantities of it are annually imported from Philadelphia.

Q. Phellos, Willow Oak. Leaves membranous, linear-lanceolate, tapering to each end, entire, smooth, with a small point. Acorn roundish. Low swampy forests on the sea coast of the southern states of North America. A large tree with something the aspect of a willow, whence its name. Its timber is stated to be strong, but very coarse. Q. laurifolia and imbricaria are nearly related to it.

Q. virens, Live Oak. Leaves coriaceous, elliptic-oblong, revolute, entire, pointless; obtuse at the base, clothed with starry down beneath. Fruit stalked. Acorn oblong. A very valuable species, confined to the Southern States of the North American Union, where it is most abundant upon the shores of creeks and bays. It is also abundant in Texas. The Live Oak yields the best oak of America, the timber being heavy, compact, and fine-grained; and is extensively employed in the American dockyards, although it does not usually acquire a large size. The acorns are stated to be remarkably sweet. It is much too tender to suit this climate; and consequently specimens are to be found only in curious collections in sheltered warm situations.

V. *Oaks of Mexico.*

These are extremely numerous, and must in many cases form highly ornamental trees. Several species have recently been introduced by the Horticultural Society, but we at present know nothing of their habits. It is to be feared that they will in general prove too tender for England.

Q. acutifolia, Sharp-leaved Oak. Leaves heart-shaped, lanceolate, tapering to a very sharp point, with coarse pointed teeth, covered with rusty down on the under side, especially along the principal veins. Young acorns in spikes, which have a short footstalk. Forests of this tree occur on the road from Acapulco to Mexico, where it is called *Aguatle*. It is described as a large tree producing timber of excellent quality.

Q. sideroxyla, the Iron-wood Oak. Leaves oblong, somewhat wedge-shaped, obtuse at the base, armed towards the upper end with sharp-pointed teeth; hoary on the under side. Acorns sessile, ovate, seated in a roundish cup. Found in Mexico, near Guanajuato, and in other places, in dry barren places 6000 or 7000 feet above the sea. It forms a large tree of great beauty. Its timber is very hard, takes a fine polish, and is extremely durable when used under ground or when sunk under water.

Q. lanceolata, the Lance-leaved Oak. Leaves lance-shaped, entire, wavy, shining on the upper side, strongly bearded beneath at the principal angles of the veins. Acorns oval, sessile, in goblet-shaped cups. Common in Mexico at the height of 5000 or 6000 feet. It is a large tree, producing a very hard wood, very durable when used under ground, and extensively consumed in mining operations.

Q. glaucescens, Blue-leaved Oak. Leaves on very short stalks, wedge-shaped, obovate, entire near the base, slightly toothed and indented at the edge, glaucous, very smooth. Acorns in racemes. Common in Mexico at the height of 2000 feet above the sea; its wood furnishes the greater part of the charcoal used in that country.

Q. obtusata, the Blunted Oak. Leaves oblong, blunt at each end, unequal at the base, bent inwards near the middle, on the under side strongly veined, and covered with a powdery down. Acorns spherical, in axillary racemes, almost entirely covered by a scaly cup. A fine tree, native of the Mexican mountains 6000 feet above the sea. Wood very compact and strong, and capable of taking a fine polish.

Q. macrophylla, Large-leaved Mexican Oak. Leaves obovate, crenate, tapering and heart-shaped at the base, downy beneath. Fruit spiked. This is doubtless the finest oak in the world. It inhabits the southern parts of Mexico and Guatemala, and has leaves 12 to 18 inches long, and broad in proportion. Its acorns are as large as French walnuts; they have been received in this country by the Horticultural Society, but unfortunately would not vegetate.

For detailed information concerning the species of oaks, the reader is referred to Blume's *Flora Javæ;* the article 'Quercus' in Rees's *Cyclopædia;* Webb's *Iter Hispanicum;* Humboldt and Bonpland's *Plantæ Æquinoctiales;* and Loudon's *Arboretum Britannicum*, vol. iv.

QUERCUS PEDUNCULA'TA (Willd). The bark of this species, the true British oak, is used in medicine. Its appearance varies with the age of the bark, as well as of the tree from which it is obtained. Its excellence is determined by the period of the year when the tree has been barked. The best is obtained from coppice oaks, not from old or full-grown trees, and is better from the branches than the trunk. According to Sir H. Davy, the greatest quantity of tannin exists in the bark in spring, at the time when the buds begin to open (*Agricul. Chemistry*, 4th ed., p. 87), which is confirmed by Biggins. This is the period usually selected to decorticate the trees, owing to the greater ease with which it is then effected, the cambium which exists between the bark and wood allowing of their easier separation. The interior cortical layers are much richer in the active principles than the external ones.

Oak-bark is commonly met with in pieces from one to two feet long. That from young stems or branches is generally thin, tolerably smooth, having a silvery or ash-grey cuticle, and frequently clothed with lichens, chiefly of the genus Verrucaria or Opegrapha. When newly detached it is whitish internally, but by exposure to the air it deepens into brown, and becomes fibrous and cracked. The bark of old stems is much thicker, very rough and cracked, and greatly inferior in quality. The chief chemical constituents are: tannin (impure tannic acid), tannates of lime, magnesia, potash, &c., gallic acid, uncrystallizable sugar, pectin, and lignin. It has the peculiar and well known odour of tan, and a bitter astringent but afterwards sweetish mucilaginous taste.

Oak bark possesses all the properties of astringent substances, except the power of decomposing tartar-emetic. [ASTRINGENTS; ANTIMONY.] It is more employed externally than internally as a wash or injection. By long continued application, it can almost tan the living tissue, and either strengthen a weak part of the skin, or convert a secreting into a non-secreting surface, as in cases of prolapsed or inverted uterus. One of the most valuable applications, and at the same time cheapest, to surfaces threatened with gangrene from pressure, as in fevers, or old bedridden persons, is a wash formed by digesting oak-bark in weak distilled vinegar, and after straining, adding hydro-chloride of ammonia. It is not only unnecessary but injurious to make a decoction of oak-bark: no tanner would think of boiling his oak-bark before steeping his hides it.

Powdered oak-bark with chamomile flowers is a cheap and often effectual mode of checking the paroxysms of agues. (Cullen's *Mat. Med.*; Pereira's *Mat. Med.*)

QUERCUS INFECTO'RIA. [GALLS.]

QUERCY, a district forming part of the antient province of Guienne. [GUYENNE AND GASCOGNE.] It was bounded on the north by Limousin, on the north-east by Auvergne, on the east by Rouergue (another subdivision of Guienne), on the south by Languedoc, on the west by Agenais, and on the north-west by Perigord (the two latter being subdivisions of Guienne). The district of Quercy was subdivided into Le Haut (or Upper) Quercy, which comprehended the chief town Cahors (population 12,417), Gourdon (population 5334), Figeac (population 6237), and other places; and Le Bas (or Lower) Quercy, which comprehended the chief town, Montauban (population 23,865), Moissac (population 10,618), and other towns. The population is according to the census of 1836.

Le Quercy was chiefly comprehended in the territories of the Cadurci, a Celtic people, from whom its name by corruption is evidently derived. It belonged successively to the Visigoths and the Franks; and was in the possession of Eudes, duke of Aquitaine, who was driven from it by Pepin. It was erected into a county by Charlemagne, and subsequently came into the hands of the counts of Toulouse. Having been wrested from these in the wars against the Albigeois, it was ceded to the English, from whom it was taken by Charles V. It is now included in the departments of Lot and of Tarn et Garonne.

QUERE'TARO, a town in Mexico, in the state of Queretaro, is situated near 20° 32′ N. lat. and 100° 10′ W. long., on the table-land of Anahuac, at an elevation of 6362 feet above the sea. The town with its suburbs contains a population of between 30,000 and 40,000. It is rather a well-built place. The site is not quite level, nor are the streets laid out with much regularity, but they abound with fine buildings and large churches and convents. The finest edifices are the churches of Guadalupe, and the convents of S. Francisco and Santa Clara, the latter of which contains 250 females, consisting of 70 nuns, and as many young ladies sent there for their education, with lay sisters and attendants. In the middle of the town is a great square surrounded with well-furnished shops. The suburbs consist of mud houses, with only one mud floor, and are almost exclusively inhabited by Indians, the number of whom is said to amount to 12,000. The town is well supplied with water from a spring in the mountains, about ten miles distant: the water is conveyed by an aqueduct, which rests on lofty light and bold arches, and its vast extent gives it an air of great magnificence. About three or four miles from the town is one of those deep depressions which frequently occur on the table-land, and which are so much below its general surface that they are partly clothed with the vegetation of a *tierra caliente.* This depression is called El Pareo de la Cañada, and is used by the inhabitants as a place to take their evening walks in.

Cotton and woollen stuffs are made; but these manufactures were formerly of much greater extent than they are at present. Humboldt states that the goods manufactured in this town at the end of the last century amounted annually to 600,000 Spanish dollars (135,000*l.*). Though the cotton-manufactures have much decreased since the ports have been opened and the English have got into the market, there are still made a great number of *mantas* and *rebozas*, or cloaks for men and women. The manufactures are divided into two classes, the *obrages* and *trapiches;* the former comprise all the establishments that can employ from ten to thirty looms, and the latter those in which only two or three are in activity. Part of the manufactured goods is retailed in the great plaza, where a market is held every evening by torchlight, and part is sent to the capital and other large towns of the Confederation. The woollen-manufactures are now principally kept up by a government contract for supplying the army with clothing. Wool as well as cotton is brought from the states lying farther north, but the best wool is the produce of the state of Queretaro. The town also carries on a considerable commerce in corn and potatoes, as it is situated in the eastern district of the tract called Baxio, which is the richest in agricultural produce in the United Mexican States, and great quantities of corn and potatoes are sent to the mining district, which comprehends the the eastern part of the state.

(Humboldt, *Essai sur la Nouvelle Espagne;* Ward's *Mexico* in 1827; Poinsett's *Notes on Mexico;* Hardy's *Travels in the Interior of Mexico; Sketch of the Customs and Society of Mexico.*)

QUERI'NI, A'NGELO MARI'A, CARDINAL, born at Venice, of an illustrious patrician family, in 1680, studied first at Brescia under the Jesuits, and at the age of seventeen entered the Benedictine order. Having become well acquainted with Greek, Hebrew, and biblical learning, he was made instructor of the novices, for whom he wrote a dissertation, 'De Mosaicæ Historiæ Præstantia.' He afterwards travelled during four years in France, England, Holland, and Germany, and enjoyed the society of some of the most distinguished men of those countries. In his 'Commentarii de Rebus ad se pertinentibus,' he gives some account of what he saw, and the conversations he had with many learned men. On his return to Italy, he published several works on liturgic antiquities:—1, 'Vetus Officium Quadragesimale Græciæ Orthodoxæ;' 2, 'Diatribæ ad priorem partem veteris Officii;' 3, 'De Ecclesiasticorum Officiorum apud Græcos Antiquitate;' 4, 'De Hymnis Quadragesimalibus Græcorum;' 5, 'De aliis Canticis Quadragesimalibus.' In the year 1721 Querini was made archbishop of Corfu; and he illustrated the antiquities and history of that island in his 'Primordia Corcyræ' and other works. In 1728 he was transferred to the see of Brescia, and soon after he was made a cardinal, and librarian of the Vatican. It was after his promotion to the see of Brescia that he wrote his literary history of Brescia, 'Specimen Brixianæ Litteraturæ quæ post Typographiæ Incunabula florebat,' 1739. He also published the Lives of Paul II. and Paul III., in the former of which he endeavoured to clear the memory of that pope from the charges of Platina and other historians [Paul II., Pope]; and he edited a collection of the epistles of Cardinal Reginald Pole. His other works consist of dissertations upon literary subjects, both sacred and profane, and of numerous epistles, chiefly in Latin. Cardinal Querini was in every respect one of the most distinguished prelates of the Roman church in the eighteenth century. Spotless in his morals, modest and simple in his habits, generous, meek, and charitable, he conciliated the esteem of men of all countries and opinions. Frederic the Great wrote to him in the most flattering terms. Voltaire dedicated to him his tragedy of 'Semiramis' and other works. Querini laboured particularly to improve the town of Brescia, of which he was bishop: he completed the structure of its handsome cathedral, founded a clerical college, a house for female instruction in the Val Camonica, and, lastly, he established the public library of Brescia. He sent donations to Berlin to complete the Catholic church there. By his will he bequeathed his property to benevolent purposes. Cardinal Querini died in 1755, generally regretted. (Corniani, *Secoli della Letteratura Italiana*.)

QUERQUE'DULA. [Ducks; Teal.]

QUE'RULA. [Muscicapidæ, vol. xvi., p. 11.]

QUERULI'NÆ. [Muscicapidæ, vol. xvi., p. 11.]

QUESNAY. [Political Economy.]

QUESNOY, LE. [Nord.]

QUEVEDO Y VILLEGAS, FRANCISCO GOMEZ DE, an eminent Spanish satirist, was born at Madrid, in September, 1560, not in 1570, as the authors of the biographical notice printed at the beginning of his translated works (Edin., 1798) erroneously assert. His father Pedro Gomez de Quevedo had been secretary to the empress Mary, and afterwards filled the same situation to Queen Anne, wife of Philip II. His mother Doña Maria de Santibañez was lady of the bedchamber to the queen. Both were of noble family, and descended from the most antient landed proprietors in the Valle de Toranzo. His father having died when he was a child, Quevedo was brought up in the royal palace by his mother. He was sent early to the university of Alcalá, where he made such progress in his studies that he took his degree of doctor in theology at the age of fifteen, a fact which would appear almost incredible. Grown weary of theology, Quevedo applied himself with ardour to the study of civil and canon law, medicine, and natural history; the learned languages, and the various systems of philosophy were also in the number of his acquirements. It is probable that at this period of his life he injured his sight by constant reading, for he was ever after incapable of distinguishing any object at the distance of three paces without the aid of glasses. But neither this deformity nor the crooked legs which he received from nature deterred him from mixing in fashionable society, and being considered a very accomplished cavalier. He is said to have been very gallant towards the fair sex, but exceedingly jealous of his honour and that of his friends; he could wield all weapons of defence with singular dexterity; and as he was endowed with much strength and courage, he remained victorious in several encounters. In one instance however his antagonist, who was a man of quality, having been severely wounded, Quevedo was compelled to quit the court, and repair to Naples, where he was kindly received by the Spanish envoy Don Pedro Giron, duke of Osuna, who not only retained him in his service, but procured his pardon at Madrid. Whilst at Naples, Quevedo executed some very important commissions with which he was entrusted by the viceroy. He crossed the sea seven times as ambassador to Madrid, and went also to Rome on a secret mission. It is even said that he was concerned in the celebrated Bedmar conspiracy at Venice, which city he entered disguised as a beggar. [Venice.] On the fall of his patron, who was recalled to Madrid, and cast into a dungeon, where he ended his days, Quevedo returned to court; but scarcely had he arrived there when he was himself arrested, and confined to his country-seat, la Torre de Juan Abad, upon the charge of being the author of certain libels on the government. After three years of close confinement, Quevedo's papers having been examined, and his innocence proved, he was allowed to revisit the court; but, tutored by experience, he refused many important offices that were offered to him, and continued to lead a country life wholly devoted to literary pursuits. It is probable that at this period he wrote the poems which appeared afterwards under the feigned name of El Bachiller la Torre. He soon after wrote his 'Politica de Dios y Govierno de Christo, which he dedicated to his patron the Duke of Osuna, and which was printed for the first time at Barcelona in 1629, 8vo. Quevedo was upwards of fifty years of age when he married; but his wife, to whom he was tenderly attached, did not live long. This induced him to revisit Madrid, where in 1641 he was again arrested on the charge of libel, and cast into prison, where he remained for nearly two years. At last Quevedo having appealed for justice to the Conde Duque de Olivares, the all-powerful minister and favourite of Philip IV., his case was for the first time investigated, when it was ascertained that the libellous publication attributed to him was the production of an obscure monk. He was consequently released, and allowed to retire to his country-seat; but the loss of a considerable portion of his fortune, which had been sequestrated during his confinement, and a chronic disease contracted in his prison, shortened his days, and he died some time after, in the neighbouring town of Villanueva de los Infantes, on the 8th of September, 1645, at the age of sixty-five.

Quevedo was undoubtedly one of the best writers of his age; and, with the exception of Cervantes, no Spanish author has ever displayed more originality in his writings. He excelled equally in verse and prose. 'His heroic pieces,' says Nicolas Antonio (*Bib. Nov.*, vol. i., p. 460) 'have great force and sublimity; his lyrics, great beauty and sweetness; and his humorous pieces, a certain easy air, pleasantry, and ingenuity of turn which is really delightful to the reader.' He appears as the rival of Gongora in numerous comic *letrillas* and romances in the old national style. But it is as a prose writer that Quevedo has acquired fame out of his own country. His prose writings are of two sorts, serious and comic: the first consist of pieces written upon moral and religious subjects; the latter are satirical and full of wit and humour; the style however in which they are written is at times so quaint as to be almost unintelligible to strangers. They were nevertheless translated into almost every language of Europe. His *Sueños*, or Visions, enjoyed the greatest celebrity. They consist of various visions of the other world, in which the author sees the end of earthly vanities, and the punishment that awaits crime. Great knowledge of human nature is displayed in them; and as to wit and humour, they are almost inimitable. Shortly after their first appearance (Mad., 1649) they were translated into German by Moscherosch. They were subsequently put into English by Sir Roger l'Estrange (Lond., 1668, 8vo.), and were so well received by the public, that in 1715 there appeared an eleventh edition of them. A new translation of them was published by Pineda (Lond., 1734, 8vo.). Lastly an edition in three volumes small 8vo. was published at Edinburgh in 1798, containing the following works by Quevedo, besides his Visions: 'The curious history of the Night Adventurer,' 'The Life of Paul the Spanish Sharper,' 'Fortune in her Wits,' 'Proclamations by All-Father Time, a treatise of all things whatsoever, past, present, and to come,' Letters on several occasions, &c. The works of Quevedo have been repeatedly printed in and out of Spain. The first edition of his collected works appeared at Madrid in 1649-64, 2 vols. 4to. They were then reprinted at Brussels in 1660-61, 3 vols. 4to., with a portrait of the author, and afterwards at Antwerp in 1669. A princely edition, with many important additions, was published at Madrid, by Harra, in 1772, 6 vols., in large 4to; but the best is undoubtedly that of Sancho, in 11 volumes, 8vo. (Mad., 1790-94), as it contains much that is not to be found in any of the preceding ones. Several detached pieces by Quevedo, till then inedited, were published about the close of the last century, in the first, third, sixth, and fifteenth volumes of the collection entitled *Semanario Erudito*; a few also of his fugitive poems may be found in the *Parnasso Español*. Quevedo wrote also several dramas and some historical works, but these have been lost to literature. Indeed there is every reason to believe that we possess in print but a small portion of Quevedo's writings, since his friend Antonio de Tarsia, who wrote his life (Mad., 1663), informs us that 'not a twentieth part of Quevedo's writings had then escaped destruction.'

('Vida de Quevedo por el Abad de Tarsia,' in the 6th volume of the 'Obras de Quevedo,' Madrid, 1772; Nicolas Antonio, *Bib. Hisp. Nov.*, vol. i.; Quintana, 'Poesias Selectas Castellanas.')

QUI TAM. In those statutes by which certain acts are prohibited under a penalty, it is usual to encourage the enforcing of the penalty by appointing the whole or some part of it to be paid to the person who shall take the risk and trouble, and incur the odium, of bringing the matter before a court of law. Where the part of the penalty not given to the informer is directed to be paid over to the poor of the parish, or to be applied for other purposes, the informer may, if he think fit, sue in his own name only; but where a part commonly a moiety, is given to the king, the proceeding is in the following form: 'A. B., who, as well (qui tam) for our lady the queen as for himself, in this behalf prosecutes, complains,' &c.

When a qui tam or other penal action is commenced, no other person can afterwards sue the defendant in respect of the same offence, whatever the result of the first action may be. It is therefore not unusual for offenders against penal statutes to seek to protect themselves by procuring one of their friends to sue. This however will be of no avail against a subsequent informer suing *bonâ fide*, provided the fraud and collusion in getting up the first action can be shown.

QUIA EMPTO'RES. [FEUDAL SYSTEM, p. 246.]

QUIBERON. [MORBIHAN.]

QUICK HEDGES. [HEDGE.]

QUICKSILVER. [MERCURY.]

QUIETISM is the name of the doctrine of certain ascetic Christians, who taught that the chief duty of man was to be wrapped up in the continual contemplation and love of God, so as to become totally independent of outward circumstances and of the influence of the senses, and they contended that when a man arrived at this state of perfection, the soul had no further occasion for prayer and other external devotional practices. Quietism is in fact the extreme of asceticism and of contemplative devotion. There have been men so disposed in all ages of Christianity, without forming a sect, and even the Mohammedans and Brahmins have their Quietists; but it was a Spanish priest called Michael Molinos, in the seventeenth century, who first embodied the principles of Quietism in his works, which were condemned at Rome, where the author was imprisoned and died in 1696. About the same time Madame Guyon, or Guion, in France, showed herself a great advocate of Quietism. Her maiden name was De la Mothe, and she was of a noble family of Auvergne. She married a wealthy man of the name of Guion, who after a few years left her a young widow with three children and a large property. Madame Guion had been from her youth piously inclined, and after her husband's death she became an enthusiast. Her spiritual director, Father Lacombe, shared the same feelings, and he wrote an ascetic work, entitled 'Analyse de l'Oraison Mentale.' Jean d'Aranthon, titular bishop of Geneva, knew Madame Guion, and esteemed her much, but he did not altogether approve of the vehemence of her zeal, and of her endeavours to introduce her devotional system into various convents. The monks particularly objected to the disuse of external forms of devotion, without which, they contended, it was impossible to keep up the internal warmth of piety, and they contended also that it was impossible to continue in a perpetual state of contemplation. Madame Guion, having fixed her residence at Paris about 1688 or 1689, became acquainted with several ladies of rank, and among others with Madame de Maintenon, and also with the Abbé de Fénélon, who was then preceptor of the young duke of Burgundy. In a work entitled 'Moyen court et très facile de faire Oraison,' Madame Guion insisted upon the necessity of praying internally with the heart rather than with the lips, and she declared that without internal prayer all other religious practices were useless. There seems to be nothing indicated by the title of this work, which has not been recommended by many of the most exemplary Christians and divines, from the age of the apostles to the present day, among whom are several whom the Church of Rome numbers among its saints. Another work of Madame Guion, 'Les Torrents Spirituels,' is a continuation of the former, and she wrote also an interpretation of Solomon's Song, in an allegorical and mystical sense; a task which appeared rather awkward for a pious lady, but which she evidently undertook with all purity and sincerity. Bossuet however thought that there was much reprehensible matter in her works in point of doctrine, and caused her to be confined in a monastery in the year 1695, and obliged her to sign a condemnation of several passages, or rather an explanation of them in an innocuous sense, which she readily did. After six months she was restored to liberty; but she was again arrested, by order of the archbishop of Paris, and sent to the Bastille, where she was detained for several years. The archbishop styled the contents of her books 'a monstrous and diabolical system.' Fénélon undertook her defence, and this led to a hot controversy between him and Bossuet, and ended in the condemnation of Fénélon by Rome in 1699. [FENELON.] Madame Guion was at last liberated, and retired to Orleans to live with some friends. She died in 1717. (*Préface Générale*, prefixed to the *Opuscules Spirituels de Madame de la Mothe Guion*, Cologne, 1704.)

QUIETUS was the son of Macrianus, an officer of distinction in the service of Valerianus. When that emperor was defeated and taken prisoner by the Persians (A.D. 260), the soldiers offered the empire to Macrianus the elder, who refused it on account of his age, but accepted it for his two sons Macrianus the younger and Quietus. In the meantime, Gallienus, the son of Valerianus, had been proclaimed Augustus at Rome; but his authority was not acknowledged beyond the limits of Italy, and numerous usurpers arose in the various provinces of the empire, who have been styled 'the thirty tyrants.' Aureolus, one of these, attacked the two Macriani, father and son, on their march through Thrace, defeated them, and put them to death. Quietus, who was a mere youth, appears to have remained behind in Asia. Being seized by Odenatus, prince of Palmyra, who assumed the command of the Roman armies in the East, he was put to death. (Trebellius Pollio, *Triginta Tyranni*, in *Historia Augusta*.)

Coin of Quietus.
British Museum. Actual size.

QUILIMANE. [MOZAMBIQUE, COAST OF.]

QUILLEBŒUF. [SEINE INFERIEURE.]

QUILO'A, called at present by the natives Keelva, is on the east coast of Africa, near 9° S. lat. and 39° 30′ E. long. It was a large town when the Portuguese first visited these countries, and the king held the sovereignty of Sofala, Mozambique, and the intervening ports. In 1505 it was taken by Francisco de Almeida, after a desperate resistance on the part of the inhabitants, which induced him to burn the town. Since that time it has never had any degree of prosperity. At a later period the Portuguese erected a fort, but the bad climate soon obliged them to abandon it. Quiloa is now a miserable village, subject to the Iman of Muskat. Part of the walls of the city still remain in a tolerably perfect state, and there are also the ruins of some extensive buildings. The fort, which still exists, and is garrisoned by the Arabs, is a substantial building of stone, and capable of containing a numerous garrison. The harbour is one of the finest on the coast, but has no anchorage outside, as the water is unfathomable. It consists of a wide basin, which branches off into several arms, which run a considerable distance inland. (Owen's *Narrative of a Voyage to explore the Shores of Africa, Arabia, and Madagascar*.)

QUILON. [HINDUSTAN, vol. xii., p. 204.]

QUIMPER, or more fully **QUIMPER CORENTIN**, a city in France, chief town of the department of Finistère, one of the departments into which Bretagne has been divided. It is at the junction of the river Benaudet with the Odet, which here becomes navigable; 294 miles in a direct line west by south of Paris, or 319 miles by the road through Versailles, Dreux, Alençon, Mayenne, Fougères, Rennes, Plöermel, Hennebon, and Quimperlé; in 48° 0′ N. lat. and 4° 9′ W. long.

The name Quimper (Kimper), which in the Celtic tongue denotes 'junction,' indicates that the town is of Celtic origin, and is descriptive of its situation. In the 'Notitia Provinciarum Galliæ,' it appears under the name Corisopiti, or rather that name belonged to the nation whose chief town it was, and who appear to have been either a subdivision of the Osismii, or else subject to them. In the Latin of the middle ages the diocese established here was called Corisopitensis, while the town itself was called Confluentia, which is a translation of its Celtic name. It has been successively called Quimper Odet and Quimper Corentin, and was capital of the county of Cornouailles in the middle ages. In the war of the Breton succession, about the middle of the fourteenth century, Quimper suffered much. Charles de Blois exercised the greatest cruelties there, and the greater part of the inhabitants were slaughtered. It was besieged by the English auxiliaries of De Montfort, but did not surrender till after the decisive victory of Auray, A.D. 1364. In the Breton war, the sequel to the war of the League, Quimper embraced the party of the duke of Mercœur, but submitted in 1595 to Henri IV.

The town is divided into the old town and the new town. The old town, situated on a rising ground, in the angle formed by the junction of the two streams, is surrounded by antient walls and towers: it has narrow streets, with the upper stories of the houses projecting over the street: the quay is lined with houses of Gothic architecture and irregular construction. The new town has wider streets than the old town; it is commanded on one side by rocky heights, rising to the height of 500 or 600 feet, covered with wood and heath, and of picturesque appearance. The cathedral, rebuilt early in the fifteenth century, is one of the noblest churches in France: the other principal buildings are the town-hall, the hospital, the barracks, and the college. There is a public walk.

The population of the commune, in 1826, was 10,032; in 1831, 9860; in 1836, 9715: showing, by its gradual diminution, the decline of the town. Quimper does not appear to have any manufactures except of hats and of coarse earthenware. Small vessels are built. The Odet is navigable up to the town for vessels of 300 tons, and by means of it considerable trade is carried on: the exports are corn, honey, linen and hempen cloth, horses, butter, tallow, and dried or salted pilchards or other fish; the imports are colonial produce and salt. There are thirteen fairs in the year. The pilchard fishery is very actively carried on. The neighbouring country is comparatively sterile: it is chiefly laid out in pasture-ground, in which many horses are reared, of small size, but great speed. Some coal is found, but we are not aware that it is worked. There are a subordinate court of justice and a commercial court, several fiscal government offices, an exchange, a public library of 7000 volumes, a high school, with a collection of the objects of physical science, an agricultural society, a departmental nursery-ground, a theatre, public baths, a seminary for the priesthood, and schools for navigation and drawing.

Quimper was the birth-place of Fréron, a critic and man of letters of some eminence; and of the Jesuits Bougéant and Hardouin [HARDOUIN], the first the author of a history of the wars which preceded the peace of Westphalia.

QUMPERLE'. [FINISTERE.]

QUIN, JAMES, was born in King Street, Covent Garden, on the 24th of February, 1693. His ancestors were of an antient English family, but his father had been settled in Dublin, and his grandfather, Mark Quin, was lord-mayor of Dublin in 1676. There is no account of his mother in any of his biographies; and in 1710, when his father died, James Quin was unable to prove his legitimacy. He was intended for the bar, and educated in Dublin by Dr. Jones of that city. At the age of twenty he came to England, and took chambers in the Temple, but finding his means after his father's death inadequate to his support, he turned his thoughts to the stage, for which profession he possessed many important qualifications, an expressive countenance, a majestic figure, a powerful eye, and a clear, full, and melodious voice. He was introduced by Ryan, the actor, to the managers of Drury-Lane Theatre, and engaged, in 1717, to appear in the course of the ensuing winter. A tavern brawl, connected with an intrigue, involved him in law proceedings, and he was compelled for a short time to retire to Ireland. On his return to London he made some sensation in the part of Bajazet, at Covent Garden: and in 1720 made his first great hit in the character of Falstaff. He was considered at the head of his profession till Garrick made his appearance, of whom he at first spoke contemptuously.

In 1746 these two great rivals performed together in the 'Fair Penitent,' and in 1748 Quin retired from the stage, but annually performed Falstaff for the benefit of his old friend Ryan, till the year 1754, when, having lost two of his front teeth, he declined appearing, declaring that he 'would whistle Falstaff for no man.' Quin died at Bath, on the 21st of January, 1766. He was a master of elocution, and was engaged in that capacity by Frederick, Prince of Wales, to instruct his son Prince George, afterwards George III. Quin's exclamation of 'I taught the boy to speak,' on hearing his majesty deliver his first speech from the throne, has been quoted more frequently than any of his jokes, although both for number and humour they would of themselves form a capital jest-book. He was a great epicure, and his manners were sometimes coarse and overbearing; but it should never be forgotten that he released Thomson, the author of the 'Seasons,' from a spunging-house by paying the debt and costs for which the poet was incarcerated, without having had any personal acquaintance with him. A full-length portrait of Quin, in a splendid suit of scarlet and gold, is amongst the collection of the late Mr. Mathews, at the Garrick club.

QUINA or QUINIA, a most important vegetable alkali, contained in the three well-known varieties of Cinchona, or bark, but principally in the yellow bark. This alkali was discovered in 1820, by Pelletier and Caventou, and they showed the process for obtaining it in its separate state. This alkali may be obtained from yellow bark by a process similar to that already described for procuring Cinchonia [CINCHONIA] from pale bark. It exists combined with excess of kinic acid, forming superkinate of quina. We are inclined to believe that the best process, with some slight modifications, is that proposed in the last edition of the *Edinburgh Pharmacopœia*, 1840. This consists in boiling the bark in a solution of carbonate of soda, so as to extract its colouring and resinous matter, treating the residue with sulphuric acid so as to obtain sulphate of quina, which is to be decomposed by carbonate of soda, and the precipitated quina being redissolved in sulphuric acid and water, and treated with animal charcoal, is to be evaporated to its crystallizing point.

The best method of preparing pure quina is to decompose a solution of the pure sulphate, or rather disulphate, of quina by ammonia, and to wash and dry the precipitate. Its properties are, that it is colourless, inodorous, and extremely bitter. It fuses at about 300° Fahr., and when cold is yellow, translucent, friable, and somewhat like resin. Boiling water dissolves only 1-200th of its weight of quina, and cold water a much less quantity. It is readily dissolved by alcohol, and when a solution in alcohol of sp. gr. 0·815 is set to evaporate spontaneously in a warm place, crystals of hydrate of quina are obtained, containing one equivalent of water. The alkaline property of quina is shown by its restoring the blue colour of reddened litmus, and by saturating and forming crystallizable salts with acids. Quina is soluble in æther, and slightly also in the volatile and fixed oils when they are heated. When subjected to a strong heat with access of air, it is totally dissipated, with the formation of the vapour of carbonate of ammonia; and if there be any residue after the action of the heat is over, it is owing to some impurity.

Quina is composed of—

Twelve equivalents of hydrogen	12	or	7·4
Twenty equivalents of carbon .	120	„	74·0
Two equivalents of oxygen .	16	„	9·9
One equivalent of azote .	14	„	8·7
Equivalent	162		100·0

We shall mention a few of the more important salts of quina, premising that the only one extensively employed is the disulphate, the *Quinæ disulphas* of the London Pharmacopœia, and the *Quinæ sulphas* of the Edinburgh.

Sulphate of Quina.—This salt may be prepared by crystallizing a solution of sulphate of quina, the acid of which has not taken up as much of the alkali as it is capable of combining with. This salt crystallizes in square prisms, effloresces when exposed to the air, is soluble in 11 times its weight of water at 55°, and in 8 times at 72°; it is also dissolved by alcohol. At 212° it fuses in its water of crystallization. This salt, though neutral in composition, is acid to litmus paper, but not sour to the taste. By the action of heat in the air it is totally decomposed and dissipated.

It is not employed in medicine, and is composed of—

One equivalent of sulphuric acid .	40	or	14·6
One equivalent of quina . .	162	„	59·1
Eight equivalents of water . .	72	„	26·3
Equivalent	274		100·0

Disulphate of Quina.—This is prepared by adding the alkali to the acid till it is incapable of combining with more. The crystals of this salt are colourless, acicular, have a pearly lustre, a bitter taste, and effloresce when exposed to the air; one part requires for solution about 740 parts of cold or 30 of boiling water, 80 of cold alcohol of sp. gr. 0·850, and much less of boiling. When heated, disulphate of quina becomes luminous, fuses, and on cooling has the appearance of melted wax; it afterwards reddens, begins to decompose, and when the heat is raised to ignition in the air, charcoal is obtained, and this, if the salt is pure, is eventually entirely dissipated without residue. It is one of the remarkable properties of this salt to give a blue tinge to water; by the addition first of chlorine, and then of ammonia, it becomes of an emerald green colour.

It is composed of—

One equivalent of sulphuric acid	40	or	9·17
Two equivalents of quina . .	324	„	74·31
Eight equivalents of water .	72	„	16·52
Equivalent	436		100·00

Nitrate of Quina.—When the solution of this salt is evaporated to a certain point, oleaginous drops are formed, which resemble wax in appearance when they have solidified. When they are kept some days under water, they gradually alter in appearance, and are converted into groups of regular brilliant crystals, and it often happens that one drop becomes a single crystal. This phenomenon depends upon the circumstance that the salt when deposited hot is fused, and contains no water of crystallization, but gradually combines with it to form crystals; the crystals are rectangular prisms with inclined bases, and do not possess any cleavage.

Hydrochlorate of Quina.—This salt crystallizes in silky or pearly tufts. It is slightly soluble in water, but more so than the neutral sulphate of quina. It fuses below 212°. There are probably two hydrochlorates, corresponding to the two sulphates of this alkali; the neutral salt consists of—

One equivalent of hydrochloric acid	37
One equivalent of quina . .	162
	199

Oxalate of Quina.—This salt is obtained by precipitating a soluble salt of quina by a neutral oxalate; it is procured in the state of a white powder, which is but slightly soluble in water when cold, but more soluble in boiling water, and as the solution cools, the salt is deposited in silky crystals. It is very soluble in alcohol, especially when heated, and the salt crystallizes as the solution cools. When excess of acid is added to the oxalate, it dissolves readily in water, and crystallizes in needles.

Gallate of Quina.—This salt precipitates in the state of a white powder, when a soluble gallate is added to a solution of a salt of quina. It is soluble in hot water, but precipitates as the solution cools; it dissolves readily in excess of acid and in alcohol. This salt is produced when infusion of galls is added to infusion of yellow bark.

Kinate, or rather *Superkinate of Quina*, is the salt which exists naturally in the bark. It is crystalline, and may be obtained by spontaneous evaporation in mammellated white crusts, which sometimes consist of small needles that lose their transparency by exposure to the air, and assume a horny appearance. This salt is very bitter, slightly soluble in alcohol, but very soluble in water.

The salts of quina in general are distinguished by their strong taste of Cinchona, and by their pearly lustre; the greater number are soluble in water, and some are soluble also in alcohol and æther. The soluble salts are precipitated by the oxalic, tartaric, and gallic acids, by the salts of those acids, and also by the alkalis and alkaline earths.

QUINAULT, PHILIPPE, born at Paris in 1635, studied the law, and afterwards followed it as a profession for a time, but owing to his inclination to poetry, he neglected it, and began to write for the stage. He wrote several tragedies and comedies for the Théâtre Français, which are now forgotten. About 1673 he began writing plays for the Grand Opera, which his friend Lulli set to music [Lulli]; and it is on this kind of composition, which partakes strongly of the lyric, that Quinault's reputation as a poet was established. He is considered the first writer of French operas; the attempts made before his time by Perrin were below mediocrity. A. W. Schlegel observes that 'Quinault, though now almost forgotten, is nevertheless highly distinguished for his lyric tragedies;' and the same critic adds that he prefers his manner and style of composition, light, animated, and fantastic, to that of the great Italian melodramatist Metastasio. The opera of 'Armide' is considered Quinault's master-piece. Louis XIV. bestowed on Quinault the order of St. Michael, with a pension of 2000 livres, and the French Academy and the Academy of Inscriptions and Belles-Lettres numbered him among their members. At Lulli's death, in 1687, Quinault ceased to write for the stage, and he died the following year, leaving a considerable fortune among his daughters. All his dramas have been collected and published: 'Le Théâtre de M. Quinault, contenant ses Tragédies, Comédies, et Opéra, édition augmentée de sa Vie, et d'une Dissertation sur ses Ouvrages et sur l'Origine de l'Opéra,' 5 vols. 12mo., Paris, 1715.

QUINCE. The fruit so called is the *Cydonia vulgaris* of botanists, of which there are three varieties, the apple-shaped, pear-shaped, and the Portugal quince. The last is by some reckoned a species. There are also some sub-varieties of the others. The quince-tree is used, and chiefly propagated in this country, for furnishing stocks for grafting with such pears as are intended to be grown as dwarfs, or when early fruiting is desired. The Portugal quince is to be preferred for this purpose, as its growth corresponds nearer with that of the pear than the other smaller-leaved sorts. It is also better for the domestic purposes to which the fruit of the quince is applied, such as marmalade and syrups or jellies. The propagation of the trees is easily effected by layering. As the tree vegetates early, it should, when used as a stock, be grafted as soon as the weather will permit. From this not being attended to, a want of success has occasionally been complained of. The stocks should be headed down even as early as January. Quinces are best adapted for light and rather moist soils. In dry soils the pears grown upon them are rendered gritty. [Cydonia.]

QUINCTILIA'NUS, MARCUS FA'BIUS, is said by Jerome (*Chron. Euseb.*) to have been a native of Calagurris (Calahorra), a town in the northern part of Spain, and to have been brought to Rome by Galba, on the death of Nero, A.D. 68. There is however sufficient evidence in the works of Quinctilian to prove that he was educated if not born at Rome; and it is certain that he must have lived at Rome at least as early as A.D. 59. He describes himself as an adolescentulus (*Orat. Inst.*, v. 7, p. 271, ed. Bipont) and juvenis (*Id.*, x. 1, p. 212) when he heard Domitius Afer, who died, according to Tacitus (*Ann.*, xiv. 59), in that year. Dodwell, in his 'Annales Quintilianei,' maintains that Quinctilian was born at Rome in the beginning of the reign of Claudius, about A.D. 42, and accounts for the statement of Jerome by supposing that Quinctilian accompanied Galba to Spain, and returned with him to Rome on the death of Nero. That Quinctilian was not born in Spain is confirmed by the fact that Martial, who was himself a native of Spain, and speaks of most of his fellow-countrymen who were in any way eminent, never mentions Quinctilian as such; in addition to which, Quinctilian himself speaks of his father as if he had been an orator at Rome (*Inst. Orat.*, ix. 3, p. 169). It is thought by some writers that M. Seneca alludes either to the father or grandfather of Quinctilian, in the fifth book of his 'Controversiæ' (*Præf.*, p. 327, ed. Bipont).

Jerome says (*loc. cit.*) that Quinctilian was the first rhetorician who received a salary from the fiscus, which must have been first given him in the time of Vespasian. (Suet., *Vesp.*, 18.) He practised as an advocate with great reputation (*Orat. Inst.*, ii. 12, p. 114), and also taught rhetoric for twenty years (*Id.*, Præf. in lib. i.), to both of which occupations Martial alludes in an epigram (ii. 90) addressed to him:—

> 'Quinctiliane, vagæ moderator summe juventæ,
> Gloria Romanæ, Quinctiliane, togæ.'

After retiring from his profession, he was entrusted by Domitian with the education of the nepotes of his sister (*Inst. Orat.*, Præf. in lib. iv., p. 210), and about the same time wrote his great work on the education of an orator. We are ignorant of the time of his death; Dodwell supposes that he lived till the beginning of the reign of Hadrian, and that this emperor bestowed upon him the consular ornaments, which we know were granted to him at some period of his life. (Ausonius, *Grat. Actio*, p. 290, ed. Bipont.) Juvenal (vii. 192) also speaks of his being a senator.

In the preface to the sixth book of his work on the instruction of an orator, Quinctilian bitterly laments the death of his wife and two sons, and complains that there was no providence in the government of human affairs. His wife died in her nineteenth year, and his younger son in his fifth, soon after the death of his mother. The elder lived to the age of ten, and died while Quinctilian was engaged in his great work. It appears however that he mar ried again, or that he had a daughter, whom he has omitted to mention; since Pliny the Younger, in a letter to Quinctilian (*Ep.*, vi. 32), speaks of a daughter of his, who was to be married to Nonius Celer.

Quinctilian was the most celebrated teacher of rhetoric in his time. The younger Pliny was one of his pupils (*Ep.*, vi. 6), as well as many other eminent men.

Quinctilian complains that many works had been published under his name without his consent. He particularly mentions two books on the art of rhetoric, which had been taken down by his pupils and afterwards published from their notes (*Inst. Orat.*, Præf. in lib. i.); and he also says that several of his speeches were published in the same way from the notes of the shorthand writers (vii. 2, p. 21). According to Juvenal (vii. 186, &c.), Quinctilian acquired great wealth by his profession, but Pliny (*Ep.*, vi. 32) speaks of him as in moderate circumstances. Juvenal however appears to speak of his wealth in comparison with other rhetoricians, while Pliny perhaps compared it with his own fortune.

Quinctilian's work on the education of an orator ('Institutio Oratoria') was written, as already stated, in the reign of Domitian, upon whom he bestows the most extravagant flattery in the preface to his fourth book, and invokes his assistance as a god in the composition of the work. It is dedicated to Marcellus Victorius, whose son he had educated, and it was undertaken chiefly for the instruction of his own son, who died before it was finished. (*Præf.* in lib. vi., p. 342.) It is divided into twelve books, and its object is not merely to give the chief rules of the art of rhetoric, but also to point out the course of education which an orator should pursue. He gives an outline of the whole work in the preface. The first book, he says, treats of those subjects which must be studied before rhetoric. In the second, the elements of rhetoric are discussed; and in the five following *inventio*, in which *dispositio* is included. Elocutio, memory, and pronunciation form the subject of the four next; and the last is devoted to a discussion of the qualifications necessary for an orator, and of the manner in which causes should be pleaded.

The first book is perhaps the most interesting to us, as it gives us some knowledge of the manner in which a respectable Roman youth was educated. Quinctilian commences by saying that the education of the orator should begin from his infancy, and recommends that the nurses and all persons about the child should have a correct pronunciation. He says that it is better to learn Greek before Latin, as the latter will be easily acquired from its being the language of the country; but he disapproved of the plan adopted by many of only allowing Greek to be spoken for a long time, since thereby the child acquired the Greek accent and Greek idioms in speaking his own language. He recommends a public school in preference to home education, as the emulation of public schools is sufficient to counterbalance any disadvantage arising from the number of the boys and the consequent inability of the master to give them his undivided attention, as in the case of a single pupil; and he replies at some length to the objection that public schools are injurious to morals, and maintains that a boy incurs as much danger of having his morals injured at home as at school. He recommends the master however to study well the disposition of each boy, and he strongly disapproves of corporal punishment. At the grammar-school, the pupil is to learn the art of speaking correctly, and also to study the antient authors, beginning first with the poets, and afterwards proceeding to the historians. Before going to the school of the rhetorician, the pupil must acquire a knowledge of music and geometry; and he also recommends him to receive some instruction in pronunciation from the comic actors, and in gesture and attitude from the masters in the Palæstra.

After passing through this course of education, Quinctilian considers the pupil competent to enter the school of the rhetorician, and accordingly in his second book he gives the first elements of the art of rhetoric. He thinks that the pupil should not attempt to speak extempore at first, but should confine himself to written exercises, which should first consist of narrations of real facts, and afterwards of panegyrics of illustrious men and dispraise of the wicked. After recommending some other subjects for written compositions, he points out the advantages attending a careful study of the best historians and orators under a master, who would point out their principal beauties and defects. In choosing subjects for declamation, he condemns the practice, which was common in his time, of taking them from the works of the poets, the answers of oracles, &c., and maintains that they should be confined as much as possible to such matters as the orator would afterwards be engaged upon in the courts. At the conclusion of the book he defines rhetoric to be the art of speaking well, and proves that it ought to be regarded as an art and a virtue (virtus), and that it comprehends all subjects which can be discussed.

The first two books are only introductory; in the third Quinctilian commences the principal subject of his work, namely, the art of rhetoric. He says that it consists of five parts, *Inventio*, *Dispositio*, *Elocutio*, *Memoria*, *Pronuntiatio* or *Actio*. He divides all causes into three kinds, the *Demonstrative* or *Panegyrical*, the *Deliberative*, and the *Judicial*. The demonstrative or panegyrical treats of subjects requiring praise (*laus*) or blame (*vituperatio*), and is frequently employed by the orator, as in funeral orations, recommending or attacking witnesses, &c. The deliberative consists of persuasion (*suadendi*) and dissuasion (*dissuadendi*), and is confined by Greek writers to speeches made in the assemblies of the people; but, according to Quinctilian, may be employed in many other speeches. The judicial consists in accusation (*intentio*) and defence (*depulsio*), and is divided by Quinctilian into the prooemium, narratio, probatio, refutatio, and peroratio. All suits, Quinctilian says, are respecting one thing or more than one. The former are called *simplices*, as in the case of theft, adultery, &c.; and the latter *conjunctæ*, as in the case of extortion (pecuniæ repetundæ), or when a person is accused of more than one crime at the same time. He also says that there is another species of law-suits, called the *comparative*, as for instance when the matter in dispute in the court of the Centumviri is, which claimant is more worthy of the inheritance; or when, in the case of a divinatio, it has to be decided who is to be the real or chief accuser; or when two informers both claim the reward.

In the fourth and fifth books Quinctilian treats of the prooemium, narratio, probatio, and refutatio, in judicial causes; and remarks, that the probatio is the most important. He divides proofs into *inartificial* and *artificial*: under the former he includes previous judgments (præjudicia), common reports (rumores), torture of slaves (tormenta), legal instruments (tabulæ), oaths (jusjurandum), and witnesses (testes); by artificial proofs he means those which the orator brings forward from the subject, and to a certain extent invents himself. Præjudicia, says Quinctilian, consist of three kinds: 1st, *exempla*, or precedents, that is, similar cases, which have been already decided; 2, *judicia* which have been passed on matters relating to the cause; and 3, *judicia* which have been already given on a previous trial of the cause. Witnesses, Quinctilian says, give their testimony in writing (per tabulas) or by word of mouth in open court; and he discusses at considerable length the best modes of examining and cross-examining witnesses.

In the sixth book Quinctilian treats of the peroratio in judicial causes; and in the seventh, of the dispositio, the second of the five parts into which he divided the art of rhetoric. He defines dispositio to be a proper distribution of the different materials and parts of a speech into their proper places.

In the eighth book he treats of what he calls elocutio, which, he says, all orators consider to be the most difficult part of their art. He recommends the orator to pay more attention to the argument of his speech than to the mere words which he should use; and maintains that those words are the best which best express our meaning, and produce in the minds of the judices the effect that we desire. He then proceeds, in the remainder of this book and in the three following, to explain all the different subjects comprehended in elocutio, as perspicuity, ornament, amplification, metaphors, &c., and gives directions for acquiring the art of extempore speaking. In the latter part of the eleventh book he briefly discusses the fourth and fifth branches of rhetoric, namely, memory and pronunciation.

In the twelfth book he treats of the qualifications necessary for an orator, and maintains that no one who is not virtuous can be a perfect orator; and that a knowledge of philosophy, civil law, and history is necessary to the orator. He also gives some general directions respecting the manner in which causes should be studied and pleaded in court; and points out the kind of eloquence which the advocate should use.

The first complete MS. of the 'Institutes' of Quinctilian was discovered in the year 1417, by Poggio [Bracciolini], in the monastery of St. Gall, which is about twenty miles from Constanz. Poggio has given an interesting account of the discovery of this MS. in a letter to Guarinus, which is reprinted in Fabricius's 'Bibliotheca Latina,' edited by Ernesti (vol. ii., p. 259). On the revival of learning, the Institutes of Quinctilian were studied almost more than any other Latin author, and lectures on rhetoric were at that time confined to an interpretation of Quinctilian's work, which accounts for the number of editions which were published in the fifteenth and sixteenth centuries. The professor in the university of Leipzig, who is now called professor eloquentiæ, formerly had the title of Quinctiliani professor.

Besides the Institutes, there are certain Declamationes which are usually published under the name of Quinctilian. Of these there are nineteen of considerable length, and one hundred and fifty-four much shorter, which are said to have originally consisted of three hundred and eighty-eight. The latter were probably written by a different person from the author of the former, and neither of them by Quinctilian himself. Quinctilian tells us that he only published one oration himself. (*Orat. Inst.*, vii. 2, p. 21.) Some modern writers suppose that the shorter Declamations were published by Quinctilian's father, who is spoken of by his son as an orator (ix. 3, p. 169), or by the Quinctilian mentioned by Seneca (*Controv.*, Præf. in lib. v.); but there are no sufficient reasons for either opinion.

Quinctilian also wrote a work on the causes of the corruption of eloquence (*De Causis Corruptæ Eloquentiæ: Orat. Inst.*, Præf. in lib. vi., p. 343), which some critics imagine to be the work entitled 'De Oratoribus, sive de causis corruptæ eloquentiæ dialogus,' which is usually printed with the editions of Tacitus. The latter work however could not have been written by Quinctilian, as we find him saying, at the end of the eighth book of his Institutes, that he had treated fully the subject of hyperbole in his work 'De Causis Corruptæ Eloquentiæ:' whereas the subject is not mentioned in the 'Dialogus de Oratoribus.' Respecting the author of this work see Tacitus.

The best critical edition of Quinctilian's Institutes is by Spalding, Leipzig, 1798-1816, 4 vols. 8vo., to which an additional volume of notes was added by Zumpt, Leipz., 1829, 8vo.; and a Lexicon Quintilianeum, by Bonellus, Leipz., 1834, 8vo. The editions of the Institutes by Lünemann, Hannov., 1826, 2 vols. 8vo., and Zumpt, Leips., 1831, 8vo., may also be recommended. The best editions of the Institutes and Declamationes together are by Burmann, Leyden, 1720, 2 vols. 4to.; and the Bipont, 1782, 4 vols. 8vo. There is also an edition of the Institutes and Declamationes by Dussault, Paris, 7 vols. 8vo.

The Institutes have been translated into English by Guthrie, Lond., 1756, 2 vols. 8vo., and Patsall, Lond., 1774, 2 vols. 8vo.; into French by Mich. de Pures, Paris, 1663, 4to., and Nic. Gedoyn, Paris, 1718, 4to.; and into German by Henke, Helmst., 1775-1777, 3 vols. 8vo., of which a new edition was published by Billerbeck, Helms., 1825, 3 vols. 8vo.

For further information respecting the life of Quinctilian, the reader is referred to Dodwell's 'Annales Velleiani, Quinctiliani, Statiani, s. vitæ C. Velleii Paterculi, M. Fabii Quinctiliani, P. Papinii Statii, pro temporum ordine dispositæ.' Oxon., 1698, 8vo.

QUINCY. [Massachusetts.]

QUINDECAGON, a figure of fifteen sides.

QUINSY, or Cynanche, or Angina, is an inflammation of the throat. Nosologists, having applied the name of cynanche to nearly all the inflammatory diseases in this part, have been obliged to distinguish the different affections of the several organs included in it, by specific names; hence we have cynanche parotidæa, another name for mumps; C. trachealis, which is croup; C. pharyngea, or inflammation of the pharynx; C. tonsillaris, or inflammation of the tonsils; and many other species, named either from the organ chiefly affected, or the character of the inflammation. Of these, mumps and croup having been treated of in separate articles, the present may be devoted to the two last mentioned, which are indeed those that are commonly intended by the popular name quinsy.

Cynanche pharyngea, or inflammation of the mucous membrane lining the back of the mouth and the upper part of the throat, is that which usually exists in a common sore-throat, brought on, as it most frequently is, by a change in the weather, or by sitting in cold or damp air. It is usually a mild disease, and chiefly annoying from its liability to recur on slight occasions. The extent of the inflammation varies greatly in different cases; it may be confined to the pharynx, or it may spread from it over the soft palate and the tonsils, and into the cavities of the nose, where it produces the additional symptoms of a cold, or into the tympanum [Ear], giving rise to deafness. On examination the back of the mouth and fauces, when thus inflamed, will be found unnaturally red and swollen, and often covered with tough mucus or lymph; and from these changes there result dryness and soreness of the throat, pain on swallowing, and a sensation as if the diseased parts were closely constricted.

A common sore-throat does not need much treatment; warmth, gentle purgatives, and sweating medicines, the avoidance of stimulating food, and the inhaling of the vapour of hot water, or hot vinegar and water, or the application of a large poultice round the throat, will usually effect its removal in a few days. Sometimes however the disease is prolonged in a slight but obstinate form, which is commonly called a relaxed sore-throat. In this condition the redness of the parts affected is still observed, but it is of a less vivid colour, and is irregularly streaky, instead of being evenly diffused; the velum also, which is commonly implicated, is elongated, and it is from its unnatural contact with the back of the tongue and the epiglottis that the tickling sensation in the throat arises, and excites a constant desire to swallow or to cough. For this condition the necessary treatment consists of stimulating gargles, such as hot wine, infusion of Cayenne pepper, very diluted mineral acids, &c., and if the patient be in general ill health, tonics and appropriate alteratives.

In more severe cases of inflammation of the pharynx and adjacent parts, matter sometimes forms either around or near the pharynx, or in the soft palate or the uvula. Wherever the existence of matter can be determined, it should be immediately let out, as from an abscess in any other part of the body. In other severe, and in some measure peculiar, cases, the intensity of the inflammation is marked by the formation of false membranes on the affected surface. This form of the disease has been named angina membranacea, and has been especially described by M. Bretonneau and other French physicians under the name of *diphtherite*. In its essential nature this affection resembles croup, with which also it is sometimes connected, the false membrane being not only spread over the mucous surfaces of the pharynx and fauces, but extending down into the trachea. In some cases the inflammation is very acute, and, being accompanied by common inflammatory fever, requires for its reduction the most active antiphlogistic treatment; the same measures, in short, as are applicable in cases of croup. [Croup.] In another severe form of quinsy, the inflammation and formation of false membranes are accompanied by a low typhoid state with great prostration of strength, and requiring all the remedies that are used in cases of low typhus fever, in malignant scarlet fever, and other dangerous diseases of the same class. It is this form of disease which is usually called putrid or malignant sore-throat, and by nosologists, cynanche or angina maligna. It sometimes occurs as an epidemic, and was long regarded as attended by sloughing of the throat, the layers of false membrane being mistaken for the inflamed tissue in a state of gangrene.

In cynanche tonsillaris or tonsillitis, the inflammation is entirely or nearly limited to the tonsils. Its symptoms are scarcely distinguishable from those of the common form of the preceding disease, but on examining the throat the redness is seen to be less diffused, and the tonsils, being more or less increased in size, are approximated to each other so as nearly to block up the posterior aperture of the mouth, and render any effort to swallow extremely painful. Hence, to avoid the pain, the patient usually lets the saliva flow from his mouth, and often, in attempting to swallow, is unable to overcome the obstacle presented by the enlarged tonsils, and discharges the fluid back through the nose. In many cases also the inflammation extends to the eustachian tube and tympanum [Ear], producing deafness, and to the parts immediately around the larynx, giving rise to difficulty of breathing and a harsh hoarse sound of the voice. With these local symptoms there is usually more or less fever, with headache, loss of appetite, &c.

The milder cases of inflammation of the tonsils may be treated in the same manner as those of the preceding disease; leeches applied to the sides of the throat where the pain is most severely felt, are probably the most beneficial means that can be employed. With a higher degree of inflammation abscesses often form in the tonsils, accompanied by all their usual signs, and with still greater obstruction in the throat. In time these will break of themselves, but it will materially shorten the patient's sufferings if they be opened as soon as matter has distinctly collected. The operation should be performed with a guarded knife, or with one that slips through a canula and can have the length of its cutting part fixed.

The most annoying result of repeated inflammation of the tonsils (and those who have once suffered are peculiarly liable to a recurrence of the disease from very slight causes), is, that they become permanently enlarged. In this state, although swallowing is not painful, it is often attended with difficulty, and by the partial closure of the fauces the respiration is always obstructed and requires an effort for its effectual performance. From this, in children, a peculiar deformity of the chest often results, the breast-bone and the fronts of the ribs becoming elevated and very much arched forwards, in a form which is commonly called chicken-breasted. But if this do not occur, the patient always suffers inconvenience from hoarseness and a kind of nasal sound of the voice; he cannot avoid snoring very loud in his sleep, and often starts up from it with a feeling of impending suffocation. The best means for the removal of this state are astringent gargles, as those with alum, oak-bark, mineral acids, &c. Iodine also, administered internally and rubbed on the throat, often proves useful; but in many cases nothing will alleviate the condition of the patient but cutting off a portion of each tonsil, so as to reduce them to their natural dimensions.

QUINTAL generally means the weight of a hundred pounds; but the term is not now English.

QUINTILE, a term of astrology and antient astronomy, meaning distant in longitude by 72 degrees, or the fifth part of the whole great circle.

QUINTIN. [CÔTES DU NORD.]

QUINTUS CA'LABER, a Greek poet, who owes his name of Calaber merely to the circumstance that towards the close of the fifteenth century Cardinal Bessarion discovered his poem in the library of a monastery at Otranto in Calabria. The poet in his own work (xii. 304, &c.; comp. ii. 233; i. 295; x. 128: Tzetzes, *Chil.*, ii. 489, &c.) calls himself a native of Smyrna, and describes himself as having in his youth been a shepherd in the neighbourhood of this city. Hence he is more properly called Quintus Smyrnæus. The original MS. bears only the name of Kointos, and it has been supposed that this is not the name of the author, but of the person to whom the MS. belonged. Under such circumstances it is not to be expected that anything respecting his life and the time in which he lived should be known, beyond what can be inferred from the character of the work itself and some allusions which occur in it. Some scholars, led away by single beauties in the work, and the richness of expression and imagery, have ascribed it to Homer himself, or some of the cyclic poets, while others have conceived him to have been a contemporary of Augustus. The most probable opinion however is that he lived in the fifth century of our æra, in the reign of the emperor Zenon or Anastasius, and that he was a contemporary of Tryphiodorus and Coluthus, whose poems were contained in the same MS. in which that of Quintus was discovered. In confirmation of this opinion we may refer to lib. xii., 335, &c., where Calchas is represented as foretelling the greatness of Rome, in a manner which can only apply to the latter period of the Roman emperors (comp. vi. 533).

His poem, which is called 'Homeri Paralipomena,' or 'Posthomerica' (for the original MS. has no title), contains in fourteen books those events of the Trojan war which are not described in the Iliad, and it is intended to be a completion and continuation of Homer. The source from which the poet derived his materials are chiefly the so-called cyclic poets. In style and language he imitated the Homeric poems; but an accumulation of *single* beauties, and the deficiencies of the work as an artistical whole, betray the age of the author.

There are several MSS. of the poem of Quintus, but all seem to be more or less correct copies of that discovered by Bessarion. The first edition of Quintus, together with Tryphiodorus and Coluthus, was printed at Venice by Aldus (about 1505). A new edition, with a Latin translation by Rhodomannus, appeared in 1604, at Hanover. In the edition of De Pauw (Lugd. Bat., 1734) the translation of Rhodomannus was reprinted. In 1783, Tychsen published a very good dissertation on Quintus and his poem, which was followed in 1807 by a new and much improved edition of the text of the 'Posthomerica' of Quintus Smyrnæus. The second volume, which was to contain the commentary, has never been published. The poem of Quintus has been translated into French by R. Tourlet (Paris, 1800, in 2 vols.). In 1821 there appeared at Oxford 'Select Translations from the Greek of Quntius Smyrnaeus,' by Alexander Dyce. (Compare Spitzner, *Observationes critic. et grammat. in Quinti Smyrnæi Posthomerica*, Lipsiæ, 1837.)

Besides the 'Posthomerica,' Brunck (*Analect.*, ii., p. 475) attributes to Quintus some verses in the 'Labours of Hercules.'

QUINTUS CU'RTIUS RUFUS. Nothing whatever is known from extrinsic evidence of the personal history of Quintus Curtius or of the time when he lived; nor is there a single passage in his work from which anything can be deduced with certainty. A passage in the tenth book (c. 9) appears to allude to some great calamity that had threatened the Roman state, and which had been averted by the emperor (princeps suus); but the name of the emperor is not stated. In the absence of all proof, it has been supposed that this Curtius may be the rhetorician of whom Suetonius is said to have treated, though that part of his work on rhetoricians is not extant; or that he may be the Curtius who was praetor and proconsul of Africa under Tiberius. (Tacit., *Ann.*, xi. 20.) Cicero also speaks of several persons of the name of Curtius, and he names one of them Quintus. But there is no proof that any of these persons is the Curtius who wrote the 'History of Alexander,' though the rhetorical style of the work would justify us in assigning it with some degree of probability to a rhetorician. One of the best examples of the declamatory style of Curtius is the well known speech of the Scythian ambassadors to Alexander (vii., c. 8).

The work of Quintius Curtius is entitled 'De Rebus Alexandri Magni Regis Macedonum,' or the 'Acts of Alexander the Great, King of the Macedonians.' It was originally in ten books, of which the first two are lost; the third book begins with the attack of Alexander on Celænæ. There seems also to be something wanting at the end of the fifth and the beginning of the sixth book; and perhaps there are some omissions in the tenth book also. There are various modern supplements to Curtius, but that of Freinshemius, who has laboriously supplied the first two books, appears to be the best.

The most opposite judgments have been passed on the work of Curtius. Some prefer him to Tacitus, and others place him, as to style, on a level with the writers of the Augustan age. Others again allow him little merit. Considered as an historian of Alexander, he was evidently deficient in essential qualities: he was not a critical writer, and he was very ignorant of geography. His style is perspicuous and easy, though rhetorical and ornate, and if he did belong to a late age (which is at least doubtful), he wrote better than his contemporaries. The work accordingly is much more suitable for elementary instruction than many other Roman writers; for instance, it is in all respects infinitely superior to the wretched collection of biographies which passes under the name of Nepos. Though somewhat diffuse, and not free from affectation of ornament in his style, the narrative of Curtius is clear and connected, neither encumbered with extraneous matter nor interrupted by digressions. Arrian himself does not keep closer to his subject than the Roman historian of Alexander.

The editions of Curtius are very numerous. The earliest are those of Rome, 1470, and of Venice, 1470 or 1471. The edition of Pitiscus, Hague, 1708, 8vo., contains the supplement of Freinshemius and a copious commentary. The translations are almost as numerous as the editions: there are translations into Italian, Spanish, French, German, English, and other modern languages. The first English translation was by Brende, London, 1553, 1561, 1584, 1592, 1614, 4to., 1570, 8vo., and the latest by Digby, London, 1714, 1726, 2 vols. 12mo., revised by Young in 1747.

QUINTUS CLAUDIUS, QUADRIGA'RIUS, a Roman historian of the time of Sulla, wrote the 'Annals of Rome,' of which only a few fragments remain, down to the 23rd book, in the shape of quotations found in Aulus Gel lius, Nonius, Priscianus, and other antient writers. These fragments were collected and inserted by Antonius Augustinus, bishop of Tarracona, in his 'Fragmenta Historicorum,' Antwerp, 1595. Quintus Claudius was one of the authors whom Livy had before him in compiling his history; and Livy quotes him in his eighth book (chap. 19).

QUIRI'TES. [Rome.]

QUI'SQUALIS, a genus of plants of the natural family of Combretaceæ, which is indigenous in Amboyna, Java, and the Malayan peninsula, and extends into India. The genus is characterised by having a very long slender tube of the calyx, which is 5-fid at the mouth. Petals 5, oval, oblong, larger than the teeth of the calyx. Stamens 10, exserted, inserted into the faux of the calyx; the alternate ones shorter. Ovary ovate, oblong, 4-valved. Style filiform, obtuse. Drupe dry, 5-angled, 1-seeded. Shrubs with climbing branches. Leaves opposite, seldom alternate, entire, ovate. Spikes axillary and terminal. Flowers change in colour from white to red. The few plants of the genus are cultivated in this country with great ease in moist stove-houses in a mixture of loam and peat. *Q. Indica* is the most common species; its fruit is reckoned a vermifuge.

QUITCH. [Couch Grass.]

QUITO, the capital of the republic of Ecuador in South America, is situated in 0° 14′ S. lat. and 81° 50′ W. long., at an elevation of 9534 feet above the level of the sea. This great elevation, and its position near the equator, render the climate very mild all the year round, and it may be compared with our finest spring weather. The temperature of the air at noon generally varies between 60° and 67°, and that of the coldest part of the night between 52° and 56°. In a few cases the thermometer has risen to 79°, and has descended to 45°. The mean annual temperature is 59°, which corresponds to that of the month of June in London. A small portion of the town is built on level ground, and the remainder on the declivity of a hill The plain contains the great square, which is surrounded by public buildings. The cathedral and the episcopal palace stand opposite to one another, and the other two sides are occupied by the palace of the government and the town-hall. The square itself is spacious, and has an elegant fountain in the centre. Four wide and straight streets branch off from the four angles of the square, but they are short, and extend only to the foot of the hill. The remainder of the town is built on the lower declivities, which are furrowed by numerous ravines, some of which are of considerable depth. This circumstance renders the streets very uneven and irregular. Some parts of the city are at the bottom of the ravines, while others occupy the sides and eminences. The larger streets are paved, and the others, which are not paved, are almost impassable after rain, which is very frequent. There are some smaller squares, on which the convents are built, among which that of the Franciscans is a vast edifice, which is both magnificent and tasteful. The greater part of the houses are built of bricks dried in the sun; and in order that they may suffer less from the frequent earthquakes, they are only one story high. The roofs are flat, and are covered with the leaves of the maguey (*Agave Americana*). The interior of the houses is very simple, the saloon for receiving visitors being the only one which is ornamented, and even that is rather scantily furnished. The more wealthy classes inhabit the upper part of the houses, and the common people live on the ground floors. There are only three public fountains in Quito; few of the private houses are provided with fountains, and the water is generally bad. Quito is the seat of the legislature and general government of the republic of Ecuador, as well as of the provincial government of the department of Ecuador. It has a university and two colleges for the instruction of the clergy. There is a large establishment appropriated for the maintenance of orphans and poor people, which is well managed. The surrounding country is not very pleasant for want of trees, but the scenery is very grand, as eleven snow-capped summits are visible from the town. The population was estimated at 60,000 by Ulloa, about a hundred years ago. Caldas, at the beginning of this century, reduces it to 40,000. There are some manufactures of cotton, silk, and leather, and silver and gold are worked rather extensively. (Ulloa's *Voyage to South America;* and Caldas, in the appendix to Mollien's *Travels in Columbia.*)

QUO WARRANTO is a writ in the nature of a writ of right for the king, and it lies against any person or corporation that has usurped or unjustly claims any public office or other franchise or liberty, or that, having originally had a grant of one, has forfeited it by abuse or neglect. Proceedings under it are prosecuted before the judges of the Court of Queen's Bench, and the defendant is called on to show *by what warrant* (*quo warranto,* whence the name of the writ) he exercises the office, liberty, or franchise in question. The first process against him is by summons. If he fail to appear in the same term in which he is summoned, he loses his franchise. After appearance, he may disclaim any title, either to the whole or part of the franchise; or he may plead in justification, showing by what warrant he has exercised it. To this plea there may be either a demurrer or replication, and subsequent proceedings as in ordinary actions. On disclaimer judgment is immediately given for the crown. In that case, or on judgment for the crown on demurrer, or after trial, the judgment is that the franchise shall be seised into the hands of the crown, or, if the crown cannot have the franchise that the defendant shall be ousted, that is, ejected. If the judgment be for the defendant, it is that he may enjoy the franchise, &c., saving the right of the king, and this saving applies to all titles except that on which judgment is given. The judgment is conclusive even against the crown. (2 *Inst.*, 282; Co., *Ent.*, 527, &c.)

Proceedings under a writ of quo warranto have fallen into disuse, and they have been superseded by informations in the nature of a quo warranto. These informations are adapted to attain the same ends, are applicable to the same circumstances, and are more expeditious, but the judgment under them is not conclusive against the crown. Except when exhibited by the attorney-general, they are filed by leave of the court.

The statute of the 9 Anne, c. 20, was passed for the purpose of regulating and expediting the proceedings under an information of quo warranto, relating to the title to corporate offices the due discharge of which affects the rights or prerogatives of the crown or the interests of the public. Although criminal in their title and form, and having for their ostensible object the punishment by fine, as well as the ejection of a party from his office, these proceedings are virtually of a civil nature; and they are now almost exclusively employed for the decision of questions relative to the exercise of corporate rights between mere individuals. Under this statute an information may, by leave of the court, be filed, in the name of the master of the crown-office, by any party desirous of prosecuting it. Such party is styled the relator. If he be in no way connected with the corporation, that is considered as a reason for refusing the application. (1 East, 46, n.) In order to obtain leave to file an information, the relator must apply by motion in open court, and must support his application by affidavits of all the facts upon which it is grounded. After hearing the application, the court may either grant or refuse a rule nisi. Formerly it seems to have been grantable almost as a matter of course; but that is no longer the case, and the court will never grant a rule where the alleged usurpation might be made the subject of a civil action, or where the office exercised is not one of a public character either actually or in contemplation of law affecting the rights or prerogatives of the crown. For instance, the court will not grant a rule for the purpose of inquiring into the right to exercise the office of churchwarden. (4 *T. R.*, 381.) If a rule nisi be granted, the case comes on for argument in the ordinary course. The defendant may either support his opposition by affidavits stating the facts which form the grounds of it, or confine himself to arguments arising on the case presented by the relator. Where the consequence of giving effect to the objections raised in the information would be wholly to dissolve the corporation, or facts are shown which discredit the motives of the relator, or prove that he has himself concurred in an election which he seeks to set aside, or that the same objections apply to his own title, or where there has not been a user, that is, exercise or possession of the office, the rule would probably be discharged. (2 *T. R.*, 767; 2 B. and Ald., 339, 479.) If however the facts or law of the case be doubtful, a rule will be granted. (3 Burr., 1485.) If the rule be made absolute, the defendant must plead, at latest, within the next term. (6 *T. R.*, 594.) If the plea be insufficient, the court will allow the defendant to amend at any time before trial. In other respects, the pleading is conducted on the same principles as in ordinary cases. If the defendant be found guilty, the court may give judgment of ouster as well as fine. By the statute of Anne, costs are given to the relator against the defendant, if the information be successful; to the defendant against the relator, if it wholly fail. If one material issue be found for the crown, the crown must have judgment, and the relator is entitled to costs on all the issues. (1 *T. R.*, 453.) The provisions of the statute of Anne only relate to offices analogous to those mentioned, that is, those of a corporate character. By the statute 53 Geo. III., c. 58, the defendant in a quo warranto information against a corporate officer is enabled to plead that he had exercised the office in question for six years previous to the exhibition of the information. If the fact be found to be so, the defendant is entitled to the same judgment as if a verdict had been found for him on the merits. This provision was in accordance with a rule which the courts had already laid down upon their own authority. By stat. 1 Vic., c. 78, s. 23, the time within which proceedings of quo warranto may be brought against any mayor, alderman, councillor, or burgess, is further limited to one year after either his election to office or the commencement of his disqualification. (Com., *Dig.*, tit. 'Quo Warranto;' Bl., *Com.*)

QUORRA (or NIGER), a river in Africa, the largest in that continent except the Nile. It is not yet determined which of these two rivers has the longer course, as the sources of the Babr el Abiad, or of the principal branch of the Nile, have not yet been visited by any traveller, and a portion of the source of the Quorra has not been accurately laid down on our maps. There can hardly be a doubt however that the basin of the Quorra is more extensive than that of the Nile.

There is some difference of opinion respecting the source of the Quorra, though all travellers agree in placing it in that extensive mountain-region which, under the name of the Kong Mountains, extends from the coast of Sierra Leone (13° W. long.) to the most eastern bend of the Quorra (7° E. long.). [KONG MOUNTAINS.] Mungo Park, who first succeeded in reaching the banks of the Quorra, and who collected much information respecting its course, laid down the source of the river in 11° N. lat. and 6° W. long. Major Laing, who in 1822 visited the countries east of Sierra Leone, was informed, at the place where he was obliged to return, that he had nearly reached the source of the Quorra, and that Mount Loma, in which it originates, was in sight. He determined therefore the source of the Quorra to be in 9° 25′ N. lat. and 9° 45′ W. long. The French traveller Mollien, who visited this part of Africa in 1818, collected other information, according to which the Quorra rises in 8° 20′ N. lat. and in 9° 10′ W. long. This difference may easily be accounted for by observing that many streams rise in a mountainous country, which unite to form a great river, and that each of them may be considered as the source of such a river. As the most western of these tributaries is that of which Major Laing got information, it is properly considered the principal river. It runs near its source due north for about 70 miles, and is there called Timbio. It then turns to the north, and exchanges its name for that of Baba, and Joli-Ba (*i.e.* large river), under which name its course as far as Timbuctoo is known, the name of Quorra being only applied to the lower portion of its course. Caillié crossed the Joliba at Curuassa, about 100 miles from its source, and found that it was navigated by large canoes. It flowed in a wide valley from south-south-west to north-north-east, which was surrounded by hills from 150 to 200 feet high. The soil of the valley was fertilised by the inundations of the river. The mountains in the neighbourhood are rich in iron-ore, and contain gold.

From Curuassa to Bammakoo, a distance exceeding 200 miles, the course of the river is unknown, not having been seen by any European traveller. But that portion of it which lies between Bammakoo (13° N. lat. and 5° 20′ W. long.) and Timbuctoo (18° N. lat. and 3° 40′ W. long.) has been laid down by Mungo Park and Caillié. Mungo Park in his first journey travelled along the banks of the river from Bammakoo to Silla, a distance of about 160 miles. Between Bammakoo and Tabbec the river runs in a north-east direction, in a wide valley which produces good crops of rice, maize, and vegetables, and has good pastures; it is pretty well inhabited, and there are several towns on the banks of the river. At Tabbec the Quorra enters the plain of Súdan, and it runs to the east as far as the town of Jennee. From Tabbec to Silla, the end of his travels, Mungo Park found the country on both sides of the river extremely fertile, well cultivated, and studded with towns of considerable size and many villages. In the rainy season the country to a considerable distance from the river is inundated. The current of the river is moderate, and offers no impediments to navigation; large river boats are frequently seen, both ascending and descending. In his second journey, Mungo Park embarked at Sego, and descended the river more than a thousand miles to the town of Boussa (10° N. lat. and 4° 40 E. long.), where his boat was wrecked, and he was killed Thus the information which he had obtained respecting this part of the course of the river and the countries adjacent to it, was lost to the world. But Caillié has partly supplied the loss. He descended the river from Jennee to Timbuctoo, and found the banks, in some places, well cultivated and rather populous. The general course of the river was north as far as the lake of Debo, and even to some distance farther, but afterwards it turned to the north-north-east, and continued so to the town of Timbuctoo, or rather, to its port Cabra. The river-barges which navigate this part of the river are from 60 to 80 tons burden, and take the produce of the country, rice, millet, corn, honey, butter of the shea-tree, &c., to Timbuctoo and other large places. The crews consist of about 20 men; the boats use no sails. The lake of Debo, through which the Quorra flows, south of 16° N. lat., is of considerable extent; it is perhaps ten miles from south to north, but it occupies a much greater space from east to west. North of the lake, where the river flows to the north-east, cultivation is more general, and the number of villages is greater. Some of them carry on a considerable traffic with Timbuctoo. In approaching Timbuctoo the river separates into two branches, which appear to unite at no great distance farther down. On the smaller and more northern of these branches is Cabra, the port of Timbuctoo. From this place to the town of Yáoorie (11° 10′ N. lat.) the course of the river is not known; but as Mungo Park, when he left Sego, went as far as Boussa, which is about 70 miles farther down the river Yáoorie, it is evident that the Joliba of Timbuctoo and the Quorra of Boussa are the same river. It seems that the Quorra leaves the great plain of Súdan before it reaches the neighbourhood of Yáoorie. From that place to the mouth of the river the Quorra has been navigated by the Landers. Between Yáoorie and Rabba (9° N. lat.) the river runs nearly south, and then it makes a great bend to the east; but before it arrives at 8° N. lat. it again runs south, and by degrees inclines to the west, in which direction it reaches the sea under the name of Nun. That portion of its course which lies between Yáoorie and 7° N. lat. is only navigable during and after the rainy season; at the end of the dry season, the bed of the river is full of rocks, sand-banks, and shoals. In these parts the river runs through a mountainous country, but the valley is low, and annually inundated; it is however very fertile, and villages and cultivation are common. The mountains by which this valley is enclosed rise to a considerable elevation, and with a gentle declivity. Between 8° and 7° N. lat. the lower offsets of the mountains on both banks of the river come close up to the water, and where they recede from it the interval is not very wide. The declivities of the mountains are covered with woods. This narrow valley does not contain so large a population as the wider one farther north. Near Abbazacca (about 6° N. lat.) the river leaves the mountain-region, and enters a low alluvial plain, in which it divides, as it appears, into a great number of branches, which diverging to the east and west form a delta, which probably occupies as large an area as that of the Nile, though it would be rather premature to decide this point, as the extent of the delta of the Quorra has not yet been ascertained. It differs greatly from that of the Nile, its surface being mostly covered with swamps, and in other places with jungle. Some parts of it are covered with high forests. The more elevated tracts of the delta are cultivated, and villages occur at distances of two or three miles, but most of them are surrounded by jungle, and not visible from the river. The river is frequently more than two miles wide, but in several places it contracts to a mile and even less, especially towards its mouth. The tide is perceptible to about 100 miles from its mouth.

The whole course of the river probably exceeds 2000 miles. We do not know that any of its tributaries are of considerable size, except the Sharry or Tchadda, which joins it near 8° N. lat., and is not inferior in size to the principal river though less deep. It has been ascended about 100 miles, but is full of rocks and sand-banks. The volume of water brought down by this river evidently shows that it must have a long course, and this, with some other facts, has induced Captain Allen to suppose that the Tchadda is the only channel by which the lake Tchad, situated in the interior of Súdan, between 12° and 15° N. lat. and 12° and 17° E. long., discharges its waters into the Quorra.

In the year 1832, Mr. Macgregor Laird, and some other gentlemen of Liverpool, formed an association for the purpose of opening a direct communication with the interior of Africa by ascending the Quorra. Two steam-boats were fitted out for the expedition, and a sailing vessel was also equipped to carry out the goods with which it was proposed to trade with the natives. The crew of the larger steam-vessel, the Quorra, including the officers, consisted of twenty-six men; and that of the Alburkah, the smaller steam-vessel, consisted of fourteen men. Richard Lander, already known by his African journeys, was engaged to take the direction of the expedition, and he had also the selection of the goods with which it was supposed that a valuable trade in indigo and other produce could be carried on. The expedition was also joined by Captain (then Lieutenant) Allen, for whom the Admiralty had requested a passage for the purpose of making a survey of the river. The expedition reached the mouth of the Quorra in safety, and the river was ascended to Rabba in 9° N. lat.; the Tchadda was also ascended to Dagbeh, in 8° N. lat., a distance of above 100 miles from its confluence with the Quorra. The results of the expedition were most disastrous. It was indeed shown that the Quorra is navigable in moderate-sized vessels from the sea to Boussa; but as a commercial speculation the expedition entirely failed, and it was attended with a melancholy loss of life caused by the climate. The only survivors of the Alburkah were Mr. Oldfield, the surgeon, and three others: the survivors of the Quorra were Lieut. Allen, Mr. Macgregor Laird, and three others. Hill, the captain of the Alburkah, and Harries, the captain of the Quorra, were among the victims. Dr. Thomas Briggs, the physician to the Quorra, also died. He was the eldest son of Dr. Briggs of Liverpool. Though only twenty-eight years old at the time of his death, his acquirements were such as to give promise of the highest excellence. His clear and penetrating understanding enabled him to master any subject to which he applied; and his virtues secured the respect and love of all who knew him.

On the 26th of December, 1839, the Colonial Secretary, Lord John Russell, addressed a letter to the Lords of the Treasury, in which he stated that the average number of slaves introduced from Africa into foreign states or colonies in America or the West Indies probably exceeds 100,000 annually, and that the most likely means of effectually abolishing the foreign slave-trade would be to arrest it at its source by the establishment of new commercial relations with those African chiefs or powers within whose dominions the internal slave-trade of Africa is carried on, and the external slave-trade supplied with its victims. Of those chiefs the most considerable rule over the countries adjacent to the Niger and its tributary streams. It was therefore proposed by her Majesty's ministers to dispatch an expedition which would ascend that river by steam-boats; and they requested the sanction of the Lords of the Treasury for the estimated amount of expense which would be required for the fitting-out and maintenance of the expedition; to which the assent of the Lords of the Treasury was given on the 30th December, 1839.

A good deal of opposition has been made to this expedition by some of the merchants of Liverpool who are engaged in trading up the Niger, and one of them, Mr. Jamieson, has published 'Grounds of Appeal against the Niger Expedition,' in which he contends that the slave-trade has almost entirely ceased on that part of the African coast, that private enterprise is rapidly extending our commerce up the Niger, and that the interference of government will immediately put a stop to that commerce, 'since no private merchant can keep his ground in or near a government merchant-settlement bolstered and sustained by the public purse.'

Government however has resolved to persevere in making commercial treaties, in opening the way for all private traders, and in examining the geography of that part of central Africa. We are indebted to Captain Washington, R.N., for the following communication respecting the expedition, which will probably have sailed before the end of this year (1840). It is composed of three iron steam-vessels, of small draft of water, fitted for river navigation. After touching at the ports of Sierra Leone, Cape Coast Castle, &c., they will proceed up one of the many outlets of the Quorra, for about 300 miles, to the confluence of the Tchadda. This will probably be made their head-quarters, and the commissioners will use their utmost endeavours to form treaties for lawful traffic and for the extinction of slavery with all the native chiefs. Should opportunity be afforded, the vessels will explore the upper part of the Quorra, towards Rabba and Boussa, and also the Tchadda, as far as water communication will admit of it; thus pioneering the way and opening the high road to the lawful merchant, to the man of science, and the missionary.

(Park's *Travels in Africa;* Mollien's *Travels in Africa,* &c.; Laing's *Travels in the Timantee,* &c.; Caillié's *Travels through Central Africa;* Clapperton's *Journal;* Lander's *Journal;* Allen, 'On a new construction of a Map of a portion of Western Africa,' &c., in *London Geogr. Journ.,* vol. viii.; and Laird and Oldfield's *Narrative of an Expedition into the Interior of Africa,* &c.)

QUORUM. [SESSIONS.]

QUOTIENT, or QUOTE, the result of dividing one number by another

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Digi

R.

R is one of the vibrating letters called liquids. It is formed at the back of the palate, and is on this account more nearly related to the liquid *l* than to *n* or *m*. For the various forms of the alphabetical symbol see ALPHABET It is convertible

1, with *l*. See that letter.

2, with *n*. See that letter.

3, with *rn* at the end of words. See N.

4, with *s*. See S.

5. It is apt to place itself at one time before, at another after a vowel. Thus in Greek *κροκοδειλος* or *κορκοδειλος*. *κρατος* or *καρτος*. So the English words *red*, *run*, are changed in the Dorsetshire dialect to *hird*, *hirn*. Again, *brid* is an old orthography of *bird*, and the town *Bridlington* is pronounced *Burlington*.

6. The letter *r*, in the neighbourhood of several consonants, is apt to disappear from words. Thus the German *sprech-en* is in English *speak*, our word *world* is in German *welt*.

7. In one language a word is found with an initial *r*, when in other allied languages there occur at the beginning two consonants, as *br*, *fr*, *wr*. Thus in Greek we have *ροδον*, *ρηγνυμι*, *ρεζω*, connected with which are the forms *βροδον*, *frango*, Latin, and *break*, English; and, thirdly, the English words *wreak*, *work*, *wrought*.

8. The letter *r* is at times confounded with *w*. Thus it is not a very rare variety of articulation that *rubbish* is pronounced *wubbish*.

9. More particularly when a word ends in a *w*, or even a vowel, it is not uncommon to pronounce an *r*, especially if the next word begins with a vowel. The London vulgarism, *winder*, *piller*, for *window*, *pillow*, is an example, nor need the philologist be ashamed to treat of such cases, which are as worthy of consideration as any dialect of the Greek tongue.

RAAB (in Hungarian, Györ, or Nagy Györ) is the capital of the county of the same name in the circle beyond the Danube. It is situated in 47° 41′ N. lat. and 11° 6′ E. long., in an extensive marshy plain, where the rivers Raab and Rabnieza fall into the Danube, and it is nearly surrounded by those three rivers. At a distance the steeples of its numerous churches give it a striking appearance. The streets are pretty regular and well-paved, and there are many handsome houses. Raab is divided into what is called the inner town or fortress, which has three gates, and the extensive suburbs. There are eight Roman Catholic churches, of which the most remarkable are the church of the Benedictines, formerly belonging to the Jesuits, and the cathedral, with a splendid choir and marble altars. There are also a Lutheran and a Greek church, a convent of Carmelite monks, and another of Ursuline nuns. Of the secular buildings, the chief are the bishop's palace, the county-hall, the town-hall, the royal academy, the episcopal seminary, the salt-office, the palaces of Count Esterhazy and Count Zichy; besides the seminary, and the academy, which has two faculties, jurisprudence and philosophy, ten professors and between 300 and 400 students, there are a gymnasium, a theological college, a lyceum, a Lutheran gymnasium, and several schools. There are likewise an indifferent theatre, assembly-rooms, an arsenal, two barracks, and two large poorhouses. Raab is the see of a Roman Catholic bishop and chapter, and the seat of government of the county.

Raab was a place of strength in the time of the Romans. Subsequently a people, whose name is not known, settled on the spot where the Romans had their winter-quarters. Their numbers having considerably increased, they were invited, in 1271, by king Stephen V., to live in the fortress of Raab, which he had erected, promising them considerable privileges. In 1593 the fortress fell into the hands of the Turks, through the treachery of the governor. It was retaken by the Austrians in 1598, on Easter Monday, on which day this event is commemorated with great pomp. In the year 1783, the emperor Joseph II. ordered the fortress to be totally dismantled, but in 1809 the emperor Francis ordered it to be again fortified. On the 14th of June in that year the French, having defeated the Hungarians, under the archduke John, near the town, laid siege to it, and became masters of it on the 24th, by capitulation. In 1820 orders were given again to level the fortifications, in doing which many gold, silver, and brass coins of Vespasian were found. Raab has nearly 18,000 inhabitants, of whom 5000 live in the inner town. The site of the old ramparts has been partly converted into public walks and partly used for new and handsome streets. The manufactures of woollen cloth, cutlery, and vinegar are considerable. The culture of silk is every year extending. Three much frequented annual fairs are held, and the town carries on a very brisk trade, which is much favoured by its situation on the navigable Danube, and on the high road between Vienna and Ofen.

(*Beschreibung des Königreichs Ungarn, &c.*, 1833; *Oesterreichische National Encyclopedie*; J. C. v. Thiele, *Das Königreich Ungarn.*)

RABATT. [MAROCCO.]

RABBI (*ῥαββί*, רַבִּי), a title of respect, similar in meaning to our word master or teacher, which was given to the teachers of the Jewish law by their disciples and the people in the time of Christ. (*Matt.*, xxiii. 7.) The title was often given to Christ by his disciples. (*Matt.*, xxvi. 25, 49; *Mark*, ix. 5; xi. 21; *John*, i. 38; iv. 31.) It is doubtful when it was first introduced. It is admitted by Jewish writers that it was not in use before the time of Hillel of Babylon, who lived in the first century before the Christian æra; and it was perhaps first introduced into the Jewish schools about the time of Christ. The word was originally used in three forms: *Rab* (רַב), as the lowest degree of honour; *Rabbi* (רַבִּי), of higher dignity; and *Rabbun* (רַבֻּן), or *Rabboni* (*ῥαββονί*), which was the most honourable of all. The title of rabboni is given to Christ on two occasions in the evangelists. (*Mark*, x. 51; *John*, xx. 16.)

The title of rabbi has continued in use among the Jews in modern times. The term rabbinical has been given to all the Jewish writings composed after the Christian æra. Some account of the most important of these works is given under HEBREW LANGUAGE, p. 92.

(Buxtorf, *Lexic. Chald. Rab. Talmud.*, 2176; Lightfoot, *Hor. Hebr. ad Math.*, xxiii. 7; Hill, *De Hebraeor. Rabbinis*, Jen., 1741; Winer, *Biblisches Realwörterbuch*, art 'Rabbi.')

RABBIT. [LEPORIDÆ.]

RABDOLOGY. [NAPIER'S BONES.]

RABELAIS, FRANÇOIS, born in 1483, at Chinon in Touraine, of humble parents, entered the order of St. Francis, but his jovial temper and satirical humour made him obnoxious to his brother monks, and he was glad to obtain permission to remove into a convent of Benedictines. But here also he could not sympathise with the habits of his brethren, and at last he ran away from his convent, and went to Montpelier, where he studied medicine and took his doctor's degree. He practised as a physician, though he retained the garb of a secular priest · in his capacity of physician he became known at the court of Francis I. In 1536 he accompanied Cardinal du Belloi to Rome, and obtained the pope's absolution for the breach of his monastic vows. On his return to France he obtained a prebend in a collegiate church, and was afterwards appointed curé or rector of Meudon, in which situation he continued till his death in 1553.

Rabelais was a man of extensive and varied information; he was acquainted with the principal European languages, besides Latin and Greek, but his principal merit consists in the acuteness with which he caught at and exposed the absurdities and the vices of his contemporaries, sheltered as they were by hallowed prejudice or by the cloak of superstition and hypocrisy. His principal work is a satirical novel, in which, under an allegorical veil, he lashes all classes of society, kings, statesmen, scholars, clerical as well as lay, prelates and popes, and especially monks, of whom he seems to have had a special dislike. Rabelais took for his first hero Gargantua, a gigantic personage, about whom there were many wonderful traditional stories, to which

Rabelais added many more. Gargantua lived for several centuries, and at last begot a son, Pantagruel, who is as wonderful as himself; beneath his tongue a whole army takes shelter from rain; in his mouth and throat are cities which contain an immense population, &c. The adventures of these personages are all ridiculous, and are described in humorous language, which often descends to low buffoonery and frequently to obscenity, according to the taste of the age. But under this coarse covering there lies a moral, for Rabelais meant to correct and improve society by his satire. He exposes the faults of the education of his time, the barbarous eloquence of college pedants, the folly of scholastic disputation, and the pretensions of self-styled philosophers; all which are successively held up to ridicule in the harangue of Janotus de Braginardo, in which he demands back the bells of the cathedral of Notre Dame, which Gargantua had detached from the belfry and appended to the neck of his mare; in the curious catalogue of the books of the library of St. Victor; in the disputation carried on by signs between Panurge and the English Thaumaste; and, lastly, in the description of the prodigies which science had produced in the country of Quint-Essence, or kingdom of Entéléchie. In another part of his work the author exposes the manners of courts and the weakness even of good monarchs. Pantagruel is a virtuous prince, devout, and severe in his morals, and yet he takes for his favourite Panurge, an arrant rogue, a drunkard, a coward, and a libertine, who seems to be a counterpart of the Margutte of Pulci's 'Morgante Maggiore,' for Rabelais was acquainted with the Italian romance writers, whose tales of giants and heroes and their wonderful achievements he probably had in view in his caricatures. The disastrous wars of Charles VIII. and Francis I. had produced too many evils in his time not to attract Rabelais' censure. To the headlong ambition of those conquerors he opposes the prudence and moderation of his heroes, who, before they enter upon even a defensive war, exhaust every means of conciliation. Two of the rash provokers of the conflict are overthrown: one is dethroned, and nobody knows what becomes of him; the other is transformed into a crier of mustard, and the circumstances which lead him to this change of condition are no less boldly imagined and described than the metamorphosis itself.

Rabelais sneers openly at the pretensions of the popes to interfere in temporal matters, and in his fourth book he exposes the pretended mortifications of a certain class of devotees who feasted on meagre days on a variety of dishes of the finest fish and other savoury things: 'Comment ès jours maigres entrelardés à leur dieu sacrifioient les gastrolatres.'

It has been assumed by some that Rabelais' work is a continued allegory of the events and personages of his time; and people have fancied that they recognised Francis I. in Gargantua, Henri II. in Pantagruel, Louis XII. in Grand Gousier, &c. This however seems very doubtful, and the notion has been strongly combated by Ch. Nodier, in an article, 'De quelques livres satiriques et de leur clef,' Paris, 1834. It seems more likely that Rabelais made occasional allusions to some of the leading characters of his age and their prevailing faults, while he lashed in general the vices and follies of society. With regard to the traditional stories of Gargantua, which he took for his subject, see 'Notice de deux anciens Romans, intitulés les Chroniques de Gargantua, où l'on examine les rapports qui existent entre ces deux ouvrages et le Gargantua de Rabelais, et si la première de ces Chroniques n'est pas aussi de l'auteur de Pantagruel,' by J. Ch. Brunet, author of the 'Nouvelles Recherches Bibliographiques,' Paris, 1824.

The romance of Rabelais has gone through several editions, and has been translated into German and English. One of the best French editions is that by Duchat, 'Œuvres de Maître François Rabelais, avec des remarques historiques et critiques,' 3 vols. 4to., Amsterdam, 1741. It is accompanied by notes explanatory of the old French words used by Rabelais, which are now obsolete. It also contains Rabelais' letters from Italy, which were published separately by M. de Sainte Marthe, Bruxelles, 1710, with curious historical remarks by the editor. A new and improved French edition of the works of Rabelais was lately published by E. Johanneau and Esmangart, with a biography of the author, and his 'Songes drolatiques,' being a collection of one hundred and twenty caricatures, designed by Rabelais himself, and intended to represent the characters of his romance, and also his 'Sciomachie,' a work which had become extremely scarce. Swift, in his 'Gulliver's Travels,' has imitated Rabelais. Rabelais was charged in his lifetime with irreligion and heresy, but he was protected by Francis I., who, having read his romance, said that he found no grounds for the charge. In the conversation between Grippeminaud and Friar John, Rabelais expresses in a striking manner the terror produced in those times by an accusation of heresy. Rabelais knew Calvin, who at one time thought of numbering him among his followers, but there was too much dissimilarity between the two men to allow any such connection, and Calvin having gravely censured Rabelais for his profane jesting, the satirist took his revenge by placing in the mouth of Panurge, while buying a sheep of Dindenault, some of the theological expressions of his austere monitor.

RABENER, GOTTLIEB WILHELM, born in 1714, at Wachau near Leipzig, was educated in the public school at Meissen. In 1734 he went to the university of Leipzig to study the law, where he became acquainted with some of the most eminent men of the age, and formed an intimate friendship with Gellert, with whom he took an active part in the establishment of a celebrated literary periodical called 'Bremer Beiträge.' In 1741 he received an office in the board of taxes for the circle of Dresden, and in 1763 he was appointed counsellor of the court of aids (Steuerrath), which office he held until his death, on the 26th of March, 1771.

Rabener was, in his time, one of the most popular writers in Germany, and he exercised a very beneficial influence upon his countrymen. His satires, in which he attacked the most glaring follies, fashions, and pretensions of his time, though not marked by much depth of thought, are still instructive and amusing as historical pictures of the age in which he lived, for the things which he ridiculed have long ceased to exist. His attacks were not directed against vice, but against follies and absurdities, especially those of the middle classes; his satires therefore are not characterised by indignation or bitterness, but by a good-natured and amiable humour, his object being to improve his countrymen by ridiculing some of their absurd habits. His satires show great power of observation and a cheerful disposition combined with a considerable share of wit; the style is easy and attractive, though sometimes rather prolix. With the exception of one, they are written in prose, and were first published in several periodicals. The first collection of them appeared in 1751, at Leipzig, in 2 vols.; the year after, another, and in 1755, a fourth volume was added. A complete edition, with a Life of the author, was published in 1777, in 6 vols.

RACAMI'NÆ. [VULTURIDÆ.]

RACCOON. [URSIDÆ.]

RACE. [MAN.]

RACE-HORSE. [HORSE.]

RACE'MIC ACID—*Paratartaric Acid*. The composition of this acid is similar to that of tartaric acid [TARTARIC ACID]; they are consequently isomeric bodies: they are associated in the grape of the Upper Rhine, the racemic acid probably existing as a biracemate of potash, which, during the process of fermentation, subsides with the bitartrate of potash.

Racemic acid is prepared by saturating the tartar of the above named district with carbonate of soda, separating the tartarate of potash and soda, which crystallizes, from the racemate, which does not; to the residual solution a salt of lead or lime is added, and, the precipitate formed being decomposed by dilute sulphuric acid, a solution of racemic acid is obtained, which by evaporation yields crystals.

The crystal of racemic acid, like that of the tartaric, is an oblique rhombic prism, and their saturating power, as well as their composition, are similar; there is also a close analogy in their general chemical relations: each forms insoluble salts with the same bases, as with lime, barytes, and oxide of lead. Biracemate, like the bitartrate of potash, is also a salt of sparing solubility; with oxide of antimony biracemate of potash forms a salt analogous to the emetic tartar which the same oxide yields with bitartrate of potash; their crystalline form is however different. The chief differences between these acids are—the less solubility of the racemic; its containing in its crystallized state two equivalents instead of one of water, one of which it loses at 212°, and the other by combining with alkalis; it does not, like tartaric acid, form a double salt with potash and soda, and the racemate is a less soluble salt than the tartrate of lime.

Racemic acid is composed of

Two equivalents of hydrogen	2
Four equivalents of carbon	24
Five equivalents of oxygen	40
Equivalent	66

The crystals are composed of

One equivalent of anhydrous acid	66
Two equivalents of water	18
Equivalent	84

RACHI'TIS. [RICKETS.]

RACINE, JEAN, born towards the end of 1639, at Ferté Milon, was the son of an officer of the Excise. He lost both his parents while he was a child. He studied first at Beauvais, and afterwards in the celebrated school of Port Royal des Champs, under Lemaistre, Lancelot, and the Abbé Hanon. He applied himself especially to the study of the Greek poets. After three years spent at Port Royal, he went to finish his education at Paris, in the Collège d'Harcourt, in 1658. He had long shown a decided inclination for poetry; and on the occasion of the marriage of Louis XIV., in 1660, he entered the lists with various other poets who wrote in honour of that event; and his composition, 'La Nymphe de la Seine,' was considered as the best of the whole. It was noticed by the king, who sent to the young poet, through Colbert, a present of 100 louis-d'or. In 1664 Racine brought out his first tragedy, 'La Thebaïde, ou les Frères Ennemis,' a subject which was suggested to him by Molière. He next wrote his 'Alexandre,' which is a feeble composition. Corneille, who was then grown old, advised Racine to give up writing tragedy. Boileau, on the contrary, encouraged him; and Racine, having studied hard for some years to improve himself, produced, in 1667, his 'Andromaque,' which was acted with great applause. In the next year he wrote 'Les Plaideurs,' a humorous comedy in imitation of the 'Wasps' of Aristophanes, which was so much relished by Louis XIV., that he bestowed upon the author a pension, accompanied by a very flattering letter. Racine now produced in succession 'Britannicus,' 'Bérénice,' 'Bajazet,' 'Mithridate,' 'Iphigénie,' and 'Phèdre,' which last is often considered his master-piece. But when 'Phèdre' was first brought on the stage, in 1677, a rival coterie intrigued against him, and succeeded in running down the work, which so disgusted Racine, that he resolved to write no more plays. About that time he married the daughter of the treasurer of Amiens, a match which proved a happy one. Racine frequented the court, where he had a warm friend in Madame de Maintenon, and he was appointed by Louis XIV. historiographer of the kingdom, together with Boileau. Of his historical labours however only a few fragments remain. Several years after, at the entreaty of Madame de Maintenon, he wrote another drama, 'Esther,' which was acted in the house of education of St. Cyr, in 1689, and was well received. In the following year he wrote 'Athalie,' which was performed in the same place, and was afterwards published, but it was received very coldly, although it has since been acknowledged to be Racine's noblest composition. This was also Boileau's opinion at the time, who told him so, adding, that the judgment of the public would right itself in time, a prediction however which was not accomplished till long after Racine's death.

'Athalie' was the last play of Racine. He continued to visit Madame de Maintenon, to whom he used to read parts of his projected history of Louis XIV. As he came to advert to the system of administration, he could not help reflecting upon the wanton prodigality of expenditure, the enormous burthen of taxation, the disastrous wars caused by mere ambition, and the consequent distress of the country and the misery of a great part of the population. Racine was a man of honest feelings: he became animated with his subject; and Madame de Maintenon was evidently affected by his picture. She suggested to him to draw up a memoir of what he thought could be done in the way of alleviating the distress of the people. Racine complied, and delivered his memoir to Madame for her perusal. As she was reading it one day in her cabinet, Louis XIV. entered, and she could not conceal from him the paper nor the author of it. Louis, having glanced at the memoir, observed with a frown, that 'as M. Racine could make excellent verses, he fancied that he knew everything; as if, because he was a great poet, he ought to be also a minister of state. Racine was informed of this, and from that time he was banished from the court. He had been for some years in a declining state of health, under the influence of mental excitement and of melancholy; and the mortification which he now felt, embittered his sufferings. His complaint, which was an abscess in the liver, was badly treated by the physicians, and he sank rapidly. Louis XIV., being informed of his danger, showed great interest in his fate, and sent to inquire after him: indeed the whole court sympathised with the dying poet. At last an operation was performed; but three days after, Racine expired, in the midst of acute pain, on the 21st April, 1697, in his 59th year. He was interred, according to his request, in the abbey of Port Royal des Champs, a spot for which he had always retained a great affection. After the destruction of that monastery, in 1709, the remains of Racine were transferred to Paris, and deposited in the church of St. Etienne du Mont, by the side of those of Pascal. Louis XIV. bestowed upon his widow a pension of 2000 livres, and the reversion of it on her sons till the death of the youngest.

The plays of Racine have gone through many editions; one of the best is that of 1768, 'Œuvres de Jean Racine, avec des Commentaires par Luneau de Boisjermain,' 6 vols. 8vo. It also contains his 'History of Port Royal,' the 'Fragmens Historiques,' several discourses delivered in the French Academy, of which he was a member, and other small compositions, with a biography of Racine.

His son Louis Racine published memoirs of his father's life, two volumes of commentaries on his plays, and a poem 'La Religion,' in six cantos.

The peculiar merits and deficiencies of Racine's plays are noticed under 'French Drama,' in the article ENGLISH DRAMA. He adhered strictly to what are called the classical unities, and his subjects were chiefly taken from antient history; but his personages, though Greek or Roman by name, are French in their character. His great merit lay in his delineation of the passions, his exquisite pathos, and the harmony of his verse.

RACK. [ARRACK.]

RACK. [TORTURE.]

RADACK and RALICK, are two chains or groups of coral islands, situated in the Pacific between 5° 30′ and 12° N. lat., and between 167° and 173° E. long. The chains extend nearly due north and south, and are not much more than 100 miles from one another. Radack, which is the eastern, consists of twelve groups of small islands, enclosed and connected with one another by coral reefs rising several feet above the sea-level. The sea which separates the single groups is of great depth. The chain of the Ralick islands is less known, and is said to consist of nine groups and three single islands. The islands themselves are of small extent, and in general situated on the windward or eastern side of the lagoons formed by the extensive coral reefs; most of them are on the reefs themselves. They are low, but well wooded. The bread-fruit tree and the pandanus are most numerous; there are also a few cocoa-nut trees. The inhabitants seem to belong to the Malay race, but they differ entirely in language, so far as is known, from the inhabitants of the other islands of the Pacific. They seem to be distinguished by great good-nature and simplicity. They have made some progress in civilization, as they mostly live on the produce of their orchards, and have commodiously built houses. Their larger boats are more than 30 feet long, and the sails are made of finely braided mats, and managed with considerable art. Though some islands belonging to this group may have been seen before, they were discovered in 1816, by Otto von Kotzebue, and some of them were more closely examined.

(Kotzebue's *First Voyage of Discovery into the South Sea and Behring's Straits.*)

RADCLIFFE, JOHN, M.D., was born of an 'antient and respectable family' (Ingram's *Memorials of Oxford*, No. 28), at Wakefield in Yorkshire, in the year 1650, and having acquired a competent knowledge of the learned languages at the grammar-school of his native town, was admitted a member of University College, Oxford, at the age of fifteen. He took his degree of B.A. in 1691, and became senior scholar of his college, but, as no fellowship became vacant there, he removed to Lincoln College, of which he had been previously invited to become a fellow. He took his degree of M.A. 1672, and commenced the study of physic, which he pursued in no other medical school, but attended the different courses of anatomy, chemistry, and botany delivered in the University. He is represented by his biographers as having 'recommended himself more by ready wit and vivacity than by any extraordinary acquisitions in learning,' and his books were so few in number, that, being visited in his rooms by Dr. Bathurst, the president of Trinity College, and asked by him where was his library, he pointed to a few vials, a skeleton, and an herbal in one corner of his room, and exclaimed with emphasis, 'There, sir, is Radcliffe's library.' In 1675 he took his degree of M.B., and began to practice as a licentiate in Oxford, where by some happy cures he soon acquired a great reputation. In 1677 he relinquished his fellowship in accordance with the statutes of his college, which require all the fellows after a certain time to enter into holy orders. He wished however to keep his rooms in college, and to reside there as a commoner, but this Dr. Marshall, the Rector (who is supposed to have been offended at some witticisms pointed at him by Radcliffe), refused to allow, which so much disgusted him that in after-life he lavished the whole of his munificence on his former college, University, leaving to Lincoln only the second presentation to a living if no fellow of University chose to accept it.[*] In 1682 he took the degree of M.D., and went out a Grand Compounder; an important ceremony in those times, and for a century afterwards, being accompanied with much expensive pomp and solemnity; all the members of the college walking in procession with the candidate, himself bare-headed, to the Convocation House. At length, in 1684, he removed to the metropolis, and settled in Bow Street, Covent Garden, where in less than a year he got into great practice, to which perhaps his pleasantry and ready wit contributed as much as his reputed skill in his profession. He was now in the high road to wealth and reputation, but it would be tedious and useless to trace all the steps of a man destitute of all the ornaments of a liberal profession, and who, as Richardson relates, once said to Dr. Mead, 'I love you, and now I will tell you a sure secret to make your fortune; *use all mankind ill:*'—by which he meant, to regard his interests and his humour as superior to all considerations of duty or propriety. There is reason however to suppose that he aimed at a vigorous and decisive method of practice, which distinguished him from the inert practitioners of the day; and it is no small praise to have obtained Dr. Mead's testimony, that 'he was deservedly at the head of his profession, on account of his great medical penetration and experience.'

In 1686 he was appointed by the princess Anne her principal physician, and from this time till his death he enjoyed the undisputed favour of the court, during the reigns of William and Anne; and although he often offended both the king and queen by his freedoms, yet such was the opinion of his medical skill, that he was always sent for in any case of danger. There are few events in his life that require particular notice, and the greater part of his biographers have only given a collection of anecdotes showing at once his wonderful skill in forming a correct prognosis, his rudeness and brutality towards his patients even of the highest rank, and the enormous sums of money which he received as fees. The reader will find abundance of these anecdotes in 'The Gold-Headed Cane;' 'The Georgian Era;' 'Lives of British Physicians,' in the *Family Library;* Ingram's 'Memorials of Oxford,' &c. Towards the end of the reign of James, the then celebrated Master of University College, Obadiah Walker, his fellow-collegian, was in vain employed to influence his religious principles. The answer of Radcliffe was firm and dignified: that 'being bred up a Protestant at Wakefield, and having continued such at Oxford, where he had no relish for absurdities, he saw no reason to change his principles and turn Papist in London.' In 1693 he entered upon a treaty of marriage with the only daughter of a wealthy citizen, and was near bringing the affair to a conclusion, when it was discovered that the young lady had an intrigue with her father's bookkeeper, which disappointment had such an effect upon him, that he determined to continue in celibacy. In 1713 he was elected into parliament for the town of Buckingham, but only two of his speeches have been preserved, and it does not appear that he was at all distinguished as a senator. He was sent for to attend Queen Anne when she lay at the point of death, but, being much indisposed himself, and knowing the case to be desperate, he declined coming, for which he was much blamed at the time, and intimation was given him that the populace in London were disposed to tear him in pieces if he should venture to come to town from his country-house. It is probable that the agitation of his mind concurred with a broken constitution in bringing him to an end two months afterwards, November 1, 1714, at the age of sixty-four. His body lay in state at the house at Carshalton, where he died, till November 27; it was then removed to an undertaker's in the Strand, and thence escorted to his favourite city Oxford, where it was interred with great solemnity in St. Mary's church, near the north-west corner of the present organ gallery, with the following simple inscription engraven on a brass plate on his coffin: 'John Radcliffe, Dr. in Physick, dyed Nov. ye 1st., 1714, in the 65th year of his age.'

In Radcliffe's character there really seems to be very little to admire. His refusing to embrace Romanism gives him but a slight claim to be considered a pious man, when all the rest of his conduct showed his carelessness and indifference to religion. He indulged in the pleasures of the table to excess, and is supposed to have shortened his days by his intemperance. There are upon record a few noble instances of his liberality during his lifetime, but not so many as might have been expected from his immense wealth. Richardson says 'he owned he was avaricious, even to spunging, whenever he anyway could, at a tavern reckoning, a sixpence or shilling, among the rest of the company, under pretence of "hating (as he ever did) to change a guinea, because (said he) it slips away so fast." He could never be brought to pay bills without much following and importunity; nor then, if there appeared any chance of wearying them out.'

It only remains to give some account of his posthumous benefactions, which were indeed most munificent, and which well entitle him to hold a place in the long list of benefactors to the University of Oxford. After making a life provision for some of his relations, he bequeathed his whole fortune to public uses. To St. Bartholomew's Hospital in London he gave for ever the yearly sum of 500*l.* towards mending their diet, and the further yearly sum of 100*l.* for buying of linen. He left 40,000*l.* for the building of a library at Oxford, which he endowed with an annual stipend of 150*l.* for the librarian (who is chosen by the same electors that appoint the travelling fellows, to be hereafter mentioned); 100*l.* per annum for repairs, and 100*l.* per annum for the purchase of books. A description of this building is given under OXFORD [vol. xvii., p. 99]. It was at first called 'The Physic Library,' being intended chiefly for books and manuscripts relating to the science of physic; comprehending, as that term was then understood, anatomy, botany, surgery, and natural philosophy. Accordingly, in compliance with a resolution of the trustees, the purchase of books is still entirely confined to works connected with natural history and medicine, and it may be added that the very small sum destined by Radcliffe for the buying of books is often exceeded. The foundation stone was laid with great ceremony, May 17, 1737; and, being completed in about ten years, it was at length opened in a most solemn manner, on Thursday, April 13, 1749; when the Duke of Beaufort, in behalf of himself and the other trustees, formally delivered the key to the vice-chancellor 'for the use of the University.' The first librarian was the Rev. Francis Wise, B.D. of Trinity College: the present one is John Kidd, M.D. of Christ Church, Regius Professor of Medicine. To University College he left 5000*l.* to build the master's lodge there, making one side of the eastern quadrangle. He also left them his Yorkshire estate in trust for the foundation of two Travelling Fellowships to be held by 'two persons to be chosen out of the University of Oxford, when they are M.A., and entered on the Physic line.' The electors are, the Archbishop of Canterbury, the Lord Chancellor, the Chancellor of the University, the bishops of London and Winchester, the two principal secretaries of state, the two chief justices of the Queen's Bench and Common Pleas, and the Master of the Rolls. The appointment is 300*l.* per annum to each of the fellows, and apartments in University College. They hold their fellowships 'for the space of ten years, and no longer, the [first] half of which time, at least, they are to travel in parts beyond sea for their better improvement.'[*] He also bequeathed the perpetual advowson of the rectory of Headbourne Worthy, in Hampshire, to trustees for the benefit of University College for ever, so that a member of that society should always be presented to it on every vacancy. He gave to the same college during his life 1100*l.* for increasing their exhibitions and for general repairs, and the painted window at the east end of their chapel appears to be his gift by the following inscription under it: 'D.D. Joan. Radcliffe, M.D., hujus Collegii quondam Socius, A.D. MDCLXXXVII.' After the payment of the bequests above mentioned, he gave to his executors, in trust, all his estates in Buckinghamshire, Yorkshire, Northamptonshire, and Surrey, to be applied in such charitable purposes as they all, in their discretion, should think best; but no part thereof to their own use or benefit. The first trustees were the Rt. Hon. William Bromley, principal secretary of state, Sir George Beaumont, Bart., Thomas Sclater, of Gray's Inn, Esq., and Anthony Keck, of Fleet Street, Gentleman. The present trustees are Lord Sidmouth, Sir Robert Peel, W. H. Ashurst, Esq., W. R. Cartwright, Esq., and T. G. Bucknall Estcourt, Esq. Out of these funds were built the Infirmary (1770) and the Observatory (1772) at Oxford, and the Lunatic Asylum on Heddington Hill near that city also received so much assistance from the same source (1827), that the committee gave it the name of the 'Radcliffe Asylum.' In 1825 the trustees gave 2000*l.* towards building the present College of Physicians in London, and they have ever been found ready to contribute according to their means to every charitable and useful purpose.

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[*] A different account is given in the *Life of Kettlewell*, prefixed to his works, from which it appears that Radcliffe was offended because a friend of his own, of University College, was not chosen to fill up his place at Lincoln.

[*] They are at present required to pass the *first* five years beyond sea, because in the last century it happened in two different instances that the Travelling

RADCLIFFE LIBRARY. [OXFORD.]

RADEMACKER, GERARD, was born at Amsterdam, in 1673. His father, an architect, much esteemed by Lairesse and other artists, instructed him in the first principles of drawing and perspective, and would have brought him up to his own profession, but perceiving his predilection for painting, he placed him under A. Van Goor, a respectable portrait-painter. Gerard applied himself to his studies with unremitting perseverance so long as his master lived, and at his death, being sufficiently advanced to give lessons in design, he was engaged by the bishop of Sebaste to teach his niece drawing. His agreeable manner gained the favour of the bishop, who, being soon afterwards obliged to go to Rome, invited Rademacker to accompany him; he spent three years at Rome, and greatly improved himself by indefatigable study. He was fond of representing views of the principal ruins and antient monuments, which he designed with great accuracy and spirit. On his return to Holland, his extraordinary success produced him numerous friends and abundance of employment. He did not however confine himself to architectural subjects, but painted many historical and emblematical pieces. His fertile invention and facility of execution enabled him to paint many pictures in a short time. He is reckoned one of the best masters of the Dutch school for the grandeur of his style, which had been cultivated by the study of the best models. He died at Amsterdam, in 1711.

RADEMACKER, ABRAHAM, supposed to be a younger brother of Gerard, was born at Amsterdam, 1675, and attained a high rank as a landscape painter without the assistance of a master. At first he drew in Indian ink, in which style he acquired great perfection; his early productions are in water-colours, and very highly finished; and he subsequently painted with equal success in oil-colour. His invention was extremely fertile; he composed readily and agreeably, and embellished his landscapes with picturesque ruins and buildings, and adorned them with well-designed groups of figures and animals. He engraved a set of nearly 300 plates, from his own designs, of the most interesting views of antient monuments in Holland and the Austrian Netherlands. They are executed in a masterly manner, and were published at Amsterdam in 1731. He died in 1735.

RADIATION OF HEAT is a motion of its particles in rectilinear directions, diverging every way from a heated body, either luminous or not; and it is imagined to arise from the existence of a strongly repulsive power by which the particles are made to recede from each other with great velocity. The intensity of heat thus emitted from a point of radiation is obviously the same at equal distances from the point; and, at unequal distances, it is inversely proportional to the squares of the distances. The radiating particles falling upon the surfaces of any bodies in the vicinity of that from which they emanate, are, according to the nature of those bodies, absorbed in them, or transmitted through them, or again they may be reflected from them; and, in the two last cases, the radiant heat, as it is called, appears to suffer modifications analogous to those which, in like circumstances, take place in light. According to M. Prevost (*Essai sur la Calorique Rayonnante*, 1809), the radiation of heat is a process which is perpetually going on among all the bodies in nature; those which are of equal temperature mutually interchanging equal quantities of caloric; but, with respect to two bodies which are unequally heated, that which has the greatest quantity sends forth emanations in greater abundance than the other; the difference however diminishing as both bodies approach to an equality of temperature.

The particles of heat (calorific particles) appear to move with perfect freedom through a vacuum, and to be impeded, but in an insensible degree, in their progress through air or any of the gases; they are also found capable of being transmitted, though in small quantities, through transparent media of the denser kinds, as glass, rock-crystal, &c.; and in passing through air they produce no sensible effect on the temperature of the latter. If a body be heated to any degree of temperature, and be placed in an absolute vacuum, it is evident that, in consequence of the repulsive power above mentioned, the heat must at length be entirely dissipated by the radiation merely; and if the body be placed in any fluid, it may be readily concluded that the abstraction of the heat must be influenced by the conducting power of the fluid.

The first direct experiments which appear to have been made on the radiation and reflection of heat are those of Mariotte, and an account of them is given in the 'Mémoires de l'Acad.,' 1682. He caused the heat of a fire to fall on the surface of a concave mirror, and observed that it was concentrated in the focus of the latter; and, on placing a plate of glass between the fire and the mirror, he perceived that the rays of heat were intercepted. The subject does not appear to have been much attended to till about the middle of the eighteenth century, when Lambert, in his 'Photometria' (1760), states that, on placing a large glass lens before a fire, the heat was scarcely sensible at the focus, while the reflected heat of burning charcoal set fire to combustibles at a considerable distance; and Scheele (a man who without any early education made many important discoveries while serving in the laboratories of his employers, the apothecaries of Gottenburg and Stockholm), in his treatise on air and fire, which appears to have been written in 1775, describes radiant heat as differing from ordinary heat by disseminating itself in right lines whose directions are not changed by the agitations of the air, and by being reflected from polished metallic mirrors, while it is absorbed in those of glass, and in the others when their surfaces are blackened.

The experiments of Scheele were varied by MM. Saussure and Pictet, who by an appropriate apparatus endeavoured to ascertain the laws of the radiation of caloric. They employed for this purpose two concave mirrors of polished tin, in the focus of one of which was placed the bulb of a Réaumur's thermometer, and in that of the other a ball of iron heated below the degree necessary to render it luminous; and, by a comparison of the height of the mercury in the thermometer with that in one which was placed out of the focus, but at an equal distance from the iron, the difference was found to be equal to about 8 degrees. M. Pictet employed also, in place of the heated ball, a glass flask containing boiling water, in order to avoid the risk of any light being combined with the heat; and the effect produced on the thermometer sufficiently proved that the calorific rays exist independently of those of light. (Pictet, *Essai sur le Feu*, 1790.) In pursuance of the experiments of Scheele with a blackened mirror, M. Pictet covered with lampblack the bulb of the thermometer in the focus of one of his mirrors, and found that the concentrated heat from the flask, which when the bulb was bright raised the mercury 2¼ degrees, now raised it 4¼ degrees. The same experimenter placed a flask of snow in the focus of one metallic reflector, and a thermometer in that of another; and the

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Fellow, after living for five years in England, preferred giving up the Fellowship to fulfilling the intentions of the founder by going abroad for the remainder of the time. It may be added that Radcliffe's bequest has been of very little use to medical science, as the only one of the Travelling Fellows (as far as the writer is aware) who has distinguished himself by his scientific writings is Sir John Sibthorpe, the author of the 'Flora Græca,' and founder of the Professorship of Agricultural Botany.

observed fall of the mercury was then considered as an indication that cold is susceptible of radiation and reflection like heat.

The nature of the apparatus, and the experiments made by Professor Leslie on the radiation of heat, are described in the article **Heat**. From these it appeared that the amount of radiation from a polished surface was only about one-eighth of that which took place from a surface without polish; and hence it was evident that the velocity of radiation depends more on the surface than on the nature of the radiating body. In making experiments respecting the absorbing power of substances, Leslie found that when the heat from the canister was suffered to fall on the glass bulb of the differential thermometer, the quantity received by the latter, if covered with tin-foil having a polish, was only one-fifth of that which it received in its ordinary state.

Professor Leslie also repeated the experiments of Pictet for determining what was called the radiation of cold; and filling his canister with ice or snow, he found that the cold apparently emitted from the varnished side was the greatest, and that from the polished side the least; he observed also that the cold, like the radiant heat, varied with changes in the absorbent power of the thermometer and of the surface of the mirror. The mercury in the thermometer fell more when the mirror was of polished metal then when of glass; it also fell more when the bulb was in its ordinary state than when covered with a polished tin-foil. (*Inquiry into the Nature of Heat*, 1804.) These circumstances, which seemed at one time to favour the opinion that cold had a material existence like heat, have received an explanation from M. Prevost of Geneva. (*Journal de Physique*, xxxviii.) This philosopher observes that a mass of ice or snow may send out radiant heat less in abundance than that which is emitted from other bodies in its vicinity; and this comparatively small quantity of heat, when reflected from one mirror to the other, and from the surface of the latter to the focus, may there produce the effect of absolute cold, by causing the thermometer to send out radiant heat to the ice, and thus render the mercury in it lower than it would otherwise be. This interchange of caloric between the thermometer and the ice may be conceived to go on, the former on the whole losing, and the latter acquiring it, till an equilibrium is established between their temperatures.

From the results of the valuable experiments made by Professor Leslie, it is apparent that the power by which bodies absorb heat is directly proportional to that by which they allow it to radiate from them; and that both are inversely so to the power of reflecting it. When the rays of heat fall on polished glass, a large portion of them is absorbed, these raise the temperature of the glass, and from the surface of the latter that heat is afterwards radiated in abundance; whereas, when the rays strike the surface of polished metal, nearly all of them are reflected. It was found however that different metals, independently of their polish, have different degrees of reflecting and radiating power. A mirror of tin being rubbed with mercury, the reflection was increased in the ratio of 12 to 20, though the degree of polish was the same; and a metal having lost some of its brilliancy by oxidation, the radiating power was proportionally augmented.

Leslie's canister was found, moreover, to produce different effects, according to the thickness of the covering material on its sides. One coat of jelly on the tin side produced an elevation of the thermometer equal to 38°, and four such coats produced an effect equal to 54°; but after a certain thickness the difference was insensible. A plate of metallic leaf rendered however the radiating power as great as a thick plate of the same metal.

Experiments made by Count Rumford, soon after the publication of Leslie's work, produced nearly the same results as the latter had obtained; and the Count draws from them several useful conclusions. He observes (*Phil. Trans.*, 1804) that when we would confine heated substances, solid or fluid, in a vessel, the surface of the latter should be highly polished; on the other hand, if the object be to cool the substances, the surface should be painted or varnished, or be covered with a soft coating which is not metallic. Also, in warming apartments by steam, the intention being to promote radiation as much as possible, the tubes conveying the steam should be unpolished or painted.

In pursuing the views of Scheele concerning the transmission of heat through screens, Leslie found that a sheet of tin interposed between the canister and the mirror entirely intercepted the heat, and a plate of glass nearly so. Employing two sheets of tin, each of which had one side covered with black varnish, while the other side was polished, the following were the results: when the varnished sides were in contact, little heat passed through, evidently because one of the exterior sides was not well adapted to receive the caloric, nor the other to radiate the little which might have been acquired; but when the varnished sides were placed exteriorly, the quantity which passed through was considerable, the varnish enabling one plate easily to absorb and the other as easily to radiate the heat.

The reality of the transmission of heat through glass plates, which both Leslie and Dr. Brewster appeared to doubt, from the difficulty of distinguishing between heat so transmitted and that which radiates from the glass after having been for a time absorbed in it, is now supposed to be sufficiently established by the experiments of MM. Prevost and De la Roche (*Annals of Philos.*, 1803), and also by the researches of M. Melloni. (*Annales de Chimie*, xlviii., &c.) The first, in order to ascertain the fact, received on a thermometer the rays from a heated body after passing through screens of glass which were renewed so often that they had not time to become heated. The second suffered a thermometer to rise to its maximum by the rays from a heated body when a transparent glass screen was interposed; and again, when there was interposed a glass screen blackened so as to prevent the radiant heat from passing, the excess of the rise of the thermometer in the former case above that in the latter gave evidently the effect produced by the radiant heat alone. The conclusion at which the experimenters arrive is, that the quantity of heat which radiates through glass is so much the greater as the temperature of the source of the heat is higher. M. Melloni found that of 100 rays incident on the same plate of glass from an oil-lamp, from red-hot platinum, from copper heated to 734°, and from the same heated to 212°, the numbers were 77, 57, 34, and 12, respectively. He has also ascertained that all bodies which have the power of transmitting heat are in general more or less transparent; and that rock-salt is the only known substance in which all the radiant heat falling on it is either reflected or transmitted, whether the temperature of the heated body be low or high.

By letting the calorific rays pass first through one screen and then through two, M. De la Roche found that, in passing through the second screen, the rays suffered less diminution of intensity than in passing through the first; and the fact is considered as proving that some calorific rays experience more difficulty in passing through glass than others: consequently that, like light, radiant heat is of different kinds. He also observed that a thick plate of glass allows a smaller quantity of radiant heat to pass through than a thin one, and that the difference is so much the less as the temperature of the heated body is higher: and it is inferred that, since radiant heat becomes more capable of penetrating glass as the temperature increases, till the body becomes luminous, heat is only a modification of light.

The theory of radiant heat is intimately connected with that of the cooling of bodies; and the first effort to determine the laws relating to this subject was made by Sir Isaac Newton, who, from theoretical considerations, inferred that when a heated body is exposed to a constant cooling cause, as the uniform action of a current of air, it ought to lose at each instant a quantity of heat proportional to the excess of its temperature above that of the surrounding air, and consequently that its losses of heat in equal intervals of time should form a decreasing geometrical progression. But it is now known that this law holds good only when the differences of temperature do not exceed 40 or 50 degrees, and its inaccuracy at high temperatures was first pointed out by Martine (1740).

From the experiments of MM. Dulong and Petit, it is found that, if it were possible to obtain the absolute loss of heat which a body in vacuo experiences (or that loss which would take place if there were no restoration of heat from surrounding bodies), the velocities of cooling, estimated by the diminutions of temperature indicated by an air thermometer, would increase in a geometrical progression when the temperature of the heated body increases in an arithmetical progression; and further, that the ratio of the former progression ($=1\cdot0077$) would be the same for all bodies, whatever might be the state of their surfaces, and whether the temperature of the vacuum remained constant or increased in an arithmetical progression. But, on taking account of the quantity of heat sent back at every instant by the surrounding medium (a quantity which will be constant if the temperature of that medium does not vary), it is found that the velocities of cooling in vacuo increase, for equal increments of temperature, in a geometrical progression whose terms are diminished by a constant quantity, which quantity varies in a geometrical progression when the temperature of the medium varies in an arithmetical progression. By direct experiments on the cooling of heated bodies in air and hydrogen gas, Dulong and Petit determined what Professor Leslie had before ascertained by an indirect process, namely, that the loss of heat when a body is in contact with a gas is independent of the surface of the cooling body. They found also, by experiments on dilated air and carbonic acid at various temperatures, that the velocity with which a body cools from the mere contact with gas (when the excess of temperature of the heated body above that of the surrounding gas is constant) depends on the density and temperature of that gas; but this dependence is such that the velocity of cooling remains the same if those elements change in such a way that the elasticity of the gas remains constant. The same chemists have also ascertained that, when the elasticity of air varies in a geometrical progression, its cooling power varies likewise in a geometrical progression, in such a manner, that when the common ratio of the first progression is 2, that of the latter is 1·366. If, instead of common air, hydrogen gas, carbonic acid, or olefiant gas be in contact with the heated body, the ratio of the first progression being as before, that of the second is 1·301. And they conclude that the cooling power of each of the last-mentioned gases is nearly proportional to the square root of the elasticity of the gas. (*Annales de Chimie*, vii.; *Annals of Philos.*, xiii.)

That the colours of bodies have some effect on the velocity of radiation and on the absorption of heat has been proved by experiments made by Dr. Stark of Edinburgh (1833). This gentleman surrounded the bulb of a thermometer successively with equal weights of black, red, and white wool, and placed it in a glass tube, which was heated to the temperature of 180° by immersion in hot water; the tube was then cooled down to 50° by immersion in cold water, and the several times of cooling were respectively 21, 26, and 27 minutes. On winding successively black, red, and white wool about the bulb, and raising the temperature from 50° to 170°, the times in which the thermometer so surrounded acquired the latter temperature were respectively 4¾, 5¼, and 8 minutes. (Turner's *Elements of Chemistry*, 'Heat.')

Having thus briefly noticed the reflection of radiant heat, its transmission through plates, and the laws of velocity with which bodies become cooled, we may conclude with a few words concerning its refrangibility. This subject was first examined by Dr. (afterwards Sir William) Herschel, who, having analysed by the prism, as usual, a beam of solar light, and having placed a Fahrenheit's thermometer successively within the fields of the different coloured rays in the spectrum, found that in the violet rays the temperature was 2°, and, gradually increasing towards the other extremity, in the red rays it was 7° above the general temperature of the apartment. He also ascertained that there was a point beyond the limits of the visible red rays at which the excess of temperature was a maximum. Similar observations were made about the same time by Sir Henry Englefield; and it was hence evident not only that the calorific rays were refrangible, but that the property existed in them in a higher degree than in light. Dr. Herschel afterwards made a number of observations on small pencils of heat proceeding from a lighted candle, a common fire, iron heated to redness, and also from iron heated to a lower degree; and he discovered that, in all these cases, the calorific rays were susceptible of refraction. He found however that there was some difference between the heat of the sun and that of terrestrial bodies, the former passing more freely through the glass than the latter. (*Phil. Trans.*, 1800.) M. Melloni has subsequently ascertained, by using prisms of rock-salt (a mineral which possesses in a high degree the power of transmitting heat), that heat from different sources, like light of different colours, has different degrees of refrangibility.

It ought to be observed that M. Berard, in a memoir on the physical properties of solar light, states that he found the point of greatest heat to be not beyond but within the red rays of the spectrum. But Sir David Brewster relates that Sir Humphry Davy discovered the cause of this difference, which is ascribed to the nature of the thermometer employed by the French chemist. On using slender thermometers with long bulbs, and filled with air which was confined by a coloured fluid, Sir Humphry Davy obtained results which confirm the observations of Dr. Herschel and Sir Henry Englefield.

M. Berard ascertained that when light suffers double refraction in Iceland spar, the two pencils formed spectra which exhibited similar properties; in both, the calorific power differed at the two ends, and existed beyond the visible red rays. Also, on polarising by reflection from glass a beam of solar light, and receiving the reflected ray on a second glass, the latter being capable of turning round till the ray ceased to be reflected from it, he found that while the light was reflected, the heat was also reflected, and that when no light was reflected, there was no heat. The like effect was produced when, instead of a pencil of solar light a portion of radiant heat from a body not luminous was employed, and the inference is, that the particles of radiant heat are polarised by reflection, like those of light. This subject has however been since more completely investigated by Professor Forbes. (*Edinburgh Phil. Trans.*, 1835.)

The subject of solar radiation, or of the direct force of the sun's rays, so important to the agriculturist as well as to the philosopher, has been treated by Mr. Daniell, in his 'Meteorological Essays,' 1823; and indeed to this gentleman we are indebted for nearly all that is known respecting it. On comparing a thermometer exposed to the action of the sun with one which gave the mean temperature of the air in the shade, Mr. Daniell observed that the power of solar radiation varies with the sun's declination; the greatest intensity taking place in June, though the greatest mean temperature of the atmosphere does not occur till July. He observed also that the radiation varies at different hours of the day, increasing with the sun's altitude till a short time after it arrives on the meridian, and then diminishing till the evening. From the observations of Captain (now Major) Sabine at Sierra Leone, at Bahia, and at Port Royal, Mr. Daniell has been led to conclude that the intensity of solar radiation diminishes in proceeding towards the equator; and the conclusion appears to have been subsequently confirmed by the observations of Captains Scoresby and Parry, and of Dr. Richardson, in the Arctic regions. From the observations of Captain Sabine on the mountains of Jamaica, Mr. Daniell considers that this radiation increases from the surface of the earth upwards.

Since all bodies, even in vacuo, lose heat by radiation, it is easy to conceive that any part of the earth's surface, when not exposed to the direct action of the sun, must emit calorific rays of heat towards the heavens, and thus must become cooled. This is called *terrestrial radiation*, and the subject has been particularly considered by Mr. Daniell, who, from observations continued during all the months of the year, found that the maximum depression of the thermometer, on account of radiation, varied from 10° to 17° between midwinter and midsummer; but that the mean depression was the least in January and July, and the greatest in April. It is obvious however that numerous observations are yet to be made in different regions of the earth before any general theory respecting the extent and law of the variations of solar and terrestrial radiations can be formed.

RADICAL. [ROOT.]

RADICO'FANI. [SIENA, Province.]

RADISH. [RAPHANUS.]

RA'DIUS (a ray, the spoke of a wheel) means the line drawn from a point, considered as a centre or pole, to any point of a curve.

RADIUS OF CURVATURE. [CURVATURE; SURFACE.]

RADIUS. [SKELETON.]

RADIX (root) is applied to any number which is arbitrarily made the fundamental number of any system. Thus ten is the radix of the decimal system of numeration, and the radix of the common system of logarithms. The term however has not acquired much fixed use, though often convenient for temporary specification of the use which is made of a particular number or fraction.

RADNOR. [RADNORSHIRE.]

RADNORSHIRE, a county of South Wales, lying between 52° 2′ and 52° 28′ N. lat. and 2° 57 and 3° 45′ W. long. This county is of an irregular form, bounded on the north by Montgomeryshire and Shropshire, on the east and south-east by Herefordshire, on the south and south-west by Brecknockshire, and on the west by Cardiganshire. Its greatest length is from near Presteign, on the east, to the Cwmtoyddwr Hills, on the west, a distance of 31 miles. Its greatest breadth, from the hills in the parish of Beguildy, on the north, to the river Wye, near Gladestry, on the south, 26 miles.

Presteign, the county town, is 151 miles north-west from London, measuring by the mail-coach road, and about 120 in a straight line. It is the smallest of the six counties of South Wales, having a superficial extent of 426 square miles (being 184 miles less than Pembrokeshire, the county of South Wales next in size). Its population also is inferior to the other counties of South Wales: the Parliamentary Returns for 1831 state the total number of inhabitants to be 24,651.

Surface, Hydrography, &c.—Radnorshire is decidedly a mountainous county, but it would be difficult to say in what direction the hills generally extend. The highest range however, that of Radnor Forest, has an inclination from south-east to north-west. The Carneddu Hills and Llandegley Rocks have a similar direction; but, with these exceptions, it is in vain to lay down any general rules in regard to the line and grouping of the mountains of this county. One portion of Radnor Forest, lying between New Radnor and Llanvihangel Rhydithon, attains the height of 2163 feet above the level of the sea. Another point, called Whimble, is scarcely inferior, being 2100 feet high. The points next in elevation are Fron, 1850 feet; Fron-wen, 1800; Bach Hill, 1750: all of which are portions of the wild tract of land called Radnor Forest, situate on the eastern side of the county, parts of which, from the name and other circumstances, it is natural to suppose were covered with wood, although now producing nothing but moss and heath. It is the property of the crown, who appoints a forester to protect its interests. There are some hills (for they partake more of the character of hills than mountains) of considerable height in other parts of Radnorshire. The southern end of Rhydd Hywel, on the right of the road leading from Rhayader to Llanidloes, 1750 feet; Bryn Maen, in the parish of Llanvihangel Nantmelan, and Gwaun Ceste, in Glascwm parish, are each 1700 feet high; Gorstaden, near Llanbadarn Fynydd, is 1650 feet; Camlo Hill, near Abbey Cwm Hir, 1650 feet; and Cefu Craig-y-Foel, near Nant-gwylt, 1550 feet.

The general direction of the rivers and streams is to the south-east; and nearly all of them empty themselves into the Wye and its tributaries. The exceptions are, the Teme, and a small stream called Afon Tylwch, which takes its rise in the north-western part of the county, and runs into the Severn at Llanidloes in Montgomeryshire.

The Wye enters Radnorshire on the north-west, between Llangerrig and Rhayader, at a distance of about eighteen miles from its source on Plynlimmon. From two miles below Rhayader to the town of Hay it forms the boundary between Radnorshire and Breconshire, the former county being on the north-east and the latter on the south-west side of the river. The Wye then separates Radnorshire from Herefordshire, as far as the village of Rhydspence, where it quits the former county. The Elan is the first considerable stream that adds its waters to those of the Wye. Rising on the elevated ground on the borders of Cardiganshire, it takes a circuitous but rapin course easterly towards the Wye, which it enters on the right bank a short distance below the town of Rhayader. The scenery of the Elan is extremely romantic, and is finely described by the Rev. Wm. Bowles, in his poem of 'Combe Elain.'

The Ithon rises on the northern side of the county, adjoining Montgomeryshire, and takes a course directly south. It forms the drain for the central portion of the county; and before its junction with the Wye, on the left bank of that river, seven miles above the town of Builth, it becomes a stream of considerable size, having a course of 30 miles. The Elan and Ithon are the only two rivers which exclusively belong to Radnorshire. The Lug rises in the east portion of the county, and runs south-west to the town of Presteign, two miles below which it enters Herefordshire, and traversing the most fertile parts of that county, falls into the Wye four miles below Hereford. The source of the Teme is in the parish of Beguildy: running in a south-west direction by Knighton, it enters Herefordshire a short distance above the village of Brampton Bryan. In its course it serves as the boundary between Radnorshire and Shropshire.

The smaller streams of Radnorshire are the Somergel, Edw, Marteg, Clywedog, Arrow, and Bach-wy. The cataract called 'Water-break-its-neck' is formed by a branch of the first-named stream. The scenery on the Edw and Bach-wy, near their respective junctions with the Wye, is well worthy the traveller's attention. The Wye and Ithon abound with salmon. The fish of the other streams are principally trout and grayling.

The lakes, or pools of natural water, are neither extensive nor numerous. The largest is Llanbychllyn, situated in the hundred of Painscastle, between Llanbadarn-y-garreg and Llandewi-fach. It is one mile and a half in circumference. The most picturesque is Gwyn Llyn, about two miles west of Rhayader, on the old road to Aberystwith. There is a third pool, called Llyn-hilan, close to the turnpike-road leading from New Radnor to Builth. It is about a mile in circumference, and at a very considerable height above the adjoining valley.

The roads of this, like those of most other counties, have been considerably improved of late years. The improvements effected in Radnorshire are owing in some degree to the flourishing state of Aberystwith in Cardiganshire and the estimation in which that town is held as a watering place and fashionable summer resort, the main roads of this county forming a communication between Cheltenham Worcester, Birmingham, &c. and the Cardiganshire coast. The road from Birmingham and Worcester to Aberystwith enters Radnorshire at Presteign. From that town there are two branches, the one through New Radnor and Llandegley, and the other, a line lately formed through the valley of the Lug, and uniting with the former at Penybont, on the western side of Radnor Forest: from thence the road runs through Rhayader and along the banks of the Wye, quitting Radnorshire at the distance of eight miles from the last-mentioned town. The Cheltenham and Hereford road enters the county at Stanner, and unites with the line just described, between Kington (Herefordshire) and New Radnor. The Cheltenham and Aberystwith mail travels this line throughout the year. Birmingham and Worcester coaches sometimes run during the summer months. The most romantic Radnorshire road is one formed through the exertions of W. Pugh, Esq., formerly of Kerry, which leads from Newtown to Builth, traversing the county from north to south, and for the greater portion of its length is carried along the banks of the Ithon. The road from Builth to Rhayader, on the Radnorshire side of the Wye, is also highly picturesque and interesting. A new line of road from the former town to New Radnor has lately been formed.

There is no water-communication of any description. The Radnorshire portion of the Wye is not navigable, and the other streams are too small or too rapid to admit of it. There is no canal in or through any part of the county The Newtown and Montgomery Canal, in the latter county, however, is used for the exports and imports of the northern district of Radnorshire. There is a railroad from Kington in Herefordshire to the lime-works at Weythel and Old Radnor, a distance of four miles. It is principally used to convey lime and the coal used in burning it. The railroad from Kington communicates with Hay, Brecon, &c.

Geological Structure.—The principal portion of the county is composed of the strata forming the Silurian system; but on the west and north-west side of the county, the upper beds of the older rocks, composing the Cambrian system, make their appearance. These Cambrian rocks in Radnorshire have a general strike from north and south, or from north-east to south-west, and for the most part dip to the north-west. These rocks comprise perhaps one-fourth of the whole county, having in their extreme western and north-western limits a slaty character, which towards the interior or east is gradually changed to quartzose grit. The character of these rocks may be examined among the hills west of Llanbadarn-fynidd; along the Wye from Rhayader to Llangerrig, on the Aberystwith road; and in the romantic dingle of the Elan, where the strata are much contorted. They also form the summits of Camlo Hill, Ralt, Wenallt, Rhiw-graid, Gwastaden, Dol-fan, &c. Proceeding east, the river Ithon forms, nearly exactly, the line of junction of the Cambrian rocks with those of the Silurian system; the latter however encroach somewhat on the west of the Ithon as that river approaches the Wye.

The lower Silurian rocks do not make their appearance at this junction; the members of the upper Silurian system resting unconformably on the Cambrian rocks. These upper

Silurians compose (with the exception of the trap rocks of Llandegley, &c., and the strata interlaced with them) the whole of the middle portion of the county; but the total absence of the two limestones of the system renders it impossible to distinguish with any accuracy between the different formations. There is no trace of the Wenlock limestone to define the boundary between the shale and the lower Ludlow rock, neither any Aymestry limestone to separate the lower from the upper Ludlow rock. The strata vary in direction from north-east and south-west to north-west and south-east. Radnor Forest is included in this district, and is chiefly composed of the upper Ludlow rock. The summit is a gritty sandstone, representing, according to Mr. Murchison, the lowest beds of the old red-sandstone.

On the eastern side of the county, at Old Radnor, and in the neighbourhood of Presteign, the strata are more varied and interesting. The trap rocks at the former place have brought to light the rocks both of the upper and lower Silurian system. At Nash and Corton, between Old Radnor and Presteign, the Caradoc sandstone may be seen highly inclined, and forming an anticlinal ridge, the beds dipping north and south, and throwing off on each side the Wenlock limestone and shale: characteristic fossils of these formations may be collected at Corton, Nash, and Woodside. There is not,' says Mr. Murchison, 'perhaps in Great Britain, a finer mass of altered and crystalline limestone than that exhibited at Nash Scar, the principal cliff of which rises to the height of 200 or 300 feet above the adjoining valley of Knill and Presteign.' This limestone is well developed at Old Radnor, where also traces of the lower Silurian rocks may be observed. The great tract of old red-sandstone, occupying the counties of Hereford, Brecon, &c., extends into Radnorshire, and occupies a considerable portion of the south-eastern part of the county. It enters Radnorshire at Llanstephen on the Wye, and extending eastward leaves the county near Huntingdon. Besides this extension of the great formation, there are three outliers of old red-sandstone of inconsiderable extent, and separated from the principal tract by the Ludlow rocks. The first lies between Presteign and Knighton, comprising an area of about five square miles. The second is situated west of Presteign, occupying the western side of Nash Scar, and appearing again on the high ground between Presteign and Harley Hill. This outlier is separated from the first by the valley of the Lug. The third is a long narrow slip between Old Radnor and Gladestry, on the east side of Colva Hill. The strata of these three outliers are all more or less inclined, and attain considerable elevations.

The chief mass of trap rocks in Radnorshire is situated near the centre of the county, having a direction from north-west to south-east, and extending from Llandegley and Llanbadarn-fawr, on the north and north-east, to the neighbourhood of Builth on the south-west, being in length about ten miles and in breadth five; forming the Llandegley rock, and the ridges of Sunny-bank, Gelli, and the Carneddau. Parallel to the main ridge, on the eastern side, are a number of smaller elongated mounds of trap running in the same direction, and besides these there are numerous *stratified* traps, alternating with beds of marine deposit. Mr. Murchison enumerates twelve of these bands of bedded trap in a section of only 350 feet in length. The stratified rocks associated with the trap are various shales, flags, &c., but principally a dark-coloured shale, representing probably the Wenlock shale; all of them much altered by the action of the intrusive igneous rock. The stratified traps consist of felspar, and of quartz, rather porphyritic, and containing crystals of iron pyrites and some carbonate of lime. Mr. Murchison compares this district to the tract of Shelve and Corndon in Shropshire. The trap in the vicinity of Old Radnor before alluded to occupies two parallel ridges: the eastern, three miles in length, comprising Stanner Rocks, Worsel Wood, and Hanter Hill; and the western, called Old Radnor hill, about half the length of the other. The trap of the first ridge passes from a coarse crystalline hypersthene rock into fine-grained greenstone, and resembles the hypersthene rock of Coruisk in the Isle of Skye. The mass of Old Radnor hill is a dark greenstone, but there is a peculiar conglomerate thrown off on the western flanks, having a base of grey and green felspar, enclosing pebbles of quartz, some of a large size. 'From this composition,' says Mr. Murchison, 'it may be inferred that a stream of compact felspar, or submarine lava, entangled in it the sand and pebbles of a former bed of the sea.' It is a stratified deposit, occupying the same place in the series as the volcanic grits of the Caradoc which underlie the Wenlock limestone. The trap may be seen in many places in contact with and penetrating the Wenlock limestone, which close to the junction is completely unstratified. Minute veins of copper-ore and crystals of copper and iron pyrites occur in the altered bedded rocks, as well as nests and coatings of anthracite. There are various proofs that the volcanic rocks penetrated the limestone posterior to its consolidation. Mr. Murchison compares the phenomena at Old Radnor to those of the Val di Fassa in the Tyrol, the latter however being on a much larger scale. The intrusive volcanic rocks do not appear at the surface at Nash, but there is every proof of their immediate vicinity, and the Corton conglomerate strongly resembles a volcanic grit. There is another ridge of trap rock called Baxter's Bank, situated a few miles north-west of the Llangedley trap, parallel to it, and near the junction of the Cambrian system with the Silurian, which presents similar phenomena of altered and dislocated strata to those before mentioned. The superficial deposits are composed of the detritus of the adjacent rocks, and bear evident tokens of a drift from the north-west to the south-east.

Although all the strata of the county are inferior to the carboniferous rocks, yet many attempts have been made and are still in progress in search of coal, which the majority of the inhabitants believe to exist under the surface. The principal cause of this delusion has been the dark lead-coloured appearance of the shale before mentioned as existing in the neighbourhood of the trappean rocks; and accordingly, where the trap rocks protrude, levels are driven and shafts sunk, while a slight acquaintance with the principles of geological science would show such attempts to be utterly hopeless.

The medicinal springs of Llandrindod, Llandegley, and Blaen Edw all issue from the altered strata in junction with the trap rocks of the district, and, like the mineral springs in Brecknockshire, are supposed to owe their origin to the decomposition of iron pyrites and other mineral ingredients. There are three springs at Llandrindod, viz. a saline, chalybeate, and sulphur. The Llandegley and Blaen Edw waters are sulphurous. Llandrindod is much frequented in the summer months, and lies on the Builth and Newtown road, about seven miles from the former town. There are other medicinal springs in the county, but they are chiefly used by persons residing on the spot.

Surface and Agriculture.—A great portion of the county consists of common, bog, and moor land, and is therefore comparatively useless for agricultural purposes. It is supposed that nearly two-thirds of the county are unenclosed, but it is probable that were the population greater, the amount of waste land would be greatly diminished, as a large part merely requires to be enclosed to render it fit for profitable cultivation; while other portions, too steep or too exposed for agricultural purposes, might be successfully planted. The proportion of waste land however has been greatly diminished of late, as enclosures are gradually making, as well as considerable plantations of larch and fir; and a bill has lately passed through parliament for enclosing the waste land of three parishes, and this will probably be followed by others. But the waste lands, even in their uncultivated state, are of great value as sheep-walks, and as about one-fourth only of the enclosed land is under the plough, and many of the pastures (owing to the scarcity of manure and the want of an efficient system of draining) are barely superior to the common land, the policy of making extensive enclosures at present may well be questioned, especially as the expense of enclosing is nearly equal to the value of the fee-simple of the land. Planting however cannot be too much encouraged. Many of the manors (so called) were until lately in the hands of the crown; but most of them have been sold by the Commissioners of Woods, Forests, and Land Revenues, to private individuals, which has been the cause of considerable hardship to many poor persons residing within the manors on spots of ground formerly enclosed from the waste, and since claimed by the new proprietors of the manors.

Notwithstanding the thin population, the quantity of wheat grown in the county is considerably less than the consumption. The best wheat is grown on the eastern and south-eastern districts. Barley and oats are grown in considerable quantities on nearly all the farms. Potatoes are cultivated to some extent, and flax in small patches for home use. There are no hops grown in any part of the county. For purposes of sale, the main dependence of the Radnorshire farmer is on the stock reared on the pasture and common land; the latter not only support large quantities of sheep, but, in the most sheltered parts, cattle of all sorts. The cows are principally of the Herefordshire breed; the black Cardiganshire cattle are not extensively bred here. Numbers of Welsh ponies are also reared on the commons. Salt butter for winter use is an article of export. A scarcity of manure retards the improvement of the land. There is excellent lime at Nash and Old Radnor; but these places being situated on the border of Radnorshire, it has to be carried a great distance, and by hilly roads, to reach the interior and opposite districts of the county. Irrigation is universally adopted with the most beneficial results.

There is little cider fruit grown; the small quantity that there is, is confined to the parts adjoining Herefordshire. The quantity of rain and the damp fogs of the winter months, in the vicinity of the hills, seem to engender a moss on the young apple-trees planted as an experiment, which soon proves destructive to their fructification if not to their growth.

The farms are of various sizes; but it may be observed that the homesteads on the largest are generally much inferior to those of Herefordshire and other English counties.

Divisions, Towns, &c.—Radnorshire is divided into six hundreds, exclusive of the borough of Radnor, and contains fifty-two parishes and three market-towns.

Hundred.	Situation.	Population.
Colwyn	South and Central	2,632
Kevenlleece	Central	3,135
Knighton	North-east	5,213
Painscastle	South	4,226
Radnor	East and Central	2,544
Rhayader	West and North	4,440
Radnor Borough	Central	2,461
	Total	24,651

Presteign, the capital town, is situated in the hundred of Radnor, at the extreme eastern verge of the county, and is 151 miles north-west from London. The nearest road from Birmingham and Worcester to Aberystwith lies through this place. The valley in which the town stands is fertile, and watered by the Lug. Under the Reform Act it is a contributory borough with New Radnor, &c. in the election of a member of parliament. The boundaries of the borough for that purpose were settled by the 2 & 3 Will. IV., c. 64. It is in the diocese of Hereford. The derivation of the name Presteign is not known: the Welsh name is Llan Andras (the church of St. Andrew). The town is supposed to owe its rise to Martin, bishop of St. David's in the thirteenth century. The parish registers in existence commence as early as the year 1561. In one of them there is an entry stating that Charles I. passed two days and nights in a house in the parish, and from thence proceeded to Chester. The town now consists of four principal streets. The assizes and quarter-sessions are held here. The shire hall and county gaol are modern buildings. The market-day is Saturday. Fairs:—Sat. before Feb. 13, May 9, June 20, and October 13. The living is a rectory, with the chapelry of Discoed annexed, and the net value is returned at 795*l.* There are dissenting chapels of Wesleyan and Primitive Methodists: the Baptists also have a place of meeting. The church contains a curious and beautiful piece of tapestry placed over the altar, representing Christ's entry into Jerusalem.

The public walks, called Warden, are prettily situated on an eminence north-west of the town. The ground was presented to the inhabitants by the present earl of Oxford. The summit is supposed to have been the site of a castle; but, if any did exist, not a vestige now remains. There are no manufactures of any description here. The population of the entire parish, which is partly in the hundred of Wigmore, Herefordshire, in 1831, was 2282. The number of electors being 10*l.*-householders, registered September, 1839, was 91.

John Beddowes, a clothier, who lived in the reign of Elizabeth, founded a free grammar-school here, and endowed it with 140*l.* a year. The number of scholars in 1835 was fifty-four. The schoolmaster is elected and the scholars admitted by a body of governors or trustees, under the terms of the bequest. The instruction is in reading, writing, and arithmetic. The books are supplied by the parents. There is a Sunday-school in connection with the Established Church, supported by subscription, with 100 scholars of both sexes. The teaching is undertaken by gratuitous instructors. There is also a Sunday-school connected with the Wesleyan Methodists. Besides these, there are several petty day-schools for boys and girls; but the education comprises nothing but reading and writing, and even this much is taught indifferently. The instruction is at the expense of the parents.

Presteign is the centre of a poor-law union consisting of nine parishes.

At Presteign was born Richard Lucas, the author of the 'Enquiry after Happiness,' who also acquired considerable reputation as a divine in the latter part of the seventeenth century. He was born in 1648, and entered a student at Jesus College, Oxford, in 1664, being then sixteen years of age. After proceeding in both degrees in arts, he took orders. His first appointment was to the mastership of the free grammar-school at Abergavenny; but being shortly after presented to the vicarage of St. Stephen's, Coleman Street, he removed to London. His great popularity as a preacher obtained for him the lectureship of St. Olave's, in the borough of Southwark, where he succeeded Dr. John Meriton, in October, 1683. Besides the 'Enquiry after Happiness,' he published some single sermons. Towards the latter part of his life he became totally blind. (*Beauties of England and Wales.*)

Knighton, the town next in size to Presteign, is situated six miles north of the latter place, in the hundred of Knighton, on the borders of Shropshire, from which it is separated by the river Teme, which enters Herefordshire about four miles below. The Welsh name is Tref-y-clawdd, which signifies 'the town upon the dyke,' Offa's Dyke running close to the town. [WALES.] The population of the parish in 1831 was 1259. This was, before the Reform Act, and still is, a contributory borough with New Radnor, &c. in returning a member to parliament. The town is awkwardly situated, being built on the side of a steep hill. The market is on Thursday, and is well attended by the neighbouring farmers. The living is a perpetual curacy, valued at 155*l.* per annum; patron, the warden of Clun Hospital. There was formerly a castle in a commanding situation at the upper part of the town, but it is now entirely destroyed. There are three infant-schools and seven small day-schools; one of the latter endowed with 4*l.* per annum. In the others the children are taught at the expense of the parents. There are also two Sunday-schools, with 100 scholars.

Rhayader, the third market-town, lies in the hundred of the same name, and in the diocese of St. David's, on the banks of the river Wye; and the original name was Rhaiadyr-gwy, which signifies the 'fall of the Wye.' Before the present bridge of one large arch was erected, there was a considerable fall of water, but the channel was then deepened and cleared. Rhayader is on the western side of the county, adjoining Cardiganshire, and is 28 miles distant from Presteign, which, as before stated, is situated on the eastern border. The road from Birmingham, Worcester, and Cheltenham to Aberystwith is through this place. Rhayader derived antiently its chief importance from its castle, of which no vestige remains excepting the fosse, which was excavated out of the solid rock. It was very favourably situated on a precipitous point of land which projects into the channel of the river on the north of the town. This fortress was built about 1178, by Rhys-ap-Gruffyd, prince of South Wales, in order to check the depredations of the Norman freebooters.

The town is miserable and dirty in its appearance. The market-day is Wednesday. It is contributory with New Radnor, &c. in returning a member to parliament. A manufactory of flannel and coarse cloth is carried on here, but on a very small scale, twenty-two being the number of persons returned in 1831 as engaged in manufacture. The population (parochial chapelry) in the same year was 669. The living is a perpetual curacy, valued at 75*l.* per annum. The Methodists are numerous, and the Presbyterian Independents have lately erected a chapel. There are five day-schools, one of which is an endowed grammar-school: two others belong to Dissenters, viz. Independents and Calvinistic Methodists: three Sunday-schools, one of which, belonging to the Wesleyan Methodists, is said to consist of 45 males and 42 females; another to Independent Dissenters, of 140 children; and the other to Calvinistic Methodists, of 90 males and females. These Sunday-schools are supported by their respective congregations. It is probable that many children attend two of these schools, by which an error has crept into the Parliamentary Returns. A mechanics' association has lately been established.

New Radnor, or Maes-yfed Newydd, formerly the capital of the county, and a place of some consequence, is now degenerated into a village, and, but for some privileges which are still retained by the inhabitants, would not be worth noticing. The borough of New Radnor comprises about one-fifth of the county, and includes the parishes of New and Old Radnor, Llanvihangel, Nantmellan, and part of Cascob. Meredydd ab Owain destroyed the town about the year 900. It was again burnt in the reign of Henry IV., and was never restored to its former state. Being a station of considerable importance in guarding one of the principal passes into the territory of the Welsh princes, it was particularly liable to these vicissitudes. Its present condition may be ascribed, first to its ceasing to be kept fortified and garrisoned as a frontier town, its proximity to Presteign and Kington, and its cold situation and the scarcity of fuel. The walls of the castle may still be traced upon a height north of the village. The burgesses and freemen of this borough, and (since the Reform Act) 10*l*.-householders, vote in the election of a member of parliament. The total number of electors in 1832 for the united boroughs of New Radnor, Presteign, Knighton, Rhayader, Kunklas, and Cefn Llys were,—freemen, 276; 10*l*.-householders, 253: total constituency, 529. The corporation consists of 25 capital burgesses, who are the common council and governing body; a bailiff, two aldermen, a recorder, town-clerk or prothonotary, a receiver, auditor, two chamberlains, two serjeants-at-mace, and an indefinite number of free burgesses.

Under the terms of the charter, the borough magistrates have equal power with county magistrates in the trial of felonies and other crimes and misdemeanors, and a court of quarter-sessions is accordingly held in the borough, the recorder, bailiff, or senior magistrate presiding; but the majority of offences committed within the borough are disposed of at the county sessions, under the 5 Geo. IV., c. 85. There is also a Court of Record held weekly for the recovery of debts under 40*s*. The county courts of the sheriff for the recovery of debts under 40*s*. are held here and at Presteign alternately. The market has long been discontinued, but several fairs are still held here in the course of the year. The population of the parish, in 1831, was 472. The living is a rectory, valued at 304*l*. per annum. There is one daily school for children of both sexes, partly supported by an endowment of 10*l*. a year for the instruction of twenty children, partly by a donation of 5*l*. from the member for the borough, for the instruction of five others: the rest are paid for by their parents. There are also a small school held three times a week for girls to learn to sew and knit, and also to spell, and one Sunday-school, with about 70 children, the teaching in which is principally gratuitous.

Old Radnor, or Maes-yfed Hen, called also Pen-y-Craig, or 'the summit of a rock,' stands on an elevated situation, about two miles south-east of New Radnor. The parish of Old Radnor is extremely large, comprising six townships. The population in 1831 was 1458. The church is prettily situated, and contains a curiously carved wooden screen. The six bells are noted for the richness of their tones. The living is a rectory, valued at 108*l*. per annum. Camden supposed Old Radnor to have been the Magnus of Antoninus, but this is now discredited. Sir Richard Hoare identifies the castle (of which there are at present no remains) with the Cruker Castle of Giraldus, this name being an easy corruption of crug or craig.

The peculiarities of Old Radnor in a geological point of view have been already noticed.

Division for Ecclesiastical and Legal Purposes.—The eastern side of the county is in the diocese of Hereford, and the western in that of St. David's; the former comprising the parishes of Presteign, Old and New Radnor, Norton, and Knighton. The parishes are, as before stated, 52 in number, viz. 14 rectories, 16 vicarages, and 22 perpetual vicarages.

The county is in the South Wales circuit. The assizes are held at Presteign, from which place the judge proceeds to Chester, and there meets the judge of the North Wales circuit. The legal jurisdiction of the borough of New Radnor has been noticed.

One member of parliament is returned for the county, no alteration having been made in this respect by the Reform Act. One member is also returned for the borough of New Radnor, in conjunction with the boroughs of Knighton, Rhayader, Kevenlece, and Kunklas, and the town of Presteign, the latter place being added by the Reform Act. The place of election for the county is Presteign; the polling-places are New Radnor, Presteign, Rhayader, Painscastle, Colwyn, Knighton, and Penybont. The election for the boroughs is held at New Radnor.

History, Antiquities, &c.—Radnorshire originally formed part of the territory inhabited by the Silures, and, after its subjugation and ultimate abandonment by the Romans, was included in one of the petty principalities into which Wales was divided, and the history of Radnorshire is naturally merged in that of Wales. The two principal events relating to it are, the conquest of it by Caradoc Vraich Vras, and its subsequent subjugation, in the beginning of the tenth century, by Elystan Glodrydd, who fixed his residence there. After the Norman conquest, it became the prey of the Norman adventurers, who obtained a settlement in the counties of Hereford and Brecknock; but principally of the Mortimer family, and afterwards of that of De Breos, who at one period held large possessions there. In the reign of Henry VIII., Radnor was formed into a county.

The Welsh name for this county, Maeshyved, is supposed to be derived from Hyfaidd, one of the sons of Caradoc Vraich Vras, before mentioned, who formed this portion of it into a lordship for his son.

That the Romans penetrated far into the county seems to be satisfactorily ascertained; for although the supposition of Camden that Old Radnor was the Magnus of Antoninus is now generally discredited, yet there is a Roman station at Cwm, situated on the right bank of the river Ithon, about midway between Llanbadarn-fawr and Disserth, and two miles north-west of Llandrindod. The form of the camp is a perfect square, including an area of about four acres. Forest Colwyn, or Colunwy Castle, on the road leading from New Radnor to Builth, and in the parish of Llansaintfraed, also appears to be of Roman origin. It is also sometimes called Maud's Castle; a name derived, it is said, from Maud de St. Waleri, the wife of William de Breos, who at one period owned this place. Radnorshire being a border county, the remains of British encampments are numerous, especially on the eastern side adjoining Herefordshire.

Offa's Dyke, the boundary formed by Offa between his kingdom of Mercia and the territories of the Welsh princes, enters Radnorshire on the north at Knighton, and the turnpike-road leading from that place to Presteign crosses it twice. The latter town lies about four miles on the English side. Running south, it enters Herefordshire at Berva Bank, a steep hill on the right of the turnpike-road between Presteign and New Radnor. On this hill are the remains of an antient fortification, probably erected to defend this boundary. The dyke can be easily traced on the high uncultivated ground, but in the valleys it is nearly obliterated. In addition to mere encampments or temporary entrenchments, there were several castles in this district, but their remains are very imperfect. One tower of Aber Edw castle remains. It is situated close to the romantic village of Aber Edw, near the junction of the Edw with the Wye, about six miles below the town of Builth. This castle belonged to Llewellyn ap Griffyth, and was that prince's last retreat. He came hither from Snowdonia, in 1282, to obtain assistance against Edward I.: finding however that Edmund Mortimer and John Giffard had marched with troops from Herefordshire to meet him, he retreated with his followers to Builth, where he crossed the Wye, but was refused admittance into the town by the garrison. He then ascended the Irvon, and stationed his followers on the northern side of the river. Llewellyn was here attacked unarmed, and killed by one Adam de Francton. [BRECKNOCKSHIRE.]

No vestige of the walls of the castle of New Radnor remains, but it appears to have been a place of some strength and of great importance, as it commanded one of the passes from England into Wales. Old Radnor was burned in 1216 by King John, in revenge for an insurrection of Llewellyn, prince of North Wales, and his son-in-law Reginald de Breos; and New Radnor, as already observed, was destroyed in the reign of Henry IV.

The battle of Pilleth, fought between the earl of March and Owen Glendower, occurred on a hill near Knighton, and takes its name from the little village of Pilleth.

The only monastic establishment in Radnorshire seems to have been that of Abbey Cwm Hir, or the Abbey of the White Monks. It is romantically situated in a narrow valley surrounded by high hills, in the north-western portion of the county, to the left of the road leading from Llandewy to Newtown. Leland ascribes the foundation of it to Cadwaltulan, or Cadwallon ab Madoc; and the 'Monasticon' assigns to it the date of 1143. Cadwallon was about this period the lord of the province of Machinydd, in which it was situated. The monastery was dedicated to St. Mary, and originally endowed for sixty monks of the Cistercian order, but it contained only three when the establishment was broken up, and was granted, 37th Henry VIII., to Walter Henley and John Williams. The only remains of the edifice are part of the exterior walls and the foundation of the pillars which supported the arches; from these there appears to have been one continuous building of 255 feet in length by 73 in width, exceeding in length, according to Leland, any other church in Wales. Some of the columns and arches of the abbey were removed to Llanidloes, and may be now seen in the church of that place. [MONTGOMERYSHIRE.] The antient font and screen at Newtown were also taken from Abbey Cwm Hir.

STATISTICS.

Population.—Of 6269 males of twenty years of age and upwards, 4394 were, in 1831, employed in agriculture. The number of occupiers not employing labourers and of occupiers who do employ labourers is nearly equal, the numbers of the former, according to the census, being 911, and of the latter 1032. The number of agricultural labourers was 2451. There were a few weavers in the county, but the number of persons returned as employed in manufactures, or in making manufacturing machinery, was only 42; but there were 232 labourers employed in non-agricultural occupations.

The population of Radnorshire at each of the four following periods was—

	Males.	Females.	Total.	Increase per Cent.
1801	"	"	19,050	
1811	"	"	20,900	9·71
1821	11,266	11,193	22,459	7·45
1831	12,453	12,198	24,651	9·76

showing an increase between the first and last periods of 5601, or nearly 27 per cent., which is less than any other county, with the exception of Merionethshire; but in Radnorshire the rate of increase has been more uniform. In the first thirty years of the present century the population increased less than might be inferred from the number of the births, and there is no doubt that many natives of the county migrate to other parts. In the ten years ending 1831, the number of registered baptisms was 6571, marriages 1653, and deaths 3651. From 1813 to 1830 nine centenarians died, namely, two aged 100, one aged 101, two aged 102, and one each respectively aged 103, 104, 105, and 108.

The following table contains a summary of the population &c. of every hundred at the census in 1831:—

HUNDREDS AND BOROUGH.	HOUSES.				OCCUPATIONS.			PERSONS.			
	Inhabited.	Families.	Building.	Uninhabited.	Families chiefly employed in Agriculture.	Families chiefly employed in trade, manufactures, and handicraft.	All other Families not comprised in the two preceding classes.	Males.	Females.	Total of Persons.	Males, twenty years of age.
Colwyn (Hundred) .	481	545	—	24	411	92	42	1,343	1,289	2,632	651
Kevenlleece " .	518	591	1	17	431	83	77	1,584	1,551	3,135	829
Knighton " .	929	1024	4	32	548	250	226	2,659	2,554	5213	1302
Pains-Castle " .	766	852	5	24	592	180	80	2,126	2.100	4,226	1092
Radnor " .	493	526	—	23	290	143	93	1,250	1,294	2544	604
Rhayader " .	806	870	5	35	561	180	129	2,219	2,221	4,440	1156
Radnor (Borough) .	444	471	3	12	302	100	69	1,272	1,189	2,461	636
Totals .	4437	4879	18	167	3135	1028	716	12,453	12,198	24,651	6269

County Expenses, Crime, &c.—In the three years 1748-49-50, the average sum assessed annually for poor's rate was 1117*l.*, and the sum expended for relief amounted to 957*l.*; in the three years 1783-4-5 the annual assessment averaged 4448*l.*, and the expenditure for the relief of the poor 3889*l.* The sums expended for the maintenance of the poor in the several under-mentioned years were—

	£		Per head. s.	d.		£		Per head. s.	d.
1811	12,065	.	11	6	1835	11,517	.	9	4
1821	11,974	.	10	7	1836	10,853	.	8	7
1831	13,571	.	11	0	1837	9,965	.	8	1
1834	13,072	.	10	7	1838	8,266	.	6	8

From 1811 to 1838 the population had increased about 25 per cent., while the sum required for the relief of the poor had decreased 32 per cent.; and comparing 1838 with 1834, there has been a diminution of expenditure under this head amounting to 4806*l.* or 38 per cent. The whole of the parishes in the county are in unions under the provisions of the Poor-Law Amendment Act. In 1835-6 the number of bastards chargeable to parishes in the county was 417, or 1 in 59 of the total population, the proportion for Wales being 1 in 139, and for England 1 in 215. The numbers affiliated in the former of these years was 110, and in the latter 92. In 1830 the number of illegitimate births to the total number of births was 1 in 7, being a higher average than for any part of the kingdom, the proportion for Wales being 1 in 13, and for England 1 in 20.

The sum raised in the county for poor-rate, county-rate, and other local purposes, in 1833, was 17,045*l.*, levied upon the following descriptions of property:—

On land	. .	£15,943
Dwelling-houses	. .	1,033
Mills, factories, &c.	.	23
Manorial profits, navigation, &c.		45
	Total	£17,045

Under the property-tax the county was assessed in 1815 at 10,357*l.*, namely, property from lands 90,652*l.*, houses 1966*l.*, tithes 10,960*l.*: the property assessed to the occupier was 90,524*l.* The annual profits of trade were assessed at 3,714*l.*

The total receipts and expenditure under the head of county-rate were as follows in each of the under-mentioned years:—

		1792. £	1801. £	1811. £	1821. £	1831. £	1838. £
Total receipts	.	220	894	932	1795	2420	2251
Expenditure	.	307	983	762	1986	2692	1988

The receipts and expenditure on account of church-rates in 1839 were as follows:—amount received 662*l.*, namely, church-rates 637*l.*, from other sources 25*l.*, expenditure 665*l.*, of which 255*l.* were laid out in the repair of churches.

In the three years ending October, 1812-13-14, the length of paved streets and turnpike roads in the county was 76 miles; and the length of all other highways used for wheel carriages was 410 miles. The amount levied annually for the repair of highways in the above years was 166*l.*; compositions in lieu of statute labour, 281*l.*: making the total sum received by surveyors of the highways 447*l.* annually. The value of statute labour performed in kind was estimated at 1313*l.*, and the total sum expended in money and the estimated value of statute labour was 1767*l.* In 1839 the expenditure on highways amounted to 1980*l.*, length of roads 478 miles; cost of repair per mile 4*l.* 2*s.*, the average for Wales being 11*l.* 3*s.*

There are only two turnpike trusts in Radnorshire. In 1835 the income from tolls was 1582*l.*, parish composition in lieu of statute duty 713*l.*, estimated value of statute duty performed 565*l.* total income 3347*l.* The expenditure amounted to 3318*l.*; there were debts incurred to the amount of 17,233*l.*, of which 14,471*l.* were bonded or mortgage debts.

Crime.—The number of persons charged with criminal offences and committed in the three septennial periods ending 1820, 1827, and 1834, was 67, 76, and 96, making the annual average of the three periods respectively 9, 11, and 13. The average of the six years from 1834 to 1839 was 18; and the numbers committed, convicted, and acquitted in each year were as follow:—

	1834.	1835.	1836.	1837.	1838.	1839.
Committed .	18	15	15	18	15	31
Convicted .	13	10	8	10	8	15
Acquitted .	5	5	7	8	7	16

During the above six years the number of male offenders was 89, females 23; but the number of the latter in 1839 was only one short of the number in the preceding five years. In 1834 (an average year) the number of criminal offenders to the population was 1 in 1369, being higher than any Welsh county, with the exception of Monmouth, Denbigh, and Glamorgan; in 1835 the proportion in Radnorshire was 1 in 1643, the proportion for England and Wales being 1 in 631. In so small a population it would not be satisfactory to give the average proportion of crimes committed, the ages of the offenders, and the degree of instruction which they have received, as the results could not be safely depended upon; but it may be stated, on a review of the absolute numbers in the tables of each year, that juvenile crime is comparatively rare, that the majority of offences are those against property committed without violence, and that of the offenders a larger proportion are totally uninstructed than in the whole of England and Wales.

Of the 31 persons committed in 1839, one male and one female were above 12 and under 16; nine males and eight females were between 16 and 21 years of age; and the remainder were of various ages between 30 and 60. There were 4 males and 6 females who could neither read nor write; 15 males and 5 females could read and write imperfectly, and the degree of instruction was not ascertained in one case. The nature of the offences was as follows:—5 were offences against the person (4 were assaults), 2 against property attended with violence, 23 against property unattended with violence (22 being cases of simple larceny), and 1 offence against the laws relating to forgery and the currency: there was not one person charged with malicious offences against property. Of the 15 persons convicted, two were transported, and 13 imprisoned, fined, or whipped.

The number of parliamentary electors registered to vote for the county was 1857 in 1835, and 2034 in 1839. During these four years the number of registered occupying tenants at a rent of 50*l.* per annum had increased from 521 to 572.

There is no savings' bank in the county.

Education.—The following summary is taken from the Parliamentary Returns of 1835:—

	Schools.	Scholars.	Total.
Infant Schools	4		
Number of infants at such schools; ages from 2 to 7 years . .		31	
Daily schools	59		
Number of children at such schools; ages from 4 to 14 years:—			
Males . .		282	
Females . .		231	
Sex not specified .		930	
Schools .	63		
Total of children under daily instruction . . .			1,474
Sunday-schools	35		
Number of children at such schools; ages from 4 to 15 years:—			
Males . .		301	
Females . .		394	
Sex not specified .		821	
			1,516

Maintenance of Schools.

Description of Schools.	By endowment.		By subscription.		By payments from scholars.		Subscrip. and payment from scholar	
	Schls.	Scholars.	Schls.	Scholars.	Schls.	Scholars.	Schls.	Scholars.
Infant Schools	—	—	—	—	4	31	—	—
Daily Schools	12	265	2	77	41	963	4	138
Sunday Schools	1	40	31	1,347	1	26	2	103
Total.....	13	305	33	1,424	46	1,020	6	241

The schools established by dissenters included in the above statement are:—

	Schools.	Scholars.
Infant-schools . .	1, containing	13
Daily-schools . . .	3 .	88
Sunday-schools . .	10 .	552

The schools established since 1818 are—

Infant and other daily schools .	22 .	447
Sunday-schools . .	30 .	1341

No boarding-schools are included in the number of schools given as above; and there does not appear to be any Lancasterian school in the county. Of Sunday-schools 5 are returned from places where no other schools exist, and the children (138) did not probably attend any other school; 4 schools, attended by 129 children, are both day and Sunday schools, and duplicate entries are made to that extent; but how far this may have been done in other cases cannot be ascertained from the Parliamentary Returns. None of the schools in the county appear to be for the exclusive use of any particular sect. There are no lending libraries attached to any of the schools.

RAEBURN, HENRY, the son of a manufacturer at Stockbridge, near Edinburgh (which now forms part of that city), was born there on the 4th of March, 1756. He lost both his father and mother whilst young, and was apprenticed by his elder brother to the business of a goldsmith. During the time of his apprenticeship he painted miniatures, though in what manner his taste first showed itself is not exactly known; but it is asserted that it certainly was altogether spontaneous, without lesson or example, and was developed before he ever saw a picture. These works were executed in such a manner as to attract notice. His master took him to see the pictures of David Martin, which made so great an impression on Raeburn, then only about sixteen or seventeen years of age, that he redoubled his exertion. He continued to paint miniatures, which were soon in general demand, and as his time was thus fully occupied, completing (as he did) two in a week, his master agreed to allow him to withdraw from the trade, receiving as an equivalent part of the young painter's earnings.

Obtaining some of Martin's pictures to copy, he adopted oil-painting and after a time wholly abandoned miniatures. At the expiration of his apprenticeship, he became a portrait-painter, and gained very extensive practice. In 1779 he married, and some time after came to London, where he was much noticed by Sir Joshua Reynolds, who advised him to visit Italy, a course which he accordingly pursued, and remained in Rome and other places in Italy two years, carefully studying the works of the great masters. In 1787 he returned and established himself in Edinburgh, where in a short time he became the chief portrait-painter. He was elected a member of the Royal Society of that city, of the Imperial Academy of Florence, and of the South Carolina and New York academies. On the 2nd of November, 1812, or, as stated by some, in 1814, the Royal Academy of London elected him an associate of their body, and on the 10th of February, 1815, he was made an academician. On the visit of George IV. to Scotland in 1822, Raeburn was knighted at Hopetown-house, and in the summer of the following year he was appointed portrait-painter to the king for Scotland, an honour which he did not long enjoy. He died on the 8th of July, 1823.

Amongst his chief portraits may be enumerated those of Lord Eldin, Sir Walter Scott, Dugald Stewart, Professor Playfair, James Watt, Francis Jeffrey, Henry Mackenzie, John Rennie, and Sir Francis Chantrey. His style was free and bold, his drawing critically correct, his colouring rich, deep, and harmonious, and the accessories, whether drapery, furniture, or landscape, always appropriate, and though carefully executed, were never made too distinct or allowed to become obtrusive. He had a peculiar power of rendering the head of his figure bold, prominent, and imposing. The strict fidelity of his representations may in a great degree be attributed to his invariable custom of painting, whether the principal figure or the minutest accessory, from the person or the thing itself, never giving a single touch from memory or conjecture. It has been judiciously said that all who are conversant with the practice of the art must have observed how often the spirit which gave life and vigour to a first sketch has gradually evaporated as the picture advanced to its more finished state. To preserve this spirit, combined with the evanescent delicacies and blendings which nature on minute inspection exhibits, constitutes a perfection of art to which few have attained. If the works of Sir Henry Raeburn fail to exhibit this rare combination in that degree, to this distinction they will always have a just claim, that they possess a freedom, a vigour, and a spirit of effect, and convey an impression of grace, life, and reality which may be looked for in vain amidst thousands of pictures, both antient and modern, of more elaborate execution and of minuter finish.

(*Annual Biography and Obituary*, vol. viii.; Allan Cunningham's *Lives of Painters.*)

RAFFAELLE. [RAPHAEL.]

RAFFLES, SIR THOMAS STAMFORD, the son of a captain in the West India trade, was born at sea, off Jamaica, July 5, 1781. His early education was imperfect, for he was taken from school at the age of 15, and placed as an assistant clerk in the India House. In this situation he showed so much talent and industry, that he attracted the notice of the directors, and in 1805 was appointed under-secretary to the new government formed by the East India Company at Pulo-Penang, or Prince of Wales' Island. Here he devoted his attention to the study of the Malay language, the vernacular dialect of almost all the Eastern islands, in which he made rapid progress, as well as in a knowledge of the productions of Penang and the adjoining country, and the manners of the inhabitants. These acquirements rendered him so useful to the government, that he was soon appointed chief secretary, an office which he filled with the greatest ability: intense application in an unhealthy climate however, soon brought on serious illness, which compelled him to go to Malacca, in 1808, for the recovery of his health.

During his stay at Malacca, Raffles had an opportunity of mixing with a great number of natives congregated there from all parts of the Archipelago, from China, Cochin-China, &c., with whom he freely associated. He thus obtained a very considerable knowledge of their customs, trade, and languages, which was afterwards of great value to him. In 1809 he published his first literary essay, 'On the Malay Nation,' by which he attracted the notice of Lord Minto, governor-general of India, who sent for him to Calcutta, and was anxious to place him in the government of the Moluccas. Other events however interfered with this intention, for Raffles so strongly represented to Lord Minto the advantages which would accrue to the English government from the reduction of the Dutch settlement of Java (Holland being at that time annexed to France), that an expedition was fitted out against Batavia, in 1811, which was attended with complete success, that place being speedily captured. Raffles offered such valuable assistance in the preliminary arrangements of this expedition and in the execution of it, that he was appointed 'Lieutenant-Governor of Java and its dependencies.' He was only thirty years of age when he undertook this responsible situation, which he held for five years, being recalled in 1816, shortly before the island was restored to the Dutch. In his administration he evinced great energy of character, and displayed an anxious desire to advance the welfare of the native population. He found it necessary to make great alterations in the economy of the government, and a complete revision of the judicial system of the colony. He likewise abolished the system of slavery in the island. The policy of some of his measures was considered doubtful by the authorities at home, and his youth made him an object of jealousy to some of his colleagues; a number of charges were consequently brought against him, which led to his recal. But the board of directors of the East India Company afterwards acknowledged that his measures were all undertaken from most benevolent and laudable motives. Raffles devoted a considerable portion of time to the investigation of the natural productions of Java, and during his residence there he made many excursions into the interior, and collected much geological and geographical information respecting the island, as well as many interesting facts concerning the numerous ruins and other antiquities, and the character of the different native tribes. He arranged and published the different materials which he had thus collected, on his return to England, in his 'History of Java,' which appeared in 1817, 2 vols. 4to.

In 1818 he was appointed lieutenant-governor of Fort Marlborough, the seat of the English government at Bencoolen, on the island of Sumatra, and again returned to India, having first received the honour of knighthood. He remained at Bencoolen six years, during which time he effected many improvements in the political constitution of the colony and in the condition of the inhabitants. He emancipated the slaves here, as he had done in Java, for which act he did not however escape censure. He established a British settlement at Singapore, which has proved an important commercial station, and founded a college there for the encouragement of Anglo-Chinese and Malay literature. Though distinguished by his administrative abilities, Sir Stamford Raffles owes his reputation chiefly to his researches into the natural productions of Sumatra, and particularly to his numerous zoological discoveries. During one of his journeys into the interior, accompanied by the enterprising and lamented Dr. Arnold, he discovered the gigantic parasitical plant (or rather flower) which has been called the *Rafflesia Arnoldii*. In 1820 he sent home a large collection of preserved animals, which are now in the museum of the London Zoological Society. A paper containing a description of them was read before the Linnean Society, and published in their 'Transactions.' The excitement of various official and scientific engagements in a pestilential country, together with many domestic afflictions (four out of his five children, and almost all his personal friends, dying from the effects of the climate), so completely destroyed his health, that he was obliged to resign his appointment and return to England in 1824. In February of that year he embarked with Lady Raffles on board the ship Fame, which took fire the same night, by the carelessness of the steward. The crew and passengers with difficulty saved themselves in the boats, and Sir Stamford was obliged to remain at Bencoolen till the following April. By this disastrous event he entirely lost the greatest part of the extensive collection which he had formed of animals and plants, as well as many volumes of manuscripts and drawings relative to the civil and natural history of nearly every island in the Malayan Archipelago; besides this, which might be considered as a public loss, his own pecuniary loss by the burning of the ship amounted to upwards of 20,000*l.*

After his return to England he founded the present Zoological Society, of which he was the first president. His health however never recovered the shock which it had sustained, and he died in 1826, before he had had time to arrange the numerous materials which he had collected in the East. He left several manuscripts behind him. (*Memoir by Lady Raffles.*)

RAFFLE'SIA is the name of a plant found in the hot damp jungle of Sumatra, growing parasitically on a kind of vine, and discovered by the late Sir T. S. Raffles, whose name it bears. It consists of a number of scales investing a fleshy calyx measuring a yard in diameter, and containing the organs of fructification within or beneath the rim of a huge fleshy central column.

This and some other plants related to it, which are equally parasitical, are regarded as intermediate between such imperfect plants as fungi and the class of Endogens; and constitute the class now called Rhizanths.

(Lindley's *Natural System of Botany*, ed. 2, p. 389; Blume's *Flora Javæ*; and *Linnean Transactions*, vol. xiii.)

RAGHUVANSA. [CALIDASA.]

RAGMAN'S ROLL, the uncouth name of the collection of those instruments by which the nobility and gentry of Scotland were constrained to subscribe allegiance to Edward I. of England in 1296, and which were more particularly recorded in four large rolls of parchment, consisting of thirty-five pieces sewed together, kept in the Tower of London. These instruments are for the most part extant in the third volume of Prynne's 'Records,' from p. 648 to 665, and have been recently but more correctly printed, under the auspices of the Bannatyne Club,* at the expense of the Right Honourable William Adam and the Right Honourable Sir Samuel Shepherd. These records contain the largest and most authentic enumeration now extant of the nobility, barons, landholders, and burgesses, as well as of the clergy of Scotland, prior to the fourteenth century.

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* 'Instrumenta Publica, sive Processus super Fidelitatibus et Homagiis Scotorum Domino Regi Angliæ factis A.D. MCCXCI.—MCCXCVI.,' 4to., Edinb., 1834.

The original and proper meaning of the word *ragman* has given much trouble to our etymologists; from other instruments and records however it seems clear that in diplomatic language the term ragman imports an indenture or other legal deed executed under the seals of the parties; and consequently that its application to the Rolls here in question implies that they are the record of the separate ragmans, or sealed instruments of homage and fealty, executed by the people of Scotland.

The 'Encylopædia Britannica' and Rees's 'Cyclopædia' speak of Ragman's or Ragimund's Roll as a roll denominated from Ragimund, a papal legate in Scotland, who, calling before him all the people who held benefices in that kingdom, caused them, upon oath, to give in the value of their estates, according to which they were taxed in the court of Rome. But this derivation evidently rests on a misnomer. No legate of the name of Ragimund ever visited Scotland. The name of the legate referred to was Bagimund, and his visit to Scotland to form his taxation was in 1274. (Spotswood's *Hist.*, p. 46.) Fordun, lib. x., c. 36, p. 122, calls him Bajamondus.

At the end of the second volume of Nisbet's 'Heraldry,' fol., p. 1-46, Edinb., 1742, there is a collection of 'Historical and Critical Remarks on Prynne's History, so far as concerns the submission and fealty sworn by the generality of the Scots Nation to King Edward I. of England in 1292, 1296, 1297, &c., commonly called Ragman-Roll.'

Much is said upon the various etymologies of Ragman's Roll in Jamieson's 'Etymological Dictionary of the Scottish Language,' vol. ii., in *voce*.

RAGU'SA or **RAU'GIA** (Rhacusa, in Latin; Dubrounik, in Sclavonian), a town in the kingdom of Dalmatia, subject to Austria, but formerly an independent state. It is situated on the eastern coast of a peninsula of the coast of Dalmatia, formed by the gulf of Breno on the east and the gulf of Santa Croce or Ombla on the west. The territory of Ragusa, which forms one of the four circles into which Dalmatia is now divided, extends along the sea-coast for about 90 miles, from the western shore of the Gulf of Cattaro to the north-west extremity of the peninsula of Sabioncello opposite the island of Lesina, which belongs to the circle of Spalatro. The width of the territory of Ragusa bears no proportion to its length, extending only a few miles inland, where it borders on the Turkish sandjak of Hertsek, which is part of the pashalik of Bosnia. On the west the territory of Ragusa is separated from the coast of Dalmatia by a tongue of land called Klek, which belongs to Turkey. The territory of Ragusa is in fact the coastline of the Hertsek or Turkish Dalmatia, and consists of a narrow strip of land between the mountains and the sea, and a few valleys in the mountains; it includes also the long low peninsula of Sabioncello, and the island of Meleda, which is nearly 30 miles long and two or three broad, Lagosta, which is 18 miles in circumference, Shupan, 9 miles in circumference, Mezzo, 5 miles in circumference, and some smaller islands or rocks. The fine island of Corzola, or Curzola, which is now annexed to the circle of Ragusa, did not belong formerly to that state, but was part of the Venetian province of Dalmatia. [CURZOLA.]

The mountains which run along the coast of Ragusa are a continuation of the mountains of Montenero, which divide Albania from the Hertsek [MONTENERO], and they are generally destitute of trees. But some longitudinal valleys which lie within these mountains are very fertile, and abound with copious springs, though no river, properly speaking, crosses the territory of Ragusa. The principal valleys are—1, that of Canale, extending more than 20 miles in length from Ragusa Vecchia to the shores of the Gulf of Cattaro near Castelnuovo; 2, the valley of Giuncheto, farther inland than Mount Bargat, or Vergato, the mountain which overtops the town of Ragusa; and 3, Val di Breno, east of Ragusa, which is three miles long and about two miles wide. The two last valleys are planted with vines and fruit-trees, and contain pleasant country-houses of the wealthy Ragusans.

The capital, Ragusa, is situated in 42° 38′ N. lat. and 18° 8′ E. long., and is built partly at the foot and partly on the steep declivity of two hills: it is fortified with walls and ditches, and has a castle on the east, at the entrance of the harbour, and another at the western end of the town. The streets are paved, but very narrow, except two. the houses, which are built of freestone, are generally large and commodious. The principal buildings are, the cathedral, which is a good structure, and the palace of the government, which is extensive, and has some fine halls and galleries. The town is well supplied with spring-water. Outside of the walls are numerous gardens and country-houses, with plantations of orange and other fruit trees, and handsome fountains. From Ragusa along the western coast as far as the creek of Ombla, a distance of about three miles, there is an almost continuous suburb. The sea is deep along the coasts, and abounds with fish. The surrounding country produces abundance of fruit and very good wine: the malmsey of Ragusa has a great reputation, and forms an article of export. Cattle and cheese are brought in from the neighbouring mountains. The country produces little corn and oil; what is wanted is imported by sea. The climate of Ragusa is temperate and healthy, and instances of great longevity are not uncommon. The population of Ragusa, which is said to have once amounted to 30,000 inhabitants (Razzi, *Storia di Raugia*, 1595), is now only about 6000. Its maritime trade, which, during the period of its independence, was very flourishing, owing to the acknowledged neutrality of its flag and the protection of the Ottoman Porte, which secured it against the Barbary pirates, was almost annihilated after the French occupation in 1806; but it has somewhat revived since the peace. The Ragusans are reckoned among the best sailors in the Mediterranean, and have a good character for honesty and steadiness. Ship-building, manufactures of soap, liqueurs, and tobacco, are the chief branches of industry. Two miles west of Ragusa is the fine harbour of Gravosa, with docks for ship-building, and fine country-houses and gardens. Timber is carried thither from the opposite coast of Monte Gargano in Italy. Ragusa is a bishop's see, and has a lyceum and other literary institutions. It has produced several learned men: among others the mathematician Boscovich; Father Kunich, long professor of classical literature at Rome; Giacomo Luccari, the historian of Ragusa; the learned Banduri, author of the 'Imperium Orientale,' in the Byzantine collection; Benedetto Stay; Dr. Stulli, a physician and naturalist; and Tommaso Chersa: the last three died in the present century Father Cerva, a Dominican, wrote biographies of the writers who are natives of Ragusa. Filippo de' Quartigiani, a native of Lucca, but who lived at Ragusa about the middle of the fifteenth century, wrote a kind of statistics of Ragusa, which has remained inedited. The language of the country is a dialect of the Sclavonian, resembling that of the neighbouring province of Hertsek, but more refined: all the educated people speak Italian, which, together with Latin, are the literary languages of the country. Ragusa has always maintained an intimate connection with Italy. (*Notizie istorico-critiche sulle Antichità, Storia, e Letteratura dei Ragusei*, 2 vols., 8vo. Ragusa, 1803.)

A few miles east of Ragusa is Ragusa Vecchia, on or near the site of the antient Epidaurus in Illyria, a Roman colony mentioned by Hirtius (*De Bello Alexandrino*, c. 44). The other towns of the territory of Ragusa are, Slano, a small place about fifteen miles north-west of Ragusa, and Stagno, about ten miles farther in the same direction. The latter, which is strongly fortified, is on the isthmus leading to the peninsula of Sabioncello. The island of Meleda contains six villages. The population of the whole circle of Ragusa is reckoned at 41,000.

History of Ragusa.—Ragusium, or Rausium, seems to owe its origin to the fugitive inhabitants of Epidaurus in Illyria, which was destroyed by the Slavi in the sixth century of our æra. The name of Rausium is said by Constantine Porphyrogennetus (*De Administrando Imperio*, c. 29) to be derived from 'lau,' a rock; from which was made 'Lausæi,' 'living upon rocks,' for such was the original situation of Ragusa; hence by corruption Rausa or Raugia, and Rhacusa. In the seventh century the population of Ragusa was much increased by emigrants from Salona, from Ascrivium (new Cattaro), from Dulcigno, and other towns of Dalmatia and Albania, and the town of Ragusa was then enlarged and fortified. The people organised their municipal government, consisting of a general council, composed of the members of the principal families, from which council the members of the senate, or executive, were drawn by lot. The chief magistrate, or president of the senate, was styled count, and afterwards rector, and was renewed every year. They also sent for a learned man from Greece, and made him rector; and through him they concluded a treaty with the emperor of Constantinople. They also made a treaty with the Sclavonian prince of Narenta, their immediate neighbour. This alliance with the Narentines, who were then very powerful by sea, continued until the latter part of the tenth century, when the emperor Basilius II. induced the Ragusans to forsake the alliance of the Narentines, who about the same time were defeated at sea by Pietro Orseolo, doge of Venice; after which the power of the Narentines dwindled away. The Ragusans now applied themselves strenuously to agriculture, as well as to maritime trade: they built vessels, and became powerful by sea. Stephen, king of Dalmatia, gave them an increase of territory; and after his death, his widow Margaret, in consequence of some disturbances which broke out in her country, retired to Ragusa with her daughter, and became a nun. Bogoslav, king of Croatia, a relative of Margaret, came with an army to besiege Ragusa, but was obliged to retire after devastating the territory. The Saracens from Africa also devastated the Illyrian coast: they took Ascrivium, Risano, and other places, and attacked Ragusa; but the emperor of Constantinople having sent an armament into the Adriatic, the Saracens left that coast, and threw themselves upon the opposite shore of Italy, where a Ragusan squadron joined the Imperial fleet, and defeated the Saracens. The annals of Ragusa for several centuries after this event exhibit a succession of wars and treaties between the republic and the Sclavonian powers of Croatia, Servia, Bosnia, and Bulgaria, as well as with the emperors of Constantinople and the Norman kings of Sicily, throughout which the small community of Ragusa preserved its independence and extended its maritime trade. Unluckily the annals are obscure and confused, especially with regard to dates, as are all the records which we have of the various Sclavonian powers which succeeded each other from the seventh to the fourteenth century in the extensive regions between the Danube and the Adriatic. Ragusan galleys joined Robert Guiscard, the Norman conqueror of Sicily, against Alexius Comnenus in the expedition to Durazzo; but Manuel Comnenus, having detached the Ragusans from their Norman alliance, bestowed privileges on their merchants, made them citizens of Constantinople, and caused a certain number of young Ragusans to be educated at his expense. Nearly about the same time the Ragusans made a treaty of commerce with Ladislaus I., king of Hungary. They also enlarged their town by building up the slope of the mountain to the northward; and as a new influx of Sclavonian families came to settle among them, Sclavonian became the prevailing language, and the Roman (probably a corrupt Latin) became gradually disused. The town now assumed the name of Dubrounik, which was derived from that of the site which was newly built upon; for until then Ragusa had retained the Roman language and customs and name, being originally descended from the Roman colony of Epidaurus. (Luccari, *Ristretto degli Annali di Ragusa*, b. i.)

About the year 1260 Demeianus, of the family of Giuda, then one of the principal in Ragusa, having been rector for one year, succeeded, by his connections, wealth, and popularity, in being re-elected for the following year, at the expiration of which, being strong with the support of the lower orders and that of some of his fellow-patricians, he contrived to prevent the yearly meeting of the great council for the purpose of electing a new rector. He thus retained the supreme magistracy for another two years, when several of the patricians, growing impatient of his usurpation, assembled privately at the house of Pirro Benescia, Demeianus' son-in-law, and resolved to get rid of him. As they could not effect this by their own strength, they agreed to call in the Venetians. Benescia repaired to Venice under pretence of commercial business, and having had interviews with the principal Venetian senators, it was agreed that Demeianus should be driven away, but on the condition that Venice should in future appoint the rectors of Ragusa. The Venetians sent two galleys, ostensibly to convey ambassadors to Constantinople. On arriving at Ragusa, the ambassadors repaired to the residence of Demeianus, and after being entertained by him, they prevailed upon him to accompany them on board. As soon as Demeianus had entered the Venetian galley, he was seized and bound, and the galley set sail for Venice. Demeianus was so enraged at this treatment, that he killed himself by beating his head against the boards of his cabin. From that time till 1368, Ragusa had Venetian rectors, who held office for two years each, and were taken from among the first patrician families of Venice. Razzi gives a list of them. Ragusa however still continued to govern itself as an independent state, and to be administered according to its own laws.

About the year 1320 the Ragusans, in order to obtain freedom of trade with the territories of the Byzantine emperor, agreed to pay him a tribute of 500 ducats a year, in consequence of which the Ragusan traders were admitted into the ports of the empire on the same footing as native subjects. In 1333, Stephen, king of Bosnia, gave to Ragusa the almost uninhabited districts of Ponta and Stagno, in the peninsula of Sabioncello, and the Ragusans set about building a strong fortress at Stagno, which commands the isthmus, at the expense of 120,000 ducats. The lands were divided, three-fourths among the nobles and one-fourth among the citizens, and an officer, with the title of count, was appointed by Ragusa to govern the ceded district. In 1348 the great plague which ravaged Europe spread to Ragusa, where it carried off 173 nobles, 300 citizens, and about 7000 of the lower orders. On this occasion, King Stephen of Bosnia showed himself friendly to the Ragusans by giving them provisions and other assistance. About 1368, war having broken out between Venice and the king of Hungary, the Hungarians advanced as far as Mestre, and Venice was obliged to sue for peace, one of the conditions of which was that Ragusa should be restored to independence and should choose its own rectors. It was also determined that the rector should be renewed every six months. In gratitude for this, the Ragusans agreed to pay a tribute of 500 ducats yearly to the king of Hungary, and to hoist his flag on their ramparts by the side of that of the republic. In the great war between Genoa and Venice (A.D. 1378-80), the Ragusans sided with Genoa, and some of their galleys were at the battle of Chioggia. After the defeat of the Genoese, Venice sent a squadron against Ragusa, which applied to the king of Bosnia for assistance, by whose means they repulsed the Venetians, after which peace was made between Venice and Ragusa. About the year 1397 a new race of formidable invaders, the Ottomans, under Sultan Bayazid, having defeated Sigismund of Hungary at the great battle of Nicopolis, overran part of Bosnia, and spread alarm as far as Ragusa. About 1414 the Ragusans purchased peace with the Ottomans by paying an annual tribute of 500 ducats, which was afterwards gradually raised as the Turks drew nearer to Ragusa. In 1433 the Ragusans introduced the manufactory of woollens from Florence, which became their principal branch of internal industry. They also constructed an aqueduct to carry the spring water from the valley of Giuncheto to their town, at an expense of 12,000 ducats.

In 1440, George Despotos of Servia, being defeated by Amurath II., took refuge at Ragusa with his family and treasures, and was there protected against the threats of Amurath, and afterwards furnished with the means of proceeding to Hungary, where he joined the brave Hunyades. About 1450 the Turks overran part of Dalmatia and Albania. Bosnia however remained free, and was still a bulwark to Ragusa on the land side. The Ragusans purchased from several Bosnian lords the district of Ragusa Vecchia and Canale, which constitutes the eastern part of their territory, and distributed the land among their citizens. But in 1463-4 Mahomet II. conquered Bosnia also, and the Turks became immediate neighbours of Ragusa, and have been ever since. About 1471 they ravaged the eastern district, Canale, but Ragusa obtained a respite by raising the tribute to 8000 ducats. Mahomet's son, Bayazid II., showed himself favourably disposed towards the Ragusans, who sent envoys to congratulate him on his accession to the throne, with large presents both for the Sultan and for the chief officers of state, and from that time the Ragusans continued to send yearly envoys to Constantinople to pay tribute and to maintain a good understanding with the Porte. During the long wars of the sixteenth century, between Sultan Solyman and his son Selim on one side, and Venice and Spain and other Christian powers on the other, the Ragusans found it a most arduous task to preserve their neutrality, as the fleets of the belligerents came repeatedly off their coasts, and landed and plundered the territory without scruple. They were charged by the pope, Venice, and the emperor, with favouring the Turks, and by the Turks with being partial to their enemies, and this because they endeavoured to keep on good terms with both, supplied their respective shipping with provisions, and

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gave shelter to the fugitives of both parties. Charles V. pressed several of their galleys into his service, and confiscated several of their merchant vessels. When the Venetians, the pope's admiral, and Andrea Doria joined their fleets in the Adriatic, in 1538, against Barbarossa, it was seriously debated among the leaders whether they should not begin by attacking Ragusa and bringing it into subjection to Charles V.; but Andrea Doria opposed this measure, saying that he had come to fight the infidels, and not his brother Christians. (Razzi, *Storia di Raugia*, who lived in the same century.) The expedition against Castelnuovo and Cattaro was then resolved upon. After the taking of Castelnuovo the Spanish garrison which was left there made incursions into the neighbouring territory of Ragusa, plundering the people, violating the women, carrying off the young girls, and committing every kind of atrocity.

Upon this the Ragusans sent a learned monk to pope Paul III. at Rome, to justify their conduct and explain to him their critical situation, being in the jaws, as it were, of the dreaded Ottomans, with a scanty and rocky territory which did not afford them the means of subsistence. At last the pope promised to protect Ragusa. By means of envoys and of presents to the various powers, and by maintaining a most prudent conduct, the Ragusans managed to steer their little bark safely through that most stormy period. Ferdinand I. of Austria, brother of Charles V., claimed the annual tribute from Ragusa in his quality of king of Hungary, but the senate answered, that Hungary having been conquered by the Porte, the tribute was now claimed by the Sultan, and from that time Ragusa ceased to pay tribute to Hungary.

Ragusa was a city of refuge; emigrants from all parts found hospitality there; Christians flying from the Ottomans; Florentine patriots emigrating after the fall of their republic, among others Soderini, the exiled Gonfalonière of Florence; Italians from every part, men of learning, found there a good reception, Ragusa being still a half Italian city. Tommaso Chersa of Ragusa has written a notice of all the distinguished Tuscans who had been in various epochs settled at Ragusa, bishops, professors, men of letters, statesmen, &c. (*Degli Illustri Toscani stati in diversi tempi d Ragusa*, Padova, 1828.)

Ragusa was a sort of neutral ground, a stepping-stone between Christendom and Turkey, and much intercourse and correspondence were carried on throught it, which could not always be carried on direct with Constantinople. Sultan Selim II. used to say that he received more correct information through the merchants of Ragusa concerning what took place among the Christians in the West than from all his pashas and sandjacks. Envoys to the Porte, from France, Venice, and other Christian countries embarked in the ports of Italy, and, after a short navigation across the Adriatic, landed at Ragusa, where they were hospitably received, and from thence proceeded by land to Constantinople.

During the seventeenth and eighteenth centuries, after a better understanding had been established between the Porte and the Christian powers, Ragusa continued to enjoy her independence and neutral security, paying the accustomed tribute to the Sultan, who however did not interfere in her internal concerns, and no Turkish soldier was allowed to step within its boundaries. The Sultan's protection was of importance to Ragusa, by securing its flag from the attacks of the Barbary pirates. In this respect the Ragusan merchant-ships had the advantage over those of most states in the Mediterranean, and they acted as carriers in that sea between the Levant and the ports of western Europe, and realised considerable profits, especially in times of war. Respectable Ragusan mercantile houses were established in many of the seaport towns of the Mediterranean. The republic maintained a small fleet of galleys and other armed vessels for the protection of its coasts and its trade. In 1667 Ragusa was afflicted by a dreadful earthquake, which ruined the greater part of the town, and which furnished the subject of an elegant Latin poem by Stay, a native of Ragusa.

The inhabitants were divided into three orders, gentiluomini or patricians, popolani or citizens, and plebeians or lower orders. The gentiluomini consisted, in Razzi's time (sixteenth century), of twenty-nine houses, which were all that remained of one hundred and thirty-two houses, of which the patrician order of Ragusa had once consisted. Razzi gives a list of these twenty-nine houses, some of which were from Epidaurus, some from Cattaro and other places in Dalmatia and Albania, and others from Italy. These houses, most of which had branched out into several families, intermarried with one another only, or with noble families of other countries. In the second edition of Luccari's more recent work (*Ristretto degli Annali di Ragusa*, 1790) we find the houses increased to thirty-three. The men wore long cloaks, in the old Florentine fashion, and round caps after the Venetian fashion. The patricians had the government entirely in their hands; they were all members of the general council or legislature, which met on the 1st of December every year, and out of which the members of the senate or executive were chosen, and were renewed every year. The rector or chief magistrate was changed in latter times every month. The patricians did not follow any trade or profession, but lived either on their rents or on the interest of their capital, which they lent to traders, ship-owners, and manufacturers. The citizens were chiefly engaged either in maritime or in retail trade. There was a council called minor, consisting of eleven old councillors, five of whom formed a court for criminal matters, and the other six judged in civil suits. There was also a board called 'Consiglio dell' Arte della Lana,' which decided questions concerning the trade, and especially the woollen trade, which was the most important. A stipendiary guard, of one hundred Hungarian soldiers and a captain, was kept by the republic, besides which there was a guard of native militia. Razzi, a foreigner and a monk, says that the councillors generally administered justice strictly, especially in criminal matters, but that in civil suits they sometimes favoured those of their own order. Luccari, a Ragusan and a patrician, says nothing about this. Razzi chiefly complains of the forwardness and impertinence of the boys of the patrician order, who used to carry things with a high hand, and even beat the other boys in the streets, who did not dare to resent this treatment in public, but sometimes, he adds, when the latter met their assailants in bye places, they took full revenge, and nothing more was said about it. He also complains that the said boys, while attending sermon, especially during Lent, would make a great disturbance in church, 'but,' he adds feelingly, 'as they were mostly of patrician families we could not control them, and must bear it with patience.' It was a proverb at Ragusa, 'Dalle mosche di Zara, e dai putti di Raugia cara, libera nos, domine' (the Lord deliver us from the flies of Zara, and from the boys of our beloved Ragusa). But of the grown-up men he speaks with esteem, as steady, well behaved, just, and civil. The people in general were content and thriving. The gentlewomen dressed mostly in black, with white veils thrown over their heads and shoulders, which covered their faces: unmarried ladies seldom appeared in the streets. The women of the other classes dressed in various colours, and went about with their faces uncovered.

The Ragusans from the beginning of their republic have belonged to the Western or Roman church. They were not very tolerant of the Greeks of the Eastern church, whom they considered as schismatics; and they drove them away from the territories which they acquired at different times Luccari gives a list of the archbishops of Ragusa. Ragusa is now only a bishop's see, and its bishop is suffragan to the archbishop of Zara.

Ragusa had remained an independent state for more than a thousand years; it had stood the attacks of numerous barbarians; it had warded off the insidious approach of its formidable Ottoman neighbours: it remained as an advanced post of European civilization on the borders of wild Bosnia and fierce Albania; its independence and its flag were respected by all the states of Europe. Coeval with Venice, it fell soon after that republic. The French Revolution and the wars resulting from it destroyed its independence, as well as that of all the old republics of Europe. In 1806, France and Russia were quarrelling about the possession of the important district of Cattaro, one of the spoils of Venice, which was ceded to France by the treaty of Presburg between Austria and France. The Russians however from Corfu had been beforehand, and had taken possession of Cattaro, with the connivance of the Austrian local authorities and with the assistance of the Montenegrins. The French troops from Dalmatia could not reach Cattaro without crossing the neutral territory of Ragusa 'The want of faith displayed in the affair of Cattaro gave occasion to another violation of faith concerning Ragusa

The soldiers of Napoleon, unable to occupy Cattaro, took military possession of Ragusa, in May, 1806, without any shadow of right, except the pretence of defending it from the incursions of the Montenegrins.' (Botta, *Storia d'Italia*, b. xxii.) But it was precisely the French occupation of Ragusa that led the Montenegrins to overrun its territory. They besieged the French within the town. The unfortunate Ragusans, placed between the regular French troops within and the savage Montenegrins without, saw their country-houses and villages devastated, but the town was saved from the Montenegrins. The result of this was, that Napoleon, by a stroke of the pen, in 1808, abolished the republican government, and incorporated Ragusa with the province of Dalmatia, and he made Marmont titular duke of Ragusa and governor of the province. Thus ended the independence of Ragusa, in the same manner and nearly about the same time as that of Genoa, Venice, Lucca, Geneva, Hamburg, and the other free towns of Germany. On the fall of Napoleon in 1814, when the Austrians again occupied Dalmatia, they found Ragusa included in that province, and they kept it, and it has ever since formed part of the Austrian territories. A good map of Dalmatia, including the territory of Ragusa, was published at Vienna in 1810: 'Carte von Dalmatien und dem Gebieth von Ragusa,' by Max. de Traux.

RAGWORT is the vulgar name of a plant called Senecio Jacobæa, which is so called from the ragged appearance of the leaves. It is a mere weed of no beauty; but the name is often applied to *Senecio elegans*, a Cape annual with purple flowers, which was formerly a common ornament of gardens.

RAI. [PERSIA, p. 476.]

RAIKES, ROBERT. [SUNDAY SCHOOLS.]

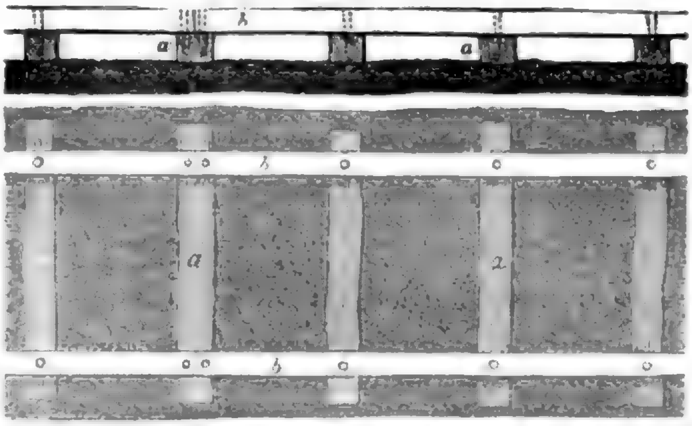
RAIL (Ornithology.) [RALLIDÆ.]

RAILWAY, a road in which smooth tracks of wood, iron, or other suitable material are laid to facilitate the motion of wheel-carriages. Railways are of various kinds, and have been used for a very considerable time as a means of transport for minerals and heavy goods; and recently, in conjunction with locomotive steam-engines, have been introduced to a very important extent for the purposes of general conveyance.

As the construction of railway carriages and the power made use of for drawing or propelling them are subjects intimately connected with that of the formation of the road itself, it appears desirable to treat of the whole in one article. It is here intended therefore to present a sketch of the progress of inventions relating to railways; an account of the designing, executing, and mode of working a line intended for general traffic; and a condensed description of the principal railways completed or in progress in this and other countries.

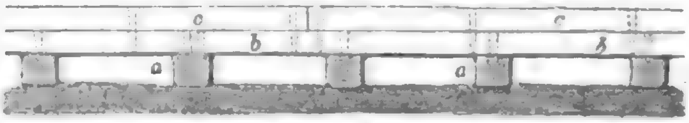
History.—Though some writers, in attempting to trace the origin of railways, have gone back to an earlier period, it does not appear that any satisfactory notice of what may fairly be considered as such is to be found before the seventeenth century, in the early half of which wooden rail, tram, or waggon ways were introduced in the collieries of the north of England. They were adopted in order to reduce the labour of drawing coals from the pits to the places of shipment in the neighbourhood of Newcastle-upon-Tyne, and they consisted, in the first instance, simply of pieces of wood imbedded in the ordinary road, in such a manner as to form wheel-tracks for the carts or waggons employed. The wooden tracks presented a much smoother surface for the wheels to roll upon than the very imperfect roads previously used, and therefore greatly increased the available power of the horses. The advantages even of this rude kind of railway were so great as to cause its extensive introduction in various mining districts, and in course of time several improvements were made upon it. About 1765, from a hundred to a hundred and fifty years after their first introduction, the wooden railways appear to have been made in the following manner:—The road was prepared by being levelled, or reduced to as uniform an inclination as circumstances would allow; pieces of wood, roughly squared, about six feet long and four to eight inches square, were then laid across it at a distance of about two or three feet from each other, and upon these other pieces, carefully sawn, about six or seven inches wide and five deep, were fastened by means of pegs, in such a manner as to form two wheel-tracks, about four feet apart. The road was then completed by filling the spaces between the cross-pieces (which are called *sleepers*), and under the rails, with ashes, gravel, or other road materials. *Fig.* 1 is an elevation and ground-plan of this primitive railway, *a a* being the sleepers, and *b b* the rails.

Fig. 1.



An important improvement on this construction consisted in the addition of a second set of rails, similar to the first, and spiked or pegged down to them, as shown in the elevation, *fig.* 2, in which *c* represents the upper rail. In the former plan the removal of a rail that was broken or worn out frequently occasioned the derangement of the sleepers, and rendered them useless, from the peg-holes becoming too large. By this improvement these inconveniences were removed, as the upper rails might be repeatedly renewed without disturbing the substructure, and there was no necessity for pegging twice into the same hole. Another advantage of the change was that, by the rail being raised, a greater depth of ballast or road material might be spread over the sleepers, to protect them from the horses' feet.

Fig. 2.

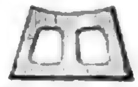


The vehicles used upon these wooden railways were generally waggons, containing from two to three tons of coal, mounted upon small wheels. The wheels were provided with a flange, or projecting rim, which, by coming in contact with the side of the rail, kept the waggon in the proper direction. Each waggon was drawn by one horse.

As it was desirable that, as far as possible, the power of the horses should be equally applied in every part of the road, it became usual at an early period, at least as early as 1716, to nail thin plates of malleable iron upon the surface of the wooden rails, wherever a steep ascent or a sharp curve rendered the draught harder than usual, so that the horse might travel with a full load upon the ordinary portions of the line, and yet, by the help of the greater smoothness of an iron surface, be able to pass the difficult points without inconvenience. The circumstances in which these lines were used were such that there was almost invariably a descent towards the river or sea-shore, which, being in favour of the load conveyed, was an advantage. Where the descent would otherwise be too abrupt, it was not unusual to make an elevated staith at the river end of the railway, and shoot the coal from the waggons, by an inclined plane, at once into the hold of the ships. Sometimes also, where the inclination would prove inconvenient if distributed equally along the line, it was so arranged that the greater part of the railway was made of a convenient descent, and the remaining fall accomplished by one or more inclined planes, or *runs*, which the waggons were allowed to descend by their own gravity, the velocity being checked by a piece of wood, called a *brake* or *convoy*, being pressed forcibly upon one or both of the wheels on one side of the waggon.

It may be supposed that the saving of labour effected by means of the wooden railway was considered sufficient for the purposes to which it was applied, as it continued in use for a century and a half without any important step being taken for the introduction of a more durable material. Some *stone-ways* were constructed for similar purposes, but, though possessing many advantages, they are not so smooth as those of wood. The next material improvement was the use of cast-iron plates upon the wooden rails. It is somewhat remarkable that, notwithstanding the well known effect of iron plates in diminishing the resistance, and their frequent use as already stated, this experiment is said to have been made more in consequence of accidental circumstances than as a premeditated measure of improvement. A wooden railway was in use at the Colebrook Dale iron-works, about the year 1767, when the price of iron became very low, and it was determined, in order to keep the furnaces at work, to cast bars which might be laid down upon the wooden rails, and save expense in their repairs, and which it was proposed to take up and sell as pigs in case of a sudden rise. This plan was suggested by Mr. Reynolds, whose name is also worthy of remembrance from the circumstance of his having erected the first iron bridge set up in England, also at Colebrook Dale. These bars, or 'scantlings of iron,' as they were called, were five feet long, four inches broad, and an inch and a quarter thick, and were cast with three holes for convenience of nailing to the wooden rails. Mr. Hornblower, an ingenious mechanician, known as a rival of Watt, in describing this road, remarks on the facility with which vehicles might be turned off the track when required, owing to the absence of a guiding flange; but this is a convenience incompatible with some of the most important qualities of a railway. Various plans have been proposed for combining the smoothness of a railway with the character of a common road, and of these perhaps none is more feasible than that patented by Mr. Woodhouse, in 1803, in which, by ingenious arrangements which it is not necessary here to detail, rails of the sectional form represented by *fig.* 3, are imbedded in an ordinary pavement or road. The concave form of the upper surface of the rail would tend to keep carriages in the right direction, and yet admit of their being turned out without difficulty. The ease of draught which would be attained by the adoption of such a plan may be conceived by observing the effect of the iron gutters in some of the streets of London, which closely resemble Woodhouse's rail in form, and are frequently made use of as wheel-tracks by drivers, notwithstanding the inconvenience, and even danger, arising from their being confined to one side of the vehicle.

Fig. 3.



Shortly after the experiment at Colebrook Dale, cast-iron rails with an upright flange, as shown in section in *fig.* 4, were brought into use. They were first used, it is believed, at the colliery of the Duke of Norfolk, near Sheffield, in 1776. Originally they were fixed upon cross sleepers of wood, like those used to support wooden rails. They were cast with holes for nails, and so laid down that the flanges should either both of them be towards the middle of the track, or *vice versâ*, so that, as explained by *fig.* 5, which represents an end section of the two rails fixed to a sleeper, with a pair of wheels on them, one flange on each rail is sufficient to prevent carriages running off.

Fig. 4.

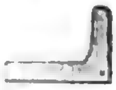
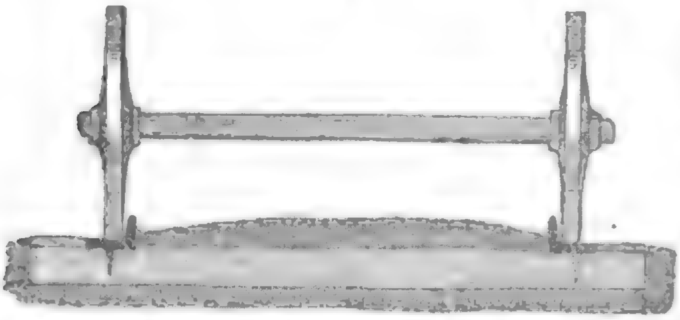


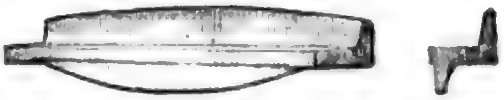
Fig. 5.



About the year 1793 blocks of stone were introduced as supports, instead of the wooden sleepers. They were, in the early railways, about a foot square, and eight or nine inches deep. One of these blocks is imbedded in the road under each joint in the rails, which are spiked down to wooden plugs inserted in the stone. As the foundation afforded by stone blocks is firmer than that of wooden sleepers, they were quickly introduced in most cases where a durable road was required.

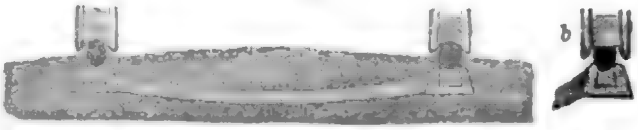
Many ingenious improvements have been made upon the kind of railway just described, which is still extensively used in mining districts for the conveyance of coal, ironstone, &c. It is, for distinction, called the *plate*-railway or *tramroad*, and is very convenient from the facility of its construction, and the circumstance that vehicles adapted for use upon it may also, if necessary, be used off the rails. The form of the rail is however a weak one, considering the quantity of iron used, and it is such as to permit the lodgement of stones and dirt, which not only impede the motion of the carriages, but are also liable to throw them out of the track. The former of these inconveniences has been in some degree remedied by the use of a rail with an under rib, as shown in *fig.* 6, a form which was adopted to reduce the cost of repairs on the Surrey tramroad.

Fig. 6.



The serious disadvantages of the plate-railway led to the use of *edge*-rails, which have now almost entirely superseded the previous form. The first edge-railway of any considerable extent was that completed in 1801 for the conveyance of slate from the quarries of Lord Penrhyn. Its construction is illustrated by *fig.* 7, which represents the two rails, and the form given to the tire of the wheels in order to keep them in the right course. These rails were of an oval section, the longest diameter being vertical. They were four feet six inches long, and had a dovetailed block cast beneath each end, which fitted into an iron sill imbedded in the road. The wheels were formed with a grooved tire, fitting loosely on the rail. It was found however that in course of time the groove became so deepened by wear as to fit the rail tightly, and thereby produce much friction. To remedy this, Mr. Wyatt, the inventor, introduced a rail and wheel formed as shown at *b*, *fig.* 7, in which the bearing surface of the rail and the corresponding part of the wheel were flat. The rails being laid only two feet apart, the carriages were necessarily small, and the friction considerable, yet the saving of power effected was such that two horses regularly drew a train of twenty-four waggons, each containing about a ton; and *ten* horses were found sufficient to conduct a traffic which had, on a common road, required *four hundred*.

Fig. 7.



The decided advantages of edge-rails were so well appreciated by the coal-owners of Northumberland and Durham, that they were adopted extensively by them within a few years after the successful experiment at Penrhyn. The form of rail most generally adopted was even better calculated to economise the strength of the iron than that of Mr. Wyatt. The following figures represent a mode of construction introduced early in the present century, and which is still used for colliery railways to a considerable extent. The rails are cast in lengths of three or four feet, and their greatest sectional dimension is in the depth. They are made of what is called a fish-bellied form, the lower edge being curved so as to give the rail greater depth in the centre than at the ends or points of support. *a*, *fig.* 8, represents the cross section of the rail in the middle, and *b* at the end. The ends are so made as to form a half-lap joint (*fig.* 9), and they fit into a suitable cavity in a cast-iron pedestal or chair, which is spiked down to the ordinary stone blocks or

Fig. 8.

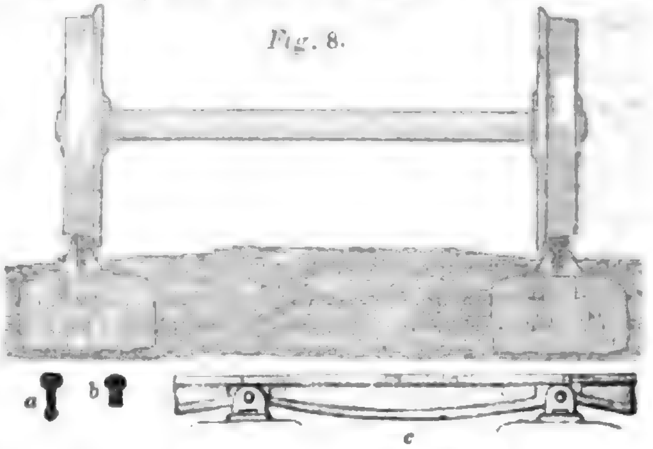
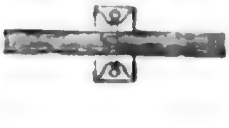


Fig. 9



wooden sleepers. A side view of the rail with two chairs is given at *c*, *fig.* 8, and the upper part of the figure is a section of the railway as completed, showing also the form of wheel employed. It will be readily perceived that the rounded surface of the rail renders the lodgement of extraneous matter almost impossible. The means adopted to keep the carriages upon the rails are much the same in this as in the plate-railway, but the position of the parts is reversed, the protecting flange being upon the wheel instead of the rail. By this arrangement the flange may be made much smaller than that of a tram-plate, and the friction is usually still further diminished by giving a slightly conical form to the wheel-tires, so that the flanges are but rarely brought into actual contact with the rails.

Although the principle of construction here given is that most commonly followed, the details vary so much that hardly any two railways are alike. More will be said on this subject in treating of the improved railways constructed during the last ten years, it being the object here to present an outline of the progress made in the construction of railways prior to their recent extraordinary extension. The sectional forms of edge-rails, though very various, generally bear a considerable resemblance to that here represented; and the fish-bellied profile has been selected as the most usual, although *parallel* rails, or those with an equal depth throughout from end to end, have also been extensively used. The form of the chairs or pedestals, and the method of securing the rails to them, is also very variable. In *figs.* 8 and 9 the rails are represented as having half-lap joints, the two ends being placed together between the cheeks of the chair, and fastened by a pin driven through the whole. Sometimes the ends of the rails are made square, abutting against one another in the chair, and secured by a separate pin through each rail. Since the general introduction of locomotive engines, the use of pins has been abandoned, as they have a tendency to work loose, and wedges or keys, which may be tightened when necessary, have been applied in different ways in their stead. In some cases edge-rails have been cast with a pedestal attached to one end, fitted to receive the opposite end of the adjoining rail.

One other improvement in the construction of railways must be mentioned in this hasty sketch of their early history: it is the introduction of malleable iron as a material for rails, an improvement which may perhaps be considered to have done more than any other in preparing railroads for becoming the principal highways of a commercial country. From the commencement of the use of iron railways, much inconvenience was caused by the frequent breakage of the rails, especially those of the tram-plate form. The brittleness of cast-iron, owing to its crystalline structure, rendered it necessary that the rails should be made much stronger than sufficient to bear ordinary loads, that they might be able to resist accidental strains and shocks; but although many of the earlier railways were relaid with heavier rails than were originally supposed needful, breakages were of such common occurrence as to occasion much trouble and expense. So long as the travelling was restricted to a low rate of speed, the accidents and delays thus occasioned were of minor importance, but the difficulty of guarding against them would no doubt have greatly retarded the use of railways for the conveyance of passengers, had not an adequate remedy been provided before the experiment was made. Bars of malleable iron were laid down as rails to a limited extent as early as 1808, and there were some engineers who advocated their use, notwithstanding the inconvenience arising from their unsuitable form, no machinery being then used by which they could be made economically in any other than a square or flat form. The desire to introduce a more durable rail led also to experiments on the combination of wrought and cast iron; but these and all similar contrivances were superseded in 1820 by Mr. Birkenshaw's invention of an efficient and cheap method of rolling iron bars suitable for rails and other purposes. [Iron, vol. xiii., p. 34.] The fibrous texture of wrought-iron makes it far less likely to break when subjected to concussion than cast-iron, and the sectional form used is such as to render bending improbable. It is a remarkable fact that malleable rails, when in use, do not rust to any material extent, while the same rails, if lying on the ground beside the track, rapidly exfoliate and waste away. One very important advantage of malleable rails is the reduction that they effect in the number of joints, they being usually made fifteen feet long, while the brittleness of cast rails rendered it unsafe to have them more than three or four feet, the space between two points of support. Originally the long wrought rails were confined to the parallel form, but they are now, by a very ingenious adaptation of rolling-machinery, made fish-bellied when that form is preferred.

The application of railways having been, down to a recent period, limited to the conveyance of minerals and merchandise, and that at a very moderate velocity, there was little that requires remark in the construction of the carriages employed upon them. They were usually four-wheeled waggons, of small dimensions compared with those used on ordinary roads, in order that the weight might be distributed over a considerable length of road. Being guided in the required direction by the flanges, it is unnecessary to attach the axles of railway carriages in such a manner as to enable them to turn, and the wheels to lock under the body, as in common vehicles; and for the same reason, combined with the greater straightness of a railway, it is unnecessary, and mostly deemed unadviseable, to allow the wheels to revolve independently of the axles. The most approved plan, especially for edge-railways, is to fix the wheels firmly to the axle, and allow the axle to revolve in bearings attached to the body of the carriage. The wheels are almost invariably made of iron, those for slow traffic being cast, and others either wholly or partially made of malleable iron, in order to diminish the risk of fracture. Cast-iron wheels were found to wear very rapidly when used upon wrought edge-rails, but the application of the case-hardening process has rendered them more durable. From a very early period, railway vehicles have been fitted with an apparatus called a *brake*, consisting of a piece of wood adapted to the form of the wheel-tires, and capable of being pressed against them by levers or screws with sufficient force to impede or arrest their revolution, and consequently the progress of the carriage. Previous to the recent adaptation of railroads to rapid travelling, the use of springs was not common, either in carriages or locomotive engines.

In the infancy of railways animal power was the only means of locomotion employed to any considerable extent, but the purpose to which they were applied, that of conveying mineral produce to a place of shipment, naturally led to the application of gravity as an auxiliary, and, in some cases, as the sole source of motion. Where, in such a case, the inclination of the ground is very moderate, the slope of the road is frequently so adjusted that no greater power is required to take a loaded carriage down, than to take it up again when empty. When a declivity occurs steeper than is convenient for the ordinary power, an ingenious arrangement called a *self-acting inclined plane* is occasionally resorted to, on which a loaded carriage, or train of carriages, is allowed to run down by the force of gravity, drawing a rope, which, after passing round a wheel at the top of the incline, is conducted down the slope and attached to an empty train—the force of the descent of the loaded vehicles being sufficient to cause the empty train to run up to the top of the plane. This admirable contrivance was introduced in the latter part of the last century, and is still extensively used. Stationary steam-engines, drawing the carriages by means of ropes guided by pulleys or sheaves in the centre of the track, have been used from an early period, generally in situations where the ascent is too great to be conveniently mounted by horse-power. Locomotive or moveable steam-engines, in many different forms, have also been tried at various times since about the year 1805, although for more than twenty years after that time their powers were very imperfectly developed.

In the following notice of the steps by which the locomotive engine has been brought to its present state of comparative perfection, those points only will be dwelt upon which are peculiar to that machine as applied to railroads, referring to Steam-Engine for more general information, and to Steam-Carriage for a notice of its adaptation to ordinary roads.

The possibility of applying the steam-engine to the purposes of locomotion was conceived by several of its earliest improvers, and in 1784 a plan was suggested in one of the patents of Watt; but it does not appear that either he or any other inventor carried their ideas into practice until about 1802, when Messrs. Trevithick and Vivian patented a high-pressure engine which, by its simplicity and compactness, was admirably adapted for locomotive purposes. Within a few years they built several carriages, one of which,

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at least, was for use on a common road. In 1805 they made some interesting experiments with a machine similar to that represented by the annexed cuts, on a tramway near Merthyr Tydvil, and thereby proved the practicability of their plan. It is remarkable that notwithstanding the extreme simplicity of this machine, it possessed almost all the essential arrangements of the modern engines; and the ideas of its inventors were so complete, that subsequent engineers have had little to do beyond improving and carrying into effect the suggestions of their specification.

Fig. 10.

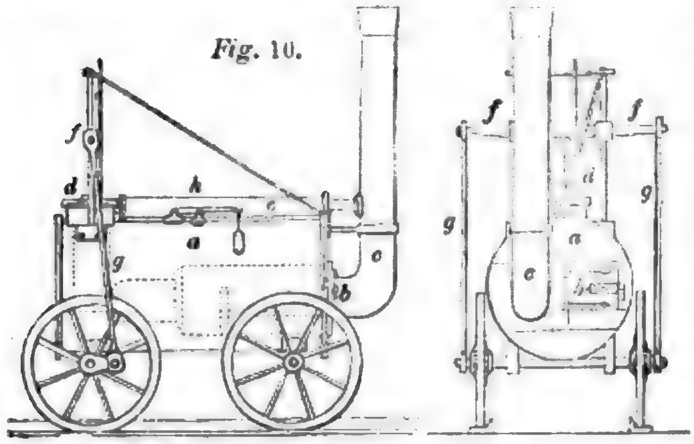


Fig. 10 is a side and end elevation of this machine, the same letters in each referring to the same parts: *a* is the boiler, which is of a cylindrical form with flat ends. The fire is contained in a large tube within, and on one side of, the boiler. One end of this is seen at *b*, and the form is indicated by dotted lines in the side view. This tube extends nearly to the opposite end of the boiler, and then, being diminished in size, it is turned round and brought out to the chimney at *c*. The fire-tube is completely surrounded by the water, by which arrangement steam is generated with great rapidity and of a high degree of elasticity. The steam-cylinder is placed vertically at *d*, being immersed nearly to the bottom of the boiler, as shown by the dotted lines. The steam is admitted alternately above and below the piston by means of a fourway-cock in a valve-box at the top of the cylinder, and the waste steam, after propelling the piston, passes by the eduction-pipe *e* into the chimney, where its emission causes a strong draft. The upper end of the piston-rod is attached to a crosshead *f*, which slides up and down on vertical guides, and from the ends of which connecting rods *g g* descend to cranks fixed on the axles of the fore-wheels, which are thus caused to revolve like the fly-wheel of a stationary engine: *h* is a safety-valve on the upper part of the boiler. The immersion of the working cylinder in the boiler is happily contrived for compactness and economy of heat, and has been frequently imitated in subsequent engines; and the admirable arrangement of throwing the waste steam into the chimney has been almost invariably followed, as it affords a blast always proportionate to the speed of the engine, and the consequent demand for the evolution of steam. This machine, when tried on the Merthyr tramway in 1805, drew a train of waggons containing ten tons of iron and a considerable number of persons at the rate of five miles per hour. Some inconvenience arose from the use of a single cylinder, because, although the impetus caused the wheels to revolve past the dead points of the crank, the motion was not regular throughout the whole revolution. A supplementary carriage followed the engine to carry a supply of fuel and water, and a small force-pump, worked by the machine itself, maintained the requisite quantity of water in the boiler.

Trevithick was aware that, although the adhesion between the engine-wheels and the rails was sufficient to ensure the progressive motion of his machine on a level or nearly level road, the wheels would slip round without advancing if the inclination were considerable or the load attached too great. He therefore in his patent proposed to remedy this by making the propelling wheels uneven by the projecting heads of bolts, cross-grooves, or fittings to railroads, where the adhesion of the plain wheels should prove insufficient. Being otherwise occupied himself, he did not proceed with his locomotive experiments, but many others entered the field, though they produced few useful contrivances that were not either used or suggested by him. An erroneous idea was for many years generally entertained, that the adhesion of plain wheels was insufficient for any practical purpose, and consequently much ingenuity was expended in contrivances for securing progressive motion by other means. One of the most successful of these experimentalists was Mr. Blenkinsop, who, in 1811, patented a locomotive engine in which the power was applied to a large cogged wheel, the teeth of which entered a rack laid down beside the ordinary rails. Blenkinsop's engine was in other respects very similar to that of Trevithick, but two cylinders and pistons were employed, working separate cranks at an angle of 90°, so that one was exerting its full force while the other passed its dead points. Engines on Mr. Blenkinsop's plan were worked for some years on a colliery line near Leeds, and drew very heavy loads at a slow rate; but the friction of the machinery was excessive, and they are consequently now disused. In 1812 Messrs. Chapman constructed engines on eight wheels, all of which were turned by the machinery in order to increase the adhesion. They also proposed to stretch a chain or rope along the railway, which should pass round a grooved wheel turned by the engine, and thereby aid the progressive motion. Shortly afterwards Mr. Brunton invented a locomotive machine, which was caused to advance by the alternate motion of two legs, thrust out from the hinder end of the engine. This singular contrivance was carried into effect, and the machine was found to have considerable power, but an accident caused the inventor to abandon it. Similar propellers have since been tried by Gordon and Gurney upon common roads.

In 1814 and 1815 engines were again tried with plain wheels, and, being found efficient, were used upon railways in the north of England. Several attempts have however been made since that time to introduce contrivances for increasing adhesion, to enable locomotive engines to ascend planes of greater inclination than they will do with smooth wheels alone.

Patents were taken out in 1816 and 1817, by George Stephenson, in connection with Messrs. Dodd and Losh under which several locomotives were constructed and brought into operation upon colliery railways near Newcastle-upon-Tyne. The boiler in these machines resembled that of Trevithick, but the fire-tube passed completely through, instead of being turned and brought out at the back. Two vertical cylinders were used, each working a distinct axle and pair of wheels, the cranks of which were kept at the requisite angle of 90° by means of an endless chain stretched over grooved or toothed pulleys fixed on the axles; or, in the more recent engines, by connecting rods outside the wheels. A curious contrivance was introduced in them to protect the machinery from the effect of jolts caused by irregularities in the road. Four cylinders, open at the bottom to the atmosphere, and communicating at the top with the boiler, were attached to its under side, and pistons, working steam-tight in these cylinders, were fastened to the axle-bearings. By this means the pressure of the steam and water on the pistons caused the boiler and machinery to rise above the axles, and relieved them from concussions affecting the wheels. This plan ensured an equal weight bearing on each wheel, although the rails might not be level, but it has been abandoned, and steel springs employed instead. Engines of this kind seldom exceeded a speed of about five miles per hour, unless unloaded, when they occasionally ran at the rate of ten or twelve.

When the projectors of the Liverpool and Manchester railway were engaged in the design and execution of that great work in 1825 and the following years, the advantages of locomotive steam-engines were so imperfectly developed, that it was uncertain whether or not they should be adopted. The experiment of forming a railway for passengers as well as general merchandise traffic, had scarcely been tried, although the Stockton and Darlington railway, which was opened in 1825, had done more than any of its predecessors in showing the capabilities of a railway for such a use. As the Liverpool line approached completion, the directors took great pains to ascertain the best method of working it. They were soon convinced that horse-power was ineligible, as it was intended to aim at considerable velocity, and the expense of animal power when applied at a speed of eight or ten miles per hour, is very great. It was not so easy to decide on the comparative merits of stationary and locomotive engines. Various suggestions were made for the application of fixed engines at intervals of a mile or two along the line to draw trains by ropes from station to station; but it was eventually determined to use locomotives, and to offer a premium of 500*l.* for the best to be produced which would fulfil certain conditions, of which some were that it should not emit smoke, should draw three times its own weight at the rate of ten miles per hour, should be supported on springs, not exceed six tons weight, or four tons and a half if on only four wheels, and should not cost more than 550*l.* The trial was fixed for October, 1829, when four steam locomotives were produced, one of which was withdrawn at the commencement of the experiment. Of the other three, the Novelty, by Messrs. Braithwaite and Ericson, was materially different from any previously used, being very light, and having the requisite draft produced by a blowing-machine. Its performance was very promising, until an accident with the boiler put an end to the experiment. More recent attempts have been made to introduce engines of similar construction, but they have not proved successful. The Sans Pareil, by Mr. Hackworth, was very similar to Trevithick's engine, but had two cylinders, both working the same axle. The two pair of wheels were coupled together by connecting rods, so as to make use of the adhesion of them all. This engine attained a velocity of fifteen miles per hour with a gross load of nineteen tons, but at length gave way owing to a trifling accident. The remaining engine, the Rocket, was constructed by Robert Stephenson and Mr. Booth, of the Liverpool and Manchester railway, and succeeded in performing more than was stipulated for.

The following engraving represents a side view of the machine, with a cross section of a portion of the furnace: *a* is a cylindrical boiler with flat ends; *b* the fire-box, which is double, as indicated by the cross section, the fire being contained in the inner part, and the space of about three inches between the inner and outer casing being filled with water. Twenty-five copper tubes of three inches diameter extend longitudinally through the boiler, opening at one end into the fire-box, and at the other into the bottom of the chimney at *c*: *d* is one of the steam-cylinders, of which there were two, placed diagonally on the sides of the boiler. The piston-rods worked in guides, and by means of connecting rods transferred the motion of the pistons in a very simple and effective manner to the large wheels. It was arranged as usual that one piston was in the middle of its stroke while the other was at the end of the cylinder and consequently powerless. The waste steam passed from the cylinders along the pipe *e* to the chimney, in order to produce draft. *f f* are pipes connecting the water in the casing of the fire-box with that in the boiler.

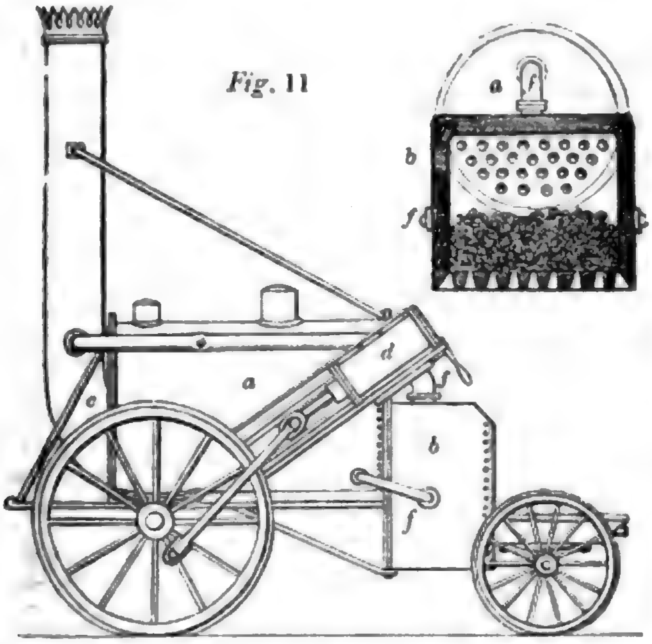


Fig. 11

The use of several tubes of small diameter instead of one large flue through the boiler, is the most important peculiarity of this machine, as, owing to the great extent of surface of heated metal thus placed in contact with the water, steam was produced with extraordinary rapidity. This plan, which was suggested by Mr. Booth, has since been carried to a great extent, by reducing the diameter and increasing the number of the tubes. The inclined position of the steam-cylinders caused the motion of the machinery to interfere less with the play of the springs than if they were placed vertically, but their situation had the disadvantage of exposing them to the cold air, by which the power of the steam is diminished, an inconvenience avoided in most subsequent engines by placing them horizontally in a casing under the chimney. The nuisance of smoke was prevented by the employment of coke as fuel.

The Rocket, with a gross load of seventeen tons, averaged a speed of fourteen miles per hour; but under some circumstances it attained double that velocity. Subsequent engines built by Mr. Stephenson were of much greater power, but, imperfect as the early attempts were, they proved, notwithstanding the incredulity of many, and even of some scientific men, the possibility of obtaining, by locomotive engines upon improved railways, a speed of travelling far beyond anything that can be effected by horses. Of the importance of this improvement in the means of intercourse, it is impossible, after the lapse of only ten years, to form an adequate idea; but the fact that since it was brought into operation a sum exceeding 60,000,000*l.* has been devoted to the construction of railways in this kingdom alone, may indicate in some degree the extent of the changes which it has been the means of introducing.

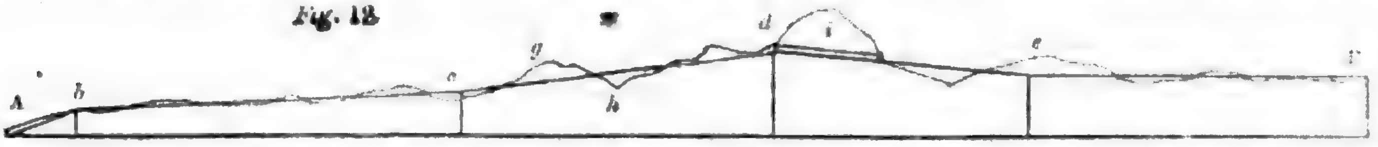
Having noticed the most important inventions and experiments connected with railways and locomotive machinery down to the time of their application on an extended scale upon the Liverpool and Manchester railway, it may be well to treat of subsequent improvements as they will come under notice in a sketch of the various operations of designing, constructing, and working a railway for general traffic.

Designing a Line of Railway.—It is not intended here to enter into a disquisition on the important economical questions which should be considered in marking out the main lines of communication in a country, and which, with some variations, are applicable alike to railways, ordinary roads, and canals. It is the opinion of many persons that a system of railroads should be laid out by the government of a country, whether they are actually formed by the state or by private individuals. Arguments in support of such a view have been drawn from the want of unity of plan which is evident in the railways of England, they having in most cases been designed in short lines from one important town to another, without due regard to combination of plan. The commissioners appointed to report on a system of railways for Ireland have considered this subject very ably, and endeavoured, in their proposed lines, to avoid the errors consequent on the limited views of private speculators. Most of the continental railways have been laid out more under government control than those of England, but there are not at present sufficient data from experience to allow of a fair comparison between the working of the two systems. In considering this point it should not be forgotten that, however desirable a comprehensive plan may be in a country yet to be supplied with railways, experience in cases most analogous leaves but little reason for supposing that the railway system would have made the sudden advances that it has, unless under the stimulating though by no means unexceptionable agency of private speculation and commercial enterprise.

When the termini and general course of a line of railway are determined on, there remain many points to be considered in selecting the precise direction which it shall take. It is necessary carefully to examine the country to be passed over,—its elevations and depressions—its rivers, canals, roads, and all other streams of water or means of communication that have to be crossed, or in any way interfered with—and its geological structure; any of which may occasionally render a deviation from the direct course adviseable.

It is evident that, as a general rule, a perfectly straight and level line is to be preferred, when the termini are of equal elevation; or a uniform slope when one is higher than the other. An attempt has indeed been made to prove that a railway formed in a series of undulations would be preferable to one perfectly level, because the power of gravity might be used to aid in the descents, and that of acquired momentum in the ascents, thereby reducing the amount of artificial power required for moving carriages upon the road. This theory excited much discussion a few years since, but the general opinion of engineers was not favourable to it. There are however some circumstances under which advantage may be taken of the powers of gravity and momentum, without the serious inconveniences which would attend the use of an undulating railway like that suggested by the author of this theory. But, desirable as a perfect level or uniform slope may be, it rarely happens that either can be attained for any great distance without involving such a deviation from the natural surface of the ground as would be very inconvenient. The engineer therefore so adjusts his inclinations or gradients as to make the nearest practicable approach to a level, avoiding if possible any loss of power from undulations of surface, by making all the inclinations on one side of the summit, or highest point to be passed over, rise towards it, and all on the opposite side descend from it. In order to the due adjustment of the gradients, a section or profile of the line of country is prepared, in which the elevations and depressions are drawn to a much larger scale than the horizontal distances, in order that, by being made disproportionately steep, they may be more readily recognised by the eye. *Fig.* 12 is a section of an imaginary line, resembling, except in its small size, those prepared for parliamentary inspection. The horizontal line at the bottom is given as a datum for measuring the elevations from, and is made to have reference to some fixed point near one of the termini. This section may be supposed to represent the line of a railway between a seaport town at A, and an inland town at F: the undulating line representing the natural surface of the ground; the straight lines from point to point, the intended surface of the railroad; and the vertical lines marking the changes of inclination. Owing to the intervening high ground, a uniform slope from A to F is impracticable, but a line with very moderate inclinations is obtained by tunnelling through the ridge at *i*, excavating the minor elevations, and filling up the hollows. If a road were made on the natural surface of the ground, a carriage passing along it would, after mounting to the elevation *g*, have to descend to *h*, and immediately remount to the top of *i*, thereby having twice to ascend an elevation equal to the difference between *g* and *h*, involving a considerable waste of power, which would be caused more or less by every undulation passed. But in a road constructed on the level of the proposed railway, not only would part of the elevation of *i* be avoided by the tunnel, but that which remains would have to be ascended but once, as every part between A and *d*, the summit of the road, rises towards it, though in different degrees; and in like manner the whole distance between *d* and *e* inclines downward, while the remaining part, from *e* to F, is perfectly level.

Fig. 12



Owing to the short interval which has elapsed since the commencement of railway operations on a large scale, many theoretical points respecting them yet remain unsettled. Even the amount of retarding effect caused by passing over a given elevation is calculated variously by different engineers. On an ordinary road the resistance arising from friction and irregularity of surface is so great that the effect of gravity is scarcely perceptible on a moderate inclination; but on a railway the friction and road-resistance are reduced to so small an amount, that gravity, which remains the same, becomes a material part of the total resistance, even where the inclination of the road is so slight as to be almost imperceptible to the eye. A theory held by many engineers is, that an elevation of twenty feet requires an exertion of power equal to that on a mile of level railway; so that the same power which would move a given load over one mile of railway rising 1 in 264, or twenty feet in the whole, would move the same load over two miles of level road. The practical importance of this question is very great, because a correct understanding of it is essential to show how far it may be advisable to deviate from a direct course in order to avoid a given elevation. Supposing, for instance, that a railway is required between two points twenty miles apart, and that a straight course may be obtained by passing over an elevation of 100 feet, it may be preferable to increase the length to twenty-four miles, if by so doing a level can be obtained; because the elevation of 100 feet will require as great an expenditure of power as five miles of horizontal railway.

Another question on which there exists much difference of opinion, is the degree of steepness that may be allowed in any of the inclined planes without injuriously affecting the working expenses. It is often necessary to conduct a railway over a considerable elevation, but engineers differ as to the best arrangement of the unavoidable inclinations. Some prefer distributing the rise and fall as equally as possible throughout the whole line, while others consider it best to concentrate them in a few steep planes, in ascending which additional power is used, and making the rest of the line comparatively level. The Liverpool and Manchester railway may be cited as an instance of the latter mode, the main line having no gradient exceeding 1 in 849, with the exception of two inclined planes of about a mile and a half each, inclining 1 in 89 and 1 in 96, near Rainhill; at which it is usual to assist the trains by an additional locomotive engine. The Great Western railway also, in a length of 117¼ miles, has no steeper gradient than six feet six inches per mile, or about 1 in 812; but has two inclined planes of 1 in 100 for a length of one and a half and two and a half miles respectively. The London and Birmingham railway is an example of the former system, its ordinary gradient being 1 in 330, or sixteen feet per mile, which is nowhere exceeded except on the extension from Camden Town to Euston Square which was intended for working by stationary engines. The characteristic or ordinary gradient on the Southampton, Brighton, South-Eastern, and many other lines, is 1 in 264, or twenty feet per mile.

A certain degree of similarity in the gradients is essential to the economical working of a railway by inanimate power which cannot be so conveniently urged as that of horses to a temporary exertion to overcome a short but steep ascent. If therefore any inclination occur so steep that the ordinary power cannot ascend it by a reduction of speed, it must either be surmounted by the aid of auxiliary power, or the engine must run over other parts of the road with less than a maximum load, and consequently at unnecessary expense. So long as this inconvenience is avoided, it is the opinion of some scientific men that the degree of inclination is of little consequence on a railway with an equal traffic in both directions, because the assistance of gravity in the descent being set against the additional resistance in ascending, brings the total amount of power required in traversing the line *in both directions* to nearly the same as would be needed were the road a perfect level.

Some highly interesting experiments have been recently made on this and other points of railway economy, under the superintendence of Dr. Lardner, of which the following seems to indicate that this compensating effect takes place on inclinations of much greater steepness than has been generally supposed. Great caution is necessary in forming calculations on such a subject from single experiments, however carefully conducted, but the results are certainly such as to justify serious inquiry. In July, 1839, the Hecla engine, with twelve carriages, making a gross weight, including the engine, of eighty tons, was run from Liverpool to Birmingham and back in the same day; by which means the same train, under as nearly as possible the same circumstances, had to ascend and descend every plane on the line, a length of about ninety-five miles. The time of passing each quarter-mile was carefully observed, so as to obtain the speed on every portion of the road. The following table, extracted from the seventh edition of Lardner on the Steam Engine, gives the result of observations on gradients varying from level to 1 in 177, or nearly thirty feet per mile:—

Gradient. One in	Speed in ascending. Miles per hour.	Speed in descending. Miles per hour.	Mean speed. Miles per hour.
177	22·25	41·32	31·78
265	24·87	39·13	32·00
330	25·26	37·07	31·16
400	26·87	36·75	31·81
532	27·35	34·30	30·82
590	27·37	33·16	30·21
650	29·03	32·58	30·80
Level	——	——	30·93

From this table it appears that although the plane of 1 in 177 diminished the speed from near thirty-one miles per hour, the velocity on a level, to little more than twenty-two miles, in the ascent, the deficiency was fully compensated by the increased rapidity in the descent. The trifling difference in the mean speed on the different gradients may probably be attributed to accidental circumstances, but, small as it is, it is rather in favour of the steepest inclinations than otherwise. The result fairly indicates a most remarkable and valuable fact, namely, that a line of railway with gradients of from twenty to thirty feet per mile may be worked in both directions by the same expenditure of power as a dead level; and this fact, if substantiated by more extended experiment, proves that many millions may be saved in the execution of future railways by being content with steeper inclinations than have hitherto been admitted by most engineers to be adviseable. The whole of the compensating effect here produced is not to be attributed to the agency of gravity and momentum; a part, and perhaps a very considerable part of it, being due to the diminished resistance of the air to the passing of the train on ascents, owing to its reduced velocity. The nature and extent of atmospheric resistance to railway trains is a point on which so little is known, and opinions are so conflicting, that the extent of its influence in the experiment alluded to cannot be stated with certainty, but it is probably considerable, as the result is very different from that which might by calculation have been expected from the mere effect of gravity and friction. The resistance of the air being almost imperceptible in the case of common roads, owing to the great friction and moderate velocity, has frequently been considered too trifling to become an element in calculations on railway transit, and hence arises much of the error that has hitherto prevailed respecting inclined planes. For further information on this subject see RESISTANCE.

Dr. Lardner thinks that his experiments indicate the gradient by which the gross resistance is doubled to be nearer 1 in 95 than 1 in 300, which he, in common with many others, had formerly considered the limit, though 1 in 264 has been mentioned above as being a more moderate and perhaps more usual calculation.

Curves on a main line of railway being, in consequence of the peculiar construction of the carriages and the speed at which they travel, very objectionable, a judicious engineer so adjusts his line as to avoid them when possible, and to make those which are inevitable of as large a radius as circumstances will admit. Curves of less than a mile radius are considered unadviseable for places where great velocity is required, although many of only half a mile radius are in use, the rails being so laid as to counteract the danger that might arise from the centrifugal force of trains passing over them, as explained hereafter. At stations and depôts, where the trains always move slowly, the radii may be much shorter without inconvenience.

It is essential to the public safety that a railway should not be allowed to cross any much frequented road on the same level. When the Liverpool and Manchester line was projected, as the rate of travelling was not expected to exceed ten miles per hour, no danger was anticipated from such intersections, which are called *surface-crossings;* and accordingly several were allowed; but their inconvenience and danger have caused some of them to be altered, the road being conducted under or over the railway by means of a bridge. In recent railway Acts it is enacted that no turnpike-road or highway shall be crossed on the same level; a rule to which exceptions are very rarely allowed; and if they are, gates must be erected to enclose the railway, and attendants stationed to open them when necessary for the passage of vehicles across it. These gates should be so hung as to completely close the railway when the road is open, and *vice versâ.* In a few instances two railways have been allowed to intersect each other on the same level, but this highly dangerous arrangement is now very rarely permitted. Where a single road is crossed, it may not be necessary to regard it much in selecting the level for the railway, as such road may be made to slope gradually to the requisite level for passing under or over it; but in approaching towns, where many communications are interfered with, it is essential that the railway level be made higher or lower than the ordinary surface, in order to avoid them. At Liverpool this is effected by tunnels under the town; at the London end of the Birmingham railway by an open cutting; and at Manchester, Birmingham, and many other places, by an embankment or viaduct. The Greenwich railway, extending over a metropolitan district the whole of its length, is entirely on a viaduct, and that from London to Blackwall, a similar line, principally so.

Railways, being usually constructed on as low a level as possible, frequently intersect the course of rivers and canals, rendering numerous and expensive bridges necessary. Where the course of the streams thus crossed is sinuous, expense may sometimes be reduced by making a new channel for the river, such a cut often being the means of avoiding the erection of two bridges, as in the instance of the Manchester and Leeds railway in the valley of the Calder.

Obtaining an Act of Parliament.—Railways being in this country constructed by associations of private individuals, with a view to their own pecuniary advantage, as well as to public convenience, it is necessary that, on the one hand, legislative restrictions should be imposed, to protect the interests of those who may, directly or indirectly, be affected by the formation of the railway; and, on the other, that the promoters of the scheme should be invested with considerable powers, to enable them to carry it into effect. Lands, buildings, rivers, canals, roads, &c. have to be intersected and otherwise interfered with; and while justice requires that no unnecessary injury should be inflicted on their owners, or the parties using them, and that every unavoidable interference should be amply paid for, it is also necessary to prevent a plan likely to be of great public benefit from being defeated by objections arising from prejudice or private interest.

Owing to the number of crude and ill-judged speculations of 1835, 6, and 7, which proved the necessity of imposing various restrictions on the facility of obtaining parliamentary powers, new standing orders were introduced with a hope of more effectually insuring the public against being misled by over-sanguine projectors. An opinion is entertained by many, that those regulations are now too stringent: and the very limited number of new undertakings sanctioned by parliament since they came into operation, though partly to be accounted for by other circumstances, leaves some reason to question whether, in the attempt to restrain improper speculation, legitimate enterprise has not been injuriously shackled.

Under the existing standing orders of parliament respecting railway bills, it is required that plans and sections of a proposed line, on a scale of four inches to a mile, shall be deposited with the clerks of the peace for the several counties through which it is proposed to carry the railway, on or before the first day of March, and in the Private Bill Office, &c., on or before the first day of April in the year preceding that in which an application is made to parliament for an Act. The plans are accompanied by a book of reference, showing the owner, lessee, and occupier of every house or piece of land liable to be passed through or otherwise interfered with. The sections indicate not only the length and inclination of each gradient, but also the actual elevation of numerous points above the base line used as a datum, and the elevation and proposed mode of crossing every stream or road intersected by the railway. Portions of these plans and books are also deposited for reference with the clerks of parishes through which the line runs, if in England, or if in Scotland or Ireland, with other specified officers; and notice is given of the intention to apply for an act of parliament, both publicly by London and county newspapers, and privately by notices to owners and occupiers of property affected. The former of these notices being given in February and March, a whole year is allowed for interested parties to consider the scheme and make preparations for advocating or opposing it in parliament. Before 1837, notices given and plans deposited in the month of November before the meeting of parliament, were considered sufficient. The shorter period was far more favourable to railway companies than the present, because the surveys are frequently made in the autumn, immediately after the removal of the crops, and the plans might then be prepared in time for obtaining an Act in the ensuing year; or, if a company were defeated in parliament one session, they might amend their line to obviate the objections brought against it, and be prepared for the next session. Now, a line surveyed in the autumn of 1840, must have the plans deposited in 1841, and the application must be made to parliament in 1842, so that it could scarcely be commenced till 1843; and a company failing in one session, must wait till the next but one, or proceed with plans deposited before a parliamentary opposition had shown what objections would be brought

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forward, or how they might be obviated. Owing to the long time between the plans being deposited and the Act being applied for, it frequently happens that they are deposited before a company is formed, with the intention of using them, if circumstances are favourable as the time approaches. The number thus provisionally deposited may be supposed from the fact that plans of thirty-six new lines were deposited for the session of 1840, none of which were brought forward. If the company intend to proceed with their project, the shareholders are required by the standing orders to subscribe to a contract, binding themselves, their heirs, executors, &c. to pay up the whole amount of the shares they take, when called upon to do so. This subscription contract must be signed between the time of making an application for an Act and the close of the session next preceding. They must also, according to the orders of the Commons, deposit a sum of ten per cent. on the proposed capital, in government securities. If the preliminaries have been duly attended to, a bill is brought in for incorporating the company and investing it with the necessary powers. After being read a second time, it is examined in a committee, which, if the bill be opposed, is composed of those members who represent the districts affected by the measure, and of a quorum, generally not less than three, of selected members having no interest in the question either personally or for their constituents. The committee report on the length, gradients, curves, and other peculiarities of the line; on the estimated outlay, and its apparent sufficiency; the traffic expected; the sufficiency or insufficiency of the existing means of communication for agricultural, commercial, manufacturing, or other purposes; and the probability of remuneration to the shareholders. They also receive lists of the owners, lessees, and occupiers of the land, &c. that may be required, showing whether they are assenting, dissenting, or neutral parties to the bill; and examine the list of shareholders, to guard against the introduction of irresponsible persons. Petitions presented respecting the bill are referred to the committee, who frequently insert clauses for the special protection of the petitioners. If there be any competing line of railway existing, in progress, or in contemplation; or if any parties oppose the bill on the ground of the line being unnecessary or injurious; a very expensive and tedious examination of witnesses is the result. Counsel are engaged on both sides, and evidence is heard sometimes on almost every point to be embraced in the report. The expense attending these contests is a strong argument against the existing system, which is considered defective also in many other points. After leaving the committee, the progress of a railway bill seldom excites much interest or attention. Unopposed bills are for the future to be re-referred only to the chairman of ways and means, and the two members in charge of the bill.

The preamble of a railway Act recites that it is expedient to construct the railway therein described, and that certain persons, whose names are given, are willing and desirous to make it at their own costs and charges. The Act forms them into a corporate body, invested with powers to take and make compensation for the necessary property, and to construct the railway. As the surveys are often made hastily and under great disadvantages, a deviation from the line laid down in the plan to the extent of a hundred yards is allowed for the sake of improving the line, such deviation being limited to ten yards in towns, and not being allowed to extend into any lands not included in the plan and book of reference. Powers are also given for altering, to a very limited extent, the levels and gradients defined on the parliamentary section. The company is allowed to raise a certain sum, sufficient to cover the estimated expense, in shares among themselves; and also, if necessary, to borrow a further sum, not exceeding one-third of their capital, as soon as one-half of it is paid up. Such additional sums may be raised in new shares, at the option of the company. Clauses are inserted to protect the rights of individuals, to specify the dimensions of road, canal, and river bridges, and the slope to be given to roads where they are altered. A board of directors, selected from the principal shareholders, and generally from twelve to twenty-four in number, is appointed to conduct the affairs of the company, to make calls for the capital as required, &c.; and provisions are inserted for a change in this body by a certain number being balloted out periodically, and the vacancies filled up by the proprietors at their annual or half-yearly meetings. Powers are given to the company to take certain specified tolls, to carry passengers and goods, and for many other purposes. To provide for the possible abandonment of the scheme, it is stipulated that the compulsory powers for taking land shall cease after the lapse of two or three years, and that, if the works are not completed within a period of, in most instances, seven years, or, having been completed, are not used for three years, the land shall revert to the owners of adjoining property.

Owing to the numerous subjects embraced, a railway Act frequently fills from one to two hundred folio pages. It has been suggested that much expense and trouble might be saved by the passing of a General Railway Act, embracing those points common to all, so that an ordinary Act need contain only what is peculiar to the individual line. In many cases Amendment Acts are required by a railway company to enable them to raise additional money, or to execute extensions or alterations of the original line; but these do not require any detailed notice. As instances of the expense attendant on the present mode of obtaining railway Acts, when opposed, it may be stated that the London and Birmingham Railway Company spent more than 72,000*l.* in procuring theirs, and the Great Western upwards of 88,000*l.* The London and Brighton is perhaps the most expensive contest of the kind that has taken place, four or five companies having engaged in it for two successive sessions. When in committee, the expense of counsel and witnesses in the latter case is stated to have amounted to 1000*l.* daily, for about fifty days.

The act of parliament being obtained, the land required for the railway is definitely set out and purchased. Power is usually given to take a width of twenty-two yards, exclusive of what is necessary for the sloping sides of cuttings and embankments, but this width is seldom required. When moderate compensation is demanded for the land taken and the injury caused by the severance of estates, the removal of buildings, and other circumstances, the company have no need to put their compulsory powers in force. But where, as too often has been the case, exorbitant claims are made, recourse is had to a jury. In most cases where this alternative has been resorted to, the sum awarded has been much under that claimed,—frequently less than a quarter, and in one recent case only about a fiftieth part of it. The item of land is one of the causes of that excess of cost over estimates which has been so severely animadverted on, and another is the expense of extra bridges claimed by landowners as communications between severed lands, the trifling utility of which is indicated by the circumstance that, after extorting an agreement to build them, persons have often accepted one-half of their cost, in lieu of having them erected.

Formation of the Road.—Under this head is included the execution of those works necessary for the construction of a road (independent of the rails and finishing works), of the required level and width. These works consist of tunneling, excavation, embankment, and masonry for bridges, viaducts, and other erections. They are commonly divided into convenient portions, and let to contractors under agreement to complete them at a stipulated price and within a specified time. It is usual to commence those works which take the longest time first, that the capital expended on others may not lie idle till they are completed.

Tunnels are, in general, the most formidable works, and the time and expense of forming them can be least accurately calculated, because unforeseen circumstances often arise to retard their progress. Trials of the nature of the ground are made by boring, but these may indicate favourable strata, while, as in the well-known instance of the Kilsby tunnel, difficulties may exist requiring great energy and skill, and an enormous outlay to overcome. Being objectionable also on other accounts, tunnels are avoided as much as possible in the more recently designed railways. For the mode of constructing them, see TUNNEL.

Cuttings or excavations of great depth and extent are of frequent occurrence where the railway passes through high ground, but not at such a depth from the surface as to require a tunnel. The depth of cuttings is frequently from fifty to seventy feet and occasionally even greater. One very extensive excavation through the Cowran Hills, on the Newcastle and Carlisle railway, is as much as a hundred feet deep. The degree of slope necessary in the sides of cuttings varies greatly in different soils. Rock will stand when nearly vertical; chalk varies from nearly vertical to a slope of one horizontal to one vertical, or an angle of 45°;

gravel stands usually at one and a half to one; London clay from one to one to three to one, having in some instances stood at the former and slipped at the latter slope. Some materials are insecure at even a greater slope; blue soapy shale having, according to Lecount, slipped at an inclination of four horizontal to one perpendicular. The unexpected slipping of the slopes sometimes occasions much trouble and expense. A case lately occurred in the north of England in which a cutting to be formed in the side of a hill was estimated to require the removal of about 50,000 cubic yards of earth. It turned out, however, that the soft earth was held up by a seam of shale, which was no sooner cut through than a mass of earth slipped down into the line of the railway, of such magnitude as to require the removal of about 500,000 cubic yards. The great cutting at Blisworth, on the London and Birmingham railway, affords an example of a convenient and economical method of passing through earth in which strata of rock occur. The railway is at a depth of fifty or sixty feet, the upper portion of which is rock, and the lower consists of a less solid material. Instead of making an excavation of the slope required by the lower strata, which would have rendered the removal of the superincumbent rock indispensible, the sides were made nearly vertical, and the rock was supported by an under-setting of masonry. The great breadth of ground occupied by the slopes of cuttings, is a serious objection when they are in the vicinity of towns or pass through valuable property, in which cases the sides may be made nearly vertical, and supported by retaining walls, so curved as to enable them to sustain the pressure of the earth. The extension of the Birmingham railway to the Euston station affords a very bold and handsome example of this kind of work. In designing the works of a railway, the amount of excavation and embankment should be balanced as nearly as possible, so as to avoid the necessity of depositing earth from cuttings in spoil-banks, or having to purchase additional land to supply material for the embankments. Attention to this point will sometimes decide which is most expedient, a short tunnel or an open cutting.

Embankments are the artificial ridges of earth formed to support the railway on a higher level than the natural surface of the ground. Their dimensions are often fully commensurate with those of cuttings, from which their materials are mostly procured. In the ordinary mode of proceeding, an embankment is formed simultaneously with a cutting, the earth-waggons proceeding filled from the excavation along a temporary railway to the embankment, where they are tipped up to discharge their contents. A heavy embankment often forms the key, as it were, to the time of completing a railway. Tunnelling and excavation may be proceeded with at many different points, but an embankment, under ordinary circumstances, can be carried on only at the ends, and the number of men employed there is restricted by the limited space. Time is occasionally saved by the erection of a temporary wooden stage at the end of the embankment, affording the means of tipping a greater number of waggons at one time than can be done without it. Where the excavations do not afford sufficient material, embankments are partially formed of earth dug from trenches along their sides, and thrown up into the centre. This is called side-cutting, and, being an expensive proceeding, should be resorted to as little as possible. An important element in the cost of embankments is the length of the *lead*, or distance to be traversed by the earth-waggons between the points of filling and emptying. The sides of embankments, like those of cuttings, require a considerable slope, especially when the material is of an unfavourable nature. The earth should be deposited in layers of two or three feet thick, slightly concave on the upper surface, and, if time permit, it is well to allow one layer to settle before another is spread over it. The subsidence of newly-made embankments is a source of great expense, and sometimes of danger. It is usual to lay the rails in such a manner as to diminish the risk of accident from this cause, and to travel slowly over parts where a tendency to slip is observable, especially in wet weather, yet casualties will sometimes occur until these great earthworks are thoroughly consolidated by time. Allowance should be made for subsidence by making the embankments rather higher than they are intended to be finally. Great difficulties are experienced in embanking across marshy or boggy soils, which frequently sink under the weight of the earth deposited, the ground bulging up at the sides in consequence. Judicious drainage may do much in such cases, and the insertion of a frame-work of timber to bind the earth together and thereby check the unequal settlement of the embankment, has been tried with apparent success by Mr. Braithwaite on the Eastern Counties railway. To prevent carriages which escape from the rails falling over the sides of an embankment, mounds of earth are sometimes raised along them. The embankments raised across Chat Moss on the line of the Liverpool and Manchester railway, and similar places have excited much interest. The difficulties arising from the yielding nature of the material are greatly obviated by drainage, as, when dry, the moss itself becomes a fit substance for embanking, and stands well at a slope of less than 45°. The railway is sustained on part of Chat Moss by a platform of timber and hurdles, covered with earth and broken stone, and floating, as it were, on the spongy substratum. A peculiar kind of embankment required in hilly districts and along coasts consists of a road on the side of a steep elevation, one side being supported by a sustaining or revêtement wall. An important work of this kind is being executed along the face of part of the Dover Cliffs, for the South-Eastern railway, in which the revêtement wall is exposed to the sea. Similar constructions have been introduced on the Dublin and Kingstown railway, where there is also a remarkable embankment across the strand at Blackrock, that, at high-water, has the appearance of a mole stretching into the sea, which is allowed to pass through it by culverts. On the Preston and Wyre railway is an extensive embankment in a similar situation, but, when completed, it is intended to exclude the sea. Though yet unfinished, carrriages are enabled to pass along by the rails being temporarily supported on piling. On the Stockton and Hartlepool line a sea embankment of clay has been recently completed, the side being puddled and formed into such a curve as to bear the dashing of the waves without injury. Retaining walls are occasionally used to diminish the space occupied by embankments, as before mentioned in the case of cuttings. The Dublin and Kingstown railway commences in this manner, arches being introduced at the intersection of streets and roads.

The earth-works on most of the great lines of railway in England are very extensive, in many cases averaging from 100,000 to 150,000 cubic yards per mile. On the London and Birmingham line alone the quantity of earth and stone removed was about 16,000,000 cubic yards, which, if formed into a belt three feet wide and one high, would more than encompass the earth at the equator! When completed, it is adviseable to sow the slopes of cuttings and embankments with grass-seed, as their appearance is thereby improved, while the roots give cohesion to the surface, and render it less likely to be affected by weather.

The amount of masonry and brickwork required in the various erections of a railway is very great. The lining of tunnels, where the ground penetrated is of such a nature as to require support, forms a peculiar kind of work. Arching of almost every kind is more or less required in viaducts, bridges, culverts, and drains; and simpler work in the retaining walls, station buildings, and other necessary erections. Viaducts of great magnitude are often executed for the purpose of crossing valleys at an elevation greater than could be conveniently obtained by embankment, and also for entering or passing through towns. They are usually of stone or brick, but sometimes of wood or iron. [VIADUCT.]

Bridges are required occasionally for crossing rivers, and very frequently at the intersection of roads, and as communications between severed property. From a statement by Lecount, in the 'Encyclopædia Britannica,' it appears that, taking the mean of nearly a hundred railways, the number of bridges averages about two and a quarter per mile. Besides ordinary arches of brick and stone, bridges consisting of cast-iron girders laid from one abutment to the other, and supporting a platform of flag-stones, iron plates, or planks of wood, are very common. When the railway itself passes over such a bridge, six ribs are used, the distances of which are so adjusted that four of them sustain the rails and the other two the parapets, leaving nothing necessary between the ribs or girders, except a flooring of iron plates. By this arrangement great strength is ensured, and the depth or thickness of the bridge is reduced to a minimum, no ballast or road material being necessary. Wooden bridges of similar character are occasionally used.

A remarkable circumstance in the appearance of railway works is the frequent occurrence of *skew*-bridges. They are introduced when the railway intersects any existing communication at an oblique angle. Such arches were built before the introduction of railways called them into general use, but as, in an ordinary road or a canal, a deviation from the straight line is of little consequence, it was seldom thought necessary to apply them, and was customary to build the arch of the ordinary form, on the square, and accommodate the direction of the road or canal to it by curved approaches. But as on a railway straightness is of great importance, it frequently becomes necessary, in crossing other roads, to adopt a skew-bridge, in which the communications over and under the bridge form unequal angles with each other. For an account of the construction of these ingenious works, see **Skew-Bridge**.

When the various works described are completed, with the requisite drains and fences (which are highly important), the road is ready for receiving those finishing works which entitle it to the distinctive name of *railroad*. The level of the earth-works, when completed, is called the *formation-level*, and is usually about two feet below the intended surface of the rails. The width of this surface is about thirty feet, exclusive of the drains and fences, and it is made a few inches higher in the middle than at the sides, in order to throw off water.

Ballasting and Laying the Permanent Way.—In order to obtain a firm dry foundation for the blocks or sleepers to which the permanent rails (so called to distinguish them from the slight temporary tracks laid down during the progress of the work), are fastened, a layer or stratum of broken stone, technically called *ballast*, is spread over the road for a thickness of a foot or more, varying according to the construction adopted and other circumstances. After the rails are laid down, similar materials are used to fill in the spaces between the blocks and sleepers. The broken stone should be so small that any piece would pass through a ring two inches and a half diameter. Other substances are occasionally used, especially for the upper part of the ballast, as gravel, river-sand, and burnt clay. In some situations, with good ballast, no surface drains are necessary; but drains consisting of a brick channel along the middle of the line, with small cross drains at intervals towards each side alternately, are often required.

The great variety of opinions as to the best form and manner of fixing the rails, renders it impossible, in the limited space which can here be devoted to the subject, to do more than select a few examples of the plans principally used. The most important question involved in these differences is that of the intermediate or continuous support of the rails. The most common method of fixing them is to fit them into iron chairs, which are spiked down to blocks of stone imbedded in the ballasting. This plan, although it appears by experiment to afford the firmest foundation, has several disadvantages. The points of support, being isolated from one another, are liable to be deranged by any subsidence in the ground, as well as by the constant vibration consequent upon the rapid passage of heavy trains, and the small but irresistibly powerful action of temperature in causing the expansion and contraction of the rails.

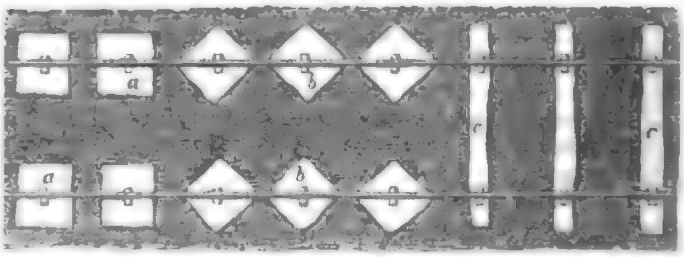
The former of these inconveniences is in some degree obviated by substituting cross sleepers of wood (like those described as being used in the early railways), for the stone blocks upon such parts of the line as are likely to sink. The two rails being, in this case, attached to the same sleeper, are not liable to be thrown out of gauge, or, in other words, to lose their parallelism, although the unequal sinking of the sleeper may cause one rail to become lower than the other. This application of wooden supports has been in most cases considered a temporary one, it being intended to lay stone blocks in their stead so soon as the ground became sufficiently firm; but as it appears from experience, both in this country and in America (where, owing to the abundance of timber and the high price of labour, wood has been much more extensively applied to railways than in this country), that the motion of carriages on those parts of a line supported by wood is smoother and quieter than on others, some engineers consider that the plan of construction upon cross-sleepers is preferable to that upon stone blocks.

In both of these modes of supporting the rail, it is sustained only at intervals of three or four feet, the intervening portion acting as a bridge, which, though very rigid, yields in a slight degree when carriages, and particularly the heavy locomotive engines, pass over it. The surface of the rail is thus converted into a series of minute undulations, the effect of which is to increase the resistance. It has been thought that these undulations were of little consequence, the gain in descending being a counterbalance to the retardation of the ascent; but Professor Barlow, in reporting on experiments made by him in 1835, for the London and Birmingham Railway Company, expresses an opinion that 'the advantage of the descent is, owing to the velocity and the shortness of the inclined plane, scarcely appreciable, and that the result of the deflection will be equivalent to the carriage being carried up a plane of half the whole length, the other half being horizontal.'

These and some other considerations have led to the adoption of a continuous support to the rail, which has been effected in several different ways, and with various success. Intermediate supports, being the most extensively employed, will be first noticed, and stone blocks, according to general opinion, claim the precedence among them.

The blocks used upon recently constructed railways are about two feet square and one thick, though much smaller ones were considered sufficient before the use of locomotive engines became general. They are roughly squared, but have so much of the surface as is to receive the chair accurately flattened. The chairs are usually fastened down by two or three iron spikes, to receive which holes are made in the stone, and filled with wooden plugs. The plugs should always be bored to receive the spike, and driven tight into the stone, though they are sometimes put in loose and split by driving the spike. Spikes or pins of well dried oak have been used instead of iron spikes for securing the chairs, and have been found very durable, but are not generally approved for lines worked at great speed. The introduction of a piece of felt between the chair and the block is useful in deadening concussion. As it is highly important that stone blocks should be well bedded, it is usual to cause them to form a solid foundation for themselves by repeatedly falling from a small elevation on to the spot where they are to rest, sand or very fine gravel being thrown under them between the times of falling. For this purpose a portable machine with an elastic wooden lever about twenty feet long is used, the block, to which the chair has been previously attached, being suspended from the short end, and a man stationed at the opposite end to raise and drop it. When the stone has made a firm bed, and has dropped in the right position, which is determined by levels and sights, it is detached from the lever and surrounded by ballasting, care being taken not to disturb it at all. It is evident that this careful bedding would be thrown away on an embankment, or any part where the newness of the ground would render subsidence probable. *Fig.* 13 is a ground-plan illustrating the use of stone blocks and wooden sleepers. *a*, *a*, represent blocks laid square with the road and *b*, *b* the same laid diagonally, a position now generally preferred, being convenient in repairing the road when a block sinks, because workmen can get at every side for the purpose of ramming ballast under it. Blocks of Scotch asphalte have been tried in lieu of stone, but with what success the writer is not aware. A few were laid down on the Southampton railway, and the chairs were spiked down without boring the block. Other similar substances have been suggested in order to diminish expense. It has also been proposed to use cast-iron bed-plates instead of blocks, by which several important advantages were anticipated, but no such plan appears to have been brought extensively into use. In the Dublin and Kingstown railway an attempt was made to ensure increased solidity by introducing *throughgoing* stone blocks, which were formed of granite, six feet long, two wide and one thick, and stretched across the track. These were placed fifteen feet apart, ordinary single blocks being used between them, at intervals of three feet. Owing perhaps to the difficulty of bedding such large blocks, the plan did not answer, the motion over them being harsh and unpleasant, and the vibration such as to break many of the long blocks. In some cases, particularly

Fig. 13.

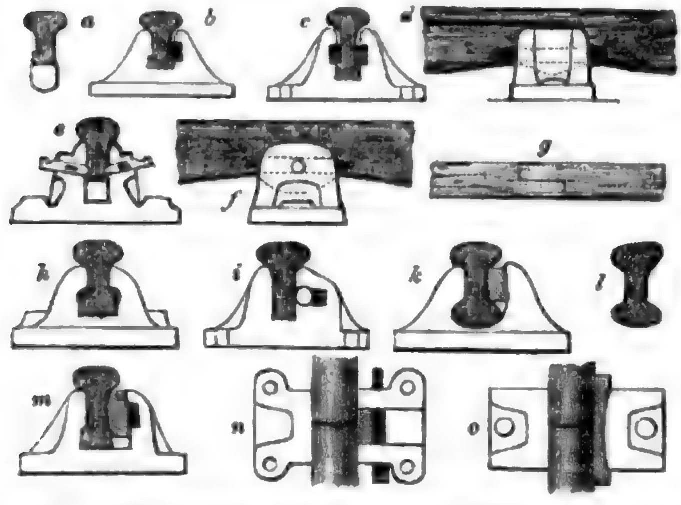


on sharp curves, iron tie-rods have been used to connect two opposite chairs, and counteract any tendency to separate which might arise in such situations from the isolation of the blocks.

The use of cross-sleepers, which are represented by *c c*, *Fig.* 13, needs little remark. They are mostly from seven to nine feet long, and consist sometimes of whole trunks of small size, and in other cases of half trunks laid with the flat or sawn side downwards. These and other timbers connected with a railway are now almost always Kyanized, and the durability imparted to them by that process is greatly in favour of their use as a permanent foundation. Several lines of railway have recently been laid entirely upon these sleepers.

The distance between the points of support varies from three to five feet. Bearings of greater length have been used, but on railways for locomotive engines have been found unsuitable, from their greater liability to get out of repair. Experience has not fully decided the comparative advantages of long bearings with heavy rails and blocks, and short ones with comparatively light supports; but a greater length than three feet nine inches or four feet has seldom proved successful. Owing to the deflection of the rails, Professor Barlow enforces the importance of placing the supports exactly opposite to each other, that both sides of a carriage may be equally affected.

Fig. 14.

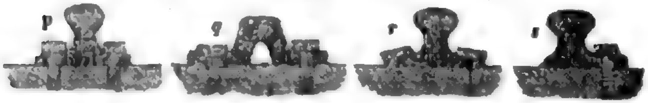


Rails and Chairs.—Allusion has been made in a previous page to the difference between fish-bellied rails, or those with the under side curved so as to give increased depth in the centre of the bridge between two chairs, and those of a parallel form, which are of the same depth and section throughout. The experiments of Barlow and others leave it questionable whether any additional strength is obtained from a given weight of iron by the fish-bellied shape, and therefore parallel rails are now almost universally adopted. They possess this, among other advantages, that the length of bearing on the different sides of a curved track may be so varied as to keep the chairs opposite to one another, which cannot be done with fish-bellied rails. *Fig.* 14 represents some of the principal varieties of form and contrivances for fixing the rails, which have been introduced on English railways: *a* is a section of the fish-bellied rail originally used on the Liverpool and Manchester railway, the shaded part being that which enters the chair, and the outline indicating the increased depth in the centre.—*b* is the same rail, as fixed in the chair, the black part representing the end of an iron wedge or key, which is driven in to secure it.—*c* and *d* are a section and side view of a plan invented by Mr. Losh, and used on the Newcastle and Carlisle railway. The rails are made with a curved projection on the under side, to fit into a suitable concavity in the chair, as indicated by the dotted lines in *d*. Two iron keys are used, driven in opposite directions. Any contraction of the rail tends to draw it laterally out of the chair; but in doing so, the curved base rises in its seat and tightens the keys, which press downwards as well as sideways.—*e* and *f* are similar views of a method contrived by Robert Stephenson, and used on part of the London and Birmingham railway. In this the seat of the rail is flat, but bears upon a segmental piece of iron laid loose in a concavity in the chair, so that an irregularity which may cause the chair to tilt in the direction of the rail, may not affect its position. The rails are secured by cylindrical pins, the points of which enter depressions in the side of the rail. Each pin has a slit through it, which, when in its proper position, tallies with holes through the cheeks of the chair. Iron keys driven into these holes prevent the pin from moving, and, acting as wedges against the end of the slit, force the pin tight against the rail. The chair represented is a joint chair, and *g* shows the form of the joint, which is called a half-lap. The narrow part of the rail is not divided, but turned aside at the joint, as shown by the dotted lines. Intermediate chairs are similar, but have a pin on one side only. This mode of fixing allows the rail to slide a little in the chair, on account of expansion and contraction, and the keys are not so liable to work loose as when in contact with the rail. These are all for fish-bellied, and the following for parallel rails.—*h* is a rail and chair invented by Mr. Daglish, and rewarded by the London and Birmingham Railway Company, as presenting the best sectional form of rail. The chair is proposed to be fixed to the block or sleeper by bolts passed through from the under side, and keyed above the chair. The rail is fastened by two semicircular iron keys driven in opposite directions. This arrangement, though ingenious, has the disadvantage that the rail could not be taken up without removing the chair.—*i* is a contrivance in which an iron ball, dropped into a socket in the chair, is forced against the rail by a key driven through a hole in one cheek of the chair. It is simple, and affords sufficient lateral movement for the effect of temperature on the rail. This form of rail is known as the T rail.—*k* and *o* are a section and ground-plan of a chair in which the rail is held by a wooden key. The keys are well seasoned, and when in use become by expansion almost immoveable; because, as shown in *o*, they are most compressed in the centre. So great indeed is the expansive force of the wood, that it occasionally breaks the chairs. This mode of construction is extensively used on the Grand Junction, Birmingham, Southampton, and other railways.—*m* and *n* show another application of a wooden fastening, adopted by Mr. Storey on the Great North of England railway. A block of wood is so placed in the chair as to be prevented from moving endways, and is held to the rail by an iron wedge driven through the cheek of the chair.—*l* is a rail contrived with the idea of fitting the wheel more accurately than those of the ordinary shape, but it is not much used. The rails here represented vary much in strength; *a* and *b* were made about thirty-five pounds to the yard, but have been found too light, and replaced by parallel rails of sixty pounds; *e* and *f* are fifty-pound rails, for three feet bearings. Rails similar to *k* are made from sixty to seventy-five pounds per yard or more, for bearings of three to five feet, and they are now seldom used of less weight than seventy pounds to the yard. The most common joints are square, as *n* and *o*, but half-lapped and scarfed or diagonal joints are also used. The concussion produced by a very slight irregularity at these points is so injurious, that probably increased care and expense in making them perfect would be well bestowed. Chairs are almost invariably made of cast-iron, as their complex form renders it difficult to manufacture them otherwise with sufficient economy; but as they are liable to breakage from their brittleness, it has been proposed to make them of malleable iron, and machinery for the purpose has been patented, but apparently not yet brought into operation.

Railways on Continuous Bearings.—The introduction of this kind of railway is perhaps mainly to be attributed to the extensive use of timber in such works in America. It has not only been used in lieu of stone, but also in a great measure in the place of iron. In many of the American and some of the Continental railroads, beams of timber laid continuously, and firmly connected together by cross pieces, are made to supply the strength usually given to iron rails; the application of iron being limited to a flat bar or plate two inches and a half wide, and from half an inch to an inch thick, nailed to the beams on their inner edges for the wheels to roll upon. Though differing in details, this construction of railway is very like the oldest form used in this country, the wooden tramway. Frequently these beams or wooden rails are supported upon cross-sleepers; but whether they are so or not, their breadth of surface causes them to receive considerable support from the ballast or road materials, along their whole length. Mr. I. K. Brunel, engineer of the Great Western railway, was one of the first British engineers who proposed a similar construction, which he did with the hope of obtaining a smoother and more elastic road, which should at once be more agreeable to ride upon, cheaper to maintain, and safer for travelling at high velocities than a railway constructed in the ordinary manner.

Although some of the supposed advantages are at present questionable, the superior smoothness of motion on such a road, when in good order, is pretty generally admitted, and an opinion seems to be gaining ground that, though longitudinal timber bearings do not produce so firm and unyielding a railway as stone blocks, and may therefore require rather more power in working, this disadvantage is more than counterbalanced by the diminished wear and tear, of which the comparative absence of noise is a tolerably accurate criterion. The Great Western railway can hardly be compared with any other, on account of its increased width, but the London and Croydon, which is entirely, and the Manchester and Bolton, Hull and Selby, and several other lines, which are partially laid in this manner, and which in other respects resemble those of the more common construction, may be fairly brought into comparison with them. The Greenwich railway is a remarkable instance of the superior comfort of timber bearings to those of stone, the rigidity of the latter being aggravated by the circumstance of being on a viaduct. On this line, as has been the case on that from Dublin to Kingstown, it has been deemed advisable to remove the blocks, and substitute a more elastic structure of wood. The longitudinal timbers on the Croydon railway vary from nine to fourteen inches wide, and four and a half to seven inches deep; and cross-sleepers are bolted under them at intervals of three feet. The rails are of the form shown at *p*, *Fig*. 15, and are screwed down at intervals of eighteen inches on each side, a layer of felt being interposed between them and the timbers. These rails weigh about forty-seven pounds to the yard.—*q*, *Fig*. 15, is the rail of the Great Western railway, which is fixed in a similar manner, but the screws on the inner side of the rail are round-headed and countersunk, while the others are ordinary square-headed bolts. The longitudinal timbers are of larger dimensions, and the cross-pieces or transoms are placed fifteen feet apart, and framed with them, their office being more to keep the track in gauge than to bear any considerable part of the weight.—*r* and *s* are forms of rail sometimes used on continuous bearings, *r* being fastened by clamps or pins driven in obliquely. Rails similar to *p* have been fixed in the same manner, but the use of screws, though expensive, is decidedly preferable.

Fig. 15.



Continuous bearings of stone have been tried, but found too harsh and rigid; and some ingenious combinations of wood or iron with natural or artificial stone or burnt clay, have been proposed, but not hitherto brought much into use.

Gauge, Width between Tracks, &c.—The gauge or width between the two rails forming a track is one of the points in railway practice which has excited much discussion. On the old railways it was of little consequence, provided a good horsepath could be ensured without interfering with the rails. Four feet was not an uncommon width, but many lines were less. Some of the colliery railways in Northumberland are four feet eight inches and a half, and from these the Stockton and Darlington, Liverpool and Manchester, and other lines, took their gauge. The advantage of uniformity has led most companies to follow this example, and for a time it was rendered imperative by parliament, but at present no standard is fixed by the legislature. The ordinary width being considered inconveniently limited, Brunel fixed upon seven feet as the gauge of the Great Western and its tributary lines. Much opposition has been made to this bold step, mainly on account of the inconvenience of not being able to connect with other lines, which is in some degree obviated by laying an inner rail for the use of narrow carriages on any portion of railway passed over by two companies whose lines are laid of different widths. The superiority of this enlarged gauge is apparent in the increased power and speed of the engines, and the stability and convenience of the carriages; but many who admit the inconvenience of the narrow gauge consider seven feet to be beyond the most advantageous width. Six feet two inches has been recommended by the Irish Railway Commissioners. Six feet is the width of some of the continental lines; the Dundee and Arbroath, and Arbroath and Forfar railways are five feet six inches; and the Eastern Counties, and London and Blackwall, about five feet. The ordinary standard in America is four feet eight inches and a half, having been copied from the Liverpool line. Several recent lines in this country have been made four feet nine inches, to allow rather more play to the flanges than the common width. One of the great recommendations of a wide gauge is the scope that it allows for improvements in machinery, a circumstance evidently of much importance when it is considered that the experience of ten years only has led to the enlargement of locomotive engines to so great a degree that their weight and cost are now nearly treble what they were when the Liverpool and Manchester railway was opened. The principal argument on the other side is that by increasing the width and bulk of carriages atmospheric resistance would become more formidable; but Dr. Lardner's experiments lead to the conclusion that this resistance is not affected by the mere *front* of a train so much as to render this objection very important.

The width between the two tracks is a matter of much less consequence, as it has little effect except in limiting the width of load that may be carried. On the Liverpool and Manchester line it is four feet eight inches and a half, which is convenient as allowing waggons to run on it during the construction of the road. The London and Birmingham railway and many others have a space of six feet, which allows loads of ten feet wide to be carried with safety. The same intermediate space on the Great Western railway, in consequence of the increased gauge, allows a maximum load of twelve feet. The space necessary outside the tracks is dependent on the width of load provided for, and seldom exceeds four feet, except on embankments, where a little more is sometimes allowed, so that in case of carriages getting off the track, there may be width for them to run on the ballasting until the inner wheels come in contact with the outer rail, which will in most cases prevent the train from overturning.

In laying the rails, allowance should be made for the effect of temperature, which will cause a difference of length in a fifteen-feet rail, exposed to a range of 76° Fahrenheit, of about $\frac{1}{11}$th of an inch. From want of attention to the temperature when the rails are laid, too much allowance is frequently made, which, especially with square joints, causes an unnecessary shock to the carriages. The insertion of a piece of wood between the ends of two rails is an ingenious mode of avoiding concussion from this cause, the wood expanding as the iron contracts.

In the description of *fig*. 8, it is stated that the wheel-tires are made slightly conical, in order that the flanges may come in contact with the rails as little as possible. In ordinary wheels three inches and a half wide, the inclination of the tire is about 1 in 7, the diameter at the outside being an inch less than close to the flange. The wheels are so fixed that when running straight the flanges are about an inch from the rails. When the rails are fixed vertically, the line of contact between them and the wheels is, in consequence of their conical shape, so narrow as to cause considerable wear. Most engineers therefore give a slight inclination inwards to the rails, that they may present a greater surface to the wheels, although the friction is increased by the rubbing of the conical tire. This inclination is stated by Lecount to be $\frac{3}{8}$ of an inch in eleven inches, or about 1 in 29, on the Birmingham railway; on the Great Western it is 1 in 20.

In running on a straight road, the conical tires keep the carriage in the true line of direction, because any deviation from it causes the wheels on one side to roll on an increased and those on the other on a reduced periphery, an irregularity which immediately checks itself. But on a curved track the centrifugal force overcomes that of gravity so far as to cause the flange on the outer side of the curve to approach the rail, and consequently the opposite wheels to roll on unequal peripheries, thereby avoiding part of the friction consequent on the wheels (which are fixed to the axle) being compelled to revolve with equal velocity, though the outer one has to pass over a greater length of rail than the other. To prevent unnecessary friction between the flange and the rail, it is usual to lay the outer rail on curves rather higher than the inner one, that the opposing forces may be so balanced as to cause average loads moving at the medium speed employed to pass round the curve without the flanges on either side coming in contact with the rails, and with the wheels rolling on diameters unequal in a degree corresponding with the radius of the curve. A pair of ordinary coned wheels, three feet diameter, might run in a circle of only 565 feet radius without the flanges touching; and as no curves of such small radius are admitted on a main line of railway, it is evident that, in theory, nothing more than an accurate adjustment of the outer rail with reference to the speed of transit is necessary to enable trains to pass along any ordinary railway without the flanges being called into action, unless by accidental circumstances. The following is selected from a much more extensive table by the Chevalier de Pambour, to show the proper elevation of the outer rail on a line of four feet eight inches and a half gauge, under given circumstances. The calculations are suited to the use of three-feet wheels, coned as above described :—

Radius of Curve.	Speed 20 Miles per Hour.	Speed 30 Miles per Hour.
1000 feet.	1·43 inch.	3·30 inches.
2000 „	·71 „	1·65 „
3000 „	·47 „	1·10 „
4000 „	·36 „	·83 „
5000 „	·28 „	·66 „

Stations, Passing-places, &c.—The convenient arrangement of the stations and depôts on a railway where an extensive and varied traffic is carried on, is a matter requiring much attention. As a general rule it is best to have them as nearly as possible on a level with the surrounding land, both to save expense in construction, and to avoid inconvenience in the transfer of goods from the railway to common road vehicles, and *vice versâ*. Wherever a higher or lower level is unavoidable, approaches of moderate inclination should be made for carriages. The station of the Brandling Junction railway at Gateshead is of novel and ingenious design. The line is on a viaduct, the arches of which are extended so as to support a level of considerable extent. A branch track at right angles with the main line is laid along the crown of each arch, by which waggons are conducted to platforms that form part of the railway level, but may be lowered, with waggons upon them, to that of the warehouses, which are underneath the arches, and communicate with the natural surface. Stations vary in character, from mere booking-offices, where passengers and parcels wait to be taken up by passing trains, to great establishments covering several acres of ground, with separate offices for passengers, parcels, and heavy goods; facilities for transferring carriages, horses, and cattle to or from the railway; extensive sheds for trains to stand under, repairing-shops for engines and carriages, and many other necessary erections. The stations of the London and Birmingham railway at Euston Square, Camden Town, and Birmingham, extend collectively over a space of about fifty acres; besides which the company have establishments of great magnitude at Wolverton, Rugby, and Hampton, and several of smaller dimensions. The original estimate for the stations was 70,000*l.*, but in consequence of the necessity of arrangements for a greater traffic than was anticipated, about ten times that sum has been expended upon them.

Contrivances for conducting engines and carriages from one track to another are required in a variety of situations. They generally consist of switches and turntables, so modified as to suit particular cases. Switches are moveable rails placed at the point where two tracks fall into one, and capable of adjustment so as to guide vehicles from the single track into either of the two, or from either of the two into the single track. In the old railways this was effected by short *tongues* of iron, moved by hand; but it is necessary where locomotives are used to have the transition from one track into the other as gradual and free from concussion as possible, and therefore the moveable bars are made of considerable length, seldom less than eight or ten feet, and, on the Great Western railway, fifteen feet. *Fig.* 16 represents a switch formed on the model of the old contrivance of moveable tongues. The black lines are the fixed rails, which at A form but one, and at B two tracks. The double line from *c* to *d* indicates the switch, which is pivoted at *d*, and tapered to a point at the other end. From its under edge proceeds the bar *e*, which passes under the rail to a lever or eccentric placed in a convenient situation for being moved by an attendant. In the position represented by the engraving, the switch would conduct a train along the upper track from A to B, because free passage is allowed for the flange between the switch and the upper rail, while the inside of the flange pressing against the switch *c d* prevents the flange on the opposite side of the track from quitting the straight course. If however, by turning the lever or eccentric connected with *e*, the switch is moved in the direction indicated by the arrow, the case will be reversed: the switch being brought into contact with the rail at *c*, the flange will be compelled to move along its inner side, and consequently that on the opposite side of the track will pass along the opening by the side of the lower rail. *f f* are fixed bars called guard-rails, which prevent the switch moving too far, and protect the narrow ends of the switch and rail from injury. Switches on this principle sometimes connect three tracks with one by *two* moveable pieces, of which an example is in use at the Great Western railway station at Paddington. A great recommendation of this kind of switch is, that unless the moveable rails are *fixed* in a wrong direction, a train can never get off the track, as the momentum enables the flange to open the switch and pass through. In some situations a spring or weight is applied with great advantage, to hold the switch in the position most commonly required, and return it to that position immediately after being acted upon. The double rail, represented in *fig.* 17, is a contrivance much used as a switch, and affords a very smooth transition from one track to another. In this the two tracks terminate in two double rails, *c d* and *c' d'*, pivoted at *d d'*, and shifted as occasion requires in a similar manner to the former, the rails being connected by cross-pieces, so that the whole are moved simultaneously. In the present position of the apparatus the lower track is that connected with the single line; but by moving the switches in the direction of the arrow, the lower track would be disconnected, and the upper one made to join the track at A. These switches, like those previously described, are occasionally used treble; and they are sometimes made to unite two tracks in each direction. Several other varieties are used, which it is needless here to particularise.

Fig. 16.

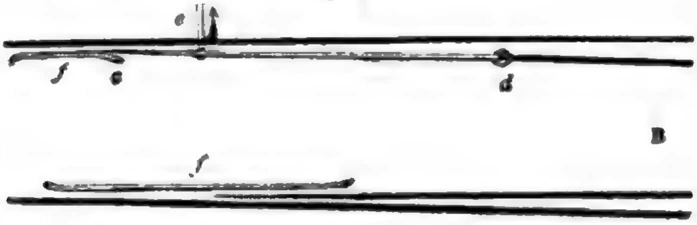


Fig. 17.

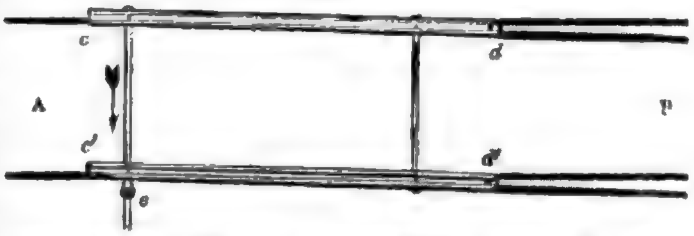
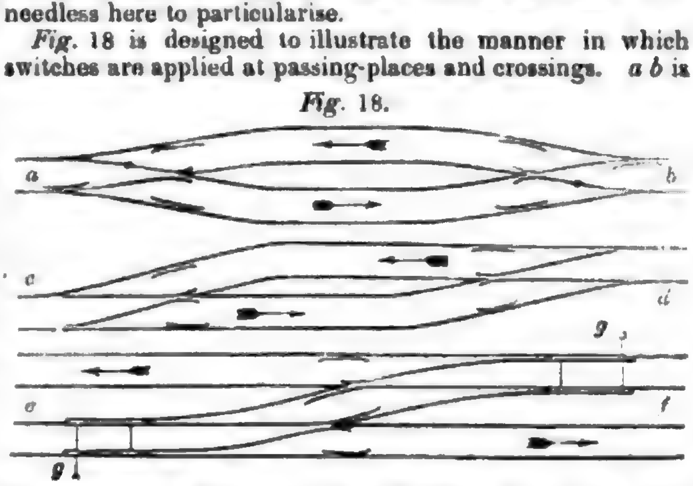


Fig. 18 is designed to illustrate the manner in which switches are applied at passing-places and crossings. *a b* is a passing-place for a single line of railway where the traffic is about equal in each direction. It should be observed that the angles in this figure are, to save room, made more abrupt than they should be on a public railway, where angles of more than 2° or 2½° are considered objectionable. In this arrangement every train from *a* to *b* takes the lower track, and those from *b* to *a* the upper one. Switches of

Fig. 18.

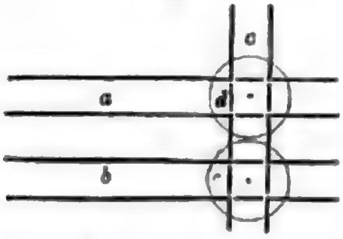


the kind first described are used at the points *a* and *b*, and, as they have always to be passed through in the same order, they are made self-acting, that at *a* being held by springs in the position for guiding carriages on to the lower track, and being opened by the flanges of the engine-wheels for the passage of the trains in the contrary direction, while that at *b* in like manner conducts trains passing towards *a* into the upper track. This kind of passing-place has been successfully used on the Newcastle and Carlisle and other railways. *c d* represents another arrangement for the same purpose, which may have the same kind of switch, but is generally used without any, the impetus of the train always keeping it to the straight track, while, if suitable openings be made for the flanges, it cannot escape from the rails in running from the double into the single part. *e f* shows the arrangement of a crossing on a railway with two tracks, switches being placed at both junctions, which, being only for occasional use, are worked by hand, men being stationed at *g g* for the purpose. Owing to the accidents which occur when switches in such situations, or at the junction of two main lines of railway, are neglected or misplaced, plans have been proposed, but not brought into use, for placing them under the command of the engineer of an approaching train, who cannot be absent from his post. It is usual to affix a signal apparatus to them, which, by displaying a coloured disk of wood or stretched canvass to the engine-driver, informs him of the position of the switches as he approaches them, and affords an opportunity of checking his speed if they are wrong.

At the points where two rails cross, grooves are formed to allow the flanges to pass; and, to check any tendency in the wheels to escape from the rails, guard-rails, as indicated in *Fig.* 18, are fixed within the track, to guide the inside of the flanges.

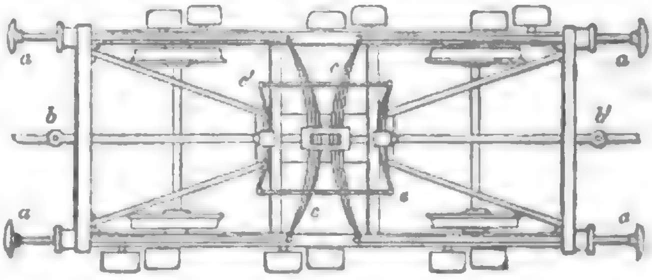
Turn-tables are useful in transferring single carriages from one track to another, which they do in much less space than any arrangement of crossings and switches. They consist of circular platforms of iron and wood, fixed on a level with the tracks, and mounted on friction-wheels, so as to turn on their centres with great facility. *Fig.* 19 represents two turn-tables so laid as to communicate with one another. Four rails are laid across each, and made to tally precisely with those of the track. If it be desired to transfer a carriage from the track *a* to that marked *b*, it is rolled on the turn-table at *d*, and then, the catches which held the turn-table steady being released, the platform, with the carriage upon it, is turned a quarter round. The carriage is then rolled on the turn-table *e*, and being again turned a quarter of a circle, is in a right position for running on the track *b*. Carriages may in like manner be transferred to a cross-track, as at *c*. Locomotive-engine houses are frequently made octagonal, with eight radiating tracks, the engines being moved to or from any of them by means of a large turn-table in the centre. That at Camden Town has sixteen tracks connected in this manner.

Fig. 19.



Carriages.—Railway carriages for the conveyance of passengers are usually very capacious, the bodies being made to project over the wheels, which on ordinary lines seldom exceed three feet diameter. This arrangement is not productive of danger, since the evenness of a railway, the comparatively low build of the carriages, and the great weight of the iron wheels, axles, and framing under the body, prevent the liability of overturning. On account of the rapid speed at which they travel, and the violent shocks to which they are occasionally subject, great strength of construction is necessary; and the circumstance of several vehicles being linked together in one train renders the use of an elastic apparatus for starting and stopping them essential, both for the safety and comfort of passengers, and the protection of the vehicles themselves. Elasticity in the traction is also necessary, in order that the engine may not have to overcome the inertia of the whole train at the same instant, which would require much more power than suffices, when they are started, to keep the whole in motion. Various contrivances, more or less complete and effective, are in use for this purpose, but *fig.* 20 may serve to give a correct idea of the principles on which they all act. It represents the ground-plan of a passenger-carriage, the body being removed. The frame, which is outside the wheels, is supported on lapped springs, which, by brass bushes or bearings, rest on the ends of the axles, they being extended beyond the wheels, and accurately turned, for that purpose. *a a a a* are buffers, or discs of wood or metal, sometimes covered with cushions, fixed on the ends of long rods which pass through the frame and along the sides to the ends of the long springs *c c*, which are capable of moving towards each other when pushed by the rods, but are prevented by stops on the frame from moving in the opposite direction. The centre being allowed to slide backwards and forwards, both springs are brought into action by an impulse given to either end. All the buffers in a train being placed at the same height and width, they come into contact when the carriages run towards one another in stopping suddenly, and the jerk is by them communicated to the springs *c c*, whose elasticity allows so much motion as to prevent any injurious shock to the carriage. The traction apparatus, or that by which the carriages are drawn forward, consists of rods passing through the frame at *b b′*, and connected in a manner which it is unnecessary to describe, with the small springs *e′ e*, which also act together, the centre of *e* pressing against the cross-bar of the carriage-frame as an abutment, when the pull is from *b*, and that of *e′*, in the like manner, when the traction is in the direction of *b′*. The connection between the different carriages often consists of a jointed bar of iron, which is disconnected, when necessary, by the removal of a pin. Chains are sometimes used, and occasionally united by a peculiar kind of screw, which draws the carriages so close that their buffers come in contact. In some carriages the same springs serve both for traction and buffing, and spiral or helical springs are not unfrequently applied to the purpose. Axle-guides, fixed to the framing, are used to keep the axles square; but a more elastic construction of carriage, in which the axles have sufficient play to enable them to adapt themselves to a curved track, and the springs for bearing the weight, drawing, and buffing, are made of an unusually light character, is being introduced by Mr. Adams, with great promise of success. Many engineers appear to be of opinion that the construction of carriages, as well as of the railroad itself, has hitherto been too rigid, and Mr. Adams conceives that the adoption of his bow-springs, and other improvements, will at once increase the comfort and safety of railway conveyance, and diminish the wear and tear, which, with the present heavy and comparatively inelastic carriages, is very great. The ordinary first-class carriages convey eighteen passengers, having a treble body, with six seats in each compartment; and the second-class, of similar make, carry twenty-four passengers. Those on the Great Western railway, which are mostly on six wheels, are much larger, some of the second class vehicles seating seventy-two persons. The wide gauge allows the use of bodies so large that some are fitted up as elegant saloons. A splendid carriage, about twenty-eight feet long and nine wide, has been recently prepared for the use of Her Majesty and suite, when travelling on this line. Open carriages, in which the passengers stand, are frequently used for short stages. Waggons for goods and cattle, trucks for the conveyance of stage-coaches and private carriages, and horse-boxes, are all mounted on springs, but their buffing-apparatus is often very simple and inelastic. The weight of the ordinary passenger-coaches, when empty, is mostly from three to five tons.

Fig. 20.



Locomotive Engines.—In the rapidly extended application of locomotive steam-engines since their successful adoption on the Liverpool and Manchester railway, improvements have followed closely upon one another, but they have been chiefly of a minor character, when compared with that of tubing the boiler, which formed the distinguishing feature of the Rocket engine. Stephenson built several engines shortly after the competition in which the Rocket had proved victorious, retaining this arrangement, but having the machinery disposed in a different manner. The cylinders were placed in a box beneath the chimney, and the piston-rods moved horizontally under the boiler, working two cranks formed on the axle of the hind-wheels, which were then made the largest. The boiler and machinery were attached to a massive frame, the sides of which were outside the wheels, and rested, by means of springs and brass bearings, on the ends of the axles. Bearings outside the wheels have this decided advantage over inner ones,—which are nevertheless preferred by some engineers,—that the ends of the axles may be turned away to so small a diameter as materially to diminish the friction, without the risk of breakage which would attend the reduction of the axle within the wheels. The superior economy of large engines becoming evident from experience, it was deemed advisable to add a third pair of wheels, which were made small, like the fore-wheels, and placed under the fire-box end of the machine. The flanges on the two pair of small wheels being sufficient to guide the machine, Stephenson removed them from the central or driving pair, which thus became mere rolling or propelling wheels, and were relieved from the lateral strains arising from the flange coming in contact with the rail at curves and switches, such strains having been found injurious to the cranked axle and the machinery connected with it. Some engine-builders still retain all the flanges, from an idea of greater security. The following figures may give some idea of the locomotive engine in this improved state, in which form it is now in use upon most of the railways in this country, and several on the Continent and in America. *Fig.* 21 is an elevation, and *fig.* 22 a longitudinal section, in which many minute details are omitted, for the sake of distinctness.

Fig. 21.

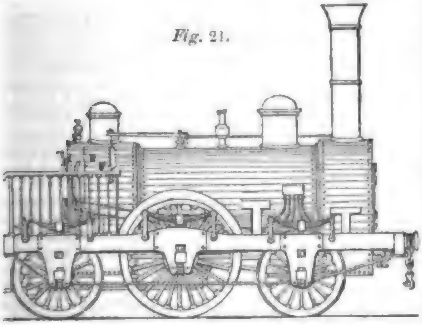
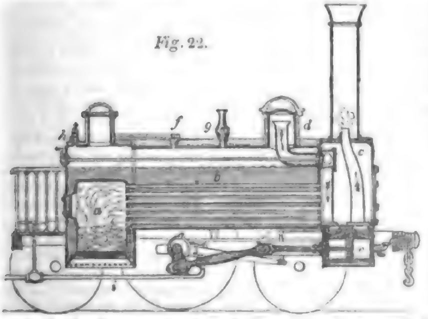


Fig. 22.



a is the fire-box, usually formed of copper, and surrounded by an outer casing of iron, leaving a space of three or four inches all round, which is filled with water and forms part of the boiler. The door by which the fire is supplied with coke is made of two iron plates, with a space of a few inches between them, to prevent the radiation of heat. Coke is carried in the tender, a supplementary vehicle attached to the back of the engine. The fire-box is usually open at the bottom, to allow the free access of air, so that cinders fall through the bars upon the road, a circumstance sometimes productive of accident. As there is very little water above the flat top of the fire-box *a*, a fusible plug is inserted in it, to act as a safety-valve in the event of the water becoming too low, and leaving it dry. The tubes through the boiler *b* for the passage of flame and heated air are now always made of brass, which is found much more durable than copper. They vary in number in different engines from about ninety to a hundred and fifty or upwards, being frequently less than an inch and a half in diameter. The power of generating steam, which is the measure of efficiency in a locomotive engine, depends much upon judicious tubing, it being desirable to deprive the heated air of its caloric as completely as possible before leaving the boiler. The chief practical limit to the reduction of the tubes, and consequent increase of their number and extent of surface, is their liability to become choked with cinders and ashes carried into them by the draft. Boilers are frequently tubed to such an extent that from four to six hundred square feet of heated metal is exposed to the water, in addition to the area of the fire-box itself. An important feature in a locomotive boiler is its security from bursting, because, as the tubes are much weaker than the external casing of the boiler, they are almost certain to give way first, and the bursting of one or two tubes is rarely productive of more serious consequence than extinguishing the fire, and thereby causing a gradual stoppage of the machine.

Owing to the limited size of the boiler, the steam which collects in the upper part is mixed with spray from the water. A steam-chamber *d* is therefore added, in which it becomes free from the spray, and then enters the steam-pipe that passes through the smoke-box *c* to the cylinders or engines at *e*. A throttle-valve in this pipe is placed under the command of the engineer by a rod passing through the boiler and terminating in a handle connected with a graduated scale at the back of the engine. By this the supply of steam to the cylinders is regulated or cut off when necessary. The action of the pistons and connecting-rods needs no explanation here. Eccentrics for working the slide-valves, which admit steam alternately to each side of the piston, are fixed on the main crank-axle, and in some engines two pair are used, one for working in common, and the other when the engine runs backwards. The steam cylinders are usually twelve or thirteen inches diameter, and eighteen inches stroke; and the driving-wheels of the engine from five to seven feet diameter, the small wheels being three or four feet. Driving-wheels of eight and ten feet diameter have been tried on the Great Western railway; but the most common diameter on that line is seven, and on railways of the ordinary gauge five or six feet.

The pipe shown in the section passing from the cylinders to the chimney is the blast-pipe for the exit of waste steam, its upper end being tapered to give greater effect to the jet. At the top of the chimney a wire gauze cap is frequently fixed to arrest sparks and small cinders which are often thrown up by the strong draft, and have been the occasion of many destructive fires; but a more effectual remedy has been recently introduced, consisting of a grating at the bottom of the chimney, which stops the cinders before they are affected by the steam-jet. *f* and *g* are safety-valves held down by springs, the former only being under the control of the engine-driver. *h* is a steam-whistle, which by its shrill sound warns persons working on the line of the approach of an engine. *i* is one of two feed-pipes, communicating between the water-tank in the tender and small forcing-pumps under the boiler, which are worked by the engine, and ensure an equable supply of water in the boiler. Valves for regulating this supply, handles for reversing the motion of the machine, steam and water gauges, and numerous other conveniences are added, being placed within reach of the engine-driver, when on the platform at the back of the fire-box. In order to economise the heat by checking its radiation, the boiler is coated with wood, and sometimes flannel is placed between them. The steam-dome and similar parts are double, the space between the inner and outer casing answering the same purpose. The tender, and sometimes the engine itself, is supplied with powerful brakes, to arrest the motion of the wheels when necessary. Some of the carriages also have them, handles for working them being placed within reach of the guards.

On some lines of railway, as the London and Birmingham, engines on only four wheels, with circular fire-boxes, and the axle-bearings within the wheels, are still used; and some engines have been recently introduced on the Hull and Selby railway, in which an attempt is made to combine the advantages of inside and outside bearings, by throwing a great part of the weight on bearings within the central or driving-wheels, while steadiness of motion is insured by external bearings to the fore and hind wheels. Where increased adhesion is desirable, as for luggage engines, or such as are intended to ascend steep gradients, four, or even six wheels are coupled together by external cranks and connecting rods, such wheels being of course of equal diameter.

Many of the American locomotives are arranged in a different manner from that described, with a view to greater facility in passing along curves; the forepart of the machine being supported on a four-wheeled truck, which is capable of adjusting itself to a curved track. It is a singular fact that while British engines have been sent to America for working several lines, an American manufacturer has competed successfully with those of England in building locomotives for the Birmingham and Gloucester railway.

Harrison's patent locomotive, though not extensively introduced, deserves mention for its bold departure from the established model, the boiler and engines being mounted on separate carriages. These have been built with ten-feet driving-wheels, and also with five-feet wheels, the velocity of which is made treble that of the cranked axle by the intervention of a toothed wheel and pinion. Hitherto no very striking advantage has been realised by these arrangements.

Stationary Engines.—The heavy expenses attending the use of locomotive engines, from the rapid action of the working parts, the addition of their own weight to the load to be conveyed, and the injury they cause to the rails, lead some persons to conceive that stationary engine-power might be applied more advantageously. The working of stationary engines themselves is unquestionably the most economical, but the friction of ropes to convey their power to the carriages forms a serious drawback. Hitherto they have been little used except for steep inclined planes, which, as at Camden Town and Liverpool, are worked by an endless rope, conducted along both tracks by grooved pulleys or sheaves, to keep it off the ground, and passing at each end round a wheel fixed below the level of the road, the upper one of which is turned by the engine. A contrivance is added to keep the rope always at the requisite degree of tension. It has been proposed, in hilly countries, to use natural or artificial falls of water instead of steam-engines for such an apparatus. Another mode of employing the power of stationary engines is by means of what are called *tail-ropes*, an ingenious application of which has been recently adopted on the London and Blackwall railway, and seems well adapted for working a railway in which numerous stations are required within a short distance. Very powerful engines are erected at London and at Blackwall, each of them turning a grooved wheel, to which a rope of nearly six miles and a half (double the length of the railway) is attached. A train starting from London is arranged with the Blackwall carriages foremost, and then those for the intermediate stations in such order that the vehicle required to stop first shall be last in the train. At a given signal, the Blackwall engine commences winding up the rope, by which the train is drawn forward at a speed of twenty to thirty miles per hour. On approaching the first station, the carriage intended to stop there is detached from the train by the guard, and stopped by means of a brake, the rest of the train proceeding without interruption; and, in like manner, vehicles are left behind at all the stations. In addition to drawing the train, the Blackwall engine unwinds the rope from the barrel of that at London, which is thereby prepared for moving the train back again when reloaded. In returning each carriage is attached to the rope, and the whole are drawn simultaneously, though on different parts of the line, towards the London terminus, where they arrive at different times, but in the proper order for another journey. This description applies to one track only, but the line has two, each having a similar apparatus, and being worked alternately in both directions. The necessary signals are made by an electric telegraph, invented by Messrs. Wheatstone and Cooke. This important appendage to a railway is described in the article TELEGRAPH. However desirable rope-traction may be under the peculiar circumstances of the Blackwall line, it is attended with great expense from the wear of the ropes, which are very costly; and, notwithstanding every precaution, the noise of the numerous sheaves that support the rope is annoying. To obviate these objections is a principal object of the invention called the 'atmospheric railway,' which, within a few months past, has been successfully tried on a length of about half a mile on the West London (formerly called the Thames Junction) railway, at Wormholt Scrubbs. The apparatus consists of an iron pipe nine or ten inches diameter, extending along the middle of the track; in which a piston is caused to move with a velocity of from twenty to thirty miles an hour, by exhausting the tube in front of it, and admitting the air to press on the opposite side. A connection is formed between this piston and the carriages by a rod passing through an opening along the top of the tube, which is kept air-tight by a well-contrived valve that opens to allow the passage of the rod. The necessary vacuum is produced by air-pumps, worked by a stationary steam-engine. Though several similar propositions have been previously made, that of Mr. Pinkus being, except in the kind of continuous valve used, almost identical with the present, the credit of proving the practicability of the principle on a large scale is due to Messrs. Clegg and Samuda, who anticipate advantages from it which it would be premature here to enumerate. One, which applies alike to all plans of working with stationary engines, is the improbability of collision, as but one train can be moved upon the same engine length of railway at once; as a set-off to which there is the inconvenience that a casualty to one part of the apparatus deranges the working of the whole line.

When railways were first proposed for the purposes of general traffic, it appears to have been considered that competition in the supply of locomotive power and travelling accommodation might be advantageously encouraged: and consequently clauses were introduced in railway Acts to enable any person to run engines and carriages on the payment of certain specified tolls, and subject to such regulations as might be made by the company to whom the road belongs. Such powers have been very rarely put in practice, and it is obvious that they may be virtually nullified by the refusal, on the part of the company, to supply some necessary facilities. But if such were not the case, it is the deliberate opinion of the late Parliamentary Committee, founded on careful inquiry, 'that it is indispensable, both for the safety and convenience of passengers and the public, to prohibit, as far as locomotive power is concerned, the rivalry of competing parties on the same line of railway;' also 'that railway companies using locomotive power possess a practical monopoly for the conveyance of passengers on the several lines of railway; and that under existing circumstances this monopoly is inseparable, from the nature of their establishments, and from the conduct of their business, with due regard to the safety and convenience of the public.' As far as regards the supply of locomotive power and the general control of the trains, a similar arrangement is essential in conducting the traffic in merchandise; but much difference of opinion exists as to the best system of managing this department of business. Some companies merely supply locomotive power and carriages, leaving the details of the business in the hands of the carriers; some have a complete monopoly of merchandise traffic, the companies acting as carriers themselves; and others combine the two systems, the companies being carriers, but conveying goods for private carriers also. On these and various other points much interesting and valuable information will be found in the 'Reports of the Select Committee on Railway Communication,' in the sessions of 1839 and 1840, with the voluminous evidence and appendices. These enter upon many subjects that have been necessarily omitted here for want of space, one of which is the passenger-tax, which is levied under the Act 2 & 3 Will. IV., c. 120. and amounts to one-eighth of a penny per mile for every passenger carried. The Committee, in order to encourage railway companies to extend the benefit of their undertakings by low fares, recommended a graduated tax, to press very lightly on the lowest fares, and form an increasing per centage as they rise to the highest rate allowed. At the recommendation of this Committee, an Act has been passed for the regulation of railways (3 & 4 Vict., c. 97), which requires that a month's notice shall be given to the Board of Trade before the opening of any railway, or portion of railway, for the conveyance of passengers or goods; and empowers the Board to call for returns from the railway companies of the amount of the various descriptions of traffic, of all accidents attended with personal injury, and of all tolls, rates, and charges levied on passengers, cattle, and goods. The Board of Trade are also allowed to appoint inspectors, who may enter upon and examine the works, stations, engines, carriages, &c. of any railway company; such inspectors not to be persons who have held any office of trust or profit under a railway company within one year of their appointment. The Act further provides for the prosecution at the public expense of companies who may not have complied with its provisions or those of any other Act under which they are regulated; and for the punishment, by fine or imprisonment, of the servants of railway companies, or any other persons wilfully, maliciously, or negligently endangering the safety of the works or carriages, or of the passengers conveyed, and of persons trespassing upon the line or stations. The power of arbitration in certain cases of dispute, and of confirming or disallowing any bye-laws of the companies, is also vested by this Act in the Board of Trade, whose new functions bid fair to be the means of collecting much important and interesting information on various points of railway economy. The conveyance of mails on railways is regulated by the Act 1 & 2 Vict., c. 98.

(Wood's *Practical Treatise on Railroads*, &c., 3rd edition, 1838; and Lecount's *Treatise on Railways*, reprinted from the new edition of the 'Encyclopædia Britannica,' are among the most generally useful works on the subject of this article.)

British Railways.

The railways laid down before the present century were mostly of very limited extent; and being for the use of private establishments, were usually formed without the authority of an act of parliament. The earliest railway Act that has come under the notice of the writer is a private act of the 31st Geo. II., 1758, respecting a waggon-way for the conveyance of coal to Leeds, an undertaking interesting from its having been worked for some years by Blenkinsop's patent locomotive engines, with toothed driving-wheels working into a rack-rail. Several of the early canal Acts contained clauses empowering the companies to lay railway branches or to make railways instead of canals in certain situations where difficult works or extensive lockage would otherwise occur. The first railway established in this country as a distinct undertaking, and intended for public use, was the Surrey iron railway, the company for which was incorporated in 1801.* In the following twenty years only twenty new railway companies were incorporated; but the Stockton and Darlington railway, the Act for which passed, after much opposition, in 1821, gave an impulse to this kind of enterprise. It was opened in 1825, and accomplished far more than any previous line had done in adapting railway communication to the purposes of ordinary commercial intercourse. The annexed table shows the number of undertakings in the ten years immediately succeeding this event to have been fifty-four, of which, though many were of minor importance, several were passenger railways, and adopted locomotive engines as the moving power. The years 1836 and 1837 added forty-four more to the list, most of which were extensive undertakings. Alterations in the mode of obtaining railway Acts, combined with other circumstances, have imposed such a check on new projects, that only five have been sanctioned since that time, although the number of Acts for alterations and extensions, and for raising additional capital, has been considerable. The following table shows the number of railway Acts passed from 1801 to 1840, distinguishing those for new undertakings from such as give amended or enlarged powers to companies previously incorporated. Acts empowering canal companies to lay railways are not included.

Year.	New Lines.	Amendments.	Total.	Year.	New Lines.	Amendments.	Total.
1801	1	0	1	1822	0	1	1
1802	2	0	2	1823	0	1	1
1803	1	0	1	1824	2	1	3
1804	1	0	1	1825	8	1	9
1805	0	1	1	1826	10	1	11
1806	0	2	2	1827	1	5	6
1807	0	0	0	1828	5	5	10
1808	1	0	1	1829	5	4	9
1809	3	0	3	1830	5	3	8
1810	1	1	2	1831	5	4	9
1811	3	1	4	1832	5	4	9
1812	2	1	3	1833	5	6	11
1813	0	0	0	1834	5	9	14
1814	1	1	2	1835	8	11	19
1815	0	1	1	1836	29	6	35
1816	1	0	1	1837	15	27	42
1817	1	0	1	1838	2	17	19
1818	1	0	1	1839	3	24	27
1819	1	0	1	1840	0	24	24
1820	0	1	1				
1821	2	1	3		135	164	299

The total length of the lines sanctioned by acts of parliament is near 3000 miles, of which a few have been either partially or entirely abandoned. Omitting lines of little public interest, those intended for the conveyance of passengers and merchandise by steam-power amount to upwards of 2000 miles, of which more than 1100 miles are now in operation. The total amount of capital is 68,825,293*l*., of which near one-third is allowed to be raised by loan. Deducting the capital of lines not proceeded with, or of only private interest, and making ample allowance for sums authorised, but not required, it appears that about 60,000,000*l*. has been invested in this country alone, in the introduction of a system which, but a few years since, had to struggle into existence through opposition arising perhaps as much from incredulity and ignorance as from self-interest.

The prospects of success as commercial undertakings are very different, but railways have invariably been found greatly to increase the amount of travelling, and the receipts of those lines which have been longest in operation are truly surprising. On the 260 miles of railroad connecting London, Birmingham, Liverpool, Manchester, and Preston, with the branch to Aylesbury, the gross receipts for the year ending June 30th, 1840, were 1,467,562*l*. 19*s*. 8*d*., or upwards of 5644*l*. per mile; and this astonishing amount of income seems likely to be materially exceeded in future.

The following tables contain every railway for which an act of parliament has been obtained since 1801, with the exception of eleven: the Anglesey, 1812; Berwick and Kelso, 1811; Dulais, 1826; Exeter and Crediton, 1832; Limerick and Waterford, 1826; Manchester and Oldham, 1826; Peak Forest, 1816; Rutherglen, 1831; Sheffield and Manchester, 1831; Usk, 1814; and West Lothian, 1825; none of which have been executed, or are likely to be so. There are some private undertakings, as the Stanhope and Tyne, Stockton and Hartlepool, &c., which are of more general interest than many contained in the table; but as it would be difficult to draw a line of separation, it has been considered better to exclude all for which parliamentary powers have not been procured; and, with the exceptions just named, to embrace all which have been so sanctioned. The number prefixed to each line is merely for convenience of reference. The date of opening, when not otherwise stated, is that of opening throughout, and where the precise period could not be ascertained, a dash is inserted to indicate that the line is completed. The length given is generally exclusive of branches. In the column of 'Original capital' the first line shows the amount of that in joint-stock, which usually indicates the estimated expense of the works; the second, the further sum allowed by loan or new shares; and the third, the total sum authorised by the act of incorporation. In the second column of capital the same arrangement is not maintained, because it is frequently optional with companies to raise additional sums by loan or new shares. The sum in this column sometimes exceeds the outlay of the company, owing in some cases to the issue of shares at a sum considerably under their nominal value; and in others, to the company having taken powers for raising money to a greater extent than has proved necessary. Where the second column of capital is blank, it intimates that no powers for raising additional money have been obtained.

* Tredgold, in his 'Practical Treatise on Railroads,' &c., 1825, mentions a railway Act of the year 1794, for making a tramway from Merthyr Tydvil to Cardiff. Such a railway, or part of it, was formed, and the experimental locomotives of Trevithick were tried upon it in 1805; but the Act, if such were really passed, has eluded the search of the compiler of the following tables, although his examination has extended back as far as 1771. The length of the line, which is chiefly used for iron-works near Merthyr, is variously stated from about nine miles to twenty-six and three-quarters. The difficulties arising from conflicting statements, as well as, in some cases, from the paucity of circumstantial information, will, it is hoped, form some excuse for omissions and minor errors in the tables.

RAILWAYS OF ENGLAND AND WALES.

NAME.	COURSE.	Date of Act.	Date of Opening.	Length in Miles.	Branches, &c.	Power used.	Original Capital.	Present Capital.	REMARKS.
1. Avon and Gloucestershire.	No. 13 at Mangotsfield, to the Avon, near Bitton, Gloucestershire.	1828	1832	4¼	To collieries. Joins No. 13.	Horses	£21,000 10,000 31,000	£46,000	To connect quarries and collieries with the Avon. Gauge, 4 ft. 8½ in.
2. Aylesbury . .	No. 53 at Cheddington, 35 m. from London, to Aylesbury, Bucks.	1836	1839	7	Joins No. 53.	Locom. Engines.	50,000 16,000 66,000	. .	For passengers and general traffic. Leased to No. 53 company. Gauge, 4 ft. 8½ in.
3. Birmingham & Derby Junction.	Nos. 4, 33, and 53, at Birmingham, to Nos. 65 and 71 at Derby.	1836	Part 1839	Total 48¼	To No. 53, at Hampton. See 4, 33, 53, 65, & 71	Locom. Engines 2 incl. pl.	630,000 200,000 830,000	1,056,666	For passengers and general traffic. Gauge, 4 ft. 8½ in.
4. Birmingham & Gloucester.	Nos. 3 and 53 at Birmingham, to No. 17 at Cheltenham, and by it to Gloucester.	1836	Part 1840	45 Brs. 8	To Tewkesbury, &c. Joins 3, 17, and 53.	Locom. Engines.	950,000 316,666 1,266,666	. .	For passengers and general traffic. The company to use 6¼ m. of No. 17. Gauge, 4 ft. 8½ in.
5. Bishop's Auckland and Weardale.	Black Boy Branch of No. 87, to Witton Park Colliery, all in Durham.	1837	In progress.	. .	To Crook. Joins No. 87.	Locom. Engines allowed.	72,000 24,000 96,000	. .	For the conveyance of coal, passengers, &c.
6. Blaydon, Gateshead, and Hebburn.	No. 68 at Blaydon, by Gateshead, to Hebburn Quay, on the Tyne.	1834	. .	. .	Several allowed. See Nos. 34 and 68.	. .	60,000 20,000 80,000	. .	Part of the line was bought by No. 68 company.
7. Bodmin & Wadebridge.	From near Bodmin to Wadebridge, parish of St. Breoke, Cornwall.	1832	1834	12	To Bodmin, &c.	Locom. Engines.	22,500 8,000 30,500	35,500	For minerals, passengers, &c. A single track. 4 ft. 8½ in. gauge. Speed abt. 8 m. p. h.
8. Bolton & Leigh	Bolton to the Leeds & Liverpool Canal at Leigh, Lancashire.	1825	June, 1831	7¼	Joins Nos. 44 & 61.	Locom. & fixed Engines.	44,000 in shares.	170,500	For minerals, merchandize, passengers, &c. A single track; gauge, 4 ft. 8½ in.
9. Bolton and Preston.	No. 61 at Bolton, by Chorley, to No. 72 at Euxton, Lancashire.	1837	In progress.	14¼	Joins Nos. 61 & 72.	Locom. Engines intended	380,000 126,000 506,000	. .	For passengers and general traffic. Originally intended to run direct to Preston.
10. Brandling Junction.	No. 68 at Redheugh, through Gateshead, to South Shields and to Monkwearmouth.	[illegible]	[illegible]	Total 15¼	Joins No. 68.	Locom. engs. some incl. pl.	110,000 36,000 146,000	400,000	For passengers, coal, and general traffic. Gauge, 4 ft. 8½ in.
11. Bridgend . .	No. 25 at Laleston to the town of Bridgend, Glamorganshire.	1828	1834	4¼	Joins No. 25.	Horses	6,000 4,000 10,000	. .	For the conveyance of minerals, &c. The line rises 190 feet.
12. Bristol and Exeter.	No. 36 at Bristol, passing near Bridgewater and Taunton, to Exeter.	1836	In progress.	75¼ Brs. 8	Six Branches proposed. Joins No. 36.	Locom. Engines intended	1,500,000 500,000 2,000,000	. .	For passengers and general traffic. Gauge, 7 ft. To be leased to No. 36 company.
13. Bristol & Gloucestershire (Old line).	Bristol to Coalpit Heath, parish of Westerleigh, Gloucestershire.	1828	Aug. 1835	9	Joins No. 1. See also No. 14.	Horses	45,000 12,000 57,000	77,000	For the conveyance of coal, stone, &c. Gauge, 4 ft. 8½ in. A tunnel 1540 ft. long.
14. Bristol & Gloucester (Extension line.)	No. 13 at Westerleigh, 7¼ m. from Bristol, to No. 17, at Standish, 7¼ m. from Glouc.	1839	In progress.	22	Joins Nos. 13 & 17.	Locom. Engines intended.	400,000 133,000 533,000	. .	For passengers and general traffic. Intended gauge, 4 ft. 8½ in. No. 13 to be improved.
15. Caermarthenshire.	"The Flats," Llanelly, to Llanrihangel Aberbythick, Caermarthenshire.	1802	1804	16	Several, to collieries, &c.	Horses	25,000 10,000 35,000	53,000 See note (a).	A plate railway, now (1840) fallen into disuse.
16. Canterbury and Whitstable.	City of Canterbury to the Sea Shore at Whitstable, Kent.	1825	May 1830	6¼	Short Branches allowed.	Locom. & fixed Eng. &c.	31,000 in shares.	111,000	For coal, passengers, &c. A single track; rises 422 feet. A tunnel 822 yards long.
17. Cheltenham & Great Western Union.	No. 36 at Swindon, by Cirencester, Stroud, and Gloucester, to Cheltenham.	1836	In progress.	42¼ Br. 4	To Cirencester. Joins Nos. 4, 14, and 36.	Locom. Engines intended	750,000 250,000 1,000,000	. .	For passengers and general traffic. Gauge, 7 ft. Part to be leased to No. 36 company.
18. Chester and Birkenhead.	No. 19 at Chester to near the River Mersey at Birkenhead, Cheshire.	1837	Sept. 1840	14¼	Joins No. 19.	Locom. Engines.	250,000 83,333 333,333	499,999	For passengers and general traffic. Gauge, . . . 8½ in.
19. Chester and Crewe.	No. 33 near Crewe Hall, Cheshire, to No. 18, at Brook Street, Chester.	1837	Oct. 1840	20¼	Joins Nos. 18, 33, and 60.	Locom. Engines.	250,000 83,333 333,333	458,333	For passengers and general traffic. Gauge, 4 ft. 8½ in. United to No. 33 in 1840.
20. Clarence . .	The Tees, at Port Clarence, 4 miles from Stockton, to No. 87, at Sun Pasture.	1828	—	Total 36	Several. Joins 26, 84, 35, 87, and 94.	Chiefly Locom. Engines.	100,000 60,000 160,000	500,000	Chiefly for coal, &c., but some passengers conveyed. Gauge, 4 ft. 8½ in.
21. Coleorton . .	No. 49, at Swannington, to collieries, &c., at Coleorton, Leicestershire.	1833	—	. .	Joins No. 49	Horses	25,000 6,000 31,000	. .	For the conveyance of coal, &c. Gauge, 4 ft. 8½ in.
22. Cromford and High Peak.	The Cromford Canal, near Cromford, to the Peak Forest Canal at Whaley Bridge.	1825	1830	33	. . . .	Fixed Eng. and Horses.	164,400 32,880 197,280	. .	For minerals, merchandize, &c. Rises 990 ft. from the Cromford Canal.
23. Croydon, Merstham, and Godstone.	No. 89, at Croydon, to Reigate. Made only to Merstham, 8¼ miles from Croydon.	1803	Part 1805	Total 15¼	To Godstone proposed, but never made.	Horses	60,000 30,000 90,000	90,000	The line sold to No. 55 company, and closed. Company dissolved in 1839.
24. Deptford Pier Junction.	No. 57, at High Street, Deptford, to the Thames at Deptford Pier.	1836	Not yet made	783 yards.	To join No. 57	Locom. Engines intended	60,000 20,000 80,000	120,000	For steam-boat passengers to and from the Greenwich Railway.
25. Duffryn-Llynvi & Porth-Cawl.	Duffryn-Llynvi to the Bay of Porth-Cawl, Glamorganshire.	1825	1828	18	Joins No. 11	Horses	40,000 20,000 60,000	110,000	Connects several mines and quarries with the Bristol Channel. Rises 490 feet.

(a) An Act was obtained in 1834 for raising additional capital, to convert the line into an edge-railway for locom. engines, but it has not been carried into effect.

NAME.	COURSE.	Date of Act.	Date of Opening	Length in Miles.	Branches, &c.	Power used.	Original Capital.	Present Capital.	REMARKS.
26. Durham and Sunderland.	From the City of Durham to the Sea at Sunderland.	1834	1836	16	To collieries, &c. Joins No. 20.	Fixed Engines.	£102,000 in shares.	£256,000	Chiefly for coal; but a few passengers are conveyed. Principally a single track.
27. Durham Junction.	No. 38, near Moorsley, to the Stanhope and Tyne (private) Railway at Usworth.	1834	Aug 1838	..	To Houghton-le-Spring. Joins No. 38.	Locom. Engines.	80,000 34,000 114,000	130,000	Chiefly for coal, &c.; but a few passengers are conveyed
28. Eastern Counties.	High Street, Shoreditch, by Colchester, to Norwich and Yarmouth.	1836	Part 1839	126	Joins No. 70. *See* also No. 92.	Locom. Engines.	1,600,000 533,333 2,133,333	..	For passengers and general traffic. Gauge 5 f. 17½ m. open July, 1840.
29. Festiniog . .	Port-Madoc, Caernarvonshire, to Slate-quarries at Festiniog, Merionethshire.	1832	April, 1836	13½	..	Horses.	24,185 10,000 34,185	56,185	For the conveyance of slates. A tunnel 780 y., being made in 1840. Gauge about 2 f.
30. Forest of Dean (formerly Bullo Pill.)	From the Severn, near Newnham, into the Forest of Dean, Gloucestershire.	1809 1826	—	7½	To collieries, &c. Joins No. 66.	Horses.	125,000 in shares. (Act, 1826).	..	For minerals, &c. The present Company was formed by the Act of 1826.
31. Gloucester and Cheltenham.	From the Berkely Canal Basin at Gloucester, to Cheltenham.	1809	—	9	One, near Cheltenham.	Horses.	25,000 10,000 35,000	50,000	A plate-railway for coal, &c. purchased for 35,000*l.* by the Companies Nos. 4 and 17.
32. Gosport Branch	From No. 58, near Bishopstoke, to Gosport, Hampshire.	1839	In progress.	15½	Joins No. 58.	Locom. Engines intended	300,000 100,000 400,000	..	For passengers and general traffic. Gauge 4 f. 8½ in. Made by No. 58 Company.
33. Grand Junction	No. 53, at Birmingham, to No. 93, at Warrington, and by it to No. 50.	1833	July, 1837	82½	Joins Nos. 3, 19, 53, 60, and 93.	Locom. Engines.	1,040,000 346,000 1,386,000	1,957,800 with No. 93.	For passengers and general traffic. Gauge 4 f. 8½ in United with Nos. 19 & 93.
34. Great North of England.	No. 98, near York, by Darlington, to Redheugh, south side of the Tyne.	1836 1837	In progress.	76 Brs. 2	To York & Durham. Joins 20, 35, 87, & 98.	Locom. Engines intended	1,000,000 150,000 1,150,000	1,330,000	For passengers & general traffic. The line from Darlington to York is by Act 1837.
35. Gt. N. of England, Clarence, & Hartlepool Junctⁿ	From a branch of 38 at Castle Eden, to 29 and 34 at Merrington, Durham.	1837	—	7½ Br. 1½	To join Nos. 20, 34, and 38.	Locom. Engines intended	52,500 17,500 70,000	..	Intended chiefly for minerals, merchandise, &c.
36 Great Western.	From Paddington, by Reading, Wellingford, and Bath, to Temple Mead, Bristol.	1835	Part 1838	117½	To Bradford and Trowbridge. Joins 12, 17, & 95.	Locom. Engines.	2,500,000 833,333 3,333,333	4,999,999 *See* note(*b*)	For passengers and general traffic. Gauge 7 f. 75 m. were open in August, 1840.
37. Grosmont . .	No. 52, at Llanvihangel, Monmouthsh., to near Llangua Bridge, Herefordshire.	1812	—	7	Joins Nos. 42 & 52.	Horses.	13,000 7,000 20,000	..	A plate-railway, for coal, merchandize, &c. The line rises 166 f.
38. Hartlepool .	Hartlepool to Moorsley, parish of Houghton-le-Spring, Durham.	1832	1836	15	To Durham, &c. Joins Nos. 27 & 35.	Locom. Engines.	209,000 70,000 279,000	492,000	Chiefly for coal, but some passengers conveyed. Gauge 4 f. 8½ in.
39. Hay . . .	From near Brecon to Parton Cross and Eardisley, Herefordshire.	1811	—	24	Joins No. 45.	Horses.	50,000 15,000 65,000	..	A plate-railway, for minerals, merchandize, &c. The line is very circuitous.
40. Hayle . . .	From the Port of Hayle to Redruth, and to adjacent Mines, Cornwall.	1834	—	12 Br. 3½	To Portreath, &c. &c. Joins No. 78.	Locom. Eng. & incl. pl.	64,000 16,000 80,000	..	Used principally for the conveyance of minerals.
41. Heckbridge & Wentbridge.	Heckbridge, parish of Snaith, to Wentbridge, parish of Kirksmeaton, Yorkshire.	1826	—	7½	..	..	11,300 2,800 14,100	21,700	For the conveyance of stone to the Knottingley and Goole canal.
42. Hereford . .	No. 37, at Monmouth Cap, Llangua, to near the City of Hereford.	1826	1830	12½	Joins No. 37.	Horses.	23,000 12,000 35,000	.	A plate-railway, in continuation of Nos. 52 and 37, for coal, corn, &c.
43. Hull and Selby	Humber Dock, Hull, to No. 48, at Selby, West Riding of Yorkshire.	1836	July, 1840	30½	Joins No. 48.	Locom. Engines.	400,000 133,333 533,333	..	For passengers and general traffic. Gauge 4 f. 9 in. Very straight and level.
44. Kenyon and Leigh Junction.	No. 8, at West Leigh, to No. 50, at Kenyon, Lancashire.	1829	—	2½	Joins Nos. 8 & 50.	Locom. Engines.	25,000 6,250 31,250	..	A single track. Worked by the Bolton and Leigh Railway Company.
45. Kington . .	No. 39, at Eardisley, by Kington, to Lime-works at Burlinjob, Radnorshire.	1818	—	14	Joins No 39.	Horses.	18,000 5,000 23,000		For coal, lime, agricultural produce, &c.
46. Lancaster and Preston Junction.	No. 72, at Dock St. Preston, to the town of Lancaster.	1837	June, 1840	20½	Joins No. 72 and 77.	Locom. Engines.	250,000 83,000 333,000	488,000	For passengers and general traffic. Gauge 4 f. 8½ in.
47. Launceston and Victoria.	Launceston, to an intended Harbour at Tremoutha Haven, Cornwall.	1836	Not yet made.	16½	..	..	165,000 55,000 220,000	..	Connected with the Duke of Cornwall's Harbour. Not in progress, November, 1840.
48. Leeds and Selby.	Marsh Lane, Leeds, to the Ouse at Selby, West Riding of Yorkshire.	1830	Sept. 1834	20	Joins Nos. 43 and 98.	Locom. Engines.	210,000 90,000 300,000	340,000	For passengers & general traffic. Gauge 4 f. 8½ in. Leased to Nos. 71 & 98, in 1840.
49. Leicester and Swannington.	The River Soar, at Leicester, to Swannington, Leicestershire.	1830	July, 1832	16	To collieries, &c. Joins No. 21.	Chiefly Locom. Engines.	90,000 20,000 110,000	175,000	For coal, lime, passengers, &c. Gauge 4 f. 8½ in. A tunnel 1½ mile long.
50. Liverpool and Manchester.	From Lime Street and from Wapping, Liverpool, to Water Street, Manchester.	1826	Sept. 1830	31	To collieries, &c. Joins 44, 80, 93, and 97 (*c*).	Locom. Eng. 3 incl. pl.	510,000 127,500 637,500	1,832,375 *See* note(*c*).	For passengers and general traffic. Gauge 4 f. 8½ in. *See* note (*c*).

(*b*) In addition to the parliamentary capital of 4,999,999*l.*, the directors have been authorised to raise 600,000*l.* on loan notes.

(*c*) An Act passed in 1839 empowers the Company to raise 208,000*l.* for making a branch of about a mile long, to connect with the Manchester and Leeds and Manchester and Bolton Railways, but it has not yet (November, 1840) been commenced.

NAME.	COURSE.	Date of Act.	Date of Opening.	Length in Miles.	Branches, &c.	Power used.	Original Capital.	Present Capital.	REMARKS.
51. **Llanelly** . .	From Docks at Llanelly to Llandilo, Caermarthenshire.	1828 1835	Part 1833	Total 26	Many, to collieries, &c.	Locom. Engines.	£14,000 6,000 20,000	£270,000	For minerals, &c. Gauge 4f. 8½ in. Greater part of the line made under Act of 1835.
52. **Llanvihangel** .	From near Abergavenny to Llanvihangel Crucorney, Monmouthshire.	1811	—	6¼	Joins No. 37.	Horses.	20,000 15,000 35,000	..	A plate-railway, for minerals, &c. Joins the Brecknock & Abergavenny canal.
53. **London & Birmingham.**	Euston Grove, London, to Nova Scotia Gardens, Birmingham.	1833	Sept. 1838	112	Joins Nos. 2, 3, 4, 33, 63, and 65. *See also* 59.	Locom. Eng. One incl. pl.	2,500,000 835,000 3,335,000	5,500,000 See note (*d*)	For passengers and general traffic. Gauge 4 f. 8½ in.
54. **London & Blackwall** (formerly Commercial).	Fenchurch Street, City of London, to Brunswick Wharf, Blackwall.	1836	Part 1840	3¼	To the East and West India Docks.	Fixed Engines.	600,000 200,000 800,000	..	For passengers and general traffic. Gauge 5 f. 0½ in. Chiefly on a brick viaduct.
55. **London and Brighton.**	No. 56, near Croydon, passing east of Reigate and Cuckfield, to Brighton.	1837	Part 1840	41¼ Br. 19¼	To Shoreham, Lewes, and Newhaven. *See* 56 and 86.	Locom. Engines.	1,800,000 600,000 2,400,000	..	For passengers and general traffic. Gauge 4 f. 8½ in. The Compy. have bought No. 23.
56. **London & Croydon.**	From No. 57, 1¾m. from London Bridge, to Croydon, Surrey.	1835	June, 1839	8¼	Joins Nos. 55 & 57.	Locom. Engines.	140,000 45,000 185,000	741,000	For passengers and general traffic. Gauge 4 f. 8½ in.
57. **London and Greenwich.**	Tooley Street, south end of London Bridge, to Greenwich.	1833	Dec 1838	3¾	Joins No. 56. *See* also No. 24.	Locom. Engines.	400,000 133,000 533,000	993,000	Chiefly for passengers. Gauge 4 f. 8½ in. Constructed entirely on arches.
58. **London & South Western** (formerly Southampton).	Nine Elms, Vauxhall, London, to near the Docks, Southampton.	1834	May, 1840	76¾	Joins No. 32.	Locom. Engines.	1,000,000 330,000 1,330,000	1,860,000	For passengers and general traffic. Gauge 4 f. 8½ in.
59. **London Grand Junction.**	Skinner Street, City of London, to No. 53, at Camden Town.	1836	Not yet made.	2½	Intended to join No. 53.	Locom. Engines allowed.	600,000 200,000 800,000	..	For passengers, &c. Commenced, but not in progress (1840). Act has expired.
60. **Manchester & Birmingham.**	Store Street, Manchester, by Stockport, &c., to No. 33, at Chebsey, Staffordshire.	1837	Part 1840	45¼ Brs. 20½	To Crewe & Macclesfield. Joins 19, 33, & 83.	Locom. Engines.	2,100,000 700,000 2,800,000	..	For passengers and general traffic. Gauge 4 f. 8½ in. *See* note (*e*).
61. **Manchester & Bolton.**	Irwell St., Manchester, nearly parallel with the canal, to Bolton.	1831	May, 1838	10	Joins Nos. 8 & 9. *See* also note (*c*) p. 263.	Locom. Engines.	204,000	650,000	For passengers and general traffic. Gauge 4 f. 8½ in. Made by the Canal Compy.
62. **Manchester & Leeds.**	Hunt's Bank, Manchester, to No. 71, at Normanton, near Wakefield.	1836	Part 1839	50½ Brs. 5¼	To Oldham, Halifax, &c. Joins 71. See (*c*) p. 263.	Locom. Eng. inc. [illegible] on brs	1,300,000 430,000 1,730,000	2,500,000	For passengers and general traffic. Gauge 4 f. 9 in.; 41 miles open, October, 1840.
63. **Mansfield and Pinxton.**	Mansfield, Notts., to the Cromford Canal at Pinxton, Derbyshire.	1817	—	7¼ Br. 1¼	To Codnor Park Iron Works.	Horses.	22,800 10,000 32,800	..	Chiefly used for coal, &c. Average inclination about 30 feet per mile.
64. **Maryport and Carlisle.**	Harbour of Maryport, Cumberland, to No. 68, at Carlisle.	1837	Part 1840	28	Joins No. 68.	Locom. Engines.	180,000 60,000 240,000	..	For passengers and general traffic. 7¼ m. opened July, 1840, chiefly for coal.
65. **Midland Counties.**	No. 53, at Rugby, by Leicester, to Nottingham, and also to Derby.	1836	June, 1840	57 Br. 1	To Mountsorrel. Joins Nos. 5, 53, and 71.	Locom. Engines.	1,000,000 333,000 1,333,000	1,533,000	For passeng. & general traffic. Gauge 4 f. 9 in. Rugby to Derby 49 m.; to Nott. 47½ m.
66. **Monmouth.** .	The "Thatched Pit," Forest of Dean, Gloucestershire, to Monmouth.	1810	1817	Total 8	To quarries, collieries, &c. Joins 51 and 52.	Horses.	22,000 6,000 28,000	..	For the conveyance of minerals, timber, &c., from the Forest of Dean.
67. **Nantlle.** . .	Slate-quarries at Nantlle pool to the port of Caernarvon.	1825	1828	9¼	..	Horses.	20,000 in shares.	40,000	For the conveyance of slates.
68. **Newcastle-upon-Tyne and Carlisle.**	Newcastle, by Hexham and Haltwhistle, to the canal basin, Carlisle.	1829	1839	61	To Redheugh. *See* No. 6. Joins 10 & 64.	Locom. Engines.	300,000 100,000 400,000	950,000	For passengers and general traffic. Gauge 4 f. 8½ inch. Partly opened in 1835.
69. **Newcastle-upon-Tyne and North Shields.**	Pilgrim Street, Newcastle, to the town of North Shields.	1836	June, 1839	6¼	To the New Quay, North Shields.	Locom. Engines.	120,000 40,000 160,000	320,000	Chiefly for passengers. An extension to Tynemouth is proposed.
70. **Northern and Eastern.**	No. 28, at Angel Lane, Stratford, to Bishop's Stortford, Hertfordshire.	1836	Part 1840	30	Joins No. 28.	Locom. Engines.	1,200,000 400,000 1,600,000	720,000 240,000 960,000	For passengers and general traffic. Gauge 5 f. Projected to go to Cambridge, 53 m.
71. **North Midland**	Nos. 3 and 65, at Derby, to Hunslet Lane, Leeds.	1836	July, 1840	72¼ Br. 2¼	To a colliery. Joins 5, 62, 65, 81, and 98.	Locom. Engines.	1,500,000 500,000 2,000,000	3,000,000	For passengers and general traffic. Gauge 4 f. 9 in.
72. **North Union** (formerly Preston & Wigan).	From No. 50, by Wigan, (see No. 97,) to Dock Street, Preston.	1831	Oct., 1838	22¼ Br. 3	To New Springs. Joins 9, 36, & 50. *See* 97.	Locom. Engines.	250,000 83,000 333,000	730,000 with No. 97.	For passengers and general traffic. Gauge 4 f. 8½ in. United with 97 in 1834.
73. **Oystermouth** .	Swansea, along the coast, to Oystermouth, Glamorganshire.	1804	—	7¼	To mines, &c.	Horses.	8,000 4,000 12,000	..	Chiefly for minerals. A few passengers conveyed.
74. **Plymouth and Dartmoor.**	Plymouth to the prison of war on Dartmoor, Devonshire.	1819	—	Total 25¼	One, to Catdown & Sutton Pool.	Horses.	27,783 5,000 32,783	41,983	For minerals, &c. The line is very circuitous.
75. **Portland** . .	The Priory Lands to near Portland Castle, Isle of Portland.	1825	—	2	..	Fixed Engines.	5,000 2,000 7,000	..	A plate-railway, for the conveyance of Portland stone for shipment.
76. **Preston & Longridge.**	From near St. Paul's Square, Preston, to Longridge Fell, Lancashire.	1836	May, 1840	7	..	Horses.	30,000 10,000 40,000	..	For the conveyance of Longridge stone, heavy goods, &c. A single track.

(*d*) In addition to the parliamentary capital of 5,500,000*l*., the directors have been authorised to raise 250,000*l*. on loan notes.

(*e*) The Company purpose constructing the railway from Manchester to Crewe and Macclesfield only, and have abandoned their works on the original main line to Chebsey. As now extended, the length will be 34¼ miles from Manchester to Crewe, and the Macclesfield branch 11 miles.

NAME.	COURSE.	Date of Act.	Date of Opening	Length in Miles.	Branches, &c.	Power used.	Original Capital.	Present Capital.	REMARKS.
77. Preston and Wyre.	No. 46, at Preston, to Fleetwood-on-Wyre, Lancashire.	1835	July, 1840	19¼	Joins No. 46.	Locom. Engines	£130,000 40,000 170,000	£400,000	For passengers and general traffic. Chiefly a single track. Gauge 4 f. 8½ in.
78. Redruth and Chasewater (or Deveron).	Redruth to Point Quay, Restrongett Creek, Cornwall.	1824	—	14	To mines, &c. Joins No. 40.	Horses	22,500 10,000 32,500	..	For minerals, merchandize &c.
79. Rumney . .	Rumney Ironworks to No. 85 at Bassaleg, Monmouthshire	1825	—	21¾	Joins No. 85.	Horses	47,100 20,000 67,100	..	A plate-railway for minerals, &c.; runs parallel with the river Rumney.
80. St. Helen's and Runcorn Gap.	Cowley Hill Colliery, St. Helen's, to Runcorn Gap, on the Mersey.	1830	—	Total 12	To collieries, &c. Joins No. 50.	Locom. and fixed Engines.	120,000 30,000 150,000	220,000	Chiefly for coal, but a few passengers conveyed. Gauge, 4 ft. 8½ in.
81. Saundersfoot .	Thomas Chapel Mountain to Saundersfoot Harbour, Pembrokeshire.	1829	—	..	Short Branches	..	17,500 8,000 25,500	..	For coal, &c. The Act provides for the improvement of the harbour.
82. Severn & Wye	From the Severn, near Lydney, to the Wye, near Ruardean, Gloucestershire.	1809	—	Total 26	Several, to collieries &c.—Joins No. 66.	Horses	35,000 20,000 55,000	115,000	For the conveyance of minerals, timber, &c., from the Forest of Dean.
83. Sheffield, Ashton-under-Lyne, and Manchester	Spital Fields, Sheffield, by Penistone, &c., to No. 60, at Manchester.	1837	In progress.	40	Joins No. 60	Locom. Engines intended	700,000 233,000 933,000	..	For passengers and general traffic. A tunnel 3 m. long, 16 ft. wide, for one track.
84. Sheffield and Rotherham .	From Brightside, Sheffield, to near West Gate, Rotherham.	1836	Oct. 1838	5¼ Br. 1¼	To Greasborough. Joins No. 71.	Locom. Engines	100,000 30,000 130,000	200,000	For passengers, coal, and general traffic. Gauge, 4 ft. 8½ in.
85. Sirhowey . .	From near Newport, Monmouthshire, to Tredegar and Sirhowey ironworks, &c.	1802	—	Total 28	To Trevill (with edge-rails), &c. Joins No. 79.	Locom. Eng. and Horses.	30,000 15,000 45,000	..	Chiefly a plate-railway, for iron, coal, &c. Joins the Monmouthshire Canal.
86. South-Eastern	No. 55, at Redhill, 20 m. from London, by Tunbridge and Ashford to Dover.	1836	In progress.	66	Joins No. 55	Locom. Engines intended.	1,400,000 450,000 1,850,000	..	For passengers and general traffic. Formerly intended to commence at Croydon.
87. Stockton and Darlington.	From Stockton, by Darlington, to Witton Park Colliery, Durham.	1821	Sept. 1825	Total 54 (*f*)	To Middlesbrough, &c. &c. Joins 5, 20, & 34.	Chiefly Locom. Engines.	82,000 20,000 102,000	450,000 See note (*f*).	For coal, merchandize, and passengers. Gauge, 4 ft. 8½ in. Principally a double line.
88. Stratford and Moreton.	Stratford-on-Avon, Warwickshire, to Moreton-in-Marsh, Gloucestershire.	1821	1826	16 Br 2¼	To Shipston-on-Stour.	Horses	33,500 7,000 40,500	77,449	For coal, corn, &c. A few passengers conveyed. A single track.
89. Surrey . .	From the Thames at Wandsworth to Croydon, Surrey.	1801	1805	9¼ Br. 1½	To Carshalton, &c. Joins No. 23.	Horses	35,000 15,000 50,000	60,000	A plate-railway for coal, lime &c. Gauge, 4 ft. Ordinary inclination, 1 in 120.
90. Taff Vale . .	Merthyr Tydvil to the Port of Cardiff, Glamorganshire .	1836	Part 1840	24¼ Brs. 17	Several, to mines, &c.	Locom. Engines.	300,000 100,000 400,000	620,000	For minerals, merchandize and passengers. 14 miles opened Oct. 1840.
91. Taw Vale . .	Barnstaple to an intended Dock at Fremington, Devonshire.	1838	In progress.	2¼	..	Locom. Engines allowed.	15,000 5,000 20,000	..	For passengers, merchandize, &c. A tunnel 418 yards long, for one track.
92. Thames Haven	No. 28, at Romford, to the Thames, at Shell Haven, Essex.	1836	Not yet made.	15¼	Intended to join No. 28.	Locom. Engines intended.	450,000 150,000 600,000	..	For coal, merchandize, and passengers. The Company to form docks at Shell Haven.
93. Warrington & Newton . .	Warrington to No. 50 at two points, at Newton, Lancashire.	1829	1833	4¼	Joins Nos. 33 & 50.	Locom. Engines.	53,000 20,000 73,000	93,000	For passengers and general traffic. Gauge, 4 ft. 8½ in. United in 1835 to No. 33.
94. West Durham.	Byer's Green branch of No. 20, to Crook and Billy Row, Durham.	1839	Part 1840	5¼	Joins No. 20	Locom. Eng. One incl. pl.	33,923 11,307 45,230	..	Chiefly for minerals. Commenced before the Act was obtained.
95. West London, formerly Birm., Bris. & Thames Junc.	Nos. 36 and 53, near Holsden Green, to the Canal at Kensington.	1836	In progress.	3	Joins Nos. 36 & 53.	Uncertn. Locom. allowed.	150,000 50,000 200,000	280,000	To connect 36 and 53 with the Thames, by means of the Kensington Canal.
96. Whitby & Pickering.	Harbour of Whitby to Pickering, North Riding of Yorkshire.	1833	May, 1836	24	To Whitby Stone Quarries.	Horses, and two incl. pl.	80,000 25,000 105,000	135,000	For passengers and general traffic. A single track. Gauge, 4 ft. 8½ in.
97. Wigan Branch	No. 50, at Parkside, to the Town of Wigan, Lancashire.	1830	Sept. 1832	7 Br. 3	To New Springs. Joins No. 50; *see* also 72.	Locom. Engines.	70,000 17,500 87,500	..	For passengers and general traffic. Gauge, 4 ft. 8½ in. United in 1834 with No. 72.
98. York & North Midland.	Tanner Row, City of York, to No. 71, at Altofts, West Riding of Yorkshire.	1836	June, 1840	23¼ Brs. 4	Branches to Nos. 48 & 71. Joins also 34.	Locom. Engines.	370,000 123,333 493,333	335,000 111,666 446,666	For passengers & general traffic. Gauge, 4 ft. 9 in. Capital reduced by Act of 1837.

RAILWAYS OF SCOTLAND.

NAME.	COURSE.	Date of Act.	Date of Opening	Length in Miles.	Branches, &c.	Power used.	Original Capital.	Present Capital.	REMARKS.
99. Arbroath and Forfar.	**No. 102, at Arbroath Harbour, to Forfar.**	1836	Jan. 1839	15¼	Joins No. 102	Locom. Engines.	70,000 35,000 105,000	160,000	For passengers and general traffic. A single track. Gauge, 5 ft. 6 in.
100. Ardrossan, formerly Johnstone and Ardrossan.	**Ardrossan Harbour to Kilwinning, Ayrshire; projected to extend to Johnstone.**	1827	Part —	(*g*) 5¼ Brs. 6¼	Two Branches. Joins 109.	Chiefly Locom. Engines.	95,658 in shares.	106,666	For coal, passengers, &c. Gauge, 4 ft. 8½ in.

(*f*) The main line from Witton Park Colliery to Stockton, is 28, or to Middlesbrough, 32 miles; and the total length of the lines specified in the Acts of Parliament is about 40 miles. It appears, however, by a letter from the Chairman to the Irish Railway Commissioners, that the Company have formed 54 miles of railway, of which 28 has a double track. The sum of 450,000*l.* is stated in the same document to have been expended, though the total *Parliamentary* capital is only 252,000*l.*

(*g*) This railway, as projected, was 22¼ miles long, but only 5¼ miles of the main line were completed. This part was worked by horses till 1840, when the capital was increased, and the line adapted to locomotive engines.

NAME.	COURSE.	Date of Act.	Date of Opening.	Length in Miles	Branches, &c.	Power used.	Original Capital.	Present Capital.	REMARKS.
101. Ballochney .	Arbuckle and Ballochney to No. 111, at Kippbyres, Lanarkshire.	1826	1828	4½ Brs. 2	Several, to collieries. Joins 111 and 116.	Chiefly Locom. Engines	£18,425 10,000 28,425	£93,333	For coal, ironstone, &c. Some passengers conveyed. Gauge 4 ft. 8½ in.
102. Dundee and Arbroath.	Trades Lane, Dundee, by the coast, to No. 99, at Arbroath Harbour.	1836	April, 1840	16¾	Joins No. 99	Locom. Engines	100,000 40,000 140,000	..	For passengers and general traffic. Gauge, 5 ft. 6 in. Part opened in 1838.
103. Dundee and Newtyle.	North side of Dundee to Newtyle, county of Forfar.	1826	Dec. 1831	10½	Joins Nos. 112 and 113.	Locom. & fixed Engines	30,000 10,000 40,000	170,000	For passengers and general traffic. A single track. The line rises 544 feet.
104. Edinburgh and Dalkeith.	Edinburgh, by Dalkeith, to the South Esk, near Newbattle.	1826	1831	Total 15	To Leith, Fisherrow, &c.	Horses.	70,125 20,000 90,125	208,753	For coal, merchandize, and passengers. Chiefly a single track.
105. Edinburgh and Glasgow.	The Haymarket, Edinburgh, to North Queen Street, Glasgow.	1838	In progress.	46 Br. 1	To Falkirk, for horse power.	Locom. Engines intended	900,000 300,000 1,200,000	..	For passengers and general traffic. Gauge, 4 ft. 8½ in.
106. Edinburgh, Leith, and Newhaven.	Princes Street, Edinburgh, to Trinity Harbour.	1836	In progress.	2½	To Leith, abandoned by Act of 1839.	Fixed Engines intended	100,000 40,000 140,000	..	For passengers, goods, &c. A tunnel 1000 yards long, 12 ft. wide, and 16 ft. high.
107. Garnkirk and Glasgow.	No. 111, at Cargill Colliery, by Garnkirk, to Glasgow.	1826	1831	8¼	Joins No. 111.	Chiefly Locom. Engines.	28,497 10,000 38,497	169,195	For the conveyance of coal, passengers, &c. Gauge, 4 ft. 8½ in.
108. Glasgow, Paisley, and Greenock.	Near Glasgow Bridge, Glasgow, through Paisley, to Greenock.	1837	Part 1840	*22½	To quays, &c. Joins No. 109.	Locom. Engines.	400,000 133,333 533,333	..	For passengers and general traffic. Gauge, 4 ft. 8½ in. * 6½ m. joint line with 109
109. Glasgow, Paisley, Kilmarnock, and Ayr.	Glasgow to Paisley, by No. 108, and thence by Kilwinning to Ayr.	1837	Part 1840	*40 Brs. 17½	To Kilmarnock, &c. Joins 100, 108, and 110.	Locom. Engines.	625,000 208,000 833,000	..	For passengers and general traffic. Gauge, 4 ft. 8½ in. * 6½ m. joint line with 108.
110. Kilmarnock and Troon.	Kilmarnock to the Harbour of Troon, Ayrshire.	1808	—	9¾	Joins No. 109.	Horses.	40,000 15,000 55,000	95,000 See note (*k*).	A plate railway for coal, lime &c. Very few passengers. Gauge 4 ft. See note (*k*).
111. Monkland and Kirkintilloch.	Palace Craig, Old Monkland, Lanarkshire, to near Kirkintilloch.	1824	1826	12	To collieries, &c. Joins 101, 107, and 117.	Locom. Engines.	32,000 10,000 42,000	204,000	For coal, &c. A few passengers conveyed. Joins the Forth and Clyde canal.
112. Newtyle and Coupar Angus.	No. 103 at Newtyle, to Coupar Angus, Forfarshire.	1835	Feb. 1837	5½	Joins Nos. 103 and 113.	Horses.	15,200 5,000 20,200	40,200	For passengers and general traffic. Worked by No. 103 company.
113. Newtyle and Glammiss.	Nos. 103 and 112 at Newtyle, to Glammiss, Forfarshire.	1835	—	..	Joins Nos. 103 and 112.	..	20,000 6,600 26,600	..	For passengers and general traffic.
114. Paisley and Renfrew.	Paisley to the River Clyde at Renfrew Ferry.	1835	April 1837	3½	..	Locom. Engines.	23,000 10,000 33,000	..	For passengers to steam-boats, &c., and general traffic.
115. Polloc and Govan.	Collieries at Polloc and Govan to the Clyde at Broomielaw.	1830	—	..	To Rutherglen, &c.	..	10,000 5,000 15,000	66,000	For the conveyance of coal, &c. Gauge 4 ft. 8½ in.
116. Slamannan.	No. 101 at New Monkland, to the Union Canal near Linlithgow.	1835	1840	12½ Br. 4½	To Bathgate, &c. Joins No. 101.	Locom. Engines.	86,000 20,000 106,000	186,666	Chiefly for minerals. A few passengers. Partly a single line. Gauge 4 ft. 8½ in.
117. Wishaw and Coltness.	No. 111 at Old Monkland, to Chapel, parish of Cambusnethan, Lanarkshire.	1829	6½m. open.	13	To collieries. Joins No. 111.	Chiefly Locom. Engines.	60,000 20,000 80,000	160,000	For minerals, &c. Part still in progress. Gauge 4ft. 8½ in.

RAILWAYS OF IRELAND.

NAME.	COURSE.	Date of Act.	Date of Opening.	Length in Miles	Branches, &c.	Power used.	Original Capital.	Present Capital.	REMARKS.
118. Belfast and Cavehill.	Stone Quarries at Cavehill, to Belfast Harbour.	1832	Sept. 1840	2	..	Locom. Engines allowed.	£7,500 2,500 10,000	£38,200	For the conveyance of stone &c. Gauge 4 f. 8½ in.
119. Cork and Passage.	City of Cork, to Passage, entrance of Cork Harbour.	1837	..	6½	..	Locom. Engines allowed.	200,000 66,000 266,000	..	To convey passengers to a steam-packet pier. Not in progress, November, 1840.
120. Dublin and Drogheda.	Custom-House Quay, Dublin, near the Coast, to Drogheda.	1836	In progress.	32	..	Locom. Engines intended	600,000 200,000 800,000	450,000 150,000 600,000	For passengers and general traffic. Capital reduced by an Act passed 1840.
121. Dublin and Kingstown.	Westland-row, Dublin, to Kingstown Harbour.	1831	Dec. 1834	5¾	..	Locom. Engines.	200,000 70,000 270,000	..	For passengers and general traffic. Gauge 4 f. 8½ in.
122. Dundalk Western.	Dundalk, county of Louth, to Ballaby, county of Monaghan.	1837	..	24	..	Horses intended	100,000 32,000 132,000	..	For passengers and general traffic. Works commenced in May, 1839.
123. Great Leinster and Munster.	Dublin, by Naas, Athy, and Carlow, to Kilkenny	1837	In progress.	73½	..	Locom. Engines intended	800,000 265,000 1,065,000	..	For passengers and general traffic. The land required agreed for in 1840.
124. Ulster.	From near Durham Street, Belfast, by Lisburn and Portadown, to Armagh.	1836	Part 1839	36	..	Locom. Engines.	600,000 200,000 800,000	..	For passengers and general traffic. 8 miles open, and a further portion in progress.

(*k*) An Act passed in 1837, but which appears not to have been carried into effect, allows the raising of 40,000*l.* by new shares, for converting this line into an edge-railway for locomotive engines.

American Railways.

The first railway constructed in the United States of America was a line of about four miles, for the conveyance of granite from the quarries at Quincy to Boston harbour, which was opened in 1827. The successful introduction of steam locomotion in England was immediately followed by the formation of numerous important lines of railroad in America, and this species of enterprise has been so greatly encouraged, that, according to a statement published by the Chevalier de Gerstner (an engineer celebrated for the promotion of railways on the continent of Europe), the railroads completed in the United States, down to the summer of 1839, amounted to more than 3000 miles; while the extent of those in progress warranted an expectation that about 4100 miles would be in operation by the close of that year. In many cases the country over which these lines have been made is favourable in a degree unparalleled in this country; and, owing to the cheapness of land and timber, the great facilities offered by the various states, and the comparatively slight construction of many lines, their average cost has been greatly below that of English railways. Stevenson, in his 'Civil Engineering of North America,' states the average of several lines to be about 4942*l.* per mile, a statement which appears to be borne out by the more recent calculation of Gerstner. Many lines are laid with but one track, and the gradients and curves are often less favourable than those of the public lines in this country, the thin population of the districts passed through, and the high price of labour, precluding much expense in cuttings and embankments. Timber is used extensively in the construction of the permanent way, on account of the facility of working it, and the expense of stone and iron. Stone blocks have been found in some instances to split from the effect of the intense frost, which forms an additional reason for the preference given to wood. The gauge most commonly adopted is four feet eight inches and a half, this width having been taken from the English lines. American locomotive engines do not usually travel so fast as those made by British manufacturers, but they are frequently adapted for ascending steep inclined planes, and, as described in a previous page, for traversing curves of small radius. The carriages used are very large and commodious, some being as much as fifty or sixty feet long, mounted on eight wheels, and so arranged that passengers may walk from one end of the train to the other.

According to Stevenson, the only railway in the British dominions in North America, down to the year 1837, was the Champlain and St. Lawrence line, which was formed under an Act passed in 1832. It is about sixteen miles long, and is worked by locomotive engines.

A railway of between forty and fifty miles, for the conveyance of passengers and goods by locomotive engines, has been made in the island of Cuba, between Havana and Guines. The rails, engines, carriages, &c. were made in England.

Continental Railways.

The first railway laid down in France was a short line formed in 1783, at Mont Cenis, for the use of the foundries of Creusot. In 1828 a line of about twelve miles was completed between St. Etienne and Andrezieux, and others uniting it with Lyon and Roanne have since that time been brought into operation, partly worked by locomotives and partly by horses. Though useful, they have not proved remunerative. Preliminary measures have been taken for several important lines, but comparatively little has been done in their formation. Railways are open from Paris to Versailles and St. Germain, and a second line to Versailles and one to Orleans are in progress. The Paris and Rouen railway, which will probably be extended to Hâvre, is about to be formed by a company composed of French and English capitalists.

In Belgium a comprehensive system of railways is in course of execution by the government. The scheme was sanctioned by the legislature in 1834, and the first section of railway was opened in the following year. The aggregate length of the lines comprised in the original plan was nearly 250 miles; but subsequent additions have increased the total length to upwards of 400 miles, of which 258 miles were in use in March, 1840, and the remainder was expected to be complete within two years of that time. Of the lines then completed, about three-fourths have but a single track, and the country being generally flat, the expense has been small in comparison with the railways of England, not having exceeded 16,000*l.* per mile, including engines and carriages. The average speed is equal to that on the English lines, and the amount of travelling has been very great, although the returns are small, the object of the government being rather to provide accommodation at the lowest possible charge, than to make the railways a source of revenue. The main line from west to east extends from the port of Ostend to Liege, and thence to the Prussian frontier, to join the railway to Cologne. Another line commences at Antwerp, and, intersecting the former at Malines, proceeds to Brussels and Mons, whence it is to extend to the frontier of France. Branches connect Namur, St. Trond, Courtrai, Tournay, &c. with the main lines, and afford facilities for communication with the projected lines of the neighbouring countries.

In Germany a railway of about 130 English miles, between Budweis, Linz, and Gmünden, has been in operation several years, part having been opened as early as 1829. It is worked by horses, and used chiefly for the carriage of merchandise. Other lines of great extent, generally for the use of locomotive engines, are in progress, and considerable portions are in successful operation. The Austrian government has afforded great encouragement to these undertakings, which will shortly connect Vienna with the surrounding countries. Important railways are also in progress in Italy and other parts of the continent of Europe.

In Russia an interesting line of about seventeen English miles, connecting St. Petersburg with the towns and royal parks of Pawlowsk and Zarscoe-Selo, was completed in 1837. It is worked by locomotive engines, and is traversed by a great number of passengers. The line has but one track, six feet wide, and was formed by a joint-stock company under imperial sanction. It is intended to continue the line to Moscow, about 420 miles from St. Petersburg, and some other extensive railways are in contemplation.

Railways have been introduced into Egypt, and projected in India and several other parts of the world, the engineers being frequently and the machinery almost invariably from England.

RAIMONDI, MARC ANTONIO, commonly called by his baptismal names Marc Antonio only, was born at Bologna about the year 1487 or 1488. He was instructed in the art of design by Francesco Maria Raibolini, known as Francesco Francia, but having seen some prints by Albert Dürer, he determined on adopting engraving as a profession. It does not appear by whom he was instructed in that art, though most probably it was by some goldsmith, for his first essays with the graver were the embellishment of silver ornaments worn at that period, a circumstance that seems to have led M. Ponce, in the 'Biographie Universelle,' to state that Marc Antonio was originally intended for that business. One of his earliest engravings on copper was a plate from a picture by Francia, representing Pyramus and Thisbe, dated 1502, and executed, with some others, it is supposed, after the same artist, before Raimondi's departure from Bologna. At Venice, whither he removed, he purchased, with all the money he had taken with him from home, a set of thirty-six prints engraved on wood by Albert Dürer, representing the Life and Passion of our Saviour. Charmed with the correctness of the design and the precision of the execution, he imitated them on copper, according to Vasari, with such exactness, that they sold in Italy for the originals. The same authority states that Dürer, having seen one of them at Nürnberg, complained to the senate at Venice of the fraud that had been practised, and that Marc Antonio was forbidden to use his signature, which was the only redress he could obtain. It seems that Vasari must have fallen into an error in this story, and mistaken the Life of our Saviour for the Life of the Virgin, as Marc Antonio copied both sets from the cuts of Albert Dürer, to the latter and not to the former of which he affixed the mark of that great artist. M. Heinecken also points out that, besides the tablet which Dürer used as his mark, Marc Antonio added within it his own initials joined, and that he also used the tablet without any mark at all. Indeed there seems altogether very little probability in the story told by Vasari. Persons acquainted with the subject of engravers' monograms are aware that the tablet of the peculiar form adopted by these two great rivals, namely, an oblong square with a small arched piece on the centre portion of the top, was a favourite mark of many artists, as may be seen on the works of Van Assen, Dolendo, Krugen, Saelert, and Voghter. After quitting

Venice, he proceeded to Rome, where he was soon noticed by Raffaelle, who employed him in engraving from his designs, and, it is said, in some instances even traced the outlines on the plates, that the correctness of the drawing might be more perfectly preserved. His first plate after Raffaelle was the Death of Lucretia, which is neatly engraved, but is not one of his best works. His next print, after the same master, was a Judgment of Paris, executed in a more bold and spirited style. These were followed by many more, and amongst them the Murder of the Innocents, after Raffaelle, who was so perfectly satisfied with the efforts of the engraver, that he sent many specimens of his works as complimentary presents to Albert Dürer himself, by whom they were thought well worthy of acceptance.

After the death of Raffaelle, which occurred in 1520, Giulio Romano engaged Marc Antonio to engrave from his designs. Amongst these works are a set of disgusting plates of subjects for which Aretino composed the verses, and which so greatly excited the indignation of Pope Clement VII., that he ordered the engraver to be thrown into prison, from which he was only released at the earnest intercession of some of the cardinals and of Baccio Bandinelli. Moved by gratitude for the services of Bandinelli, Marc Antonio engraved his celebrated print of the Martyrdom of St. Lawrence from a picture by him, which, besides greatly conducing to the engraver's high reputation, procured him not only the entire pardon of the pope, but his active protection and support. On the sacking of Rome by the Spaniards, in 1527, he was obliged to fly, having lost all he had acquired by his art. He returned to his native place, where he continued to engrave until the year 1539, which is the date affixed to his last plate, representing the Battle of the Lapithæ, after Giulio Romano He is said by Malvasia to have been assassinated by a Roman nobleman for having, contrary to his engagement, engraved a second plate of the Murder of the Innocents, from the design of Raffaelle.

This engraver may be considered one of the most eminent artists in that branch that has ever appeared. His outlines are pure; the character and expression of his heads beautiful; whilst the exact and correct drawing of his works, particularly in the extremities of his figures, evidence that he was in all respects a complete master both of drawing and design. He was one of the first Italian engravers of distinction. The high reputation of Raffaelle, and the happy chance which conduced to the engagement of Marc Antonio as the engraver of his chief works, contribute as well to his reputation as to the high value which is ever set upon his engravings, and the great price they always obtain. Berghem paid sixty florins for an impression of his Murder of the Innocents; and one of Saint Cecilia was sold at the sale of St. Yves for six hundred and nineteen francs. M. Ponce has given the date of his death as 1546; but M. Heinecken seems to consider that the date upon the Battle of the Lapithæ was about the period at which he ceased to work. Some of his prints are marked with an A. and an M. joined, and others with M. A. F. also joined, the F. being used in consequence of the cognomen La Francia having been given to him from his successful study under Raibolini; and some are marked with the tablet mentioned by M. Heinecken.

The works of Marc Antonio are exceedingly numerous. A very copious catalogue of them is given in the work of the last-named author, which extends to a hundred and twenty-five pages. Mr. Bryan observes, that in the prints of this eminent artist great attention should be paid to the different impressions of the plates, which have been greatly retouched and altered by the different printsellers through whose hands they have passed. The best impressions are without the name of any publisher. After the plates were taken from the stock of Tommaso Barlacchi, they came into the possession of Antonio Salamanca; afterwards they passed through the hands of Antonio Laferri, from thence to Nicholas van Aelst, and lastly became the property of Rossi, or De Rubeis, at a time when they were nearly worn out.

In the Print Room of the British Museum there is a very fine collection of the works of Marc Antonio. They amount to about five hundred, the whole of his labours enumerated by Bartsch being six hundred and fifty-two; but it must be recollected that the works of two of his principal pupils, Agostino Veneziano and Marco da Ravenna, are counted with them. Amongst those of the greatest rarity are the Transgression of Adam and Eve; David cutting off the head of Goliah, before the monogram of Marc Antonio was added, a copy of which produced 45*l.* at the sale of the late Sir M. M. Sykes, Bart., in 1824; the Madonna lamenting over the dead body of Christ, called 'La Vierge au bras nud,' from the circumstance of having one arm naked, a print of much value, a copy of which fetched at the same sale 25*l.*, whereas the other print of the same subject, which has the arm draped, engraved also by Marc Antonio, produced only 2*l.*; the Massacre of the Innocents, with the chicot-tree, the Martyrdom of St. Lawrence, a subject mentioned above, a first impression with the two forks, of the estimated value of a hundred guineas, a very inferior copy of which, as to condition, produced at the above sale 46*l.*; the Pest, a proof taken before the letters were engraved, of which only three copies are known to exist; and the Dance of Cupids, a small plate, which, if in good condition, is valued at 60*l.*, a copy of which sold at the sale before alluded to for 57*l.*

There does not appear to be any certainty as to the exact time of the birth of Marc Antonio. M. Heinecken observes that Vasari alone has given us any notice of him. Borghini, Malvasia, and Baldinucci, as well as all the later writers, draw from Vasari all that they say. None of them mention either the year of his birth or death. If however the piece representing Apollo and Hyacinth was engraved by him in 1506, at the age of nineteen years, as the signature would seem to indicate, for the nine only is legible in the impression in the Imperial collection at Vienna, we may infer that he was born at Bologna in 1487 or 1488. (Heinecken, *Dict. des Artistes*; *Biographie Universelle*; Strutt's and Bryan's *Dictionaries*; Bartsch, *Le Peintre Graveur*.)

RAIN. The antients appear to have been very imperfectly acquainted with the constitution of the atmosphere; and Descartes is probably the first who, in attempting to refer meteorological phenomena to their causes, has approached near the hypotheses now generally received; for he ascribes the formation of clouds, snow, rain, and hail to variations of temperature in the upper regions of the air. He supposes that when the coldness in any portion of those regions becomes intense, the subtle matter disseminated among the particles of vapour becoming too weak to keep those particles at a distance from one another, the latter must rush together, and either form small spicular filaments or spherical drops of ice. The superficies of these filaments or drops being supposed to be considerable when compared with their volumes, he conceives that the resistance of the air may be great enough to prevent them from descending by their weight, and that thus a great assemblage of them may remain suspended in the form of a cloud above the earth. The filaments becoming by an accession of heat partially liquefied, it may happen that many of them will adhere together, and thus form flakes of snow, which, at length acquiring sufficient weight to overcome the resistance of the air, descend to the ground. In order to explain the origin of rain and hail, he supposes that the flakes, on arriving near the surface of the earth, may pass through a warmer region than that in which they were formed, and there dissolving, they assume the figure of spherical or spheroidal drops of water. Again, if in the descent the latter should meet a current of cold air, they become globules of ice. (*Meteora*, cap. v., vi.)

The diffusion of the electric fluid through the earth and atmosphere has led some meteorologists to believe that the variations in its quantity or intensity in particular regions may be the cause of the formation of snow, rain, and hail. The electrical particles, being endowed with a great repulsive power, are supposed to keep in general the particles of vapour asunder; and when, from any cause, some given volume of air is deprived of its natural quantity of electricity, these particles unite by their mutual attractions, and thus form drops of rain or ice. From the showers which accompany a thunder-storm, there is no doubt that electricity co-operates in some measure in the production of rain; and it may be remarked in support of the above hypothesis that rain is most abundant among mountains, their elevated summits being favourable for receiving and discharging electricity; while in some regions where thunder is little known there is also little rain.

But the theory first proposed by Dr. Hutton of Edinburgh (*Phil. Trans.*, Edin., 1784) is that which appears to correspond most satisfactorily to the observed phenomena of the atmosphere; and accordingly it has been adopted by nearly every distinguished meteorologist since that time. This theory will be briefly described.

The atmosphere surrounding the earth is known to consist of air and aqueous gas or vapour, both of which are elastic; and, according to the experiments of M. Gay-Lussac, the elasticity of the vapour is equal to that of the air at an equal temperature, both when the vapour exists alone, and when it is combined with the air; hence it is inferred that in the atmosphere the vapour and air are in mechanical union only, and also that the particles of the former have the power of moving freely in the intervals between those of the latter. The atmosphere is supplied with humidity by evaporation from the waters of the earth, and its power to hold the water in solution depends on its temperature, an increase of the latter augmenting that power, and a decrease diminishing it: but in the theory of Hutton, the diminution of the power takes place in a higher ratio than the diminution of the temperature.

Now the quantity of moisture in the atmosphere will at all times be nearly equal to the greatest quantity that can be maintained in it in a state of vapour at the existing temperature. Therefore if two volumes of air thus saturated with moisture, but of different temperatures, become by any means mixed together, a mean degree of heat results from the union; but the whole quantity of moisture in the sum of the volumes of air will, agreeably to the theory, be greater than that which is due to the mean temperature, and the excess will of course be condensed or precipitated. The vapour so condensed forms a cloud; and if this be specifically heavier than the air in which it is formed, it will begin to sink. Should the atmosphere near the earth be less dense than the cloud, the latter will continue to descend till it touches the ground, when the aqueous particles, if small, will form what is called a mist; or if large, and particularly if the condensation of the vapour has been rapid and copious, they will descend by their gravity in rain, snow, or hail, according to the temperature of the region through which they pass. It may happen however in the descent that a cloud arrives in a warmer region than that in which it was formed; in this case the condensed moisture may again become vapour, and the cloud may re-ascend to a region at which a new condensation takes place. But though it be true that some precipitation must follow, whatever be the difference between the temperatures of the two volumes of air, yet unless the mean of the two quantities of vapour should be greater than the quantity necessary for complete saturation at the mean of the two temperatures, the precipitation will not be perceptible in the form of rain.

In order to illustrate the general subject of clouds and rain, Mr. Daniell, in his 'Essays on the Constitution of the Atmosphere,' supposes, first, that the earth is a sphere of uniform temperature, and surrounded by an atmosphere of dry and permanently elastic fluid; and he shows that on this supposition the density of the air would diminish in a geometrical progression at elevations increasing by equal increments. He observes also that the temperature would decrease with the densities, and that the atmosphere would be constantly in equilibrio. This would continue to be the case if the general temperature of the sphere were to be increased, provided that increase were uniform at all points on its surface. Now, if the temperature of the sphere, instead of being uniform, were supposed to increase from the poles towards the equator, the unequal densities produced in vertical columns of the air by the differences of temperature at equal heights above the surface of the sphere, would give rise to lateral pressures which, in the lower strata, would produce currents tending from the poles towards the equator; but the elasticity of the air, which is constant near the surface of the sphere, varies with the height above that surface, according to such a law that, beyond a certain elevation, it would produce lateral pressures exceeding those which arise from the density in the neighbouring columns at equal altitudes, and thus there would arise a current in the upper regions flowing continually from the equator towards the poles.

He supposes next that the sphere is covered with water everywhere of equal temperature, and is surrounded by an atmosphere of pure aqueous vapour; and he shows not only that the density of this vapour would diminish upwards according to the law before mentioned, but that the atmosphere would in this case also be in equilibrio and transparent even when the general temperature of the sphere experiences a uniform increase. But if the temperature of the sphere were to increase as before, from the poles towards the equator, the density and elasticity of the vapour varying also with the temperature, there would arise by evaporation at the equator a current tending from thence to the poles, and this, being condensed in its course, would return from the poles towards the equator in the form of water. The condensation thus going on would cause the atmosphere to be constantly charged with clouds and rain. Unless however the excess of temperature at the equator were maintained by some foreign power, as solar radiation, the temperature over the whole sphere would by degrees become equalised; the equatorial parts becoming cooled by evaporation, while the polar regions would become warmed by the condensation.

Mr. Daniell afterwards contemplates an atmosphere consisting of a permanently elastic fluid mixed with aqueous vapour, and surrounding a sphere of water of uniform temperature; and he observes that, since the evaporation would be slow, the small quantity of water precipitated would be almost immediately dissolved by the superior temperature of the stratum below, into which it would tend to fall; therefore this atmosphere would be free from clouds. But in the event of the temperature of the sphere increasing from the poles to the equator, the evaporation in the latter region would destroy the regular gradation of temperature in the atmosphere from the surface of the sphere upwards; the evaporated water rising to the middle regions would there, in consequence of the diminished temperature, give out its latent heat, and become condensed; then descending, it would acquire from below a new portion of heat, with which it would rise till it was again forced to part with its caloric. This process may be supposed to continue till those regions of the atmosphere become saturated with vapour, and at the same time rarified by the heat. The rarefaction of the air would diminish its resistance to the general movement of the vapour towards the poles, and thus the vapour would rush with force in those directions; but on arriving in latitudes at which the temperature is too low to allow the air to hold it in solution, condensation would take place, and clouds would be formed.

The circumstances just mentioned correspond nearly to those which would take place about the earth if local and other accidental circumstances did not interfere with the general process. In its actual condition, when a column of air vertically over any place is from any cause heated more than the neighbouring columns, it begins to ascend by its diminished specific gravity, the colder air of the vicinity flows in to fill up the void, and thus the relation between the temperature and humidity at the place is deranged. Then, agreeably to the general theory of Dr. Hutton, a precipitation of the vapours takes place.

In proportion to the density of the vapour, the magnitudes of the condensed particles of water are greater; in the upper regions of the air the cloud assumes a light appearance, but below it is more dark. After their formation, the clouds are driven about by the winds, receiving new accessions of precipitated vapour till the air is no longer capable of supporting them, and then their substance descends in rain, snow, or hail.

On the supposition that the surface of the earth is without inequalities, and that the temperature gradually diminishes from the equator towards either pole, it should follow that the rarefaction of the air and the evaporation of the water, and consequently the quantity of rain, must diminish according to some law with the distances of places from the equator. Now the mean temperature in any latitude being known, the quantity of moisture in the atmospherical column at that latitude can be found, since it depends on the temperature; hence knowing also the variations to which the temperature of the atmosphere at the place is subject in the course of the year, the mean annual depth of rain in that latitude may be computed. On such principles Humboldt has determined that the mean annual depth of rain should be, at the equator, 96 inches; in lat. 45°, 29 inches; and in lat. 60°, 17 inches. The circumstances however which render the temperatures in different latitudes, and even on the circumference of the same parallel, irregular, must produce irregularities in the quantities of rain which fall at different places; yet the results of observation show that, in proceding from the equator towards the north pole, there is in reality a diminution in the mean annual quantities of rain.

From an average of the observations made during fourteen years (1810 to 1823 inclusive), the mean annual depth of rain on the Malabar coast is 123·5 inches, and the mean annual temperature is 80·4° (Fahrenheit), but the annual depths of rain are very irregular and differ considerably. From a mean of observations for seven years (1817 to 1823 inclusive), the mean annual depth of rain at Bombay was only 85·24 inches. From a mean of observations during seventeen years (1802 to 1818 inclusive), Mr. Dalton makes the mean annual depth of rain at Manchester equal to 33·596 inches, the mean annual temperature being 47·6°; and here also the annual quantities of rain vary very irregularly. The same meteorologist estimates the average of the annual quantity of rain in England to be 31·3 inches; the greatest quantity being at Keswick in Cumberland (=67·5 inches), and the least at Upminster in Essex (=19·5 inches); but it is supposed that this estimate of the mean quantity is higher than the truth, because too many of the observations were made in the maritime counties, where the atmosphere may be expected to be the most humid. In regions where the trade-winds blow constantly, rain seldom falls; and the reason may be, that both the temperature and the currents of air being there nearly uniform, the vapours raised from the ocean are carried about the earth without suffering those partial accumulations by which condensation and precipitation might be produced. But elsewhere the irregular distribution of land and water, the existence of mountain-chains, and even the various capacities of different parts of the earth's surface for absorbing or communicating heat, independently of variations in the electricity of the air, are to be considered as the most frequent causes of perturbation in the general currents of the atmosphere, and consequently of the fall of rain.

The dense mists which rest on the ocean near Newfoundland are precipitations caused by inequalities in the temperature of the ocean in the line of the *Gulf stream*. In the year 1821, in consequence of very strong winds between the tropics during the summer having caused an extraordinary difference between the levels of the waters in the Gulf of Mexico and those of the Atlantic Ocean, the stream of warm water was found to extend eastward of the Azores; and it deserves to be remarked that this unusual circumstance was attended, both in France and in England, by a very hot and damp winter, together with an excessive fall of rain. (Sabine, *Experiments on the Figure of the Earth*, 1825.) The rains which frequently deluge the tropical islands are in part produced by the volumes of air which are intermingled by the sea and land breezes; and those which fall at the time of the summer solstice in Africa may be ascribed to the immediate precipitation of the vapours which flow from the seas to supply the place of the rarefied air above the heated lands: while the drought which prevails in the sandy deserts of that quarter of the earth is explained by the level character of those deserts, over which the currents of air may be supposed to flow nearly without interruption.

From April to October, the winds blowing from the south-west towards the coast of Malabar are accompanied by heavy rains, and the circumstance may be accounted for by the vapours of the ocean being brought from a warm region to one which is less so, and consequently becoming there condensed and precipitated. On the other hand, the prevailing winds on the coast of Peru, being from the south and south-west, come from a cold to a warmer region; consequently a diminution of the degree of saturation must there take place, and the vapours remain suspended; accordingly it is found that rain seldom falls on that coast. The clouds which overhang the coast of Malabar during the monsoon above-mentioned are arrested by the chain of the Ghauts, and while it rains on the western side the fair season is enjoyed on the coast of Coromandel. Again, the currents of air which pass over Peru, in crossing the chain of the Andes, where the temperature is lower, become condensed by the cold, and the rain is there precipitated in abundance. The vapours which come from the Atlantic ocean, and pass over the south-western counties of England, must be more abundant than those which arrive there from the continent of Europe; and from observations made at Penzance, the rains which accompany the westerly winds at that place exceed those produced by the easterly winds in the ratio of about three to one.

In tropical regions the quantities of rain which fall in different months of the same year are very unequal: at Bombay the mean monthly depth in June was found to be 24 inches, and in October, 1·26 inches. In temperate climates the quantities differ much less, but more rain falls during the second half year than during the first. The means of observations continued during 40 years at London give, for the depth of rain from January to July inclusive, 8·539 inches, and from July to December inclusive, 12·147 inches.

In general the lowest stratum of air about the earth contains the greatest quantity of water in solution; and hence it might be expected that more rain should fall on low level plains than in elevated countries. The contrary however is the fact: and this may be accounted for by the variety of currents among mountains, and by clouds resting frequently on the summits of hills without descending to the plains. While the average annual depth of rain at Keswick is 67·5 inches, in the interior of the country and on the sea-coast it is but 25 inches: and while the average depth on the St. Bernard is 63·13 inches, that at Paris is 20 inches only. Yet, from the observations of Dr. Heberden, Mr. Howard, and M. Arago, it appears that the depth of rain on the level of the ground is greater than at the top of a building. The first of these philosophers found that the annual depth at the top of Westminster Abbey was 12·099 inches, while at a lower level, on the top of a house in the neighbourhood, it was 18·139 inches; and on the ground, in the garden of the house, it was 22·608 inches. M. Arago observed, from observations during twelve years, that on the terrace of the Observatory at Paris the annual depth was 50·471 centimetres (19·88 inches), while in the court of that building, which is 28 metres (30 yards) lower, the annual depth was 56·371 centimetres (22·21 inches).

Mr. Howard has observed that, in this country, when the moon has south declination there falls but a moderate quantity of rain, and that the quantity increases till she has attained the greatest northern declination; and on some such results of observation the popular opinion that there is a connection between the alternations of rain and fair weather and the changes of the moon may be founded. Our knowledge of the variations to which the temperature of the air is subject, is however yet too imperfect to allow much dependence to be placed on predictions relating to the weather which are formed from the moon's phases, or even from variations in the state of the barometer or hygrometer.

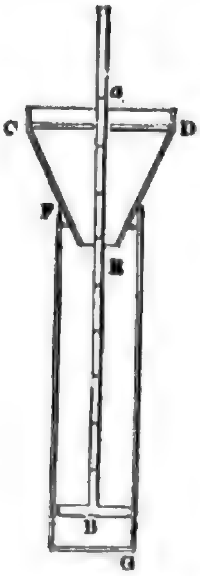
RAIN, FOSSIL. Singular as may appear the notion that the impressions of rain should be recognisable and be recognised on the surfaces of stratified rocks, the opinion is held by some eminent geologists, on the evidence of specimens of new red-sandstone taken from the Storeton Quarries near Liverpool. In March, 1839, Mr. Cunningham, to whose researches in the Storeton quarries we are indebted for much of our knowledge of the foot-prints of Cheirotheria and other antient animals, communicated a paper on the subject' to the Geological Society of London. 'In examining some of the slabs of stone extracted at the depth of above 30 feet, Mr. Cunningham observed that their under surface was thickly covered with minute hemispherical projections, or casts in relief, of circular pits in the immediately subjacent layers of clay. The origin of these marks, he is of opinion, must be ascribed to showers of rain, which fell upon an argillaceous beach exposed by the retiring tide, and their preservation to the filling up of the indentations by sand. On the same slabs are impressions of the feet of small reptiles, which appear to have passed over the clay previously to the shower, since the foot-marks are also indented with circular pits, but to a less degree, and the difference Mr. Cunningham explains by the pressure of the animal having rendered these portions less easily acted upon.' If these impressions on the clay be really the marks of rain or hail (a specimen is before us, and it certainly resembles such impressions on clay), perhaps the easiest way of comprehending the preservation of them is to suppose dry sand drifted by the wind to have swept over and filled up the foot-prints, rain-pits, and hollows of every kind which the soft argillaceous surface had received. (*Geological Proceedings*, 1839.)

RAIN-GAUGE, a vessel for measuring the quantity of rain which falls on any particular part of the earth's surface, the quantity being indicated by the depth of the precipitated water which would cover the ground about the spot, supposing the ground to be horizontal and that the water could neither flow off nor penetrate into the soil.

In order to ascertain the quantity of rain which has fallen during the continuance of a shower, it might suffice to place a prismatical or cylindrical vessel, open at the top, in a horizontal position on the ground or on the top of a building, and, when the shower has ceased, to measure the depth of the water in the vessel by a scale of inches. But, unless the depth were ascertained immediately, a portion of the water would be carried off from such a vessel by evaporation, and the measure would be less than it ought to be. The difficulty also of ascertaining the true amount of a small depth of water would render the instrument of no practical use. For the purpose therefore of obtaining a more correct estimate of the quantity of rain, it has always been the practice to receive the water in a second vessel, or in a tube, the area of whose horizontal section is less than that of the first, so that the height of the column may be greater. And, since the heights of equal quantities of water in two prismatical or cylindrical vessels are inversely proportional to their bases, it is easy to perceive how a rod may be graduated so as to show, in inches, the depth of water in the upper vessel, and consequently the depth which would have lain on the ground if no absorption had taken place.

Originally this instrument, which has been called indifferently udometer (*ὕδωρ* and *μέτρον*), pluviometer (pluvia), and ombrometer (*ὄμϐρος*, rain), was nothing more than a prismatical box, having a square base, open at the top and communicating with a prismatical box, placed vertically under it, by means of a pipe open at both ends; the area of a horizontal section of the lower box being, for the reason above given, less than that of the upper box. But it is evident that a prismatical or cylindrical vessel must retain, by adhesion to its sides and bottom, a sensible portion of the water which enters it; and consequently the depth measured in such vessel must indicate a quantity of rain less than that which has really fallen; it has therefore been customary of late to make the upper part of the vessel in the form of a funnel, or inverted cone.

The most general construction of a rain-gauge is shown in the subjoined diagram, which represents a vertical section of the instrument. The part CDE is a conical funnel, open both at top and bottom, and the lower extremity enters into the cylinder FG below, which thus receives the rain from the funnel. The rod AB passes through a perforation in a bar CD (in the direction of a diameter of the cone at its upper surface), and is attached, at B, to a circular piston, which has nearly the same diameter as the interior of the cylinder: the weight of the piston and rod is such as to allow the former to float with its upper surface on a level with the surface of the water; and the graduations, which are numbered towards B, commence from a point *a* on a level with the upper surface of the bar CD, when the piston B touches the bottom of the cylinder. A rim, of a cylindrical form, rises a little way above the upper extremity of the conical part of the funnel, in order to prevent the rain-water, which would strike the interior of the latter near that extremity, from being thrown out in consequence of the shock.



The diameter of the funnel at the top may be 12 inches, and that of the cylinder six inches; in which case the area of the horizontal section on which the rain falls will be to that of the cylinder in the ratio of four to one. Hence a depth of water equal to one inch at the horizontal section will be expressed by a space equal to four inches on the length of the rod; and, each of such spaces being divided into 100 parts, the depth of water at the said section will be indicated in hundredths of an inch. The height of the cylindrical vessel below the funnel may be from 25 to 30 inches.

For the sake of diminishing the evaporation and of measuring small quantities of rain with greater precision, the diameter of the cylinder is sometimes reduced to two inches, and the collected water is, by means of a small pipe, inserted in the bottom of the cylinder, and furnished with a cock made to pass into a glass tube whose interior diameter is half an inch. In this case, the diameter of the upper extremity of the funnel being the same as before, the area of the surface which receives the rain from the atmosphere will be to the area of a horizontal section of the glass tube as 576 to 1. Consequently a shower of rain whose depth on the ground might be one-hundredth part of an inch would be indicated by 5·76 inches in the tube.

The funnel of the cylinder may be of tin or copper, and, however the instrument be constructed, it is evident that it should be placed in a vertical position in some place where no object may interfere with the free descent of the rain into the funnel. It is usual to observe the quantity of water in the vessel every morning, if rain has fallen during the preceding twenty-four hours; but, as some evaporation will take place, it would be advantageous to make the observations more frequently.

The sum of all the depths observed during any period of time, as a day, month, or year, will give the whole quantity of rain which has fallen in that time at the place. It is supposed that the rain falls uniformly over the tract of ground lying within the limits of the shower, and consequently that the quantity which passes through the circular area at the upper surface of the cone is equal to that which falls upon an equal area of ground anywhere within those limits.

A rain-gauge can never serve further than to give an approximation to the quantity of rain which may have fallen, since some of the water will always adhere to the sides of the vessel, but the following method of ascertaining the allowance to be made for the quantity thus lost has been recommended:—Let a sponge be made damp, yet so that no water can be squeezed from it, and with this collect all the water which adheres to the funnel and cylinder after as much as possible has been drawn off; then, if the sponge be squeezed and the water from it be received in a vessel which admits of measuring its quantity, a near estimate may be made of the depth due to it; and this being added to the depth given by the instrument would probably show very correctly the required depth of rain.

RAINBOW, a circular arch of variously coloured light which is visible in the heavens when the sun or moon is shining, and when, at the same time, a shower of rain is falling on the opposite side of the spectator. When the rain is abundant, a second bow is commonly seen on the exterior, and concentric with the first; their common centre being in a line drawn from the luminary through the eye of the spectator and produced towards the opposite part of the heavens. Both bows consist of concentric bands of the different prismatic colours arranged as they appear in the solar spectrum, but the order in which they are disposed in the first bow is inverted in the second. The lower edge of the interior bow is violet and the upper edge is red; on the contrary, the lower edge of the exterior bow is red and the upper edge is violet.

The rainbow is a phenomenon which appears at all times to have been understood to depend upon the light of the sun or moon and the drops of falling rain, but the first complete explanation of the circumstances connected with it is due to Newton (*Optices*, lib. i., p. 2, prop. 9). In the beginning of the sixteenth century no better notion was entertained of the cause of the phenomenon than that the interior bow was a distorted reflection of the sun's image from the surface of a cloud, and that the exterior bow was a reflected image of the first. But the reflection of light is not capable of producing different colours, and it is said that Fleischer of Breslau (1571) was the first who entertained the idea that the particles of light from the sun entered into the drops of rain. His opinion was that a ray of light suffered one refraction on entering and another on leaving a drop; and that it entered the eye of the spectator after reflection from the surface of a second drop. It appears that Kepler, in a letter to Harriot (1606), suggested that the particles of light, in a ray which is a tangent to some part of the surface of a drop of rain, might enter the drop by refraction, and that this ray, being subsequently reflected at the interior surface of the latter, might enter the eye of the spectator after being again refracted on leaving the drop. The hypothesis is worthy of Kepler's sagacity, and, as far as it goes, it differs from the fact only in the manner in which the incident ray is supposed to fall on the drop. Newton ascribes the first idea of the true explanation to Antonio de Dominis, bishop of Spalatro, whose work, 'De Radiis visûs,' was published in 1611, but is said to have been composed in 1590; the work however appears to have been so obscurely written and to betray so much ignorance of the laws of optics, that it is doubtful whether or not the author had any more than a vague conception of the cause of the colours. (See Montucla, *Histoire des Math.*, tom. ii.)

Descartes is certainly the first who has distinctly explained the causes by which the two bows are produced, and he states (*Meteora*, cap. viii.) that he detected those causes on observing the phenomena presented by a glass globe filled with water, which he placed in various positions with respect to the sun. He shows that the interior or primary bow is produced by rays from the sun falling upon the drops of rain near their upper surfaces, where, being refracted, they pass to the side of the drop which is farthest from the sun and spectator; from thence they are reflected towards the lower surface, and, on quitting the drop, they suffer a second refraction. He shows also that the exterior or secondary bow is produced by rays from the sun falling upon the drops of rain near their lower surfaces, where, being refracted, they pass, as before, to the farther side of the drop; from thence they are reflected towards the upper surface, and there they suffer a second reflection. After this they pass to the side of the drop which is nearest to the sun, and from thence they emerge after a second refraction. Now it is not sufficient that the pencils of light which are incident on the drops of rain should be so refracted and reflected; it is moreover necessary that each pencil on emerging from the drop should consist of parallel rays of light, that, when it enters the eye of the spectator, it may produce in the mind the perception of brightness; and Descartes determined by computation the positions of the incident and emergent rays so that this effect may be produced.

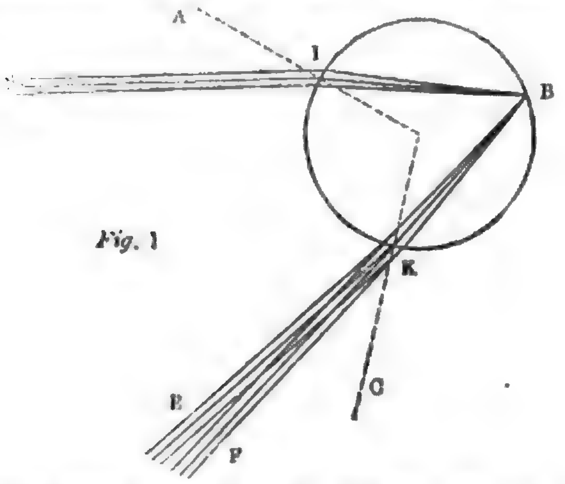


Fig. 1

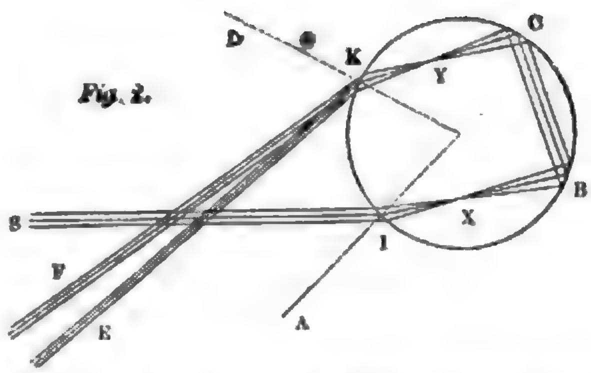


Fig. 2.

Thus, let SI (*fig.* 1) be a very slender pencil of rays of some one colour incident on a spherical drop of water at the angle AIS, and let this angle be such that the rays in the pencil may, by the laws of refraction in water, converge at B: then, though many rays will pass through the drop at that point and be dispersed, yet many will be reflected from thence as from a radiant point, and will emerge at K in parallel directions, as they entered at I, so that if KE be the direction of the emergent pencil, the angle CKE will be equal to AIS: the angle made by the lines SI and EK produced was found by Descartes to be about 42 degrees. If the angle AIS were varied, the rays of the pencil would leave the drop in a divergent state, and then the impression which they would make on the eye might be too feeble to produce the sensation of brightness. Again, let SI (*fig.* 2) be a very slender pencil of rays of some one colour incident on a spherical drop of water at the angle AIS, and let this angle be such that, by the laws of refraction in water, the rays after crossing at X and being reflected from B may pass from B to C in parallel directions; then, after a second reflection, crossing at Y and being refracted at K, they will emerge in parallel directions as they entered at I, so that if KE be the direction of the emergent pencil, the angle DKE will be equal to AIS: the angle made by the lines SI and EK was found by Descartes to be about 52 degrees. If the angle AIS were varied, the rays of the pencil would leave the drop in a divergent state.

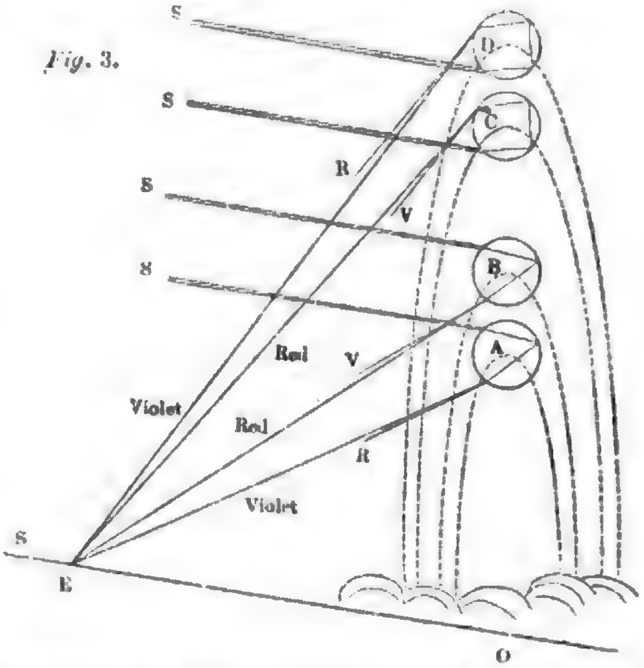


Fig. 3.

Now let A, B, C, D (*fig.* 3) be four globules of rain in a cloud covering a considerable part of the heavens on one side of the horizon. Let E be the eye of the spectator, and, on account of the remoteness of the sun, let the rays of light which proceed from his disk be considered as parallel to one another. Let SE be a line drawn from the sun through the eye of the spectator, and let it be produced towards O; also let SA, SB, &c. be very slender pencils of parallel rays (supposed at present to be of one colour) falling upon the globules of water. Let the refraction and reflection of these pencils in A and B be similar to those which are shown in *fig.* 1; and the refraction and reflection in C and D be similar to those in *fig.* 2: also from the points of emergence suppose lines to be drawn to E. It is evident, on account of the parallelism of the lines SO, SA, &c., that if the angle AEO or BEO were nearly equal to 42°, and if the angles CEO or DEO were nearly equal to 52°, the eye would be affected by the sensation of brightness as explained above; therefore if the lines AE, BE, &c. were to revolve conically about EO as an axis, all the globules of rain upon the conical surfaces so described would send pencils of parallel rays to the eye, and two concentric arches of bright light would be seen in the heavens. This hypothesis accounts satisfactorily for the existence of two concentric bows of bright light, but it affords no indication of the bands of colours of which they consist. Descartes however very sagaciously refers their cause to the decomposition of light on entering and quitting the drops of rain; observing that the convex surfaces of the latter must produce effects similar to those which take place when light is made to pass through the plane faces of a triangular prism of water.

But when Newton had discovered the different degrees of refrangibility in the different coloured rays which compose a pencil of white or compounded light, he was able to assign immediately the cause of the coloured bands in the rainbow, the order of their position, and the breadth which they must occupy. Thus, if the incident pencil SI (*figs.* 1 and 2) had consisted only of violet-coloured light (for example), the angle AIS must have had that particular value which alone would allow the rays of the emergent pencil to be parallel to one another; but if the incident pencil were supposed to consist of light of another colour, as red, it should have fallen nearer to the centre of the drop, in order that the angle AIS might have the particular value which would allow the rays of the emergent pencil to be parallel to one another. Since the red rays suffer less refraction than the violet rays, if KE be the direction in which the latter emerge from a drop, KF in both figures may represent the direction in which the former would emerge; and if the eye be situated so as to receive the pencil KE, it would have the impression of a violet colour; while, if situated so as to receive the pencil KF, it would have that of a red colour. We have mentioned, for simplicity, only the violet and red rays, which form the two extremes of the coloured spectrum; but it is easy to conceive that a like explanation might be given for rays of the intermediate colours. And since the pencils of all the different colours diverge from one another on quitting a rain-drop, it is evident that the spectator whose eye receives one of the pencils will be affected by the colour of that pencil only, the other pencils passing either above or below his eye.

Newton has determined by computation that when the angle AEO (*fig.* 3) = 40° 17′, the violet rays alone, after two refractions and one reflection, will enter the eye of the spectator at E, the other rays falling below; and when ∠ BEO=42° 2′, the red rays alone will enter the eye, the violet rays passing above. Again, when ∠ CEO=50° 59′, the red rays only will enter the eye, after two refractions and two reflections, the violet rays falling below; and when ∠ DEO=54° 9′, the violet rays alone will enter, the red passing above. If the interval between the drops A and B, and also between the drops C and D, were occupied by other drops, it may readily be imagined that the pencils of parallel rays which come from them to the eye would be of all the prismatic colours between the red and violet, and that thus there would appear in the heavens two narrow spectra: the length of that between A and B would be 1° 45′, and of that between C and D would be 3° 10′. Therefore, if all the lines drawn to E from the drops in the two spectra were to revolve conically about EO as an axis, the drops on these lines would be in situations to send to the eye rays of their own proper colours, and thus there would exist the appearance in the heavens of two concentric bands of variously coloured light.

But it has been here supposed that the pencils SA, SB, &c. come from the centre only of the sun's disk, whereas each point of the disk produces two bows similar to those which have been described: therefore the lower extremity of the interior bow will be a violet band whose breadth is equal to half the diameter of the sun (suppose 15′), and which is situated immediately below the violet line formed by the centre of the disk; and in like manner the upper extremity of the interior bow will be a red band whose breadth is also = 15′, and which is situated immediately above the red line formed by the centre of the disk: consequently the whole breadth of the interior bow is about = 2° 15′. Similarly 30′ (the measure of the sun's diameter) must be added to the breadth of the outer bow, as before determined, which thus becomes about = 3° 40′. In both bows, the colours between the violet and red are less distinct than those two colours, because of the interference of the coloured light from all parts of the disk.

On account of the two reflections which take place in the interior of the drops which give rise to the outer bow, while there is but one reflection in those which produce the inner bow, there must be a greater quantity of light lost by transmission through the drops in the former case than in the latter; and hence the outer bow is always fainter than the other. The interval between the primary and secondary bow has occasionally been observed to be occupied by an arch of coloured light; but this, which is not always concentric with the others, has been ascribed to some reflection of one of those bows.

A rainbow can never be greater than a semicircle, if the spectator be not on elevated ground; for if it were, the centre of the bow would be above the horizon, and the sun, which is in a line drawn through that centre and the eye, would then be below the horizon; but, in this case, the sun could not shine on the drops of rain, and consequently there would be no bow. When the rain-cloud is of small extent, there is seen only that portion of the bow which the cloud can form: yet the bow is sometimes seen against the blue sky, when there exist in the air vapours which are not dense enough to be visible in the form of a cloud; and a portion of a bow has occasionally been seen in an inverted position on the ground by the refraction of the light in drops of rain adhering to the grass or the leaves of trees. It may be added that a coloured bow similar to that which is produced by rain may be observed in the spray from a fountain when the jet of water is agitated by the wind, and also in the mists which at times lie upon low grounds.

The lunar rainbows appear in general white: and when they are coloured, they differ from those produced by the sun only in the colours being much more faint.

The circle of light which is occasionally seen surrounding the sun or moon at some distance from the disk of the luminary, is called a *halo* or a *corona*, and is caused by the refractions of light in particles of ice which float in the air. This phenomenon having some resemblance to that which has been just described, a brief explanation of it may be with propriety introduced in this place.

The cause of the halo was first investigated by Descartes, who observes (*Meteora*, cap. ix.) that this phenomenon differs from the rainbow, inasmuch as the latter is seen only while rain is falling, whereas halos are never seen at such times; and he ascribes their formation to refractions of light in star-shaped crystals of ice, which he remarks are thicker in the middle than at the edges, and are therefore proper to produce refractions.

Sir Isaac Newton also ascribes the halo to refraction in floating hail or snow; but it appears that Mariotte (in 1686) was the first who considered it to be produced by refraction in the small equilateral prisms of ice which abound in the air in a separate state before they unite together and form the flakes which descend during severe frosts; and Dr. Young, without being aware of Mariotte's hypothesis, entertained and developed the same idea.

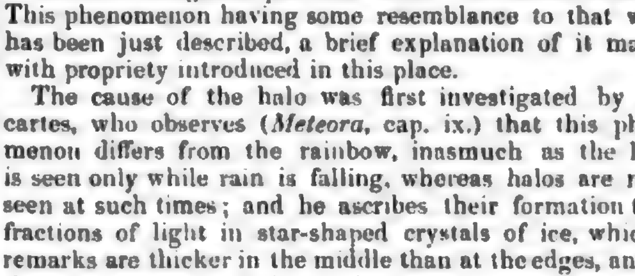


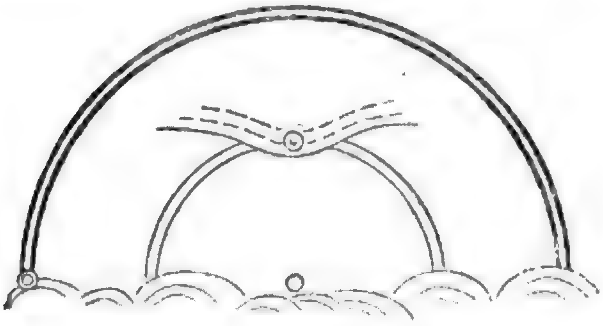
Fig. 4.

According to this philosopher, there may be in the air an immense number of prismatic particles whose transverse sections are equilateral triangles, the planes of the sections deviating but little from one passing through the sun or moon and the spectator. Now, by the laws of refraction in water, when a pencil consisting of parallel rays of light, as SI (*fig.* 4), is incident on a face of such prisms, and makes the angle of incidence SIP equal to about 41° 50′, the axis KE of the emergent pencil will make an equal angle EKQ on the other face, and the angle of deviation SAF, or the angle between the incident and emergent ray will be 23° 40′. Therefore if the line FE produced to the spectator's eye were to revolve conically about a line joining the sun and spectator as an axis (which line, since the sun is very remote, may be considered as parallel to SA), all the prisms similarly situated on such conical surface would transmit to the eye pencils of parallel rays, if the light were of one colour, and thus there would be produced the perception of a bright circle in the heavens, having the sun for its centre; its radius subtending at the eye an angle of about 23° 40′. The angle SAF varies very slowly, the variation amounting only to about 3°, when the angle SIP varies as much as 30° consequently there may be innumerable prisms in the air in such positions that the angle SIP, for pencils incident upon them, does not vary more than 15° on either side of that which has been above supposed; and these will transmit to the eye light in such abundance as to produce the appearance of an annulus about 3° broad. This is the appearance of the common halo. Dr. Young supposes further, that when there is a very great number of particles of ice so formed, the rays, after being refracted through one prism, may fall on another and there suffer a like refraction. This would produce the appearance of a second circle concentric with the former, and at twice its distance from the sun; thus there might be produced at one time two haloes, of which the distance of the exterior from the sun would be above 47 degrees.

The parhelia which sometimes appear above or below the true sun, are supposed to be produced by the refractions of light in equilateral prisms of ice, when such prisms happen to be very short, so as to have the form of thin triangular plates, and when the flat sides are in or near a vertical plane passing through the sun and spectator. A great number of such prisms would, by refracting the light as above shown, give rise in the halo to the appearance of a bright spot resembling the true sun, and in a vertical line passing through it; and, if the prisms in such positions have a certain length, the image of the sun would be distorted, and might assume the appearance of being winged. The horizontal parhelia are accounted for in a similar manner. Sometimes false suns (*anthelia*) appear on the side of the heavens which is opposite the true sun; and these are supposed to be produced by two refractions and two internal reflections in such prisms of ice. In this case the images ought to be 60° beyond the halo; that is, they ought to be about 83° from the true image of the sun.

Subjoined is a sketch of the double halo with parhelia, which was observed by Sir Henry Englefield at Richmond in 1802. (Young's *Nat. Phil.*; and *Journal of the Royal Institution*, vol. ii.)

Fig. 5.



RAISIN, or RAISEN, MARKET. [LINCOLNSHIRE.]

RAISINS. The dried fruits of several varieties of the vine are called raisins, a term derived from the French, raisin in that language being a general name for grapes, the dried fruit being distinguished as *Raisins secs ou passés.*

Raisins are named after the countries where they are produced, or the places whence they are imported; as Malaga, Valencia, and Smyrna. The peculiar small and generally seedless grapes, formerly called Corinths, are now better known as the dried or Zante currants of the shops. Other denominations by which different kinds of raisins are distinguished, arise from the variety of grape employed, or from the mode of preparation; as muscatels, blooms, sultanas, raisins of the sun, and lexias.

The most simple, and, when circumstances are favourable, the best mode of preparation is to dry the grapes, after being cut when fully ripe, by exposure to the heat of the sun on a floor of hard earth or of stone. Another method is to cut the stalk half-way through when the grapes are nearly ripe, and leave them suspended till the watery part is evaporated; the flow of sap is in a great measure prevented from entering the fruit, in consequence of the incision, and whilst evaporation continues to go on undiminished, desiccation must take place.

Some sorts are prepared by dipping the grapes in a ley, and afterwards drying them in the sun. This ley is formed of water, wood-ashes, and a small portion of oil of olives. The ashes of vine branches and tendrils are preferred. In Valencia, in addition to the ashes of rosemary and vine branches, a little slacked lime is used. Raisins so prepared are called lexias; whilst those prepared entirely by sun-heat are denominated raisins of the sun.

A fourth method, only used for raisins of inferior quality, is to dry the grapes in an oven.

The currant-grapes are gathered in the end of August and beginning of September. Rains often spoil the crop when they occur at the time of gathering or drying. The fruit, when sufficiently dry, is separated from the stalks by small rakes, and afterwards stored in magazines, '*seraglie*,' constructed somewhat like a lime-kiln, having an opening at top, where the fruit is put in, and a door at bottom, opened only at the time of sale. The fruit is rendered so compact by its own weight, that considerable force is requisite to break it up for the purpose of being packed in the large casks in which it is exported.

The Malaga raisins are esteemed the finest; and the muscatels from thence exceed all others in price by at least one-third. The black Smyrna raisins are those of least value.

Of all the known varieties of grapes, the white muscat of Alexandria is that which furnishes raisins of the finest description. The berries are large, oval, white, rather firm-fleshed, with a rich muscat flavour, superior in this respect to all others that have hitherto been fruited in this country. From the synonyms which it has obtained, its extensive cultivation and use as a raisin grape may be inferred; for example, it is called the muscat of Jerusalem, Malaga, Passé-Musquée, Passé-Longue Musquée, Muscat d'Espagne, &c. There is also a black muscat of Alexandria, and a red muscatel, both of which have a firmness of pulp which renders them fit for drying; for grapes, however rich they may be, and excellent in a fresh state, yet if they do not possess a certain degree of firmness, are unfit for drying, inasmuch as their substance would be too much dissipated in the process.

The variety of grape-vine that bears the small and generally seedless bunches of grapes, which, when dried, become the *Corinths* or *Zante currants* of the shops, belongs to *vitis vinifera*, and is not a distinct species, as it has been by some supposed. This has been proved by plants sent direct from Zante, and which have been fruited in the garden of the Horticultural Society. In a good season it is capable of being ripened against a south wall. The berries have the same size and character as those imported, being small and seedless, except occasionally one that acquires a somewhat larger size and contains a seed; such are even found amongst imported fruit. The variety is figured in the *Hort. Soc. Transactions* (2nd series), vol. i., p. 246. According to M. Beaujour, the first grapes of this variety that appeared in the great marts of Europe were brought at the beginning of the seventeenth century from the Gulf of Corinth, and hence were called *Corinthian* raisins. Latterly however the cultivation has become chiefly confined to the western territories of the Morea and the Ionian Islands, particularly those of Zante, Cephalonia, and Ithaca. The fertile island of Zante is the place where this variety of grape is produced in greatest abundance.

The chief employment of raisins in medicine is to flavour unpleasant mixtures, or for their demulcent properties. In the former point of view they are unimportant; in the latter, of considerable utility. Fresh grapes are cooling, aperient, moderately nutritive, and demulcent. Their use in the south of France is thought to contribute greatly to the amelioration which consumptive persons experience there, and in some instances their effect is so striking as to have given rise to the term *cure de raisins*. The dried fruit is less acid, but more nourishing, and more demulcent. It possesses all the soothing qualities of jujube, and is much cheaper. It may be easily made into a conserve by removing the seeds and beating the pulp into a thick mass. For persons with irritable throats and liable to winter coughs, a portion of this put into the mouth before going into the open air is an excellent protective measure, and often prevents cough, which, when once excited, it is difficult to allay. An excellent demulcent drink is made from a compound of barley and raisins. Currants contain more acid than common raisins, and should be preferred where an aperient action is desired.

An oil exists in the seeds of the grape, in the proportion of 12 pounds of oil to 100 pounds of seeds. Though it is not obtained without difficulty, it is extracted in Italy in large quantity. When heat is used, it has a harsh taste, and is mostly used for burning; but when cold-drawn, it may be used for food.

Tannin of the purest kind may be obtained from the seeds of the grape.

Nearly all the raisins imported into this country are from Spain and Turkey. Of the total quantity imported, 99 per cent. is from these countries, namely, 64 per cent. from Spain, and 35 per cent. from Turkey. A small supply is received from Portugal, Italy, and the Cape of Good Hope.

Malaga and Valencia are the two great Spanish ports of shipment. At the commencement of the present century, Laborde estimated the exports of Malaga at 240,577 cwts., valued at 625,000*l.*, and those of Valencia at 36,500 cwts., valued at 11,800*l.* In 1829 however M. Moreau de Jonnès (*Statistique de l'Espagne*) estimated the total value of fruits exported from Spain at only 300,000*l.* In 1834 the exports of raisins from Malaga consisted of 274,626 boxes and 162,806 barrels, one-half of which were shipped for the United States, and one-sixth for England. Nearly the whole of the supply from Turkey is shipped at Chesmé and Vourla, small ports near Smyrna, the only raisins shipped at Smyrna being the small fine species called sultanas. Chesmé owes its prosperity entirely to this trade; and the Franks go down there in the month of October merely to ship the fruit which is produced in great abundance in the vicinity. Mr. Macfarlane states (*Constantinople in* 1829) that fourteen English vessels, three Austrian, and one American took fruit (many of them whole cargoes) during his stay in the town.

In August, 1834, the import duty on raisins was reduced to 15*s.* per cwt. on foreign, and 7*s.* 6*d.* if from British possessions. The duty had previously been:—from British possessions 10*s.*, foreign sun 42*s.* 6*d.*, other sorts 22*s.* (reduced in 1829 to 20*s.*). In the five years from 1829 to 1833 the old duty produced annually 154,748*l.*; and in the five years following the reduction from 1835 to 1839, the annual average duty amounted to 120,520*l.* The average annual consumption in the United Kingdom, in each of the following periods of five years, was as follows:—1820-4, 138,287 cwt.; 1825-9, 144,141 cwt.; 1830-4, 146,559 cwt.; 1835-9, 160,740 cwt. The consumption of 1839 exceeded any previous year, being 179,335 cwt. Since the reduction of the duty on foreign wines, the use of raisins in this country for making sweet wines has been greatly diminished, and thus the beneficial effect of lowering the duty on raisins is not so apparent as it would otherwise have been.

RAJA is a Sanscrit word, signifying king or ruler, and is the same word as the Latin *rex, reg-is.* In the antient writings of the Hindus the word is applied to all the different kings or princes of Hindustan, and the title is still given to native princes.

RAJAMUNDRY, the name of a district and town of Hindustan, in the presidency of Madras and province of the Northern Circars. [CIRCARS, NORTHERN.]

RAJAST'HAN. [RAJPOOTANA.]

RAJMAHAL, a town of Hindustan, in the presidency and province of Bengal, on the west bank of the Ganges, in 25° 2′ N. lat. and 87° 53′ E. long. Though formerly a large city, and at one time the capital of the province of Bengal, it now consists of little more than a long street of mud huts, some tombs and dilapidated mosques, and the ruins of a vast palace, which was built by the Sultan Sujah, brother of the emperor Aurungzebe, and completed in 1630. In the following year however a fire destroyed the greater part of the town and a considerable part of the palace; and not long afterwards a branch of the Ganges changed its course, and carried away nearly all the houses which remained. The Mogul governor of Bengal was then obliged to transfer his residence to Dacca, and Rajmahal has continued in a state of decay ever since. Its population however is said to be still not much less than 30,000.

RAJMAHAL HILLS, a group of mountains which derive their name from the town of Rajmahal, near which the southern part of them commences: they extend about 60 miles northward along the west bank of the Ganges. They form a detached mass, resemble the greater part of the Welsh mountains both in height and general appearance, and occupy an area perhaps equal to Merionethshire and Caernarvonshire. They are bounded on all sides by a level country, and rise from the flat surface of Bengal as if out of the sea. They are well wooded, and there is much thick jungle, so that they abound in wild animals of all kinds, from the jackal to the tiger, and from the deer to the elephant and rhinoceros.

The Rajmahal Hills, and indeed all the hilly country between Rajmahal and Burdwan, are inhabited by the *Puharrees* (or mountaineers), who appear to be an aboriginal race, differing from the inhabitants of the plain in features, language, manners, and religion. They are easily distinguishable from the Hindus by their long narrow eyes, broadish faces, and flattish turned-up noses; in stature they are rather short, but strong and active. They live chiefly by the chace, in which they use bows and arrows, few of them having fire-arms, and they shoot the larger animals with poisoned arrows. In addition to hides and game, they dispose of wax and honey, in which their hills abound, and they cultivate millet in considerable quantity.

Their language differs very remarkably, both from the Hindustanee and the Bengalee, but is said to bear a striking resemblance to that of the Bheels and the Gonds, so that these tribes are apparently different branches of the same great family, which extends over all the mountainous centre of India. [HINDUSTAN, p. 221.] At some remote period they have probably been driven to these mountain-wilds by the tribes professing the Brahminical faith.

The villages of the Puharrees are very small and wretched, but the inhabitants pay no taxes, and live under their own chiefs under British protection. The men, being chiefly occupied in hunting, dislike work, but the women are industrious in cultivating the little patches of garden round their villages. Each village has a chief, and a number of villages compose a district, over which also there is a chief. Inferior crimes are tried by a jury of five old men in every village; but capital crimes are tried in the presence of the European judge by an assembly of village chiefs presided over by a district chief. Polygamy is not forbidden, but is rare.

The Puharrees have no castes; they care nothing for the Hindu deities; and they have no idols or images of any kind. A black stone, found in the hills, is consecrated by some ceremonies, and used as an altar. Buffaloes, hogs, fruits, fowls, grain, and spirits, are on certain occasions offered up to the gods, and afterwards feasted on. Prayer to 'Budo Gosaee,' which in their language means the supreme God, is strictly enjoined and practised morning and evening. They have several inferior deities, and also some evil ones. They believe that the souls of the good are sent back to earth in the bodies of great men, and those of the wicked in the form of brutes and even trees.

Till within the last sixty years a deadly feud had existed between the Puharrees and the inhabitants of the neighbouring lowlands, and as the former were continually making forays, the Mohammedan zemindars shot them like mad dogs whenever they came within reach. But Mr. Cleveland, having been appointed judge of Boglipoor, rigorously forbade and promptly punished all violence from the zemindars against the Puharrees; he got some of the latter to enter his service, and took pains to attach them to him, and to learn their language; and at last raised a corps of Sepoys from among them, which he stationed at Sicligully. Judge Cleveland died in 1784, in the twenty-ninth year of his age, and a monument was raised to his memory near Boglipoor, at the joint expense of the Puharree chiefs and the lowland zemindars, and was endowed by them with some lands for keeping it in repair. The natives meet once a year, in considerable numbers, and have a handsome 'poojah,' or religious spectacle, in honour of Cleveland's memory. A school has since been re-established by Lord Hastings, for the Puharrees, at Boglipoor, which was originally set on foot by Cleveland, but was shamefully neglected by his successors in office.

(Heber's *Narrative of a Journey through the Upper Provinces of India*, London, 1828.)

RAJPOOTA'NA, an extensive territory of Hindustan, so called because the greater part of it belongs to the Rajpoot princes. It is, to a considerable extent, coincident with the antient province of *Ajmeer. Rajast'han*, or 'the abode or country of princes,' is another name for the same territory. Rajpootana is situated between 23° 45′ and 31° N. lat. and 70° 23′ and 77° 45′ E. long. It is bounded on the north by Lahore, on the north-west by Mooltan, on the west by Sinde, on the south by Guzerat and Malwa, and on the east by Agra and Delhi; but the boundaries are very irregular, and not distinctly defined. Its greatest length, from south to north, is about 480 miles, and its greatest breadth, from east to west, about 400 miles. If estimated as a square, each side would probably be about 300 miles; so that its territory may be reckoned at 90,000 square miles, or about 6000 square miles more than the area of Great Britain.

Rajpootana is divided into eight principalities, besides the Batti country, or Hill States. The principalities are—Jypoor, Kotah, Boondee, Mewar (or Oodipoor), Marwar (or Joudpoor), Tonk, Jessulmir, and Bikanir. The city of Ajmeer, with a small territory surrounding it, belongs to the British.

The great chain of the Aravulli mountains stretches, in a north-eastern direction, through the greater part of Rajpootana, from the hilly country which connects it with the Vindhya mountains almost to the confines of Delhi. [ARAVULLI.] Nearly the whole of the country west of the Aravulli is a sandy waste, extending northward to the Ghurra branch of the Indus, and rising towards the south in a succession of steppes. In this barren territory are comprised the principalities of Marwar, Jessulmir, and Bikanir. A few oases occur, the largest of which are those in which the towns of Joudpoor, Jessulmir, and Bikanir have been built. To the north-east is the country of the Batti, the Hill States, which is separated from Lahore by the Sutledj. It is mountainous to the east, and encroached on by the desert to the west, but that part which is watered by the Gagor is very fertile, and produces corn, rice, sugar, and tobacco. To the east of the Aravulli mountains, and running nearly parallel with them, are the Chitore mountains. [HINDUSTAN, p. 214.] The country between the two ranges, which is from 60 to 100 miles broad, comprises the principalities of Mewar, Boondee, Tonk, and Jypoor. Kotah is on the east side of the Chitore mountains, in a rocky district.

Rajpootana, west of the Aravulli mountains, is for the most part little better than a desert; vast tracts of it consist of nothing but fine sand, on which not a blade of grass grows, and which the winds form into hills, sometimes 80 or 90 feet high, which continually change their form and position, so as to render it dangerous to pass across those parts of the country where they occur. In some places the sand is more consolidated, and mixed with stones, and produces stunted bushes and coarse grass, which affords a scanty supply of pasturage to a few herds of camels and flocks of sheep in the season when the periodical rains occur, which however are of short duration and not abundant. A village is found here and there, consisting of huts made of straw, and surmounted by a conical roof. A few fields surround the huts, and these are enclosed by a hedge of stunted thorns. Nothing can be more wretched than the appearance of these villages and their miserable inhabitants. The aspect of the country somewhat improves as it rises towards the Aravulli mountains on the south-east: the oases become more frequent, and those large ones in which the great towns of Jessulmir, Bikanir, Nagore, and Joudpoor are situated, are tolerably fertile. The whole of Marwar indeed has a better soil and is in a better state of cultivation than the other principalities on the west of the Aravulli mountains, and as good as most parts of those on the east. There are numerous wells for irrigating the land, but as they are very deep, agriculture is expensive. Still the villages are in a good state; the corn looks well; the cotton is as fine as any in India; and the oxen and sheep are large and highly prized. There are no fruit-trees, but the water-melon is in great abundance. The principality of which Joudpoor is the capital is described in the article MARWAR.

Rajpootana, east of the Aravulli range, though its soil is of a similar sandy character to that on the west, is much more fertile and generally better cultivated. The periodical rains are more abundant and continue longer, and wells for the purpose of irrigating the land in the dry season are very numerous. These wells are of two kinds, common draw-wells and 'boolees.' The common draw-wells are often very deep, sometimes upwards of 200 feet. The manner of sinking them is curious, and perhaps the only one which would be practicable in a deep loose sand. A circular hollow tower of masonry, of a suitable diameter, and fifteen or twenty feet high, is constructed, and is left standing for a year or more, till it is well consolidated and set. The sinking of the well is then commenced, and the tower, being undermined, sinks gradually and steadily down, forming the casing of the well. When the top of the tower has reached the surface of the ground, more masonry is added, and thus the sinking proceeds till water is reached. The boolees are square pits, lined with hewn stone, fifteen or twenty feet across, and sixty or seventy feet deep. A flight of broad stone steps at one side descends to the water's edge. On the opposite side, at the top, is a pulley, as in the common wells, to draw up the water by oxen. The steps are used by persons who desire to wash themselves, or who have not rope enough to reach the water from the surface. Many of these boolees are very beautiful, with noble staircases, and with a kind of portico and pillars, richly wrought, as an approach to them. The practice of having steps down to the edge of the water arises from the religious observances of both Mohammedans and Hindus, which make washing an accompaniment of prayer. For irrigating the land the water is drawn up in a large leathern bucket, by oxen, over a rude pulley, and poured by the labourer into the 'gools,' or small channels, by which it is conducted to the fields. For ablution and other purposes an earthen jar is let down by a string from some of the galleries which are constructed on the flight of steps; those who have not this convenience are obliged to go down to the bottom with a skin, and bring the water up on their heads or backs.

The principality of Jypoor, with its capital, is described under JYENAGHUR. The small territories of Boondee and Tonk may be considered as included under the same head. The principality of Kotah, though small, is somewhat larger than the two preceding. It escaped the ravages of the Pindarees through the bravery and talents of the regent Zalim Singh, who by the employment of very limited means made his little territory a sort of Eden amid the surrounding misery which those ferocious robbers occasioned, and his court became an asylum for the unfortunate from every neighbouring principality. The town of Kotah is seated on the Chumbul, a branch of the Jumna, in 25° 12′ N. lat. and 75° 47′ E. long.

Mewar, though mountainous, is tolerably fertile, and produces all kinds of grain, sugar, indigo, cotton, and opium, but not enough of the last to export any. Good pastures are rare, and the cattle are smaller than in the neighbouring districts. Mewar suffered to a dreadful extent from the Pindarees, and has since only partially recovered from the desolation which they occasioned. Oodipoor, the capital of Mewar, is in 24° 34′ N. lat. and 73° 45′ E. long. It is seated in a mountainous district, and is a place of great strength, which can only be approached by three narrow defiles. Chitore, the former capital, having been taken by the Mohammedans, Oodipoor became the residence of the raja, or ranah, as he is called. This Hindu family is one of the oldest and purest in India, and its members have steadily resisted any attempts at intermixture either with Mohammedans or Hindus, always intermarrying with one another. The town of Chitore is situated in a rocky plain, in 24° 53′ N. lat. and 74° 45′ E. long., on the banks of the Bunnass, over which are the ruins of a long, lofty, and handsome stone bridge of eight Gothic arches, and one semicircular one in the centre. Chitore is a tolerably large town, with many pagodas and a meanly built bazaar. There is a beautiful minaret, dedicated to Siva. It is a square tower upwards of one hundred feet high, consisting of nine stories of white marble elaborately and tastefully sculptured, and surmounted by a cupola, the two highest stories projecting like balconies, so that it is smaller at the bottom than the top. A fortress of great strength and considerable extent, including the former palace of the ranah of Oodipoor, is situated on the top of a high rock close to the town.

Ajmeer, in 26° 28′ N. lat. and 74° 42′ E. long., is a moderate-sized town on the slope of a high hill. The houses are well built, and are mostly whitewashed. On the top of the hill is a remarkable fortress called Taraghur, which is a place of great strength, and is in most parts inaccessible. Ajmeer is resorted to by great crowds of Mohammedan pilgrims, who come here to visit the tomb of Shekh Kajah Mowûd Deen, a saint whose miracles are celebrated all over India. Just above the town of Ajmeer is a large lake, which was formed by the emperors of Delhi by damming up the outlet of an extensive valley, into which a number of rills were conducted. The lake is four miles in circumference in dry weather, and six during the rains. It affords the means of irrigation to a large district on its banks, supplies abundance of excellent water to the inhabitants of Ajmeer, and is full of fish. In 1818 the city of Ajmeer, with the surrounding district, was ceded to the British by Dowlet Rao Sindh, in exchange for a part of the territory of Malwa.

The other principal towns of Rajpootana which have not been noticed, are the following:—Bikanir, in 27° 56′ N. lat. and 73° 20′ E. long., a large town surrounded by a wall and ditch. The raja resides in a fort not far from the town, where there is an excellent spring of fresh water. Boondee, the capital of the principality of Boondee, is a small town on the side of a range of hills, on the summit of which is the raja's palace, a large stone edifice strongly fortified. Jessulmir. [HINDUSTAN, p. 221.] Tonk, on the Bunnass, in 26° 12′ N. lat. and 75° 47′ E. long. Kishengurh, in 74° 57′ N. lat. and 26° 38′ E. long., situated on a cone of granite hills, surrounded by walls of solid masonry, and with its castle on the mountain top. The raja's palace is a large but rudely-built fort on the banks of a fine pond. Wuerh is a large town surrounded by a high mud rampart well flanked by semicircular bastions, and with a wide but shallow ditch.

The principal rivers of Rajpootana are—the Chumbul [HINDUSTAN, p. 215]: the Bunnass, an affluent of the Chumbul; and the Loony, or Salt River, which flows through Marwar, and disappears in the great salt marsh of the Runn.

The climate of Rajpootana is oppressively hot in summer, with parching winds. In winter it is colder than is pleasant in a country where fuel is everywhere scarce and extremely dear. The dried dung of camels or cows is almost universally used for fuel. Wood for burning or building is only grown in the south-east on the confines of Agra.

The vegetable productions of Rajpootana will be sufficiently known from the preceding descriptions. Of wild animals there are tigers, wolves, foxes, and wild hogs. East of the Aravulli mountains large herds of deer are occasionally met with, which are found to be extremely tame in a country where they are seldom used as food. There are considerable numbers of camels, oxen, and some buffaloes, large flocks of sheep, and an excellent breed of horses. The pea-fowl is regarded as a sacred bird, and is very abundant, as is also a beautiful green pigeon, and both are as tame as barn-door fowl. There are mines of iron and lead. Salt, cattle, camels, horses, and cheese are exported from Rajpootana by the ports of Gujerat. At Sambur, about forty miles west from Jypoor, is a large salt lake, which supplies the greater part of western and northern Hindustan with that useful article.

The inhabitants of Rajpootana are generally Hindus, but there is a considerable number of Mohammedans. Probably the whole population does not exceed 3,000,000, and consists principally of Rajpoots, Bheels, Jains, Jauts, and Mairs, besides the Mohammedans. The Rajpoots are Hindus. Till they came under the protection of the British they were little better than robbers, and were engaged in incessant warfare with each other: consequently the towns and many of the larger villages of Rajpootana are fortified, and generally placed in situations where they might be protected by a fortress on a rocky height. The Rajpoots, though more peaceable than they were, are not improved in other respects. They are described as idle, and addicted to intoxication, opium-eating, and other kinds of sensuality. The Bheels or Bhils [HINDUSTAN, p. 221] are a wild race, who dwell generally in the mountain-fastnesses, whither they appear to have been driven by the Rajpoots. They bear a strong resemblance to the Puharrees of Rajmahal, and by similar treatment might probably be similarly improved. [RAJMAHAL HILLS.] The Jauts are in considerable numbers in all parts of Rajpootana, and the whole of the Batti race may be considered as belonging to them. The Mairs are described in the article ARAVULLI.

The Rajpoot states were never properly subjected by the Mohammedan emperors; for though they were compelled to pay a tribute and furnish a certain number of mercenary soldiers, they continued in a state of half independence, and their continual revolts occasioned their principal cities to be several times destroyed. After the death of Aurungzebe, in 1707, Rajpootana continued nominally subject to the emperor of Delhi till 1748, when its chiefs became independent. Since then the desolating attacks of the Mahrattas have compelled them to place themselves under the protection of Great Britain. The rajas of Rajpootana are independent sovereigns, but an English officer commands its forces, and a garrison has been established at Ajmeer sufficient for its protection against its enemies, and also to keep the Rajpoot chiefs themselves in subjection.

(Tod's *Annals of Rajast'han*; Heber's *Narrative*; Mill's *History of British India*; *Maps* of the Society for the Diffusion of Useful Knowledge.)

RALEIGH, SIR WALTER, born in the year 1552, in the parish of Budley, on the coast of Devonshire, was the second son of Walter Raleigh and his third wife Catherine, daughter of Sir Philip Champernon and widow of Otho Gilbert, Esq. of Compton, Devon. Sir Humphry Gilbert, whose name is connected with the attempts to discover a north-west passage, was Sir Walter Raleigh's half-brother. In the retired neighbourhood of Budley, Raleigh received the rudiments of his education. He was entered a commoner of Oriel College, Oxford, in or about the year 1568, where, to use the words of Anthony Wood, 'he was worthily esteemed a proficient in oratory and philosophy.' In 1569 Raleigh accompanied his relative Henry Champernon with a volunteer corps to France in aid of the Huguenots. He served in France five years, and subsequently in the Netherlands, as a volunteer under the Prince of Orange. In 1576 Sir Humphry Gilbert obtained a patent to colonise any parts of North America not settled by the allies of England. Raleigh and Gilbert attempted a joint expedition, from which Raleigh returned unsuccessful in 1579. In the next year we find him commanding a company of the royal troops in Ireland during the rebellion raised by the earl of Desmond; he was one of the officers to whom the charge of murdering the Spanish prisoners was committed by Lord Deputy Gray. Some difference arising between the lord deputy and Raleigh, the latter was called upon to defend himself before the council, which he did with so much ability and grace that he gained the queen's ear. The romantic incident which tradition gives as the origin of his favour with the queen is well known. Elizabeth's partiality for handsome men was notorious, and Raleigh's personal recommendations were great. In two or three years from the time he was introduced at court he was knighted, made captain of the guard, seneschal of the county of Cornwall, and lord warden of the stannaries, and he received a grant of 12,000 acres of the forfeited estates of the Earl of Desmond, and a lucrative patent for licensing the vendors of wine in England. In 1583 Sir Humphry Gilbert sailed on a second expedition to North America, towards which Raleigh, now too much engaged at court to accompany it himself, subscribed 2000*l.* This attempt also proved abortive, and Gilbert perished on his return in a storm in which his ship foundered. Raleigh, undismayed, obtained for himself in 1584 a patent investing him with power to appropriate, plant, and govern any territories that he might acquire in North America. In 1585 the first body of colonists landed, under the government of Mr. Lane, in Virginia, so called in honour of the virgin queen. Harriott, a celebrated mathematician of the day, went out to survey the colony; his survey and report, and the introduction of the tobacco-plant into England for the first time, were the only fruits of this attempt. [HARRIOTT.] The misconduct of the colonists brought the hostility of the Indians upon them; and they re-embarked within a year on board Sir Francis Drake's squadron, who visited the Chesapeake on his homeward voyage. A second body went out in 1587; but this expedition also failed; the governor returned home for fresh forces, which were very difficult to obtain, as he arrived in the height of the preparations for the Spanish invasion. Raleigh however dispatched two small vessels, which were plundered at sea, and forced to put back; and when at length assistance was sent out, the colonists had been murdered by the Indians. In 1589, finding that his resources were unequal to the forming of a colony, he made over his patent to a company of merchants. Raleigh has been charged with neglecting those wretched men who were left among the Indians; but it appears from Purchas, that previous to the year 1602, he had sent five several times, at his own charges, to find these people, who were left in Virginia in 1587 (IV., p. 1653). This is a sufficient answer to the charge; but it is somewhat difficult to comprehend, why these few adventurers, in number about one hundred, should not have left the country where they were unable to maintain themselves, if they had the opportunity.

In 1587 Raleigh had been appointed one of a council of war to put the forces of the realm in the best order to withstand any invasion, and had command of the forces in Cornwall, of which county he was lieutenant-general. In July, 1588, after the Armada had passed up the Channel, he joined the British fleet with a small squadron, and greatly distinguished himself in the several engagements which ended in the discomfiture of the Spaniards. As a reward for these services he received an augmentation to his patent of wines, and the right to levy tonnage and poundage on them. In 1589 he accompanied the Lisbon expedition under Drake and Norris, the object of which was to place Don Antonio on the throne of Portugal. [ANTONIO.] In 1591 he sailed on an expedition to intercept the plate fleet, which was unsuccessful; and during his absence, the queen having discovered that an intrigue existed between Raleigh and Elizabeth, daughter of Sir Nicholas Throckmorton, one of the maids of honour, he was, immediately on his return, thrown into the

Tower. Raleigh married Miss Throckmorton, and on being released after a short confinement, retired to his estate of Sherborne in Dorsetshire. It was during this retirement that he formed his scheme for the discovery and conquest of El Dorado, that fabulous land of gold and unbounded wealth in the interior of South America, in the existence of which he firmly believed. On the 5th of February, 1595, Raleigh sailed from Plymouth with five vessels, and arrived at Trinidad about the end of March. He surprised the newly founded town of S. Josef, and took prisoner the governor, Don Antonio Berrio, from whom he extracted information which enabled him to ascend the Orinoco about 60 leagues, when he was forced to return. He arrived in England towards the end of the summer, 1595. Raleigh published an account of this voyage, under the sounding title of 'The Discovery of the large, rich, and beautiful empire of Guiana,' a work which had not the merit of any methodical arrangement of the matter, though it contains numerous vigorous passages, such as characterise the style of Raleigh. That Raleigh, though not without a disposition to the marvellous, actually believed all that he wrote, is hardly an admissible supposition. His regard to truth was never so strong as to prevent him from embellishing facts real or supposed, when he thought he could thus gain his ends. His restoration to favour at court, which took place shortly after, prevented any further prosecution of his designs on Guiana during the reign of Elizabeth. In 1596 he was employed, with the rank of rear-admiral, at the taking of Cadiz, where he greatly distinguished himself, and was severely wounded in the leg. In 1597 he took Fayal. About this time he was restored to his post of captain of the guard, and appointed governor of Jersey. He now became deeply engaged in court intrigue, and combined with Cecil, who afterwards crushed him, to destroy the Earl of Essex. He strongly urged Cecil, in a letter which appears among his works, to put down the earl; but it is doubtful whether this letter was written before or after the condemnation of Essex, as it has no date. Raleigh turned his influence with the queen to good account, by procuring a remission of the sentence for such of Essex's adherents as could afford to purchase his good offices. One of these, Mr. Littleton, paid Raleigh 10,000*l*. A transaction so shameless has no other apology than that it was not condemned by the opinion of the age. Bribery and corruption were universal, and we cannot expect a man of Raleigh's character to have had a higher standard of morality than his contemporaries. In the house of commons, of which he had been elected a member some years before, he made himself conspicuous by advocating principles far before his age: he maintained that every man should be left at liberty to employ his capital and labour where and how he liked, and that all restrictions on the trade in corn should be removed.

After the death of Elizabeth, Raleigh's fortunes fell. His haughtiness and rapacity, with the share he had in the ruin of Essex, had made him universally disliked; and Cecil, his former friend and associate, had completely poisoned James's mind against him. The post of captain of the guard was speedily given to another, and his wine-patent was withdrawn. An opening soon offered for a more serious attack. James had not long been seated on the throne before two or three plots against him were discovered. Among these was one named the Spanish or Lord Cobham's treason. Lord Cobham being intimate with Raleigh, the idea of his participation instantly suggested itself. Raleigh being examined before the council, declared his utter ignorance of any plot, but admitted that he was aware of some intercourse having taken place between Cobham and the Count D'Aremberg, the Flemish ambassador, and he recommended that La Renzi, one of that nobleman's suite, should be examined. This being made known to Cobham, he flew into a violent rage, declared that in all his intrigues he had been instigated by Raleigh, and that the money to be paid by Spain was to be lodged in the island of Jersey, of which island Raleigh was governor. He shortly afterwards fully and solemnly retracted all that he had said against Sir Walter, who was nevertheless committed to the Tower on a charge of high-treason, in July, 1602. While there he made an attempt at suicide by stabbing himself. In September, 1603, Raleigh was tried at Winchester, and found guilty. Doubts have frequently been thrown on the whole of the facts connected with Raleigh's accusation. That his condemnation was procured by the power of his enemies, and that the verdict of the jury was not justified by the evidence, there can be no doubt; but the French ambassador, Beaumont, considered him morally guilty. It is certain that such a plot did exist for placing Lady Arabella Stuart on the throne, that the archduke knew of it, and that his minister Aremberg had corresponded with Cobham on the subject, and had promised a sum of money in support of it. It seems probable, indeed almost certain, that Raleigh was aware of Cobham's correspondence, although he might not be an actual participator in the plot. Some judicious writers are of opinion that he was even a principal mover in it. The best account of this celebrated trial is in Mr. Jardine's 'Criminal Trials' (*Library of Entertaining Knowledge*), to which we refer for some interesting remarks as to the supposed illegality of the procedings on Raleigh's trial, and on the state of the criminal law at that time.

Raleigh's conduct during his trial entirely changed the general feeling of dislike entertained towards him: an eyewitness observed, 'In half a day, the mind of all the company changed from the extremest hate to the greatest pity. He was reprieved and sent to the Tower, where he was confined for thirteen years. His family suffered severely by his attainder: he had some years before conveyed his estate of Sherborne to his son, reserving his own life-interest, which was now forfeited, and a slight flaw being discovered in the deed of conveyance, Carr, the king's favourite, petitioned for and obtained the estate himself, reserving only 8000*l*. as a compensation for Raleigh's family. During his long imprisonment he turned to intellectual pursuits, and, with many minor pieces, executed his greatest work, 'The History of the World,' a project of such vast extent, that the bare idea of his undertaking it excites our admiration. As an author, Hume says, 'he is the best model of our antient style,' and Hallam observes that he is 'less pedantic than most of his contemporaries, seldom low, and never affected.' The first part of the 'History of the World,' which is all that Sir Walter Raleigh completed, is contained in five books, commencing with the creation, and ending with the second Macedonian war, about 150 years before Christ. The following extract gives a good specimen of the style, while it accounts for his not continuing the work: 'O eloquent, just, and mighty Death! whom none could advise, thou hast persuaded: what none hath dared, thou hast done· and whom all the world hath flattered, thou only hast cast out of the world and despised: thou hast drawn together all the far-stretched greatness, all the pride, cruelty, and ambition of man, and covered it all over with these two narrow words. *Hic jacet!*'

'Lastly, whereas this book, by the title it hath calleth itself the "First part of the General History of the World," implying a second and third volume, which I also intended, and have hewn out; besides many other discouragements persuading my silence, it hath pleased God to take that glorious prince (Prince Henry) out of the world to whom they were directed, whose unspeakable and never enough lamented loss hath taught me to say, with Job, "Versa est in luctum cithara mea, et organum meum in vocem flentium."'

In 1615, Cecil being dead, and Somerset disgraced, Raleigh bribed the uncles of Buckingham, the new favourite, and induced Sir Ralph Winwood to recommend his project of opening a mine in Guiana. Upon this he was released conditionally. He equipped thirteen vessels for this expedition, which, from the magnitude of the undertaking and the celebrity of his name, attracted much attention, and Raleigh's ship was visited by all the foreign ambassadors. A writer in the 'Edinburgh Review' (No. cxliii., p. 82) gives an extract from a dispatch of Count Desmarests, the French minister, deeply implicating Raleigh's honour; it is to this effect: Raleigh 'resolved to abandon his country, to make the king of France the first offer of his services and acquisitions, if his enterprise, from which he confidently expected great results, should succeed.' The fleet reached the Coast of Guiana about the middle of November, 1617. Raleigh was so unwell that he could not ascend the Orinoco in person. Captain Keymis, the steady follower of Raleigh, led the exploring party, consisting of five companies of fifty soldiers each. A conflict took place with the Spaniards near St. Thomas, a small town recently built, in which the Spanish governor and Raleigh's eldest son Walter were slain; after which Keymis, having spent about twenty days in a fruitless search for the mine, and suffered considerable loss, returned to the fleet. Keymis, meeting with nothing but reproaches for his ill success, committed suicide. Raleigh sailed for Newfoundland to victual and refit; intending afterwards possibly to return to Guiana, but certainly in the mean time to attack the Spanish plate fleet, if he could fall in with it. Before he reached Newfoundland the fleet separated, and on his arriving there, his own crew mutinied, and the majority declaring for a return to England, he was forced to accompany them. He arrived at Plymouth, in July, 1618, and was shortly after arrested by Sir Lewis Stukely, Vice-Admiral of Devonshire. He was conveyed to London, and on his journey made some ineffectual attempts to escape, and at Salisbury he feigned sickness. James, strongly urged by the king of Spain to punish Raleigh for his attack on St. Thomas, and being anxious to gratify that monarch, laid the case before his council, when it was argued that Raleigh, being under an unpardoned sentence for treason, was civilly dead, and accordingly could not be tried again. James therefore resolved to carry into execution a sentence sixteen years old, which had been followed by an imprisonment of thirteen years. He was brought up before the Court of King's Bench to receive sentence on the 28th of October, 1618, and beheaded the next morning, in the 66th year of his age. His conduct after his committal to the Tower, and up to the moment of his death, was so calm and resigned, as to move the sympathy even of his enemies.

Of Sir Walter Raleigh's character and personal appearance, Aubrey says, 'he was a tall, handsome, and bold man, but his næve was that he was damnable proud: he had a most remarkable aspect, an exceeding high forehead, long-faced, and "sour eie-lidded, a kind of pigge-eie."' In an age of magnificence in dress, Raleigh was conspicuous for his splendour. Of an original and versatile genius, an eminent commander by sea and land, a navigator and discoverer of new countries, an accomplished courtier, a statesman, a proficient in the mechanical arts, a poet of no mean ability, Sir Walter Raleigh was one of the most remarkable characters of an age celebrated for its eminent men. Little can be said in favour of his moral character: he was crafty and rapacious, and his conduct was not regulated by truth and probity; but he had kindly affections, and was much beloved by his dependants. Besides his great work, he was the author of many smaller pieces on a variety of subjects, philosophical, political, naval, military, geographical, besides letters, and a collection of small poems. He had two sons by his wife: the elder was killed in South America; the second, Carew, who was born in the Tower, survived him.

(Birch and Oldys, *Life and Works of Sir W. Raleigh;* Tytler, 'Life of Sir W. Raleigh,' in *Ed. Cab. Libr.;* Jardine's *Criminal Trials;* Hume; Hallam, *Const. Hist.;* *Edinburgh Review*, No. cxliii.)

RALEIGH-TOWN. [CAROLINA, NORTH.]

RA'LLIDÆ, a family of birds belonging to the *Grallæ* of Linnæus, *Grallatores* of Illiger.

Brisson placed the *Rails* in the first section of his seventeenth order, with the *Lapwings*, the *Jacana*, the *Pratincole*, &c.

The genus *Rallus* of Linnæus consisted of Rails properly so called; and the species in the last edition of the 'Systema Naturæ,' as left by him, were *Crex aquaticus*, *Porzana*, *fuscus*, *striatus*, *torquatus*, *Philippensis*, *Benghalensis*, *Carolinus*, and *Virginianus*. The genus is placed in the order *Grallæ* (the fourth), between *Parra* and *Psophia*.

Latham also gave it a place among the *Grallæ* (his seventh order), between the *Pratincole* and the *Jacana*.

Lacépède arranged *Rallus* among his *Oiseaux de Rivage*, in his thirty-third order (birds with a straight and compressed bill), between the genera *Hians* and *Scopus*.

In M. Duméril's system *Rallus* is placed in the first family (*Pressirostres* or *Ramphostènes*) of his fifth order, *Echassiers*, between the *Jacanas* and *Oystercatchers* (*Hæmatopus*).

Illiger's *Macrodactyli*, belonging to his sixth order, *Grallatores*, include the genera *Parra*, *Rallus*, and *Crex*.

In Cuvier's fifth order, *Echassiers*, *Rallus* appears in its fifth family, *Macrodactyles*, between the *Kamichis* (*Palamedea*) and the *Fulicæ*.

M. Vieillot's second tribe (*Tetradactyli*) of his fourth order (*Echassiers*) includes, among many other families, the *Macrodactyles*, including the genera *Rallus*, *Porzana*, *Porphyrio*, and *Gallinula*. The *Macrodactyles* are placed between the *Macronyches* (*Jacana*) and the *Pinnatipèdes* (*Fulica*, *Phalaropus*, &c.).

M. Temminck places *Rallus* between *Scolopax* and *Gallinula*, in his thirteenth order (*Gralles*).

In M. de Blainville's system *Rallus* is also placed among the *Macrodactyles*, in the order *Grallatores*.

The late lamented Mr. Vigors, treating of the family *Scolopacidæ*, remarks that among the groups which originally composed the *Tringa* of Linnæus, the *Phalaropus* of Brisson may be distinguished, which, by its lobated feet and habits of swimming stands at the extremity of the *Scolopacidæ*, and leads the way to the succeeding family of *Rallidæ*. He then observes that the family of *Rallidæ*, composed of the Linnean genus *Parra*, with its congeners, *Palamedea*, Linn., and *Chauna*, Ill., together with *Rallus*, Linn., and *Fulica*, Linn., corresponds with the *Macrodactyles* of Cuvier. He conjectures that *Chionis*, Forst., comes into this family; but he adds that he knows too little of the group to speak with any confidence. The Linnean groups, he observes, are distinguished from the *Scolopacidæ* by their stronger bill and the greater length of the hind toe. They are also separated from the other birds of the order, and united among themselves, in his view, by the shape of their body, which is compressed and flattened on the sides, in consequence of the narrowness of their sternum. Mr. Vigors goes on to remark, that were we allowed to draw an inference from the analogical construction of other bodies, which move with the greater facility through the water in proportion as they assume this compressed and keel-like form, we might almost conclude that this structure, peculiar to the birds of the present family, facilitates their progress through that element, and is intended to counterbalance the deficiency in the formation of the foot, which separates them from the truer and more perfectly formed water-birds; and he alludes to Wilson's observation, who, when speaking of the *Rallus Virginianus*, mentions this character as conducive to the progress of the bird through the reedy marshes. 'It is certain,' continues Mr. Vigors, 'that the greater portion of these birds are excellent swimmers; and in such habits, as well as in the shortness of their *tarsi*, which is equally conducive to their powers in swimming, they are found to deviate from all the remaining groups of the order. They thus become an aberrant family, and lead directly, as has been before noticed, to the succeeding order of *Natatores*. The genus *Parra*, Linn., distinguished from *Rallus*, Linn., by the greater length of the toes, and more particularly by the length and straightness of the nails, is yet allied to that genus by the general structure of the bill. With *Parra* may be allied *Palamedea*, Linn., and *Chauna*, Ill., the *Parra chavaria* of the 'Systema Naturæ,' both of which seem to approach *Parra* in affinity, although the latter of them is so imperfectly known, that its situation cannot be decided with certainty. To *Rallus* succeeds *Crex*, Bechst., which, by its stronger and shorter bill, seems to lead on to *Gallinula*, Briss., from which genus, although agreeing with it in general appearance, it is decidedly separated from its terrestrial habits. *Gallinula* is set apart from the foregoing groups by the greater length of the toes and the dilatation of the upper mandible upon the forehead. This latter character is still further developed in the ensuing genus *Porphyrio*, Briss., where the base of the bill exhibits a considerable degree of robustness; and is also carried on to *Fulica*, which immediately adjoins *Porphyrio*. The species that compose the true *Gallinula* and *Porphyrio* may be observed to possess a narrow membrane on each side of the toes, which extends along their whole length straight and entire. We thus recognise the gradual approximation of these genera to the lobated foot of *Fulica* and *Podoa*, which unite the swimming *Waders* to the true web-footed *Natatores*. The dilatation of the upper mandible into a flat crown upon the forehead, which characterises the latter groups of this family, together with the same length of the toes, is found to exist in some species of *Parra;* and thus we are led back to the groups from which we commenced our observations on the family.' Mr. Vigors then enters the family of the *Charadriadæ* by the genus *Hæmatopus*. (*Linn. Trans.*, vol. xv.)

The *Macrodactyles* of M. Latreille form the sixth family of his fourth order, *Echassiers*, and consist of the *Jacana*, *Kamichi*, and *Chauna*.

M. Lesson makes the *Rallusinées*, the fourth family, according to him, of the *Echassiers*, consist of the genera *Jacana* (*Parra*), *Palamedea*, *Chauna*, *Glareola*, *Rallus*, *Crex*, *Gallinula*, *Porphyrio*, *Podoa*, and *Fulica*. The *Rallusinées* are placed between the *Scolopacidæ* and the *Charadriadæ*.

Mr. Swainson observes that the *Rallidæ* comprise the rails and water-hens, and constitute a very natural and well-marked family in the order of Waders. They have been designated, he remarks, by these familiar names, from their peculiarly harsh notes, and from assuming much of the appearance of the gallinaceous or rasorial birds; another proof, he adds, that the true analogies of nature are often perceived by the vulgar, although passed over by the scientific. 'The most permanent differences,' says Mr. Swainson in continuation, 'in their structure, when compared with the foregoing families (*Tringidæ* and *Charadriadæ*), is the great size of the leg and the length of the toes, particularly the hinder one: the body is very thin and unusually flattened; a structure particularly adapted to the habits of Rails, since they live for the most part in the tangled recesses of those reeds and aquatic vegetables which clothe the sides of rivers and morasses. They are for the most part solitary and timid birds, hiding themselves at the least approach of danger, but quitting their semiaquatic retreats in the morning and evening, to feed in more open spots: their flight, from the shortness of their wings, is very feeble, but they run with swiftness; and by the peculiarly compressed form of their body, are able to make their way through dense masses of reeds and high grass with so much facility as to escape even after being desperately wounded. The flesh of all these birds is delicate; and from living chiefly upon aquatic seeds and vegetable aliment, they may be considered as aquatic *Gallinacea*. The following are amongst the most obvious genera or subgenera which enter into the present group. Of these the Jacanas (*Parra*) are the most singular; they are distinguished by toes of such remarkable length, that by covering an enormous circumference, these birds can walk upon aquatic plants floating on the surface of the water with as much ease and security as if they made their way over hard ground. Most of the species are armed with a short and formidable bony spur on the shoulder of the wings; and the head is either partially naked or furnished with fleshy wattles. Several species occur in the hot latitudes of America, Africa, and Asia, but the genus is unknown in Europe. It is probable that the typical characters of the family are best seen in the genera *Rallus*, *Crax* (Crex?), *Gallinula*, and *Fulica*. The purple water-hens are most beautiful and majestic birds, in size nearly as large as a fowl; they have a very thick and strong bill, the corneous front being continued over the fore part of the head like a helmet. There is a fine species found in the marshes of Sicily; and another, almost exactly resembling it, in the distant regions of Australia. The genus *Podoa* probably belongs to the next order (*Natatores*).' (*Classification of Birds*, vol. ii.)

In the synopsis of the same work, the *Rallidæ* are placed between the *Tantalidæ* and *Scolopacidæ*, and consist of the following genera: *Parra*, *Porphyrio*, *Fulica*, *Rallus*, *Gallinula* (with the subgenus *Alecthelia*).

The genera of *Rallidæ* (which family he places between the *Scolopacidæ* and the *Phaleropodidæ*), enumerated by Prince Lucien Bonaparte in his 'Birds of Europe and North America,' consist of *Aramus*, Vieill., *Rallus*, Linn., *Ortygometra*, Leach, *Gallinula* (Briss., *Stagnicola*, Br.), *Fulica*, Linn., and *Porphyrio*, Ray.

The *Rallidæ*, in Mr. G. R. Gray's 'List of the Genera of Birds,' are the fifth and last family of the *Grallatores*, and immediately preceded by the *Palamedeidæ* (which embrace the genera *Parra*, *Chauna*, *Palamedea*, and *Alecthelia*). The order *Natatores* follows.

The following are the subfamilies and genera of Mr. G. R. Gray's *Rallidæ*:—

Subfamily I. Rallinæ.

Genera.—Ortygometra, Ray (*Rallus*, Linn., *Porphyrio*, Briss., *Crex*, Bechst., *Gallinula*, Lath.).

Porzana, Vieill. (*Rallus*, Linn., *Gallinula*, Lath., *Zapornia*, Leach).

Rallus, Linn. (*Gallina* (Gallinula ?), Ray).

Ocydromus, Wagl. (*Rallus*, Forst.).

Subfamily II.

Porphyrio, Briss. (*Fulica*, Linn., *Gallinula*, Lath.).

Gallinula, Ray (*Fulica*, Linn., *Hydrogallina*, Lacép., *Stagnicola*, Brehm).

Fulica, Linn.

Subfamily III. Heliorninæ.

Heliornis, Bonn. (*Plotus*, Gm., *Podoa*, Ill., *Colymbus*, Bodd.).

Podica, Less. (*Heliornis*, Vieill., *Podoa*, Boie, *Rhigelura*, Wagl.)

We proceed to notice some of the leading forms of this family.

Rallidæ.

Feet very large. Bill in general short, and greatly compressed. Tail excessively short, nearly hidden by the covers. Hinder toe elevated. (Sw.)

Parra.

Generic Character.—Bill straight, slender, moderate. *Feet* very long. Toes and claws of enormous length; the latter straight or recurved. *Carpus* generally armed with acute spurs. (Sw.)

Mr. Swainson remarks that the *Jacanas* or *Parræ* are wading birds, somewhat analogous, both in structure and habits, to the European Water-hen; but in their native haunts, from not being disturbed, they are less shy. 'The number of these birds,' says Mr. Swainson, 'on the lakes of Brazil, the elegance of their movements, and their fearlessness of man, excite an interest in the traveller who journeys through regions ornamented alone by nature. They are very light birds, and their long toes spreading over a wide surface enable them to walk on the floating leaves of aquatic plants with as much facility as if they were on land. In such situations their appearance is really delusive; for their pressure being sufficient to sink the surrounding leaf just below the surface, the birds actually appear to walk upon the water.' (*Zool. Ill.*, 2nd series.)

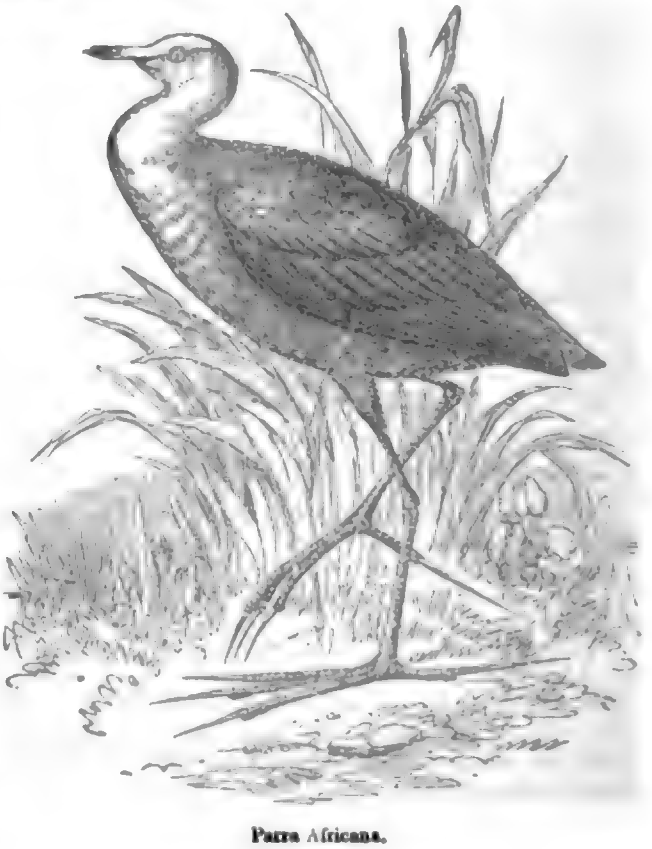
Geographical Distribution of the Genus.—Numerous in South America; some in India; and a few in Africa.

Example, *Parra Africana*.

Description.—Deep cinnamon above; crown of the head naked; throat white; breast fulvous; neck and quills black; spur on the wing obsolete.

Localities.—Africa, Abyssinia (Bruce), Mozambique (Salt), Western Africa (Swainson, on the authority of Ward), South Africa (Smith).

The strong bony spur with which the wing is armed in the typical species, becomes so small in *Parra Africana*, that it is hardly perceptible when the wing is closed. In another African species, *Parra Capensis*, the spur or spine has become a small tubercle. The African Jacanas may therefore be referred to the aberrant group of this genus. Dr. Smith only met with one individual of *Parra Capensis*, and he strongly suspects that it was in immature plumage. It was killed while seeking for its food upon some water-plants which coated the surface of a small river near Algoa Bay, and he has figured the bird standing on the leaf of a water-lily. He notices *Parra Africana* as the only other species of the group which has yet been found in Southern Africa, and states that it never ranges so far to the westward as the Cape Colony, though it is often found to the westward of Port Natal.



Parra Africana.

Porphyrio.

Generic Character.—Bill short, strong, high; the base dilated into a flat plate on the front of the head; the culmen arched. *Nostrils* large, basal, covered by a membrane, naked; the aperture terminal and oval. *Feet* very large. Toes without any lateral membrane. Claws large, slightly curved. (Sw.)

M. Temminck states that the *Porphyriones* live nearly like the Water-hens, to which they are the most closely approximated: like them, their habitual haunts are the fresh-waters; but the immense rice-fields (rizières) and marshes of the south equally serve them for an asylum and retreat. More inclined by their appetite to cereal grains and plants, than aquatic herbs, the Porphyrios frequent the land more than the Water-hens: they move with grace on the water, and run with elegance and swiftness on the land or over the plants which grow in the water. Their body is not so compressed nor so slender as that of the water-hens; their formidable bill, composed of a very hard substance, and nearly without a nasal fossa, which is covered by a membrane, serves them as an instrument for cracking the husks of grains and breaking the hardest stems; their feet, which they use to seize their food and convey it to their bill, are provided with very long toes, easily retractile, and with nails which bend also with some facility, which gives them a power of prehension. A brilliant plumage, where blue or a turquoise hue predominates, clothes the greatest number of the known species.

It is not clear what species of this genus was known to the antients, who held it in high estimation. The *Porphyrio* does not appear to have been sought after for any other purpose than that of keeping it alive; indeed Ælian states that he never heard of one being served at any banquet. Pliny (*Hist. Nat.*, x. 46 and 49) speaks of the Porphyrios as 'laudatissimi in Comagene,' and says that their bill and long legs are red; the Balearic Islands are also named by him as a place whence they were sent to Rome. He speaks of their peculiar mode of drinking, their soaking their food in water and raising it to their bills in their claws: 'Bibunt aves suctu, ex his quibus longa colla, intermittentes, et capite resupinato velut infundentes sibi. Porphyrio solus morsu bibit, idem est proprio genere, omnem cibum aqua subinde tingens, deinde pede ad rostrum veluti manu afferens.'

But there was another quality which was supposed to reside in the *Porphyrio*, which made it both a highly prized and dangerous inmate. The bird was considered as a kind of guard over the women of the house in which it was domiciled: it was believed that it took notice of adultery, and that if the crime was committed, it would give notice to the master of the house by making signs as if it wished to strangle itself. It is to this that the old quatrain alludes in the 'Portraits d'Oyseaux'

> 'Porphyrion declare l'adultere
> Fait au logis auquel on l'entretient;
> Car à ces fins tous les semblans il tient
> De se vouloir estrangler et deffaire.

Though, as we have observed, it is not certain what particular species was known to the antients, indeed there appears to have been more than one, we do not know why *Porphyrio hyacinthinus*, which, as we shall presently see, is very common in Sicily, and has a very wide range, should not have been kept in a state of domestication by them.

Example, *Porphyrio hyacinthinus* (*Pollo Sultano*, Savi).

Description.—(Both sexes.)—Bill fine red; legs and feet fleshy red; irides lake-red; cheeks, throat, sides of the neck, and chest turquoise-blue; remainder of the plumage deep dull indigo-blue, having the edges of the greater and lesser coverts of the wings lighter in colour and more brilliant; under tail-coverts white. (Gould.)

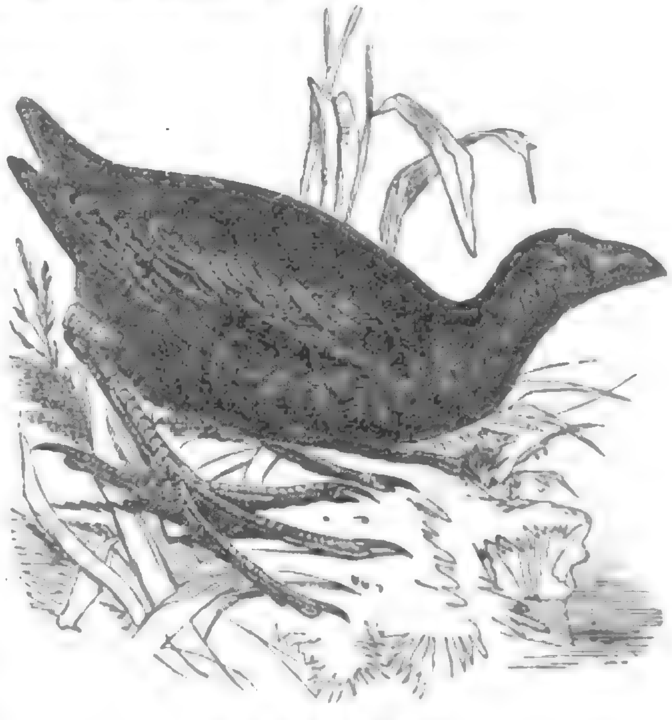
Young of the Year.—Belly, till the month of October, white; occiput yellowish-brown; median part of the head whitish; mantle bluish-ash. Feet reddish-olive. At the time of the moult, which takes place towards the end of October, individuals are found in a state of transition from the livery of youth to that of the adult: early in May the rich blue plumage is complete. (Temm.)

Geographical Distribution.—'Independently of the southern and eastern parts of Europe, the marshes of which are the places of constant resort for this beautiful bird, its range is extended,' says Mr. Gould, 'over a great portion of Africa to the south, and as far as the mountains of the Himalaya to the east. In Europe it is especially abundant in the Grecian Archipelago, the Levant, and the Ionian Islands: it is less common in Dalmatia and Sardinia. The southern provinces of Hungary and Russia and the borders of the Caspian Sea may also be enumerated among its European localities.' M. Temminck states that it is to be seen in many cities of Sicily (where, according to M. Cantraine, it is very common in the neighbourhood of Lentini), that it is not known in Dalmatia nor Calabria, and is rare in Sardinia; and that it is known in Catania under the name of *Gallo-fagiano*.

Food, Habits, Reproduction, &c.—Mr. Gould states that, like the Water-hen or Common Gallinule, this species dwells on the borders of rivers and in all marshy situations. In its food, he tells us, it is partly herbivorous, feeding on various kinds of marine vegetables; still, as the robust and hard character of its bill implies, it prefers hard seeds and grain, to which are added snails, frogs, and other aquatic animals.

'Although its form,' continues Mr. Gould, 'would seem to deny the fact, its actions and appearance on the land are both elegant and graceful. It is extremely quick in all its movements, running with ease and swiftness; and from the great expansion of its feet, it is enabled to pass with facility over soft oozy mud, aquatic herbage, &c.; but although much agility characterises this species on land, its aërial evolutions are heavy, and apparently performed with considerable difficulty.' M. Temminck states that it lives in the marshes where the water is not deep, and that its stupidity is such that when closely pursued it buries its head in the mud. M. Verneuil informed him that solitary individuals are sometimes found in Dauphiné: that of the museum of Grenoble was, he adds, killed in the marshes of Burgundy.

Porphyrio hyacinthinus breeds in marshes, much in the manner of the Common Gallinule, giving preference to the sedgy parts of the morass and partly inundated rice-fields, where it constructs a nest of aquatic plants, and lays three or four white and nearly round eggs. (Gould.)



Porphyrio hyacinthinus.

Fulica.

Generic Character.—Bill as in *Porphyrio*, but more slender; the base straight; the gonys short and angulated. *Feet* very large; the toes margined with a lateral membrane, which is either narrow and of equal breadth or dilated into lobes. The natatorial type. (Sw.)

Example, *Fulica atra.*

Description.—Head and neck deep black; upper parts slaty-black; all the lower parts bluish-ash; frontal plate very wide, pure white; bill white, slightly tinged with rose-colour; iris crimson-red; feet ash-colour, tinged with greenish, but of a yellow or greenish-red above the knee.

The sexes do not differ, excepting that in the female and the young the frontal plate is less developed, and that in the latter, after the autumnal moult, the lower parts are slightly tinged with reddish. Before the moult, the frontal plate of the young is hardly apparent, and that and the bill are greenish-ash; all the lower parts are whitish-ash: in this state it is, according to M. Temminck, *Fulica Æthiops*, Sparm.; Gmel.

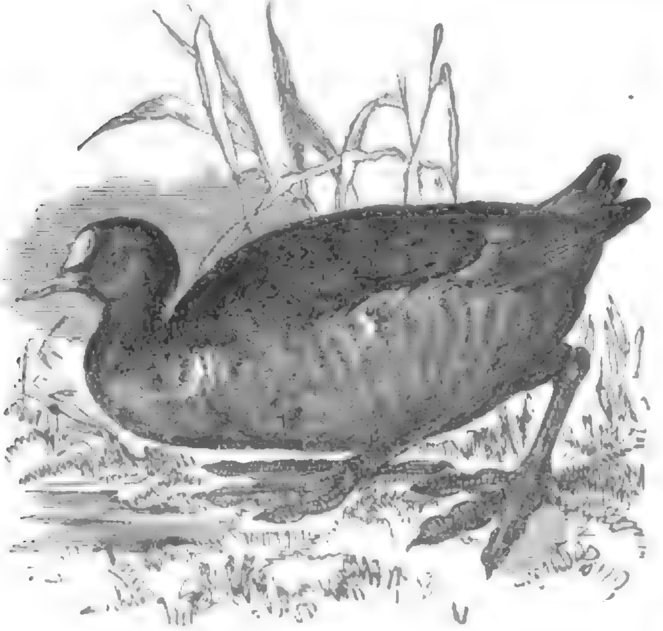
Varieties.—Pure white (very rare), or whitish with the colours weakly shown. Wings white; all the rest of the plumage as in ordinary. It is then *Fulica Leucorix*, Sparm.; and Gmel.

Fulica atra is the *Foulque*, *Macroule*, or *Morrelle* of the French; *Schwarzes Wasserhuhn* of the Germans; *Meir Koet* of the Netherlanders; *Folaga* and *Folacra* of the Italians; *Blas-klacka* of the Swedes; *Vand-Hoene* and *Blee-Hoene* of the Danes; *Iâr ddwfr foel* of the antient British, and *Coot* of the modern British. Some have thought that it is the κέπφος (Cepphus) of Aristotle,—quære tamen.

Geographical Distribution.—Europe, in marshes, lakes, and gulfs; very abundant in Holland and in the lakes of the interior of France; less numerous in Germany and Switzerland. Dr. Von Siebold and M. Bürger saw it in Japan.

Habits, Food, Reproduction.—'The coot,' says Mr. Gould, 'is indigenous to our islands, residing on all large sheets of water, but giving preference to those overgrown with rushes and margined with a belt of thick reeds and luxuriant vegetation.' Such is the meer or pond before William of Wykeham's palace at Bishop's Waltham, where they abound. In such haunts it builds, early in the spring, a strong and solid nest of rushes, grasses, and water-plants. The large nest thus constructed rises above the surface of the water, on the bottom of which, when shallow enough, the base of the nest sometimes rests. Its more frequent situation however is in the reedy and rushy tufts and rank vegetation of the water's edge, so as to be concealed. The eggs, which are brownish-white, spotted with dark brown, range from seven to ten in number. The young, when hatched, are clothed in a black down, and take water very soon. As winter approaches, the coots seek the open waters near the sea, and the mud-flats at Southampton are among the places visited by them in great numbers. The coot swims and dives admirably, but flies heavily and with effort. Its food consists of worms, slugs, aquatic plants, insects, &c.

Much cannot be said for it as an article of food, except when it is young, and then it requires much perseverance to get off the black down next to the skin.



Fulica atra.

Gallinula.

Generic Character.—*Bill* short, straight; the margins not inflexed. The cutting edges of the upper mandible folding over the lower. Gonys very short, angulated. Toes simple, without any marginal membrane. The rasorial type. (Sw.)

M. Temminck remarks that the Water-hens have their body very much compressed throughout its length. They live on land, but, like the *Ralli*, haunt fresh-waters. They swim with considerable celerity, dive with facility, run very fast on land, even where the herbage and reeds are thickest, and often, like the *Rails*, over the leaves and plants that grow at the surface of the water. Their food, like that of the *Rails* also, consists of insects and vegetables. They undergo perhaps a double moult, but the colours do not change. The young differ much from the adult; the plumage of the first does not attain its permanent colours till the expiration of a year. The males are only distinguished from the females by purer tints, and the frontal plates of the former are more extended.

Example, *Gallinula chloropus.*

Description.—(*Old Male.*)—Head, throat, neck, and all the lower parts slaty blue; upper parts deep olive-brown; external border of the wings, large longitudinal spots on the sides, and lower coverts of the tail, pure white; three or four of the feathers placed at the centre of the tail-coverts deep black; base of the bill and large frontal plate bright red, point of the bill yellow; iris red; feet yellowish-green; on the tibia a naked circle of a fine red.

Old Female differs only in having the tints of the plumage a little less bright.

The Young, till their second autumnal moult, differ much from the old. The top of the head, the nape, the back, and rump are olive-brown; quills deep brown, terminated by bright brown borders; tail deep brown; throat, front of the neck, and a spot below the eye whitish; rest of the lower parts bright grey; point of the bill olive-green, blending into olive-brown at the base; iris brown; feet olive, but tinged with yellowish on the tibia.

Young of the Year.—More of the whitish around the bill; and the lower parts with the tints less bright. Individuals in a state of transition from one period of age to another have the frontal plate more or less large, coloured with red or yellowish.

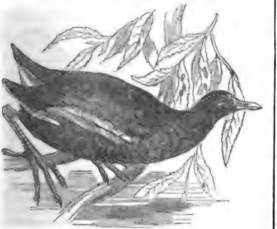
Such is M. Temminck's description, but Mr. Gould (*Birds of Europe*) says, 'One circumstance respecting this familiar bird appears to have escaped the notice of most ornithologists: we allude to the fact of the female being clothed in a dark and rich plumage, and having the base of the bill and the frontal shield of a bright crimson-red tipped with fine yellow; her superiority in these respects has caused her to be mistaken for the male, which, contrary to the general rule, is at all times clothed in a duller plumage, and has the upper surface more olive than in the female; the bill is also less richly tinted. We were first led to notice this fact in consequence of observing the birds sitting or rising from the nest to be those whose richly coloured bills had induced us to believe them to be males, and which the dissection of a great number of individuals has now fully proved to us to be the females. Besides this difference, the sexes vary in size, the female being about one-fifth less than her mate.' The same author states that the young are clothed with a black down, and during the first autumn, although equal to the adults in size, have a much lighter plumage, the whole of the throat and under surface being then greyish white, and the bill and legs olive. The male has the bill red at the base, strongly tinged with olive; the centre of each feather on the flanks is blotched with a large oblong patch of white, which is the colour of the under tail-coverts; irides red: tarsi and toes greenish olive; the former being encircled with a red mark immediately above the tarsal joint, called the *garter*.

This bird in its different states of plumage is the *Poule d'eau* of the French; *Gallinella* of the Italians; *Wasserhuhn*, *Grünfüssige Rohrhuhn*, and *Braune Meerhun* of the Germans; *Common Gallinule*, *Waterhen*, or *Moor-hen* of the modern British; and *Dwfriar* of the antient British.

Geographical Distribution.—Very wide. Mr. Gould states (and he is confirmed by others), that this species appears to be not only dispersed over the whole of Europe, but extends its range over the greater portion of Africa and India; and, like the Peregrine Falcon and Barn Owl, may be said to be universally distributed over the globe: 'it is even questioned,' adds Mr. Gould, 'whether those from tropical America, China, and the islands of the Pacific, which exhibit the most trifling marks of difference, should not be considered as identically one and the same species.' It was seen by Dr. Von Siebold and M. Bürger in Japan; and M. Temminck remarks that the African variety, which is also found in the isles of Sunda, has the anterior border of the wing reddish; the lower tail-coverts, which, in European, Asiatic, and Japanese individuals, are of pure white or Isabella colour, have a reddish tinge in the variety from Africa and the Sunda Isles, which is also somewhat less than European and Japanese birds, and has the frontal plate larger. The variety from the Sunda Isles is, according to M. Temminck, *Gallinula Orientalis* of Horsfield (*Linn. Trans.*, vol. xiii.). The only difference between the Japanese bird and that of Europe is the Isabella tint of the lateral under tail-coverts in the former: in the European variety those feathers are white.

Habits, Food, Reproduction, &c.—In our islands the haunts of the common Gallinule are rivers, meers, ponds, sedgy spots, and marshy places. The nest is formed of interlaced flags, weeds, &c., generally in the most concealed parts of the rushy rivulet or sedgy margined pond, and in it from five to nine pale yellowish-brown eggs spotted with red are deposited. Incubation continues for three weeks. The young are exposed to many enemies, for their parent has not only to guard them against birds of prey and the smaller carnivora, rats, &c., but against the attacks of the pike. The food consists of aquatic insects, mollusks and worms, seeds and water herbage. The flesh of a water-hen in good season, after having had the advantage of a neighbouring wheat or barley stubble, is well flavoured, juicy, and sapid. The sportsman who is not well acquainted with their habits, often leaves them behind perched among the boughs of the trees or shrubs that overhang the water or closely adjoin it; for these birds when hard pressed not uncommonly get up into such retreats till the danger is passed. On its feet it is lively and not ungraceful: on wing it is heavy and slow.

Some of the African Gallinulos, figured by Dr. Smith (*Gallinulæ dimidiata* and *Jardinii* for instance), present certain differences which would appear to warrant subgeneric distinction.



Gallinula chloropus.

Rallus.

Generic Character.—*Bill* lengthened, slender. Both mandibles in general slightly curved, and with their margins considerably inflected beyond the nostrils. The tenuirostral type. (Sw.)

Example, *Rallus Aquaticus.*

Description.—Throat whitish; sides of the head, neck, breast, and belly leaden ash-colour; all the feathers of the upper parts red-brown, marked in the middle with deep black; sides deep black transversely striped with white bands; lower coverts of the tail white; bill red but clouded with brown at the point and above; feet brown flesh-colour; iris orange.

The Young of the Year have the middle of the belly of a red-brown, and the abdomen is blackish-ash without the white bands. (Temm.)

Mr. Gould remarks that the sexes are alike in plumage, but that the male is generally the largest. M. Temminck observes that they undergo a double moult, but that there is no marked difference between the two liveries.

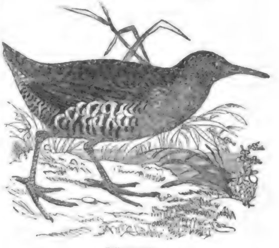
This species is the *Rale d'Eau* of the French; *Porciglione, Merla aquarola*, and *Merla d'Acqua* of the Italians; *Wasser Ralle* of the Germans; *Water-rail, Bidcock, Bilcock, Velvet-runner, Brook-runner*, and *Brook-Ousel* of the modern British; and *Cwtair* of the antient British. It is the *Rasle noir* of Belon, who gives the following synonyms:—'Ορτυγομήτρα[*] (Ortygometra), *Matrix Cothurnicum, Ralla, Rasle, Ralle, Roy et mere des Cailles*, and *Re de Quaglie.*

Geographical Distribution.—Europe, over which it is dispersed generally, but it is is more particularly abundant in the low districts of Holland, Germany, and France. In our islands it is more plentiful than is generally believed from its very shy and retired habits. Dr. Von Siebold and M. Bürger saw the bird in Japan.

Habits, Food, Reproduction, &c.—'Except when closely pressed,' says Mr. Gould, 'the Water-Rail seldom takes to flight, but evades pursuit by quietly yet quickly traversing the bottoms of thickset reed-beds and banks overgrown with luxuriant vegetation bordering the sides of pools and ditches, where it finds a covert through which its slender and compressed form enables it to pass with the greatest facility; besides which it possesses the power of swimming and diving, both of which materially aid its escape. Without denying the possibility of this bird being migratory, we have the strongest reason to believe that numbers remain with us during the whole of the year, frequenting during the summer season fen-land, morasses, ponds, and ditches, about which it incubates; resorting, on the approach of winter, to the sides of our large streams and rivers. Its nest is composed of rushes and vegetable fibres closely concealed among herbage, at a little elevation from the water; its nidification in fact closely resembles that of the Moor-hen. Its eggs[*] are of a yellowish-white colour, marked with spots of red-brown. Its food consists of worms, snails, soft insects and their larvæ, which abound in swampy places; vegetable substances also form a part. The young, when first excluded from the egg, are covered with black down, and are observed to be in perfect possession of the powers of swimming, and providing for their own safety and subsistence, remaining however under the parent's care and protection.'

The Water-rail is a delicious bird for the table. The writer of the old quatrain in the 'Portraits d'Oyseaux,' thus alludes to its celerity in running:—

'Le Rasle noir par les ruisseaux habite,
Et est cogneu en diverse contrée
D'un bon coureur la vistesse est monstrée,
Quand on le dit, comme un Rasle, aller viste.'



Rallus aquaticus.

Crex.

Generic Character.—*Bill* shorter than the head, thick at the base, subcultrated, compressed; the culmen gradually deflecting from the forehead to the point of the bill; lateral furrow of the upper mandible broad, and occupying more than half its length; angle of the under mandible bending upwards; both mandibles of an equal length. *Nostrils* concave, lateral, linear-ovoid, pierced in a membrane occupying the mandibular furrow in the middle of the bill. *Wings* armed with a spine, and having the second and third quill-feathers the longest. *Plumage* soft, thick, and open in texture. Legs strong, of mean length, with the lower part of the tibiæ naked. *Feet* fourtoed, three before and one behind. *Toes* long, slender, and cleft to their base, without any lateral membrane hind toe resting on the ground. Claws arcuate, compressed, and pointed. (Selby.)

Mr. Selby remarks that the *Crakes* hold an intermediate station between the *Rails* on the one hand and the *Gallinules* on the other, from the first of which they are distinguished by a shorter, thicker, and more angular bill, and from the latter in wanting the extension of the lateral membrane that borders the soles of the toes, as well as the naked callous skin (or plate) that occupies the forehead. By Linnæus, he observes, they were included in his genus *Rallus*, but Latham afterwards, under his system, transferred them to the genus *Gallinula*, in which he has been followed by Temminck. Mr. Gould has also placed the Land-Rail (*Rallus Crex*, Linn.) under *Gallinula*, but with regard to the smaller and spotted Crakes he has adopted Leach's generic name of *Zapornia*, which is supposed to be a transmutation of *Porzana*, *Rallus Porzana* being the Linnean name of one of those species. Bechstein separated the Crakes from *Gallinula* and *Rallus*, under the generic name of *Crex*, which included the *Spotted Crakes* (*Zapornia*), and many ornithologists have adopted his view. Mr. Selby, who is one of those who follow Bechstein, states that the habits of the Crakes are similar in many respects to those of *Gallinula* and *Rallus*, the former being of a shy and solitary disposition, living concealed in the thick herbage of meadows or marshy districts. 'They have,' says Mr. Selby, 'the same thin and compressed shape of body, and they run with a skulking gait, and with great quickness, seldom taking wing unless suddenly surprised, or when forced to it by persevering pursuit, of course with the exception of the times of their annual migration. They feed on worms and insects, as well as vegetables and seeds. Their flight is awkward and heavy, and they hang their legs, when only on wing for a short distance. All the British species are migratory, and come under the designation of summer visitants. The plumage of both sexes is nearly alike, differing only in the colours of the male bird being purer and brighter in tint. The young however are very different, and do not acquire the matured plumage till they undergo the second general moulting.'

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[*] Aristot., 'Hist. Anim.,' viii., c. 12.

[*] From six to ten. Tem.

Example, *Crex pratensis*, Bechst. (*Rallus Crex*, Linn.).

Description.—A large ash-coloured eyebrow, prolonged upon the sides of the head; all the feathers of the upper parts blackish brown in the middle, bordered laterally with ash-colour, and terminated with reddish; the long feathers which extend on the quills entirely bordered by a large band of olive-reddish; coverts of the wings of a rusty red; quills reddish externally; throat, belly, and abdomen white; breast olive-ash; sides reddish, striped with white; upper mandible brown, lower whitish; iris reddish-brown; eyebrows flesh-colour; feet flesh-colour or reddish-brown.

The *Young* have the tints less vivid, but brighter, with some white spots.

This is the *Rale de Genet*, or *Roi des Cailles* of the French; *Re di Quaglie* of the Italians; *Wiessen-Knarrer* and *Wachtel-König* of the Germans; *Kwartel Koning* of the Netherlanders; *Vagtel-Konge*, *Aker-Rixe*, and *Skov-Snarre* of the Danes and Norwegians; *Land-Rail*, *Corn-crake*, *Daker-hen*, *Bean-crake*, and *Corn-drake* of the modern British; and *Rhegen yr yd* of the antient British. Belon gives the following synonyms:—Ὀρτυγομήτρα ἄλλη, *Ortygometra altera*, *Ralla*, *Re de Quaglie*, *Ralle rouge*, or *Ralle de Genet*.

Geographical Distribution.—'The Land-rail,' says Mr. Gould, 'appears to be extensively spread over the whole continent of Europe; it is very abundant in Holland, and not uncommon in France and Germany. It is a migratory species, arriving with us about the latter end of April or the beginning of May, when it scatters itself in pairs over the whole of the British Isles.'

Food, Habits, Reproduction, &c.—Worms, snails, insects and their larvæ, seeds, and grain form the food of the Land-rail. It is very fond of grasshoppers. 'Its habits,' says Mr. Gould, 'are extremely shy and retiring, selecting for its places of abode grassy meadows, fields of young corn, ozier-beds, and marshy grounds, seldom allowing itself to be seen; and were it not for the peculiar note of the male, which consists of a singular grating monotone—sometimes sounding as if beneath one's feet, and again appearing as if uttered at a distance,—its presence would not be betrayed. In these its favourite places of resort and concealment it carries on the process of incubation, constructing its nest on the ground, and occasionally on small hillocks, the nest being composed of slender flags or grasses; the female laying from eight to twelve eggs, rather less than those of the moor-hen, to which, in the markings, they bear some resemblance, of a yellowish-white, covered with dull rust-coloured spots. The young when hatched are covered with a blackish down, and are soon able to follow the parent birds, attaining, by the commencement of the shooting-season, nearly the adult size and plumage.' Its southward migration commences in October, when it passes over to the Continent.

After it is once flushed, it is almost impracticable to force the Land-rail to take wing a second time, until it has run through every part of the cover that holds it. It is easily shot when on wing, though its flight is generally very short, for it flies heavily, and with the legs hanging down. It will run before a dog with the greatest rapidity, and very frequently escapes by trusting to its legs alone.

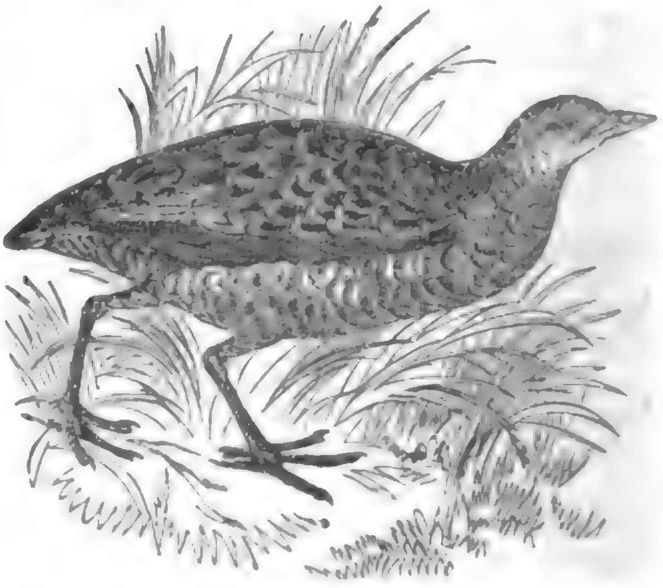
When dressed on the same day on which it is killed, with the trail in, it is very delicious, and it has always been highly esteemed for the table.

In the old quatrain under the cut of the Land-rail we read,—

> 'Au Ralle noir est ressemblant ce Ralle,
> Sinon de bec, de grandeur et coleur.
> A la Perdrix il ne cede en valeur,
> Mesme leur chair est en bonté egale.'

In the 'Northumberland Household-Book,' *Reys* are among the birds admitted to his lordship's table, and are charged at twopence each, the same price as that of a quail, and double that of a teal. Drayton too, in his 'Polyolbion' (twenty-fifth song), notices—

> 'The Rayle, which seldom comes but upon rich men's spits.'



Crex pratensis.

The reader will find the other European Crakes beautifully figured in Mr Gould's grand work 'The Birds of Europe;' of these, *Zaporniæ Baillonii* and *pusilla* were observed by Dr. Von Siebold and M. Bürger, in Japan.

RALPH, JAMES, was born at Philadelphia, in what year is not recorded, and passed the earlier part of his life there as a schoolmaster. In 1725 he came to England in company with his townsman Benjamin Franklin. 'We have not learned,' says the writer of his article in the 'Biographia Dramatica,' 'what was then the immediate object of his pursuit, but it was probably something in the public offices dependent on the court; for he soon became a frequenter of the levees, and attached to some great men to whom his abilities recommended him.' It may be doubted notwithstanding if he had any other employment for some time except writing in the newspapers. In the first book of the 'Dunciad,' published in 1728, Pope mentions him as one of the 'gazetteers,' who are described in a note as 'a band of ministerial writers, who, on the very day their patron (Walpole) quitted his post, laid down their paper, and declared they would never more meddle in politics.' The lines in the text are—

> 'And see, thy very gazetteers give o'er,
> Even Ralph repents, and Henley writes no more.'

This same year appeared Ralph's first separate and acknowledged literary performance, a poem, entitled 'Night.' It is to this work that Pope alludes in the third book of the 'Dunciad,' where he exclaims—

> 'Silence, ye wolves, while Ralph to Cynthia howls,
> And makes night hideous; answer him, ye owls!'

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To this passage is appended a very abusive note, in which Ralph, whose name is stated to have been inserted after the first editions of the poem, is denounced as the author of 'a swearing piece called "Sawney,"' which, it appears, was an attack upon Pope and his two friends Swift and Gay. 'This low writer,' it is added, 'attended his own works with panegyrics in the journals, and once in particular praised himself highly above Mr. Addison, in wretched remarks upon that author's account of English poets, printed in a London journal, September, 1728. He was wholly illiterate, and knew no language, not even French. Being advised to read the rules of dramatic poetry before he began a play, he smiled and replied, 'Shakspere writ without rules.' He ended at last in the common sink of all such writers, a political newspaper, to which he was recommended by his friend Arnall [manager of the 'British Journal'], and received a small pittance for pay.' In reply to this, his admirer in the 'Biographia Dramatica' says, 'It is very certain that he was master of the French and Latin languages, and not altogether ignorant of the Italian; and was in truth a very ingenious prose writer, although he did not succeed as a poet.' His dramatic writings are—'The Fashionable Lady, or Harlequin's Opera,' produced at the theatre in Goodman's Fields, in 1730, with some success, in the rage for such entertainments which had been recently excited by the 'Beggar's Opera;' 'The Fall of the Earl of Essex,' a tragedy (altered from the 'Unhappy Favourite' of John Bankes), brought out at the same house in 1731; the 'Lawyer's Feast,' a farce, performed at Drury Lane in 1744; and the 'Astrologer,' a comedy, 'once acted,' says the title-page, 'at Drury Lane,' also in 1744. 'The Astrologer' was only an alteration of an old play, called 'Albumazar,' written by a Mr. Tomkis, of Trinity College, Cambridge, in 1615. 'Ralph, in his advertisement,' says the 'Biographia Dramatica,' 'complains that ten years elapsed before it could obtain the favour of a representation; that he was not unknown to the great, nor destitute of private friends; and having devoted the most serious of his studies to the service of the public, he had some reason to expect the public favour; yet that the receipts of the house upon the first night were but twenty-one pounds; and when the manager risked a second, to give the author a chance for a benefit, he was obliged to shut up his doors for want of an audience.' Both the play and Ralph's dramatic reputation would thus appear to have been very bad. Another of his latter publications, which is described as 'a very excellent and very entertaining performance,' a tract, entitled 'The Case of Authors,' is stated to have also had 'some relation to the stage;' it was probably an argument for the protection of dramatic copyrights; though his own do not seem to have been in much danger of infringement.

Most of Ralph's publications however were political pamphlets on the topics of the day; and he is also supposed to have continued to be an active contributor to the public journals to the end of his life. He attached himself latterly to the faction of the Prince of Wales, and frequent mention of him may be found in Bubb Dodington's 'Diary.' Horace Walpole, in his 'Memoirs of the Last Ten Years of George II.,' writes, under date of 2nd of June, 1753:—'A new anti-ministerial paper appeared, called "The Protester," supported at the expense of the duke of Bedford and Beckford [the alderman], and written by Ralph, a dull author, originally a poet, and satirized in the 'Dunciad;' retained, after his pen had been rejected by Sir Robert Walpole, by Dodington and Waller; but much fitter to range the obscure ideas of the latter than to dress up the wit of the former: from them he devolved to the Prince of Wales in his second opposition, and laboured long in a paper called 'The Remembrancer,' which was more than once emboldened above the undertaker's pitch, by Lord Egremont and others. Ralph's own turn seemed to be endeavouring to raise mobs by speculative ideas of government; from whence his judgment at least may be calculated. But he had the good fortune to be bought off from his last journal, the 'Protester,' for the only paper that he did not write in it.' Other accounts make him to have been 'taken off' by a pension towards the end of Sir Robert Walpole's time, in consequence of having then made himself so formidable to the ministry. The death of Prince Frederick (in March, 1751) was an annihilating blow for the moment to Ralph, as well as to his patron Dodington, who had promised to make him his secretary if he should live to have the seals of secretary of state for the southern department, which the prince had engaged to give him (*Diary*, July 18 and 19, 1749); but it is said that he obtained a considerable sum from the government for the surrender of an important manuscript written by the prince, or under his royal highness's direction, which had come into his possession. On the accession of George III., he got another pension, which however he did not long enjoy, for he died of gout at his house in Chiswick, 24th January, 1762, followed in a few weeks by his only daughter, in her eighteenth year, of the same disease. Ralph had more talent and perhaps more principle too than the hostile notices we have quoted would allow him. Of his political pamphlets, the only one which is now remembered is his answer to the duchess of Marlborough's famous 'Account of her Conduct,' an octavo volume of four hundred and sixty-seven pages, entitled 'The Other Side of the Question, or an Attempt to rescue the Characters of the Two Royal Sisters, Queen Mary and Queen Anne, out of the hands of the D——s D—— of ——, in which all the Remarkables in her Grace's late Account are stated in their full strength, and as fully answered; the conduct of several noble persons is justified; and all the necessary lights are thrown on our Court history from the Revolution to the change in the ministry in 1710: in a Letter to her Grace, by a Woman of Quality,' Lond., 1742. This is by far the ablest and most important of the various answers and defences which her grace's publication drew forth; and some things in it appear to have been supplied by the family of the late earl of Oxford (the lord-treasurer Harley). Ralph is also the author of another anonymous work (published indeed without the name of either printer or bookseller) entitled 'Of the Use and Abuse of Parliaments; in Two Discourses, viz. 1, A General View of Government in Europe; 2, A Detection of the Parliaments of England from the year 1660,' 2 vols. 8vo., Lond., 1744. In an advertisement we are informed that the first of the two discourses, which however fills only seventy-eight pages of the first volume, is from the pen of Algernon Sydney. The rest of the book is a hasty performance, and of little value. But his principal work, also anonymous, is his continuation of Guthrie's History, entitled a 'History of England during the Reigns of King William, Queen Anne, and King George I.; with an Introductory Review of the Reigns of the Royal Brothers, Charles and James; in which are to be found the seeds of the Revolution. By a Lover of Truth and Liberty:' 2 vols fol., Lond., 1744-46. Notwithstanding a systematic and very unfair depreciation of King William, which runs through a great part of it, this work is written with considerable spirit and acuteness, and contains many new facts and corrections of the views of preceding historians. It has decidedly risen in reputation with our increasing knowledge of the times of which it treats.

RAM. [SHEEP.]

RAMA. [VISHNU.]

RAMADHA'N, the ninth month in the Arabian calendar, and a sort of Lent observed by the Mohammedans, in obedience to the express command of the Koran. During this month every good Moslem is bound to fast from the first appearance of day-break until sunset. He must abstain from eating, drinking, smoking, smelling perfumes, and all other unnecessary indulgences or pleasures of a worldly nature; even from intentionally swallowing his spittle. He is allowed to bathe himself, but it is on condition that he is not to plunge his head under water, lest some drops should enter his mouth or ears. Some even are so scrupulous that they will not open their mouths to speak, for fear of breathing the air too freely. To make amends for this extreme rigour, Moslems generally feast all night till day-break, though the more rigid begin the fast again at midnight. As the Ramadhân happens at different seasons of the year, the fast is very severe when it falls in summer; the abstinence from drinking being most painfully felt. Persons who are sick, or on a journey, and soldiers in time of war, are not obliged to observe the fast during this month, but then they should fast an equal number of days at a future time. Fasting is also dispensed with in the case of nurses and pregnant women. The prophet even disapproved of any persons keeping the fast of Ramadhân, if not perfectly able; and he desired no man to observe it so strictly as to injure his health or disqualify himself for necessary labour, which is frequently the case among the lower classes of people. The reason given by the Mohammedan theologians for the month of Ramadhân having been fixed upon for this purpose is, that the prophet received his first revelation in that month; others pretend that it was chosen by Mohammed from its being generally spent by the antient Arabs in revelry and mirth and excessive drinking.

RAMÁYANA. [Sanscrit Literature.]

RAMAZZI'NI, BERNARDO, was born at Carpi, near Modena, in 1633. He studied medicine at Parma, and took his doctor's degree there in 1659. He practised successively at Carpi and at Modena; and when the university of the latter place was instituted, he was appointed professor of the theory of medicine by the duke Francis II. In 1700 he was invited to the second professorship of medicine at Padua, and in 1708 was raised to the principal chair there, though blind and so infirm that he earnestly desired to decline that honour. He died in 1714.

Ramazzini was a frequent writer and a very warm controversialist both in medical and literary subjects. His first work was a series of letters in a controversy with Moneglia, a physician of Modena, in which both engaged with much more acrimony than medical judgment, but in which Ramazzini certainly supported the best view of the case, which respected the removal of the placenta after childbirth.

The works by which Ramazzini is now best known are 'De morbis artificum diatriba,' Mutin., 1770, and 'De abusu chinæ-chinæ diss. epist.' The former was translated into several languages, and among them into English in 1725. It contains a fair description of all the diseases to which each class of artificers is liable, as far as they were then known, the descriptions being very carefully drawn up both from the writings of his predecessors and from his own observations. The latter was intended to detract from the extravagant reputation which the Peruvian bark at that time enjoyed, and though it may now be evident that the author fell into the opposite extreme, and degraded that medicine far below its real merits, the work was probably in its day productive of much benefit. The whole of Ramazzini's writings were published collectively at Cologne, in 1689, at London in 1717, and at several other places at nearly the same time. They are still held in high repute by the Italian physicians, who seem to regard their author with as much reverence as they did, who in his life-time honoured him with the title of Hippocrates III.

RAMBEH, the Malay name of a fruit described by Mr. Jack as being common in the peninsula of Malacca, but unknown at Bencoolen, while the *Choopa*, which is nearly allied to it, is abundant at the latter, but is not found at the former place. The fruit is that of a tree called *Pierardia dulcis*, of the natural family of Sapindaceæ. Another species of the same genus is called *P. sapida*, from its also yielding an edible fruit. It is found in the district of Tippera, to the eastward of Calcutta, and also in China, where it is cultivated for its agreeable fruit, according to information obtained by Dr. Roxburgh from Chinese gardeners. It is remarkable that it should there be called Lutqua, as it is called Lutco by the Hindus on the eastern frontier of Bengal.

RAMBERVILLER. [Vosges.]

RAMBOOTAN, a fruit of the Malayan archipelago, belonging to the same genus (Nephelium, of the natural family of Sapindaceæ) as the Chinese fruits Litchee and Longan. The fruit is about the size of a pigeon's egg, something like that of the Arbutus, but larger, and of a brighter red. It has a skinny red coat covered with soft spines, whence is derived its Malay name from *rambut*, 'hair.' Within the covering is enclosed a small quantity of semi-transparent rich subacid pulp, which forms the edible part of the fruit, and covers a large kernel. Mr. Marsden describes the flavour of this fruit as rich and of a pleasant acid, but Mr. Crawford states that it is not much esteemed. It has been cultivated in this country in a rich light loam in hothouses.

RAMBOUILLET. [Seine et Oise.]

RAMILLIES, or RAMELIES, a small village, with about 600 inhabitants, in the province of South Brabant, 13 miles north of Namur and 26 south-east of Brussels, in the present kingdom of Belgium. A victory was obtained in its vicinity, on the 23rd of May, 1706, by the allied army under the Duke of Marlborough and the Dutch field-marshal Van Ouwerkerk, over the French and Bavarians commanded by Marshal Villeroi and the Elector of Bavaria. This battle is considered as the most complete and successful exemplification of the military talents of Marlborough. The numbers were about 60,000 men on each side, but the French generals were no match for Marlborough: and the day ended in a complete victory on the part of the allies, who lost only 4000 men, while the loss of the French was 15,000. The immediate evacuation of Flanders by the French was the result of this battle.

RAMIRO II., son of Ordoño II., succeeded to the throne of Asturias and Leon by the abdication of his elder brother Alfonso IV., surnamed 'el Monge' (the monk), who, in 930, renounced the vanities of the world, and retired into the monastery of Sahagun. Ramiro rendered himself illustrious by his wars with the Mohammedans, from whom he wrested many considerable districts and towns, thereby extending the limits of the small kingdom founded by Pelayo. [Pelayo.] Soon after his accession to the throne (932), Ramiro, profiting by the internal troubles which at that time agitated the Mohammedan empire, made a successful irruption into the states of Abd-er-rahmán, the reigning khalif, destroying Madrid, Talavera, and other towns; and when Al-mudaffer, the khalif's uncle, arrived at the head of considerable forces to revenge the outrage, he defeated him with dreadful carnage on the banks of the Duero, not far from the town of Osma. In 938 Ramiro turned his victorious arms to another quarter; he invaded Aragon, or *Thagher* (as that province was then called by the Arabs), and laid siege to its capital, Saragossa, which he would have reduced if the governor had not hastened to pay him homage and acknowledge himself a feudatory of his crown; though these advantages seem to have been counterbalanced by the victory gained by the Mohammedans over his troops in 938, near a village called Sotuscobas. Ramiro was again victorious in a battle fought under the walls of Ramora, in which the Moslems, according to their own authorities, lost upwards of 40,000 men, and Abd-er-rahmán himself was well nigh taken prisoner. [Moors.] Ramiro, like most of his predecessors, had often to contend with internal enemies. Scarcely had he ascended the throne when his brother Alfonso, growing weary of monastic life, forsook his cell, and with a considerable force hastened to Leon to reclaim his throne. He was there invested by Ramiro, who compelled him to surrender, and again consigned him to his monastery, where he was soon after deprived of his eyes, a species of punishment much in use among the Visigoths of Spain. The dependent count of Castile, Ferran-Gonzalez, and one Diego Nuñez, a count also in the same province, next revolted against Ramiro, but he marched against them, seized their persons, and confined them to a dungeon; though he soon after pardoned them and even married his eldest son Ordoño to Urraca, daughter of Ferran. Ramiro died on the 5th of January, 950, after a glorious reign of nearly twenty years. Some time before his death he abdicated in favour of his son Ordoño, and, assuming the penitential garb, passed the remainder of his days in religious retirement.

RAMISERAM. [Ceylon.]

RAMLER, C. W. [Germany, vol. xi., p. 196.]

RAMPHA'STIDÆ (*Toucans*), a family of scansorial birds.

Belon, at the end of the twenty-eighth chapter of his third book 'De la Nature des Oyseaux vivants le long des rivières, ayants le pied plat, nommez en Latin *Palmipedes aves*' (A.D. 1555), gives a wood-cut of the bill of a Toucan, which, from the black patch at the end of it, was probably that of *Ramphastos Toco*. He describes the bill as belonging to a bird of the *terres neufues*, which possesses that organ half a foot long, large as a child's arm, pointed and black at the tip, white elsewhere, and notched some little on the edges, hollow within, and so finely delicate that it is transparent and thin as parchment. Its beauty, he observes, has caused it to be kept in the cabinets of the curious. He further says that he has not seen the bird, but that he suspects that it is *de pied plat*, and therefore he has placed it with the River Birds.

In the 'Portraits d'Oyseaux' also, the cut of this bill is placed at the end of 'Le Second Ordre des Oyseaux au pied plat.' Above it appears the following description:—

'Bec d'un Oyseau aquatique apporté des terres neufues.'

"Si quelqu'un avoit fait un corps d'oyseau à ce bec sans avoir grosseur suffisante, qu'on le juge fait à discretion, car nous l'avons mieux aymé laisser ainsi, que luy en foindre un.'

Below the cut is the following quatrain,—

'Ce bec est gros comme le bras d'un enfant,
Creux par dedans, transparent comme verre;
Tenue et leger, venu d'estrange terre,
Noir par le bout, et blanc au demourant.'

The birds themselves do not seem to have found their way to England a century after the date of Belon's works; for, in the Museum Tradescantianum, the standard collection of the time, and which, from the list of contributors, appears to have been the great receptacle for all curiosities, we read, under the division (No. 2) of *Beaks* or *Heads*,—'Aracari of Brazil, his beak four inches long, almost two thick, like a Turke's sword' (A.D. 1656). But if the bird itself had not been brought forward, it is probable that Tradescant knew its nature, from the description above given. Petiver (tab. xliv., f. 13) gives a figure of the bird complete, and though it bears all the marks of the imperfect state of the arts at that time, as far as engravings of subjects of natural history are concerned, it is substantially correct, and the arrangement of the toes right. The description is, 'Toucan Surinamensis niger, ex albo, flavo, rubroque mixta,' taken from a Dutch painting, in Mr. Clark's collection: this does not exactly agree with any authors I have yet read.' Willughby (tab. xx.) gives a figure of a Toucan (*Ramphastos Toco*, probably) under the name of 'the Brazilian Pie of Aldrovandus, the Toucan of Marcgrave and others, the Xochitenacatl of the Mexicans: Nieremb.' The figure is incorrect about the feet, to which three anterior toes are given, though Willughby, who cites Thevetus, Faber, Dal Pozzo, Lerius, Oviedo, and John de Laet, was evidently aware of the true organisation, viz. two toes before and two behind.

Brisson placed the form in his thirteenth order, consisting of those birds which have four toes, two before and two behind.

Linnæus arranged the Toucans (*Ramphastos*) at the head of the second division (*pedibus scansoriis*) of his second order, *Picæ*.

Latham also assigned to them the same situation.

Lacépède places *Ramphastos* at the head of the second order (*Bec dentelé*) of his *Grimpeurs*, or climbers.

Duméril arranged the form at the head of the *Levirostres*, or *Cénoramphes*, the second family of his third order, *Grimpeurs*.

The *Scansores* form the first order in the method of Illiger, and *Ramphastos* and *Pteroglossus* appear at the head of the second family, *Serrati*.

In Cuvier's system the Toucans are arranged in his third order, *Grimpeurs*, between the *Anis* [CROTOPHAGA] and the Parrots [PSITTACIDÆ].

The *Zygodactyli* are the first tribe of M. Vieillot's second order, *Sylvicolæ*, and the Toucans are placed in the fourth family, *Ptéroglosses*, between the Jacamars and Barbets.

M. Temminck arranges the form in the first family of his fifth order, *Zygodactyles*.

Mr. Vigors (*Linn. Trans.*, vol. xiv.) opens his section on the *Scansores* with a remark on the deviation which had been observed in the *Buceridæ* (arranged by him among the *Conirostres*) from the more perfect formation of the foot, as preparing us for the still more considerable deviation that takes place in the same particular among the *Scansorial Birds*. 'Besides the approach which we have just noticed in the *Buceridæ* [HORNBILLS] to the imperfect form of the scansorial foot, we may perceive that the large and disproportionate bill of that family is carried on to the *Ramphastidæ*, the first family of the *Scansores* that meets our attention. There is seldom perhaps a surer guide to relations of affinity and analogy than common observation; and a trivial or provincial name often anticipates the more correct and scientific views of the naturalist. In seeking for the immediate point of junction between the two tribes now before us, we are in this manner directed at once to the object of our search; a scansorial genus, belonging to the family of *Ramphastidæ*, the *Scythrops* of Dr. Latham, being designated, as may be seen in the collection belonging to the Linnean Society, by the denomination of *Psittaceous Hornbill*.' [SCYTHROPS.] The family of *Ramphastidæ* then, according to Mr. Vigors, consists of the genera *Ramphastos*, Linn., and *Pteroglossus*, Ill., which fill up the some station in the New World that *Buceros* maintains in the Old. To these genera he adds *Scythrops*, as equally assimilated to both groups, and thus supplying their place in Australasia. *Scythrops*, in the opinion of Mr. Vigors, unites the *Ramphastidæ* with the larger and more prominent billed *Cuculidæ*, which meet it at the other extremity of the tribe. The connection of *Ramphastos* with the *Psittacidæ* is, he observes, not so evident. [PSITTACIDÆ, vol. XIX., p. 85.]

The *Grandirostres* form the fifth family of the *Grimpeurs*, the third order in the system of M. Latreille, and embrace the genera *Toucan* and *Aracari*, which are placed between the *Proglosses* (Wryneck, Woodpecker, &c.) and the *Galliformes* (*Musophaga*, *Touraco*).

The Toucans appear as the fifteenth family of the Normal Birds of M. de Blainville, and are placed between *Buceros* and *Picus*.

In M. Lesson's 'Projet' the *Ramphastidæ* succeed the *Picidæ*, and are the last family of the first tribe of his *Insessores* or *Grimpeurs* (*Heterodactyles*).

Mr. Swainson (*Classification of Birds*) states that the fourth family of the *Scansores*, or *Climbing Birds*, is represented by the *Toucans*, whose enormous bills give to these birds a most singular and uncouth appearance. He remarks that their feet are formed, like those of the parrots, more for grasping than climbing, and that they do not appear to possess the latter faculty; but as they always live among trees, and proceed by hopping from branch to branch, their grasping feet are peculiarly adapted to such habits. He adds that the intervals between the toucans and the parrots is not perhaps so great as between the latter and the woodpeckers; but that still it is sufficiently wide to make us believe that one if not two of the intervening types are wanting. The genera of the *Ramphastidæ*, according to Mr. Swainson, are *Ramphastos*, *Pteroglossus*, *Aulacorhynchus*,* and *Scythrops*.

Mr. G. R. Gray (*List of the Genera of Birds*) makes the *Ramphastidæ* the first family of the *Scansores*, with the following genera:—

Rhamphastos, Linn. (*Pica*, Gesn., *Tucana*, Briss.).
Pteroglossus, Ill. (*Ramphastos*, Linn.).
Selenidera, Gould (*Ramphastos*, Linn.; *Pteroglossus* Wagl.).
Aulacoramphus (*Ramphastos*, Linn.; *Pteroglossus*, Sw.; *Aulacorhynchus*, Gould).
Scythrops, Lath.

Mr. Gould, in his beautiful monograph of the *Ramphastidæ*, divides them into two great sections:—

1. Caudâ breviore, quadratâ; rostro maximo. *Nigri, gutture caudæque tegminibus discoloribus.* RAMPHASTOS. (The *Toucans*.)

Of these Mr. Gould records eleven species, arranged in four subdivisions, according to the distribution of their colouring.

2. Caudâ longiore, graduata; rostro majore. *Viridescentes; capite, gastræo, tegminibusque caudæ superioribus in plurimis discoloribus.* PTEROGLOSSUS. (The *Araçaris*.)

Of these Mr. Gould records twenty-two species, arranged in twelve subsections, also according to the distribution of their colouring.

Geographical Distribution, Habits, &c.—The *Toucans* and *Araçaris* appear to be restricted in their geographical range to tropical America, and there they live retired in the deep forests, mostly in small companies. Their flight is straight but laborious, and not graceful; while their movements, as they glide rather than hop from branch to branch, are elegant.

Mr. Broderip gives the following account of the habits of a Toucan (*Ramphastos erythrorhynchus*) in captivity. Mr. Swainson, who had seen the Toucans in their native forests, had previously informed Mr. Broderip that he had frequently observed them perched on the tops of lofty trees, where they remained as if watching. This circumstance, joined to others connected with the remains of food found in the stomachs of such as were dissected, induced Mr. Swainson to suspect that these birds were partly carnivorous, feeding upon eggs and young birds, as well as fruits and berries; and that while perched upon these high trees, the Toucans were in fact busily employed in watching the departure of the parent-birds from their nests. Mr. Swainson could never catch the Toucans in the fact, nor did anything appear in his dissections to determine with certainty on what they fed. Mr. Such informed Mr. Broderip that he had seen these birds in Brazil feed on the Toucan-berry, that he had frequently observed them engaged in quarrels with the monkeys, and that he was certain that the Toucans fed also on eggs, nestlings, &c.

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* Employed in botany.

On the 23rd of November, 1824, the late lamented Mr. Vigors had spoken at the Zoological Club of a living Toucan, which was then exhibited in St. Martin's Lane. Mr. Vigors stated that the bird had been fed on a vegetable diet; but that the proprietor had told him that on the occasion of a young Canary bird having escaped and gone near to the Toucan, the latter appeared more than usually excited, that thereupon the barrier between them was removed, and that the Toucan instantly seized and devoured the Canary bird. On the next day Mr. Broderip went to the place where the Toucan was exhibited, and thus describes what he saw:—

'After looking at the bird which was the object of my visit, and which was apparently in the highest state of health, I asked the proprietor to bring up a little bird, that I might see how the Toucan would be affected by its appearance. He soon returned, bringing with him a goldfinch, a last year's bird. The instant he introduced his hand with the goldfinch into the cage of the Toucan, the latter, which was on a perch, snatched it with his bill. The poor little bird had only time to utter a short weak cry; for within a second it was dead, killed by compression on the sternum and abdomen, and that so powerful that the bowels were protruded after a very few squeezes of the Toucan's bill. As soon as the goldfinch was dead, the Toucan hopped with it, still in his bill, to another perch, and placing it with his bill between his right foot and the perch, began to strip off the feathers with his bill. When he had plucked away most of them, he broke the bones of the wings and legs (still holding the little bird in the same position) with his bill, taking the limbs therein, and giving at the same time a strong lateral wrench. He continued this work with great dexterity till he had almost reduced the bird to a shapeless mass; and ever and anon he would take his prey from the perch in his bill, and hop from perch to perch, making at the same time a peculiar hollow clattering noise; at which times I observed that his bill and wings were affected with a vibratory or shivering motion, though the latter were not expanded. He would then return the bird to the perch with his bill, and set his foot on it. He first ate the viscera, and continued pulling off and swallowing piece after piece, till the head, neck, and part of the back and sternum, with their soft parts, were alone left: these, after a little more wrenching, while they were held on the perch, and mastication, as it were, while they were held in the bill, he at last swallowed, not even leaving the beak or legs of his prey. The last part gave him the most trouble; but it was clear that he felt great enjoyment; for whenever he raised his prey from the perch he appeared to exult, now masticating the morsel with his toothed bill and applying his tongue to it, now attempting to gorge it, and now making the peculiar clattering noise accompanied by the shivering motion above mentioned. The whole operation from the time of seizing his prey to that of devouring the last morsel lasted about a quarter of an hour. He then cleaned his bill from the feathers by rubbing it against the perches and bars of his cage. While on this part of the subject it may be as well to mention another fact, which appears to me not unworthy of notice. I have more than once seen him return his food some time after he had taken it to his crop, and, after masticating the morsel for awhile in his bill, again swallow it; the whole operation, particularly the return of the food to the bill, bearing a strong resemblance to the analogous action in ruminating animals. The food on which I saw him so employed was a piece of beef, which had evidently been macerated some time in the crop. While masticating it, he made the same hollow clattering noise as he made over the remains of the goldfinch. Previous to this operation he had examined his feeding-trough, in which there was nothing but bread, which I saw him take up and reject; and it appeared to me that he was thus reduced from necessity to the above mode of solacing his palate with animal food. His food consists of bread, boiled vegetables, eggs, and flesh, to which a little bird is now added about every second or third day. He shows a decided preference for animal food, picking out all morsels of that description, and not resorting to the vegetable diet till all the former is exhausted.

'It is said that the nerves are very much expanded within the internal surface of the bill in these birds; and independently of the sensual enjoyment which the Toucan above mentioned appeared to derive from palating his prey, I have observed him frequently scratching his bill with his foot, which may be considered as furnishing additional evidence of the sensibility of this organ. While taking his prey he never used his foot for the purpose of conveying it either to his bill or elsewhere. The bill was the sole vehicle and the organ actively employed; the foot merely confined the prey on the perch.

'But there is yet another of the peculiarities of this bird which cannot be passed over in silence. When he settles himself to roost, he sits a short time with his tail retroverted, so as to make an acute angle with the line of his back; he then turns his bill over his right shoulder, nestling it in the soft plumage of the back (on which last the under mandible rests), till the bill is so entirely covered that no trace of it is visible. When disturbed, he did not drop his tail, but almost immediately returned his bill to the comfortable nidus from which on being disturbed he had withdrawn it. He broke a short time ago some of his tail-feathers, and the proprietor informed me that before that accident the bird when at roost retroverted his tail so entirely that the upper surface of the tail-feathers lay over and came in contact with the plumage of the back; so that the bird had the appearance of a ball of feathers, to which indeed when I saw him he bore a very considerable resemblance. The proprietor informs me that he always roosts in the same way.' (*Zool. Journ.*, vol. i.)

In a subsequent volume (ii.) Mr. Vigors gives the following interesting account of a Toucan, *Ramphastos Ariel* (Vig.), which he kept in a state of domestication for many years:—

'With respect to the manners of my bird, I can add but little to the very accurate and interesting account of those of a species nearly allied to it, which has appeared in a preceding number of this journal.* I have not allowed it to be indulged in that disposition to animal food which so strikingly belongs to this family. I find in fact that it thrives sufficiently well upon a vegetable diet; and I fear that if it should once be allowed any other, it would be difficult to restrain its inclination for it within moderate limits. Eggs are the only animal food with which it has been supplied since it came into my possession. Of these it is particularly fond, and they are generally mixed up in his ordinary food, which consists of bread, rice, potatoes, German paste, and similar substances. He delights in fruits of all kinds During the period when these were fresh, he fed almost exclusively on them; and even in the present winter months he exhibits great gratification in being offered pieces of apples, oranges, or preserved fruits of any description. These he generally holds for a short time at the extremity of his bill, touching them with apparent delight with his slender and feathered tongue; and then conveying them by a sudden upward jerk to his throat, where they are caught and instantly swallowed. His natural propensity to preying upon animals, although not indulged, is still strongly conspicuous. When another bird approaches his cage, or even a skin or preserved specimen is presented to him, he exhibits considerable excitement. He raises himself up, erects his feathers, and utters that "hollow clattering sound" noticed by Mr. Broderip, which seems to be the usual expression of delight in these birds; the irides of his eyes at the same time expand, and he seems ready to dart upon his prey, if the bars of his cage permitted his approach. On one occasion, when a small bird was placed by chance over his cage at night, he showed great restlessness, as if aware of the neighbourhood of the bird; and he would not be composed until the cause of his anxiety was discovered and removed.

'When in his cage, he is peculiarly gentle and tractable, suffers himself to be played with, and feeds from the hand. Out of his cage, he is wild and timid. In general he is active and lively; and, contrary to what might be expected, from the apparent disproportion of the bill and the seemingly clumsy shape of the birds of this genus, as they are usually set up or represented in figures, his appearance is not only graceful, but his movements, as he glides from perch to perch, are light and sylph-like; so much so as to have suggested to an intelligent friend who witnessed them the specific name which I have ventured to assign him. He keeps himself in beautiful plumage, his lighter colours being strikingly vivid, and the deep black of his upper body in particular being always bright and glossy. For this fine condition he seems to be much indebted to his fondness for bathing. Every day he immerses himself in cold water with apparent pleasure, even in this severe weather· and in no respect indeed does he appear to suffer by the transition from his own warm climate to our uncongenial atmosphere.

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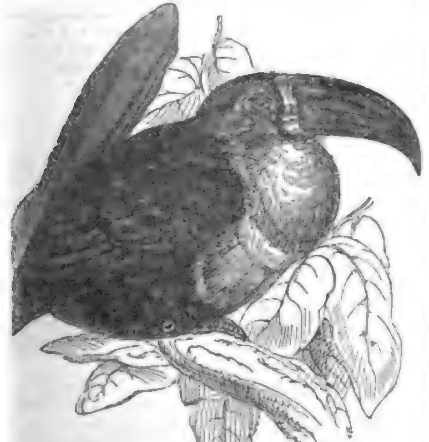
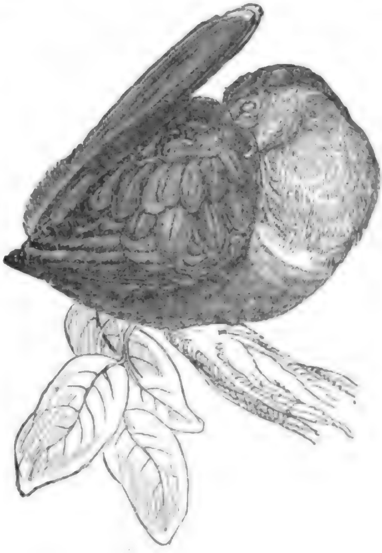
* Mr. Broderip's account, above given.

'Besides the "hollow clattering noise," as my friend Mr. Broderip so expressively terms the usual sounds of these birds, he utters at times a hoarse and somewhat discordant cry when he happens to be hungry, and to see his food about to be presented to him. On such occasions he stands erect, raising his head in the air, and half opening his bill as he emits this cry. These are the only sounds I have heard him utter; and in neither can I say that I have detected any similarity, or even approach, to the word Toucan, as has sometimes been asserted, and from whence the trivial name of the genus has been supposed to originate. Neither have I been able to verify another observation which has been advanced respecting these birds, that the bill is compressible between the fingers in the living bird. The bill, notwithstanding the lightness of its substance, is firm, and capable of grasping an object with much strength. The mode in which Mr. Broderip describes his Toucan as having broken the limbs of the bird which he was about to devour, by "a strong lateral wrench," sufficiently shows that the bill is not deficient in power. Indeed I generally observe that my bird takes what is offered him rather by the sides than by the point of his bill; and I suspect that much of the powers of that member are centred in this lateral motion. The serration of the edges also may be supposed to tend to these peculiar powers. The manner in which he composes himself to rest is represented in the accompanying plates. Since the cold weather has commenced, he has been brought into a room with a fire, and the unusual light seems to have interfered with his general habits; he does not go to rest as early or as regularly as was his custom; and he sometimes even feeds at a late hour. During the warmer months however, when he was more free from interruption, his habits were singularly regular. As the dusk of the evening approached, he finished his last meal for the day; took a few turns, as if for exercise after his meal, round the perches of his cage; and then settled on the highest perch, disposing himself, almost at the moment he alighted on it, in the posture represented, his head drawn in between his shoulders, and his tail turned vertically over his back.



Toucan at roost; first stage.

'In this posture he generally remained about two hours, in a state between sleeping and waking, his eyes for the most part closed, but opening on the slightest interruption. At such times he would allow himself to be handled, and would even take any favourite food that was offered him without altering his posture further than by a gentle turn of the head. He would also suffer his tail to be replaced by the hand in its natural downward posture, and would then immediately return it again to its vertical position. In these movements the tail seemed to turn as if on a hinge that was operated upon by a spring. At the end of about two hours he began gradually to turn his bill over his right shoulder, and to nestle it among the feathers of his back, sometimes concealing it completely within the plumage, at other times having a slight portion of the culmen exposed. At the same time he drooped the feathers of his wings and those of the thigh-coverts, so as to encompass the legs and feet; and thus nearly assuming the appearance of an oval ball of feathers, he secured himself against all exposure to cold.'



Toucan at roost; second stage.

All are now agreed that in a state of nature the *Ramphastidæ* are omnivorous. Mr. Swainson (*Classification of Birds*) says, 'The apparent disproportion of the bill is one of the innumerable instances of that beautiful adaptation of structure to use which the book of nature everywhere reveals. The food of these birds principally consists of the eggs and young of others, to discover which nature has given them the most exquisite powers of smell;' and he notices the size of the bill as ancillary to this development.

Mr. Gould, who alludes to the papers of Mr. Broderip and of Mr. Vigors, states that in their choice of food the Ramphastidæ are perfectly omnivorous; and although their elastic bill and delicately feathered tongue would lead us to conclude that fruits constituted the greatest proportion of their diet, we have abundant testimony that they as readily devour flesh, fish, eggs, and small birds, to which, in all probability, are added the smaller kinds of reptiles, caterpillars, and the larvæ of insects in general.

The incubation of most if not all of this family takes place in the holes of trees, a habit that was very early known. We find Willughby, after quoting Faber for proof that in the structure of their feet, &c., the toucans resemble the woodpeckers, 'to the genus whereof the toucan, as Faber in this place proves, doth undoubtedly belong,' continuing thus: 'for it not only hath a like situation of toes, but also in like manner hews holes in trees to build its nest, as Fryer Peter Alvaysa, and other Indians and Spaniards, who had long lived in America, told Faber for a certain truth; and Oviedus, in the forty-third chapter of his summary of the history of the West Indies, published in Italian, writes, adding that he thinks there is no bird secures her young ones better from the monkeys, which are very noisome to the young of most birds. For when she perceives the approach of those enemies, she so settles herself in her nest as to put her bill out at the hole, and gives the monkeys such a welcome therewith that they presently pack away, and glad they escape so. From this quality of boring the trees, this bird is by the Spaniards called *carpintero*, and by the Brazilians *tacataca*, in imitation, I suppose, of the sound it makes.' The feathered structure of the tongue is also there noticed.

Mr. Gould remarks that the true toucans, unlike many of the araçaris, offer no sexual difference in the colour of the plumage; but the females are rather less than the males in all their proportions. He adds that the young of both genera assume at a very early age the adult colouring; but that their large bills, as might be expected, are not fully developed for a considerable period.

The colours of the bill, which are generally very vivid during life, become, in many instances, greatly changed and deteriorated by death: this should be borne in mind by those who describe species from dead specimens, especially if they have been a long time preserved.

Before we proceed to the description of one or two of the species of this most interesting family, it will be necessary to lay before the reader a summary of the anatomy of this form, as it has been demonstrated by Professor Owen, in Mr. Gould's *Monograph*.

ORGANIZATION.

Digestive Organs.—Professor Owen remarks that the organs of digestion in the toucan present a general simplicity of structure, which accords with its geographical position and power of assimilating both animal and vegetable food, so abundantly provided by nature in a tropical climate. The size of the œsophagus and general width of the intestinal canal correspond to the magnitude of the beak. There is no lateral dilatation of the crop, nor is the gizzard so encroached upon by its muscular parietes as to render such a reservoir for the alimentary substances necessary. The intestinal canal is equally devoid of lateral pouches, or *cœca;* the gastric glands are of a simple form, and are disposed for the extent of an inch around the termination of the œsophagus. The communication of the gizzard with the proventriculus is free, readily permitting regurgitation to take place; and here Professor Owen refers to the record of that act in the papers of Mr. Broderip and Mr. Vigors, adding that as the substances so regurgitated were, after undergoing a second mastication, again swallowed, the act may be compared to the rumination of herbivorous quadrupeds.

In the museum of the Royal College of Surgeons, No. 524 D, prepared by the professor, shows the proventriculus and gizzard of *Ramphastos Ariel*, Vig. It will be seen that the lining membrane at the termination of the œsophagus is thrown into narrow but distinct longitudinal folds; as it passes into the proventriculus it becomes finely reticulate, the orifices of the gastric glands being situate in the interstices of the meshes. These glands are simple cylindrical follicles, forming a complete zone at the end of the gullet, and not separated from that tube by any constriction. The proventriculus communicates with the gizzard by an equally wide aperture. The muscular coat of the gizzard does not exceed half a line in thickness the lateral tendons are small, but very distinct. The lining membrane is of a horny texture, and was stained of a deep yellow colour. The pyloric orifice is remarkably contrasted in its diminutive size with the ample entrance to the gizzard; a structure which facilitates the regurgitation of the alimentary substances. The description then goes on to state that as the regurgitated morsels have been observed to undergo a second mastication, the digestive processes exhibit in this bird the analogy to the ruminants above noticed, and that as the thin parietes of the gizzard of this omnivorous bird are sometimes unequal to the comminution of the food, the utility of the extraordinary developed beak becomes apparent, which thus compensates by additional mastication for the absence of the grinding structure so peculiar to the stomachs of the true vegetable-feeders. (*Cat. Mus. Coll. Chir.*) Professor Owen states that the intestinal canal does not exceed the length of the body including the bill, and that the general structure of the digestive apparatus of the hornbill agrees with that of the toucan. The liver of the latter is composed of two lobes of unequal size, joined by a small band, and the margins of the lobes are more rounded than usual. There is no gall-bladder, and Mr. Owen remarks that in this deficiency the toucan manifests an affinity to the *Picidæ* and *Psittacidæ*, among the *Scansores;* while the hornbill, on the contrary, resembles the *Corvidæ* in the large development of its biliary receptacle. A small hepatic duct enters the duodenum near its commencement; and a second duct, about two lines in diameter, passes to a more distant part of the intestine, where it terminates close to the insertion of the two pancreatic ducts.

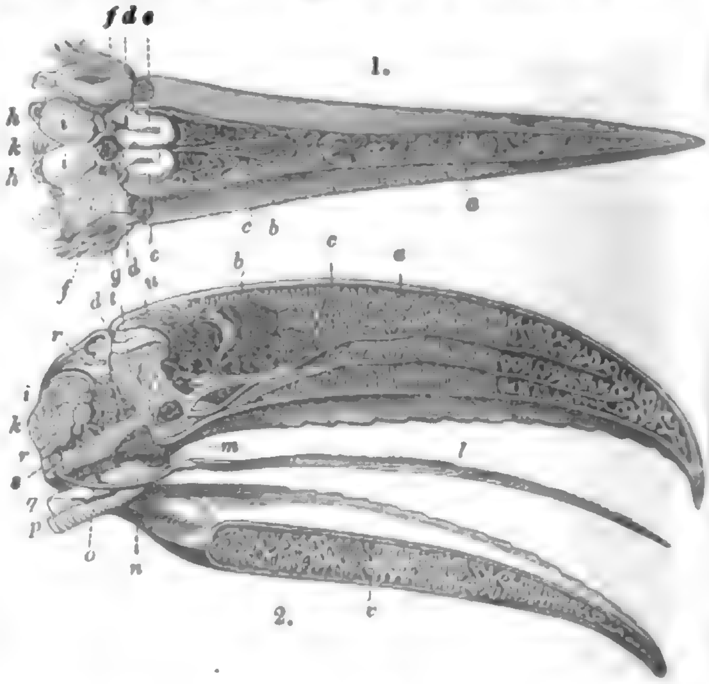
The same anatomist states that the length of the tongue, one of the most remarkable among birds, in a full grown *Rhamphastos Toco* was six inches. The posterior ridge, or backward-projecting process, was broad and finely notched, and situated about four lines from the glottis. Anterior to this process, Mr. Owen describes the tongue as being soft and minutely papillose for the extent of four lines, and here he thinks most probably the sense of taste resides: the rest of the organ consists of a transparent horny lamina, flattened horizontally, and supported by the anterior process of the os hyoides, which forms a ridge along the middle of its inferior surface. At about four inches from the extremity of the horny lamina the margins become obliquely notched, and these notches, becoming deeper and closer together towards the extremity, occasion the bristled appearance on each side of the tongue: these bristles were applied to the food in the cases of the captive toucans above recorded. The cornua of the os hyoides are 1½ inches in length.

No. 1479 B. (*Mus. Coll. Chir., Physiol. Series*) is the preparation of the tongue of a toucan, showing the flat sheath of horn and the series of short processes directed forwards on each side like the barbs of a feather. The upper larynx, wide fauces, and commencement of the trachea are also here preserved. The base of the tongue is soft, and covered with fine papillæ; it forms posteriorly a denticulated ridge, which is directed backwards, and may serve to protect the laryngeal aperture like an epiglottis. (*Cat. Mus. Coll. Chir.*, vol. iii.)

Upper surface of Tongue of Toucan. (Owen.)

l, The fringed or feathered portion; *m*, orifice of larynx; *n*, orifice of pharynx: *o*, cornua of the os hyoides; *p*, trachea or windpipe; *q*, gullet.

Mr. Owen observes that the osseous portions of the mandibles of the Toucan are disposed in a manner adapted to combine with the great bulk of those parts a due degree of strength and remarkable lightness, and the bony structure is consequently of a most beautiful and delicate kind. 'The external parietes,' continues Mr. Owen, 'are extremely thin, especially in the upper beak: they are elastic and yield in a slight degree to moderate pressure, but present considerable resistance if a force is applied for the purpose of crush-



1. Section of the cranium and upper mandible of Ramphastos Toco. *a*, The cancellated structure of the beak; *b*, the cavity at the base; *c*, branches of the fifth pair of nerves; *d*, *d*, external orifices of the nostrils; *e*, osseous parietes of the nasal passages; *f*, osseous tubes protecting the olfactory nerves; *g*, pituitary membrane exposed, and branches of the olfactory nerves radiating from it; *h*, superior semicircular canals of the internal ear; *i*, *i*, hemispheres of the cerebrum; *k*, cerebellum. (Owen.)

2. Vertical longitudinal section of the head. The same letters indicate the same parts as in the previous figure. *l*, The tongue; *m*, glottis; *n*, internal aperture of the nostrils; *o*, os hyoides; *p*, trachea; *q*, œsophagus; *r*, beginning of the spinal chord; *s*, articulating surface of occipital bone; *t*, nasal septum or partition; *u*, air-cell anterior to the orbit, from which the air passes into the mandible; *v*, cancellated structure of the lower jaw. (Owen.)

ing the beak. At the points of the mandibles, the outer walls are nearly a line in thickness; at other parts in the upper beak they are much thinner, varying from 1-30th to 1-50th part of an inch, and in the lower beak are from 1-20th to 1-30th part of an inch in thickness. On making a longitudinal section of the upper mandible, its base is seen to include a conical cavity, about two inches in length and one inch in diameter, with the apex directed forwards. The walls of this cone consist of a most beautiful osseous network, intercepting irregular angular spaces, varying in diameter from half a line to two lines. From the parietes of this cone a network of bony fibres is continued to the outward parietes of the mandible, the fibres which immediately support the latter being almost invariably implanted at right angles to the part in which they are inserted. The whole of the mandible anterior to the cone is occupied with a similar network, the meshes of which are largest in the centre of the beak, in consequence of the union which takes place between different small fibres as they pass from the circumference inwards. It is remarkable that the principle of the cylinder is introduced into this elaborate structure: the smallest of the supporting pillars of the mandibles are seen to be hollow or tubular, when examined with the microscope. The structure is the same in the lower mandible, but the fibres composing the net-work are in general stronger than those of the upper mandible.'

Nervous System and Senses.—Mr. Owen states that the medullary membrane lining these cavities appears to have but a small degree of vascularity. Processes of the membrane, accompanying vessels and nerves, decussate the conical cavity at the base of the beak. The principal nerves are two branches of the fifth pair, which enter at the lower part of the conical cavity, and diverge and ascend as they pass forward to the end of the bill, giving off branches, which are distributed to the horny covering, and supply it with sensibility. 'The air,' says Mr. Owen, 'is admitted to the interior of the upper mandible from a cavity situated anterior to the orbit, which communicates at its posterior part with the air-cell continued into the orbit, and, at its anterior part, with the maxillary cavity. The nasal cavity is closed at every part, except at its external and internal apertures, by the pituitary membrane, and has no communication with the interior of the mandible.'

Smell.—'The organ of smell is confined to the base of the upper jaw. The canal, which is traversed by the air and odorous particles in inspiration, forms a sigmoid curve in the vertical direction. The external orifice is on precisely the same perpendicular line as the internal one. It is situated at the posterior surface of the upper mandible, where it is raised above the level of the cranium; the orifice is consequently directed backwards, secure from all injury that might happen to it in the act of penetrating dense or interwoven foliage. The olfactory canal is at first of almost a cylindrical form, and about two lines in diameter. It passes forwards for about half an inch, receiving from the mesial aspect the projection of the first spongy bone; it then bends downwards and backwards, and is dilated to admit the projections of the two other spongy bones: from this point it descends vertically to the palate, at first contracted, and afterwards dilating to form the internal or posterior orifice. The first or outermost spongy bone is almost horizontal, and has its convexity outwards. The second is nearly vertically placed, with its convexity directed backwards: it terminates in a narrow point below. The third or superior spongy bone makes a small projection towards the mesial plane about the size of a pea. These spongy bones are formed by inward projections of the inner and posterior osseous parietes of the nasal passage: they are cellular, and air is continued into them from the cranial diplöe; but the parietes of the nasal passage are entire and smooth, and lined by a delicate pituitary membrane. The inner table of the skull is continuous with the parietes of the nasal cavity, by means of the bony canal which accompanies and protects the olfactory nerves, and which represents, as it were, a single foramen of the cribriform plate of the mammalia. The communication of the cavity of the cranium with that of the nose is thus similarly formed, and is only obstructed in the recent state by the pituitary membrane, on the posterior *cul-de-sac* of which the olfactory nerve distributes its branches in a radiated manner. These branches were confined, as Scarpa has observed in other birds, to the pituitary membrane covering the septum narium and the superior spongy bone.'

Hearing.—'The external orifice of the meatus auditorius is situated about half an inch behind the lower boundary of the orbit. The membrana tympani closes it so obliquely that its plane is directed almost backwards; its anterior edge is consequently about three lines from the external orifice, while its posterior margin is at least six lines from the same point. It is convex outwardly, as in birds generally. The apparatus of the internal ear is easily exposed, the semicircular canals being lodged in a delicate reticulation of the diplöe of the cranium. These parts, with the ossiculum of communication and the cochlea, do not present any deviations from the ordinary structure worthy of notice.'

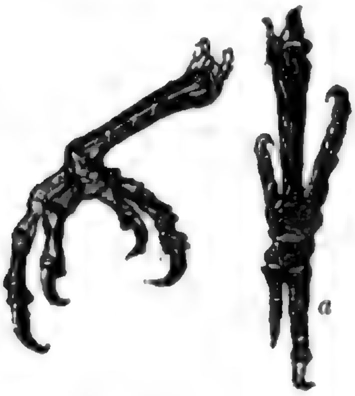
Sight.—The sense of sight in the *Ramphastidæ* appears to be sufficiently well developed, but requires no special observation.

Respiratory and Circulating System.—Mr. Owen found the trachea narrow and simple in its structure, the rings somewhat flattened, and decreasing in diameter towards the inferior extremity, from which a single pair of muscles passes off to the sternum. The length of the lower fourth of the tube, and the state of tension in the bronchia are regulated by a pair of small muscles, which, arising from the sides of the tracheal cartilages, are inserted into the bone of divarication at the extremity of the trachea: this part of the tube is subjected to variations in length, as is indicated by the tortuous character of the recurrent nerves attached to the sides of the trachea in this part. The lungs, small in proportion, are of the usual form and structure, and the abdominal air-cells are also small. The heart is more oblong than it is in birds generally; its apex, as it were, truncate; and its length one inch.

Urinary and Genital System.—The kidneys, composed of three lobes, of which the middle one is smallest, are an inch and a half in length, with a surface convoluted, though in a less marked degree than it is in reptiles. Between the anterior extremities of these glands Mr. Owen found, in a female *Ramphastos Ariel*, the ovary of a triangular shape, and apparently healthy. The ova were like minute granules, and disposed in a convoluted manner. The supra-renal glands were imbedded in the posterior part of the ovary. The oviduct, of the size of a crow-quill, commenced by the usual fimbriated and wide aperture, was slightly tortuous at the commencement, and then continued straight to the cloaca.

Osseous and Muscular Systems.—Certain parts of this system bear upon peculiar functions performed by the Toucans, and are thus described by Professor Owen:—'The pectoral muscles, as in the *Psittacidæ*, are but feebly developed, and the keel of the sternum is of moderate size, not projecting more than half an inch from the plane of the bone. The sternum has four notches at its posterior margin. The clavicles, or lateral halves of the furcula, are here, as in the *Psittacidæ* and *Struthionidæ*, separate; they are an inch in length, slender, pointed at their lower ends, and joined to each other and to the sternum by a ligament only.'

'The peculiar motions of the tail called for a particular examination of that part. It is difficult to state the precise number of the caudal vertebræ, in consequence of the terminal ones being anchylosed, requiring for this purpose the examination of a young specimen at a period before the anchylosis takes place. In the skeleton of a Black-billed Toucan which I have examined, it would appear that three vertebræ are thus anchylosed, making the entire number of coccygeal vertebræ nine. The Woodpecker has also nine caudal vertebræ, and this seems to be the greatest number found in birds. The first six of these vertebræ in the Toucan are articulated by ball-and-socket joints, the ball and the socket being most distinct in the last two joints. That between the sixth and the anchylosed vertebræ is provided with a capsule and synovial fluid; the others have a yielding ligamentous mode of connection. The spinous processes of these vertebræ, both superior and inferior, are of moderate size, but smallest in the sixth, where the greatest degree of motion takes place. The transverse processes, on the contrary, are large and broad, so as almost wholly to prevent lateral motion. The first of the anchylosed vertebræ is broad and flat, and of a rounded form, supporting the two coccygeal glands: the last of these processes is compressed laterally, and of the ordinary ploughshare form. The caudal vertebræ can be inflected dorsad till their superior spines are brought into contact with the sacrum; in the opposite direction they can scarcely be bent beyond a straight line; and it is to this structure of the bones and joints that is to be attributed the capability in the Toucan of turning its tail upon its back (as represented in the 'Zoological Journal,' vol. ii., pl. xv.*), the muscles presenting comparatively few peculiarities, since the motion alluded to is remarkable rather for its extent than the vigour with which it is performed. The principal elevators of the tail are the sacro-coccygei superiores (sacro-suscaudiens of Vicq d'Azyr). They arise from two longitudinal ridges on the inferior and convex part of the sacrum, and are inserted into the superior spines of the first six vertebræ by detached tendons terminating broadly in the anchylosed vertebræ. The principal antagonists of these muscles, the sacro-coccygei inferiores (sacro-sous-caudiens of Vicq d'Azyr), pass over the first five vertebræ, and terminate in the sixth and anchylosed vertebræ; their origins are wider apart than in the preceding pair of muscles, coming off from the margin of the sacro-sciatic notches. In the interval are situated small muscles passing from the transverse processes to the inferior spines of the first six vertebræ. From the limited nature of the lateral motions of the tail, the muscles appropriate to these movements are feeble, especially in comparison with those which are observed in the birds that spread their tail-feathers in flight, in order to regulate their course during that vigorous species of locomotion. These muscles are in number two on each side, arising from the posterior extremites of the ischia, and inserted into the expanded anchylosed vertebræ. From the disposition of these muscles it is obvious that after the proper elevators have raised the tail to a certain height, they also become dorsad of the centre of motion, combine their forces with the elevators, and by this addition of power terminate the act of throwing up the tail by a jerk. Mr. Vigors, in his observations on the living animal, observes, that "in these movements the tail seemed to turn as if on a hinge that was operated on by a spring."' (Owen, in Gould's *Ramphastidæ.*)



Foot of Toucan. a, seen from below.

We now proceed to give some examples of the *Toucans* and Araçaris.

Ramphastidæ.

Bill enormous, vascular within; the margins serrated. *Wings* short, rounded. *Feet* with two toes before and two behind. (Sw.)

Ramphastos.

Generic Character.—Bill smooth. *Nostrils* entirely concealed, and placed at the edge of the thickened frontlet of the bill. *Wings* short, rounded; the four outer quills graduated and abruptly pointed. *Tail* short, rounded. (Sw.)

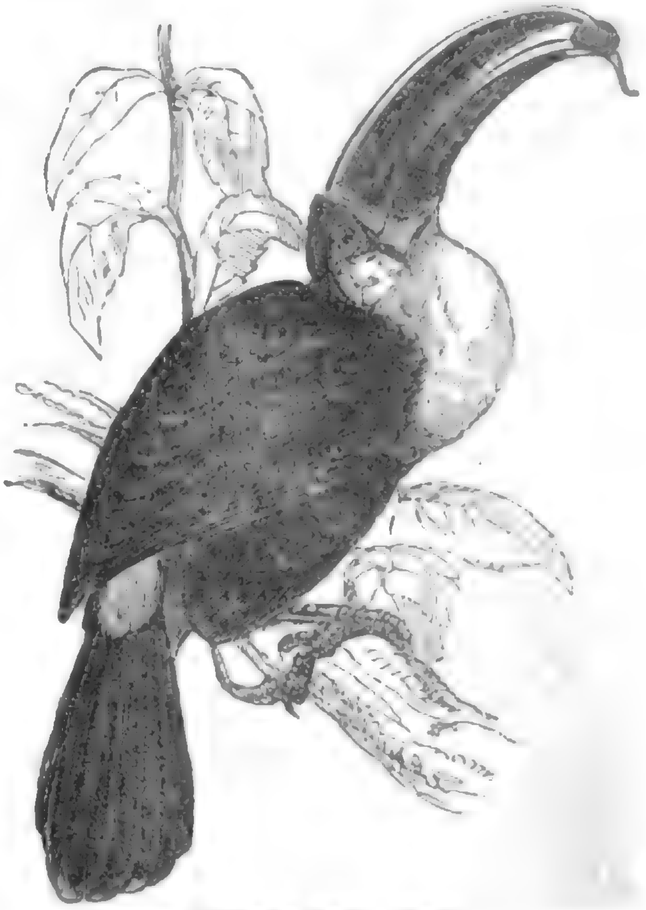
Ramphastos Toco appears to be one of the largest species, being 27 inches in total length. The bill measures 7½ inches; the wings, 10; the tail, 7; and the tarsi are 2 inches in length. A beautiful figure of the bird, by Lear, is given in Mr. Gould's magnificent work. The range of the species is very wide, perhaps wider than that of any other, being distributed throughout the whole of the wooded districts from the River Plata to Guiana.

We select as an illustrative example, *Ramphastos Cuvieri.*

Description.—Beak brownish black on the sides, with a large basal belt and culminal line of greenish yellow, the basal belt being bounded behind by a narrow line of black, and before by a broader one of deep black, which is only apparent in certain lights; the top of the head and whole of the upper surface black, with the exception of the upper tail-coverts, which are bright orange yellow; cheeks, throat, and chest white, with a tinge of greenish yellow, terminated by a band of scarlet; under surface black; under tail-coverts scarlet. Total length 24 inches; bill 7½; wings 9; tail 6½; tarsi 2. (Gould.)

Mr. Gould states that this bird is very rare; his own specimen, which he says will be added to the museum of the Zoological Society of London, being the only one which he has ever seen, with the exception of another, of which he has some recollection, in the museum at Berlin. He adds that there is no example in the Paris collection.

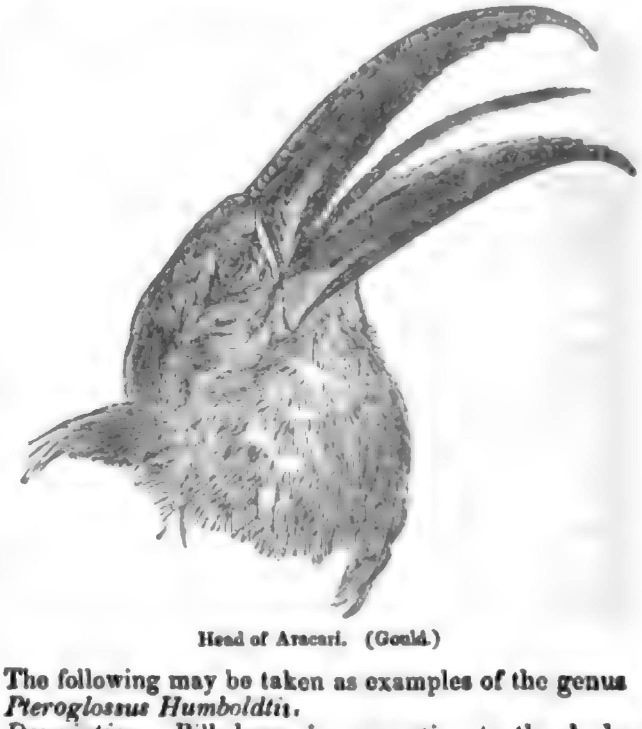
Locality.—The densely-wooded districts on both sides of the Amazon.



Ramphastos Cuvieri. (Gould.)

Pteroglossus.

Generic Character.—Bill smooth, less compressed. *Nostrils* vertical, naked, round, pierced on the upper surface of the bill, on the edge of the frontlet. *Wings* short, rounded. *Tail* lengthened, graduated. (Sw.)



Head of Aracari. (Gould.)

The following may be taken as examples of the genus *Pteroglossus Humboldtii.*

Description.—Bill large in proportion to the body: a band of black occupies the culmen from the base to the tip: the remainder of the upper mandible of a dull yellowish orange, with the exception of an indefinite mark of black which springs from each serrature, and a fine line of the same colour surrounding it near the base; lower mandible black, with the exception of the base, which is surrounded with pale yellowish orange; the head, back of the neck, throat, and chest black; all the upper surface, except a spot of scarlet on the rump, of a dull olive; primaries blackish brown; under surface pale straw-yellow with a slight tinge of green; thighs chesnut; naked space round the eyes and tarsi lead-colour. Total length about 16 to 17 inches; bill 4, wing 5½, tail 6¾, tarsi 1¾. (Gould.)

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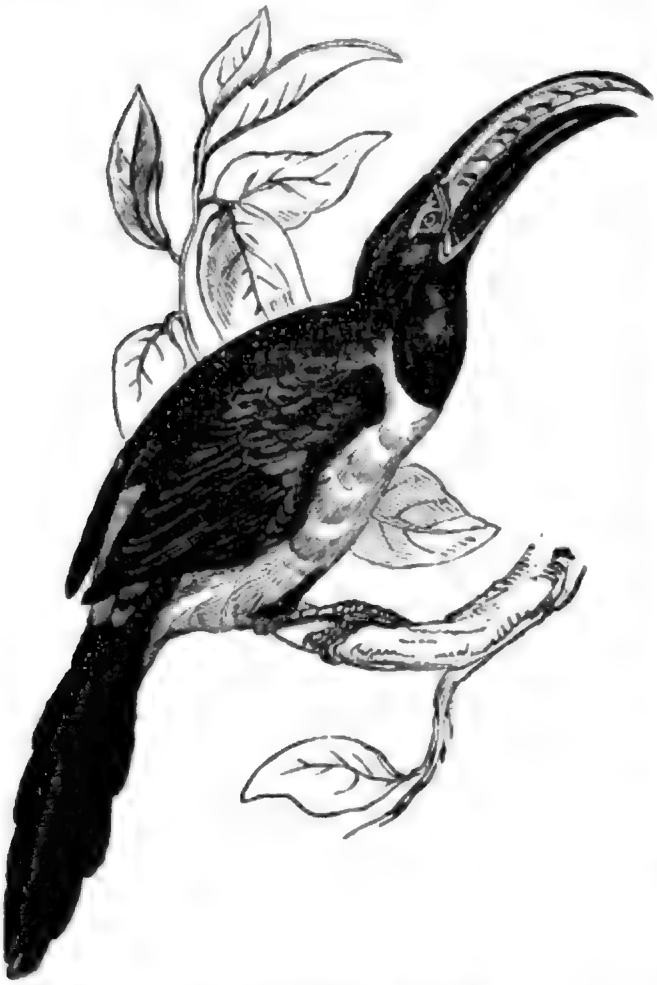
* See page 289.

Mr. Gould's elegant figure of a male is taken from a specimen, supposed to be unique, in the Cabinet of Natural History at Munich.

Locality.—Brazils; probably near the Amazon.



Pteroglossus Humboldtii. (Gould.)

Pteroglossus pluricinctus.

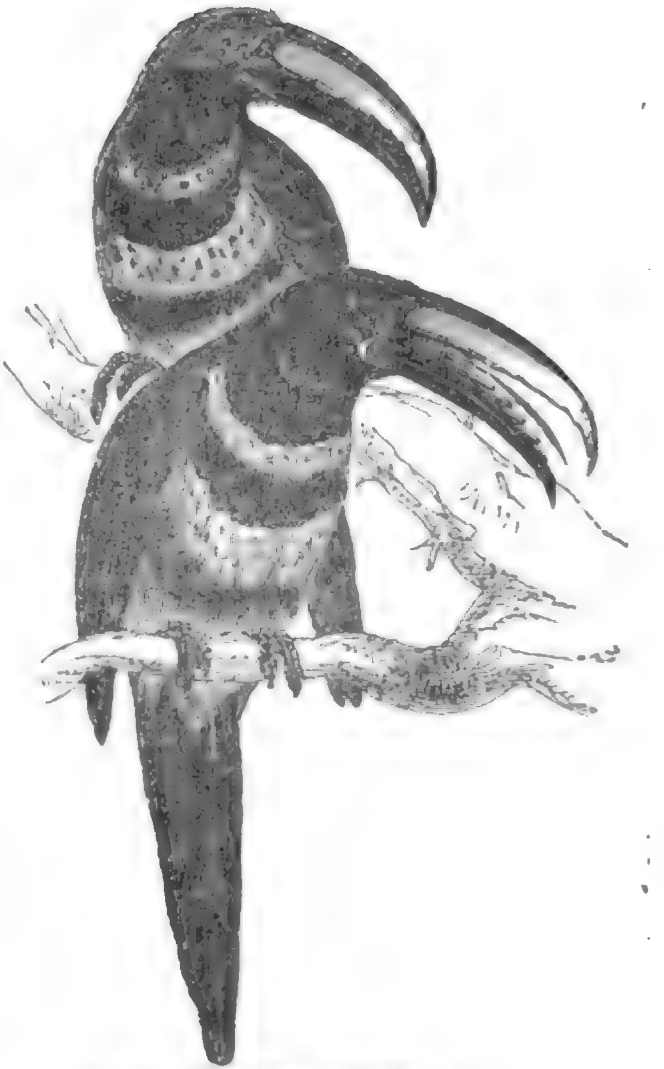
Description.—(*Male.*)—A broad band of black advances from the nostrils along the whole of the culmen, and forms a narrow belt down the sides of the upper mandible at its base; the elevated basal margin of the bill is yellow; the sides of the upper mandible beautiful orange-yellow, fading into yellowish-white towards the tip; under mandible wholly black with a yellow basal ridge; head, neck, and chest black; whole of the upper surface, except the rump, which is scarlet, dark olive-green; breast marked with two broad bands of black, the upper separated from the throat by an intervening space of yellow dashed with red; a similar but broader space separates the two bands of black, the lower of which is bounded by scarlet, advancing as far as the thighs, which are brownish-olive; under the tail-coverts light yellow; naked space round the eyes, tarsi, and feet dark lead-colour.

Female.—Differs from the male.in having the ear-coverts brown, and a narrow belt of scarlet bordering the black of the throat.

Total length 20 inches; bill 4½, wings 6½, tail 8½. (Gould.)

Locality.—Brazil.

The most characteristic figures of the *Ramphastidæ* known to us are those by Mr. Swainson, in his 'Zoological Illustrations,' and the highly finished plates in Mr. Gould's *Monograph*; the latter, from their size, beauty, and accuracy, have all the air of portraits.



Pteroglossus pluricinctus.
Upper figure, female; lower, male. (Gould.)

RAMPHO'STOMA, Wagler's name for the *Gavials* [CROCODILE, vol. viii., p. 167.]

RAMPION (*Campánula Rapúnculus*) is a biennial plant, indigenous to Britain as well as to various parts of the continent of Europe. It has a long white spindle-shaped root, which may be eaten in its raw state, like a radish, and is by some esteemed for its pleasant nutty flavour. Both leaves and root may also be cut into winter salads. The seeds should be sown at the end of May, in rather light soil, and thinly covered. The roots will be fit for use throughout the following winter.

A different plant, the *Œnothera biennis*, is sometimes called German Rampion (*Rapunzel Sellery*). Its roots are used like those of the above, and the plants are cultivated in the same manner as carrots or parsnips.

RAMPOOR. [HINDUSTAN, p. 219.]

RAMSAY, ALLAN, was born in 1685, of parents of the humblest class, at a small hamlet, or settlement of a few cottages, stated to be now in ruins, on the banks of the Glangonar, a tributary of the Clyde, among the hills that divide Clydesdale and Annandale. The parish was probably that of Crawford in Lanarkshire, through which the Glangonar flows, and where are situated Lord Hopeton's lead-mines, in which Ramsay's father is said to have been a working man, and he himself to have been employed when a child as a washer of ore. When he made his first appearance in Edinburgh, about the beginning of the last century, Allan was apprenticed to a barber; and he appears to have followed that trade for some years. In course of time however he exchanged it for that of a bookseller, led probably by a taste for reading which he had acquired. He seems to have early in life enjoyed considerable popularity as a boon companion, and we may presume that it was in this character that he first gave proof of his poetic talents. He gradually however obtained the acquaintance of many of the most distinguished persons both in the literary and fashionable circles of the Scottish capital: and in 1721 he published a volume of his poems, which was very favourably received by his countrymen. In 1724 he published, in two small volumes, 'The Evergreen, being a Collection of Scots Poems, wrote by the Ingenious before 1600. The materials of this collection (which has been lately reprinted) were chiefly obtained from the volume called the Bannatyne MS., preserved in the Advocates' Library; but Ramsay, who had little scholarship, and who lived in a very uncritical age as to such matters, has paid no attention to fidelity in making his transcripts, patching and renovating the old verses throughout to suit his own fancy. 'The Evergreen' was followed the same year by 'The Tea-Table Miscellany, or a Collection of Choice Songs, Scots and English,' in four volumes, which has been often reprinted. The edition before us, dated 1763 (London), is designated the twelfth. This collection, besides many new verses contributed by Ramsay himself and some of his friends, contains numerous old Scottish songs, which, he observes in his preface, 'have been done time out of mind, and only wanted to be cleared from the dross of blundering transcribers and printers.' His scouring however went the length in many cases of rubbing away the old song altogether; and his substitutions are by no means always a compensation for what he thus destroyed, though most of them are clever and spirited, and have acquired general currency among Scottish song-singers. No older copies, it ought to be stated, either printed or manuscript, are now known to exist of many of the songs professing to be antient preserved in this collection; and there can be little doubt that Ramsay was indebted for many of them merely to oral tradition. Ramsay afterwards wrote many more verses in his native dialect; but his only two original performances of any considerable pretension are his comic pastoral, the 'Gentle Shepherd,' published in 1729, and his continuation of the old Scottish poem of 'Christ's Kirk on the Green,' attributed by some to James I.; by others, with more probability, to James V. There is a good deal of rather effective though coarse merriment in the latter attempt. The 'Gentle Shepherd' is, as a whole, not very like anything else that Ramsay has written; but there seems to be no evidence for the notion which has been suggested, that in this instance he fathered the production of some other writer. The name of this supposed other writer, we believe, has never been so much as suggested or attempted to be guessed at; nor were any of the circumstances attending the publication suspicious or mysterious. The poem too, although more careful and elaborate than anything else that Ramsay has left us, is not without the wonted qualities of his manner, both good and bad. It has no more elevation or refinement than any of Ramsay's other works, though less that is offensively coarse or boisterous than some of them; both in the diction and the thought it flows easily and smoothly; and though there are not many happy touches, and no daring strokes, there is a general truth of painting about it in a quiet tone, which is very soothing and agreeable. It has also some humour, which however is rather elaborate and constrained.

Ramsay died in 1758, leaving a son of the same name, who acquired considerable distinction as a portrait-painter.

(See Currie's *Life of Burns*; and, for a very severe, indeed an outrageous critique of the 'Gentle Shepherd,' Pinkerton's *List of the Scottish Poets*, prefixed to his *Antient Scottish Poems*, 1786, vol. i., pp. 132, &c.)

RAMSDEN, JESSE, was born at Salterhebble, near Halifax, Yorkshire, in 1735. He was the son of an innkeeper. When nine years old he was admitted into the free grammar-school of Halifax; and after attending there for about three years, he was placed under the protection of an uncle, who resided in the north of Yorkshire. By him he was sent to a school conducted by Mr. Hall, a clergyman, who was in repute as a teacher of the mathematics, and under whom he attained to some proficiency in geometry and algebra. His studies were interrupted by his father apprenticing him to a cloth-worker at Halifax. At the age of twenty we find him engaged as a clerk in a cloth warehouse in London, in which capacity he continued till 1757-8, when his predilection for other pursuits led him to bind himself for four years to a working mathematical and philosophical instrument maker, named Barton, in Denmark Court, Strand. Upon the completion of his term, he engaged himself as assistant to a workman named Cole, at a salary of twelve shillings a week; but this connection was of short duration. He then commenced working on his own account, and his skill as an engraver and divider gradually recommended him to the employ of the leading instrument-makers, more particularly Nairne, Sisson, Adams, and Dollond. Ramsden subsequently married Dollond's daughter, and he received with her a part of Mr. Dollond's patent right in achromatic telescopes. His occupation afforded him frequent opportunities of observing the defective construction of the sextants then in use, the indications of which, as had been pointed out by Lalande, could not be relied on within five minutes of a degree, and might therefore leave a doubt in the determination of the longitude amounting to fifty nautical leagues. The improvements introduced by Ramsden are said by Piazzi to have reduced the limits of error to thirty seconds. This circumstance, added to the cheapness of his instruments, which were sold for about two-thirds the price charged by other makers, soon produced a demand which, even with the assistance of numerous hands, he found difficulty in supplying. In his workshops the principle of the division of labour was carried out to a considerable extent, and a proportionate dexterity was acquired by the workmen; but it is asserted that in none of these, even the most subordinate, and least of all in the higher departments, did the skill of the workmen surpass that of Ramsden himself. His attention was incessantly directed to new improvements and further simplification, the result of which was the invention of a dividing-machine, which has been already noticed under GRADUATION. The date of this invention is prior to the year 1766. At first it had many imperfections; but by repeated efforts of ingenuity throughout a period of ten years, they were successfully removed. In 1777 it was brought under the notice of the Commissioners of the Board of Longitude, by Dr. Shepherd, and by them a premium of 615*l.* was paid to the author, upon his engaging to divide 'sextants at six, and octants at three shillings, for other mathematical instrument makers. A description of the machine was immediately published, by order of the Board, under the supervision of Dr. Maskelyne (London, 1777, 4to.), and was shortly after translated into French by Lalande. A duplicate of the machine itself is said to have been purchased by the president, Bochard de Saron, and introduced into France concealed in the support of a table made for that purpose. (Weiss, *Biog. Univers.*) As early as 1788 no less than 983 sextants and octants had issued from Ramsden's workshop. In 1779 the description of another machine constructed by Ramsden for dividing straight lines by means of a screw was also published by order of the Board; but this invention does not appear to have been of much practical use. It was however in the construction of many of the larger class of astronomical instruments that Ramsden acquired most reputation, though they were probably least productive of pecuniary gain. The theodolite employed by General Roy in the English Survey was made by Ramsden, and no instrument of the kind that had been previously made would bear comparison with it. A similar remark is applicable to the equatorial constructed for Sir George Schuckburgh, which was also the largest that had then been attempted. Ramsden took out a patent for his new equatorial, and a description of it was published by the Hon. Stewart Mackenzie, brother to the earl of Bute; but his inventive genius seldom permitted him to construct two instruments alike. His telescopes, erected at the observatories of Blenheim, Mannheim, Dublin, Paris, and Gotha, were remarkable for the superiority of their object-glasses; and in his mural quadrants, furnished to the observatories of Padua and Vilna, Dr. Maskelyne was unable to detect an error amounting to two seconds and a half, a degree of accuracy which was then a matter of admiration among astronomers. Ramsden however always recommended that the mural quadrant should be superseded by the mural circle; and the circles erected in the observatories of Palermo and Dublin, the first of which was of five and the latter of twelve feet diameter, were constructed by him in accordance with this recommendation.

Among Ramsden's minor inventions and improvements may be enumerated his catoptric and dioptric micrometers (described in the 'Phil. Trans.,' 1779), the former of which was an improvement upon that of Bougier; optigraph; dynamometer (for measuring the magnifying powers of telescopes); barometer; electrical machine; manometer; assay-balance; level; pyrometer; and the method introduced by him for correcting the aberrations of sphericity and refrangibility in compound eye-glasses. (*Phil. Trans.* 1783.)

Ramsden was elected a fellow of the Royal Society in 1786. In 1794 a similar compliment was paid him by the Imperial Academy of St. Petersburg; and the following year the Copley medal was awarded to him by the Royal Society, in testimony of the importance of his various in ventions. By this time his health had become much impaired by his ardent devotion to his profession. In 1800 he was advised to visit Brighton, where he died, on the 5th of November of that year. From 1766 to 1774 his shop and residence was in the Haymarket; but in the latter year he removed to Piccadilly, where his business continued to be conducted after his decease.

In his habits we are told that he was temperate to abstemiousness, and that for many years he restricted himself to very few hours of repose. Most of the time that he could spare from the immediate duties of his profession was devoted to the perusal of works of science and literature. His memory was remarkably retentive, and at an advanced age he made himself sufficiently master of the French language to read Molière and Boileau. The fortune of which he died possessed was not considerable, and a large portion of it was directed by his will to be distributed among his workmen.

See CIRCLE; EQUATORIAL; GRADUATION; TRANSIT-INSTRUMENT; SEXTANT; &c.; and Pearson's *Practical Astronomy*, Lond., 1829, vol. ii., pp. 12, 18, 47, 181-5, 194-6, 285-6, 413-28, 519, 533-46, 558-60, and 573.

(Piazzi's *Account of the Life and Labours of Ramsden*, in a letter addressed by him to Lalande, and published by the latter in the 'Journal des Sçavans' for Nov., 1788, p. 744. This interesting letter was written by Piazzi while urging the progress of his mural circle, the construction of which had been undertaken by Ramsden, but the advance of which towards completion does not appear to have kept pace with Piazzi's wishes; and though it doubtless contains no unmerited eulogium, it seems to have been intended by Piazzi to act as a stimulant. *Philosophical Magazine*, vol. xvi.; *European Magazine*, February, 1789; *Biog. Univers.*; and the *Communication of the Rev. L. Dutens to Dr. Aikin*, in *General Biography*, art. 'Ramsden.')

RAMSEY. [MAN, ISLE OF.]

RAMSGATE, a town in the Isle of Thanet in Kent, 71 miles from London-bridge, through Dartford, Rochester, and Canterbury. The ville of Ramsgate, comprehending 260 acres, was included formerly in the parish of St. Lawrence, in the hundred of Ringslow or Thanet, in the lathe of St. Augustine; but provided separately for its own poor: in 1827 it was made a distinct parish. The ville is a member of the Cinque-Port of Sandwich. Ramsgate was antiently a poor fishing-town, consisting of a few meanly-built houses, built on the coast of the Isle of Thanet, which here fronts the south-east: it had a small wooden pier. After the Revolution of 1688, some of the inhabitants engaged in the Russian trade, by which they acquired wealth, and this led to the improvement of the town. When the practice of families from London and elsewhere resorting to the seaside became general, Ramsgate was one of the earliest frequented spots, though for some time eclipsed by the superior attractions of Margate. The improvement of the harbour by the erection of the piers and other works in the middle and latter part of the last century, gave another impulse to the prosperity of the town. Early in the present century a stone lighthouse was erected on the head of the west pier; a small battery is fixed at the head of the east pier. The east pier is one of the longest in the kingdom, extending 2000 feet; the western pier extends about half that length: they are built of Portland and Purbeck stone and Cornish granite. The harbour includes an area of 48 acres, and furnishes a convenient shelter for vessels which are obliged by heavy gales to run from the Downs. It is provided with a basin and floodgates in the upper part of the harbour for scouring it from the drifted sand or mud.

The old part of Ramsgate is situated in one of those natural depressions (called in the Isle of Thanet 'gates,' or 'stairs') in the chalk, which open upon the sea. This part of the town is low compared with the higher parts on each side of it. The streets in the old part of the town are narrow and indifferently built. The newer part of the town, from its elevated site on the cliffs, commands an extensive sea-view, and consists of several streets macadamized and lighted with gas. Many of the houses are very handsome: some are arranged in streets, terraces, or crescents, while others are detached villas. At present (1840) a considerable number of houses are building. There are bathing-rooms, assembly-rooms, boarding and lodging houses, a handsome new church, a chapel-of-ease, and several dissenting meeting-houses.

The population of the ville of Ramsgate, including the town, was, in 1831, 7985. There is considerable coasting trade; coal is imported in considerable quantity; and ship building and rope-making are carried on. It is observable as indicating the commercial character of the place, that though the population of Margate exceeds that of Ramsgate by 2300 or 2400, there are not half as many persons engaged in retail trade or handicraft as at the latter place. The markets are on Wednesday and Saturday. A considerable fishery is carried on; in the summer steam-boats sail regularly between London and Ramsgate.

The living of Ramsgate is a vicarage, of the clear yearly value of 400*l.*, in the gift of the vicar of St. Lawrence, the mother church.

There were, in 1833, two infant schools, with 217 children of both sexes; a national day and Sunday school with 150 boys and 100 girls; twenty day-schools, estimated to contain about 525 children; six boarding-schools, supposed to contain 170 children; and three Sunday-schools, two of them containing 300 children; from the other no return was made.

RAMSON (*Allium ursinum*), a species of garlic found wild in many parts of Britain, and formerly cultivated in gardens; but its use is superseded by the *Allium sativum*, a native of Sicily, which is the *Garlic* now in cultivation.

RAMTILLA, a genus of plants of the natural family of Compositæ, and subtribe Helianthеæ, so called from the Indian name *ram-tilla*, by which the oil of its seed is designated The plant is remarkable for the number of names by which it has been described by botanists. Of these we need only mention the *Verbesina sativa* of Roxburgh, and the *Ramtilla oleifera* of De Candolle. Cassini had however previously formed it into a new genus, and under the name of Guizotia 'dedicated it to the celebrated historian, then minister of public instruction.' This name, being prior to that of Ramtilla by a year or two, is now retained as that of the genus. De Candolle, having obtained specimens and seeds from various countries, discovered that the Indian plant was identical with one from Abyssinia, which has been mentioned by Bruce under the name of Polymnia frondosa. The fact is interesting in a plant cultivated in both countries for the same purposes, and forming one of the links which indicate the connection which existed in early times between India and Upper Egypt. This plant is cultivated in different parts of India, from October to March, in fields, for the sake of the seed, from which an oil is expressed, and used as a substitute for that of the Sesamum, which is considered the best kind. It is used both in dressing food and as a lamp oil.

RAMUS, PETER (PIERRE DE LA RAME'E), was born in a village in Picardy, in the year 1502, according to one account, and in the year 1515 according to another. His parents were extremely poor, and the future philosopher was set when a boy to tend sheep. Disgusted with this employment, and having an ardent desire to get knowledge, he ran away from his parents to Paris. After some time, and after he had encountered much misery, one of his uncles offered some pecuniary assistance, and Ramus now entered the College of Navarre as a servant. He made great progress in all studies, with very little assistance from masters. At the completion of his course, when he presented himself for the degree of master of arts, he undertook as an exercise what then seemed the almost impious task of showing that Aristotle was not infallible. This was the beginning of the anti-Aristotelian opinions by which Ramus afterwards gained his notoriety and fame. The exercise was adjudged successful, and Ramus henceforth devoted himself to the study of the works of Aristotle as to the object of his life. In 1543 he published his new system of logic, with strictures on the logic of Aristotle. The publication of this work exposed him to great obloquy. He was charged with impiety and sedition, and with a desire to overthrow all science and religion, through the medium of an attack on Aristotle. On the report of an irregular and partial tribunal, appointed to consider the charges made against him, the king ordered his works to be suppressed, and forbade his teaching or writing against Aristotle on pain of corporal punishment. Ramus availed himself of the leisure which the compulsory cessation of his lectures procured for him, to study mathematics and prepare an edition of Euclid. Shortly afterwards he began a course of lectures on rhetoric at the College of Presles, the plague having driven away numbers of students from Paris. He was named Principal of this college, and the Sorbonne ineffectually endeavoured to eject him on the ground of the royal prohibitory decree. This decree was cancelled in 1545, through the influence of the Cardinal de Lorraine, to whom he had dedicated his edition of Euclid. He now began a course of mathematics in Paris. In 1551, he was named by the king (Henri II.) professor of philosophy and eloquence in the College of France. During the next ten years, he published a Greek, Latin, and French grammar, and several treatises on mathematics, logic, and rhetoric. Ramus had embraced Protestantism, and now shortly again brought upon himself great trouble by the zeal with which he advocated the new doctrines. Charles IX. offered him an asylum at Fontainebleau; but while he was absent from home, his house was pillaged and his library destroyed. He returned to Paris in 1563, and resumed possession of his royal chair. Civil troubles again drove him away from Paris, and in 1568 he asked permission to travel. He went to Germany, and was received everywhere with honour. He gave lectures on mathematics at Heidelberg, and while in this town he made public profession of Protestantism. Shortly after his return to Paris, he fell a victim in the massacre of St. Bartholomew.

Although Ramus had many merits as a philosopher, and did much good by his opposition to the Aristotelian philosophy, which then held men's minds in bondage, he was wanting in depth and caution, and his strictures on Aristotle are by no means altogether just. He had many followers. The influence of Melanchthon, on the other side, did not prevent the progress of his system of logic in the German universities. France, England, and particularly Scotland, were full of Ramists. Andrew Melville introduced the logic of Ramus at Glasgow.

The following is a list of the principal works of Ramus: 1, 'Institutiones Dialecticæ Tribus Libris distinctæ;' 2, 'Animadversiones in Dialecticam Aristotelis;' 3, 'Rhetoricæ Distinctiones in Quintilianum;' 4, 'Arithmeticæ Libri Tres;' 5, 'In Quatuor Libros Georgicorum et in Bucolica Virgilii Prælectiones;' 6, 'Ciceronianus.' (A life of Cicero, interspersed with many philological remarks on the Latin language, and strictures on the state of education in France.) 7, 'Scholæ Grammaticæ Libri Duo;' 8, 'Grammatica Latina;' 9, 'Grammatica Græca quatenus à Latina differt;' 10, 'Gramère Fransoeze;' 11, 'Liber de Moribus Veterum Gallorum;' 12, 'Liber de Militia Julii Cæsaris;' 13, 'Commentarius de Religione Christiana, Libri Quatuor;' 14, 'Præfationes, Epistolæ, Orationes' (Paris, 1599, and Marburg, 1599) The Greek Grammar of Ramus received considerable additions from Sylburgius.

The above list is taken from the article 'Ramus,' in the *Biographie Universelle*. For a complete list of the works of Ramus the reader is referred to Niceron (*Mém.*, tom. xiii.).

RAMU'SIO, GIAMBATTISTA, was born at Treviso in the Venetian State, in 1485, of a family originally from Rimini, which produced several men of learning. He filled several offices under the republic, and became secretary to the Council of Ten. Having undertaken a collection of the most important narratives of voyages and travels performed in distant counties both in antient and modern times, he translated into Italian those that had been written in other languages, and added his own remarks and several dissertations, which show that he possessed very extensive general information for the age in which he lived. He was a friend of Bembo, Fracastoro, and other learned contemporaries. His work is entitled 'Raccolta di Navigazioni e Viaggi,' 3 vols. fol. The first volume was printed by Giunti at Venice, in 1550; another volume appeared in 1556, and a third in 1559, after Ramusio's death, which took place at Padua, in July, 1557. Subsequent editions appeared with the addition of several travels which had not appeared in the first. The most complete edition is that of 1606. The following list of contents will convey an idea of the value of the work:—Vol. i., 'Leo Africanus's Description of Africa; Cadamosto a Venetian navigator, preceded by a Discourse by Ramusio; Sintra, a Portuguese narrative; Hanno's Periplus; Navigation from Lisbon to St. Thomé, by a Portuguese pilot; Ramusio, a Discourse on the Navigation of the Portuguese to the East Indies; Voyage of Vasco de Gama in 1497, written by a Florentine; Pedro Cabral Alvarez, voyage from Lisbon to Calicut in 1500, written by a Portuguese pilot; Amerigo Vespucci, two letters to Pietro Soderini; a Summary of Vespucci's Voyages; Thomas Lopez, a Portuguese, Voyage to the East Indies; Giovanni da Empoli, a Florentine, Journey to India; Ludovico Barthema of Bologna, Itinerary, preceded by a Discourse by Ramusio; Iambolus, Voyage extracted from Diodorus, with a Discourse by Ramusio; Andrea Corsali, a Florentine, Two Letters to Julian and Lorenzo de' Medici; Alvarez, Travels to Ethiopia, with the submission of Prester John to Pope Clement VII.; Ramusio, Discourse on the Rise of the Nile, with a reply by Fracastoro; the Voyage of Nearchus translated from Arrian's text; Journey of a Venetian from Alexandria to Diu in India in 1538; Arrian's Navigation from the Red Sea to India; Barbosa, a book of travels to the East Indies; a brief account of Kingdoms and Towns between the Red Sea and China, translated from the Portuguese; Antonio Conti, a Venetian, Journey to India, written by Poggio Bracciolini; Jeronimo da San Stefano, a Genoese, his letter written from Tripoli in 1499; Ramusio, Discourse on the Voyage round the World by the Spaniards; Maximilian of Transylvania, Epistle concerning the Navigation of the Spaniards; a short account of the Voyage of Magalhaens; Pigafetta, Voyage round the World; the Navigation of a Portuguese who accompanied Edward Barbosa in 1519; Ramusio, a Discourse concerning the Voyages to the Spice Countries; Juan Gaetan, a Castilian pilot, Discovery of the Moluccas; Information concerning Japan, by the Portuguese Jesuits; João de Barros, Chapters extracted from his History.'

Vol. ii. contains 'Marco Polo's Travels, with a preface by Ramusio; Hayton, an Armenian, Discourse on the origin of the Great Khan and the condition of the Tartars; Angiolelli, Life and Actions of Hussan Cassan; the Travels of a Merchant into Persia in the years 1517-20; Giosafat Barbaro, a Venetian, Journey to the Tana (the river Tanais) and into Persia; Ambrosio Contarini, Journey into Persia; Alberto Campense, Letters to Clement VII. concerning the affairs of Muscovy; Paul Giovio, Reports on the affairs of Muscovy, by him collected; Herbestein, Commentaries on Muscovy and Russia; Arrian's Letter to Hadrian concerning the Euxine; Interiano, a Genoese, on the habits and manners of the Zythi, called Circassians; Hippocrates, extract of his Treatise on Air and Water, in which he speaks of the Scythians; Piero Quirino, a Venetian, Account of his Voyage and Shipwreck; Sebastian Cabota, Navigation in the Northern Seas; Caterino Zeno, a Venetian, Travels to Persia; Niccolo and Antonio Zeno on the Discovery of Iceland; Travels into Tartary by some Dominican monks; Olderico da Udine, Two Journeys into Tartary; Guagnini, a Venetian, Description of European Sarmatia; Matthew Micheow of Cracow, Description of the two Sarmatias.'

Vol. iii.:—'Pietro Martire of Angleria, extract from his History of the New World; Oviedo, extract from his History of the West Indies; Hernan Cortez, Narrative of his Conquest of Mexico; Pedro de Alvarado, two letters to Hernan Cortez; Diego Godoy, a letter from New Spain; Narrative of one of Cortez's companions concerning Mexico, with two maps, one of the Great Temple, and another of the Lake; Alvaro Nuñez, Narrative of the Indies and of New Galicia in 1527-36; Guzman on the Conquest of New Spain; Francisco Ulloa, Voyage in the Mar Vermejo, or Sea of California; Vasquez de Coronado, Narrative of a Journey to Cevole, or the Kingdom of the Seven Cities; Alarcon, Voyage to discover the Kingdom of the Seven Cities in 1540; Ramusio, Discourse on the Conquest of Peru; Narrative of a Spanish Captain concerning the Conquest of Peru; Francisco Xeres, Narrative of the Conquest of Peru and New Castile; Narrative of a Secretary of Francisco Pizarro concerning the Conquest of Peru; Gonzalo de Oviedo, Navigation of the river Marañon; Ramusio, Discourse concerning New France; Giovanni da Verazzano, a Florentine, Narrative written from Dieppe, in July, 1524; Discourse of a great Naval Captain concerning the Navigation of the West Indies; Jacques Cartier, First and Second Narrative of Voyages to New France; Cesare de Federici, Voyage to the East Indies and beyond India; Three Voyages of Hollanders and Zealanders to China, New Zembla and Greenland.'

Among the above series are several curious narratives which are not found in any other collection. Ramusio left materials for a fourth volume, which unfortunately were destroyed in a fire which broke out in the printing-press of Giunti, in November, 1557.

(Camus, *Mémoires sur les Collections de Voyages*; Gamba, *Serie dei Testi di Lingua*.)

RANDAZZO. [MESSINA.]

RANDERS is a thriving Danish trading town, in the diocese of Aarhuus, in the province of Jutland. It is situated in 56° 28′ N. lat. and 10° 3′ E. long., near the

Baltic, on the river Guden, which is here navigable. It is a walled town with seven gates, and next to Aarhuus, is the most considerable place in Jutland, having a population of 5600 inhabitants. There is one church, a large hospital, a grammar-school, and an Agricultural Society. The inhabitants manufacture gloves, stockings, woollen cloth, earthenware, and lampblack; calico-printing, brewing, and brandy-distilling are carried on to a considerable extent. There are some vinegar manufactories and one sugar-house. This place has a very brisk trade, especially in corn.

RANDOLPH, THOMAS, an English poet, was born in the year 1605, at Badby in Northamptonshire. He was the second son of William Randolph of Little Houghton, steward to Edward lord Zouche, by his first wife Elizabeth, daughter of Thomas Smith of Newnham in the same county.

He was educated at Westminster school, and thence elected scholar of Trinity College, Cambridge, in the year 1623. He was afterwards made fellow on the same foundation, and admitted to an ad eundem degree at Oxford in 1631. After some stay at Cambridge, he came to London, where he was much noticed by Ben Jonson, who called him his adopted son. He became intimate also with many of the other wits of that day. The promise of his youth was marred by a career of dissipation and extravagance, which shortened his life prematurely. He died while on a visit to a friend at Blatherwick in Northamptonshire, where he was buried, March 17, 1634-5, and his memory honoured by a monument erected at the charge of Sir Christopher (afterwards lord) Hatton of Kirby.

Randolph's 'Poems, Translations, and Plays,' were published in London, 1634, 4to.; and his 'Poems, with the Muses' Looking-Glass and Amyntas,' at Oxford, in 1638, 4to. There have been several other editions published since, both in London and at Oxford. His plays are—'Aristippus,' and 'The Conceited Pedlar,' published together in 1630, 4to.; 'Jealous Lovers,' 1632, 4to.; 'The Muses' Looking-Glass,' Lond., 1638, 4to.; 'Amyntas,' Oxford, 1638, 4to.; 'Hey for Honesty, Down with Knavery,' a comedy. 'The Prodigal Scholar,' a comedy, and 'The Dolium Cornelianum,' a Latin play in the style of Plautus, have been attributed to him.

Randolph's writings are the production of a mind well imbued with classical literature, and he has in many passages not unskilfully interwoven the language and imagery of the best authors of antiquity. He wrote Latin verse with ease and fluency, and translated from Claudian with considerable elegance. But his English compositions are not free from the faults imputed to most of his contemporaries, and are often disfigured by licentiousness, obscurity, and strained conceits, exhibiting more learning and ingenuity than good taste. They consist of addresses to different friends, epigrams, translations, and amatory pieces. His dramas present very few attractions to the modern reader. The characters are either mere impersonations of virtues and vices, or feeble and pedantic travesties from Greek and Roman comedy. The plots are perplexed and devoid of interest, and the dialogue seldom rises above mediocrity, though occasionally relieved by passages showing much original power of description. The most popular of his plays is the 'Muses' Looking-glass,' which was re-acted in the last century. For further particulars of his life see Jacob's *Poetical Register* (which contains a curious anecdote of his first interview with Ben Jonson); Wood's *Athenæ Oxonienses*; Baker's *Hist. of Northamptonshire*. His works are reviewed in the *Retrospective Review*, vol. vi.; and a list of them is given in Watt's *Bibliotheca Britannica*.

RANELLA. (Malacology.) [SIPHONOSTOMATA.]

RANGE. [GUNNERY; PROJECTILES.]

RANGER (*Rangeator*), an antient officer in the king's forests and parks, appointed by patent, and enjoying certain fees, perquisites, and other advantages. His duty was of three kinds: 1, to make daily perambulations, to see, hear, and inquire concerning any wrong doings in the limits of his bailiwick; 2, to recover any of the beasts which had strayed beyond the limits of the forest or chase; and, 3, to present all transgressions at the next forest-court.

RANGOON is the most commercial port of the Birman Empire. It is near 16° 40′ N. lat. and 96° 18′ E. long., and is built on the most eastern branch of the river Irawadi, about twenty-six miles from the sea. About two miles below the town, the river divides into two arms, of which the eastern, running nearly due east, is called Syrian River; and the western, running nearly due south, Rangoon River. Both of these branches are navigable, but the Rangoon River is generally preferred. Though the navigation is somewhat intricate, the difficulties are easily overcome by the assistance of tolerable pilots. Vessels of 1200 tons burden have proceeded to the town. This eastern branch is the only one of the Irawadi which is navigable for large vessels, except that of Bassein, which has the disadvantage of being nearly dry above the town of Bassein during the dry season, whilst the eastern branch may always be navigated by large river-boats; consequently Rangoon has the advantage of an uninterrupted communication with the upper provinces at all seasons.

The town is on the left bank of the river, at a place where it runs nearly due east and west. From the banks of the river the ground continues to rise gradually for more than two miles to the foot of the hill on which the grand Dagong Pagoda is built, the bottom of which appears to be 70 or 80 feet above the level of the Irawadi. The town and suburbs extend about a mile along the bank of the river, but the houses are very unequally scattered over this area. The streets are narrow, but clean and well paved. The houses are raised on posts, the smaller supported by bamboos and the larger by strong timbers. There are a few brick houses, chiefly belonging to Europeans, who pay a heavy tax for this privilege: no subject of the Burmese emperor is permitted to erect a brick building. These brick houses are built within the myo, or city, which is an irregular quadrangle, surrounded by a stockade 14 feet high, and composed of heavy beams of teak timber. The north and south faces of this stockade are 1145 yards long; the east 598, and the west 197 yards. It has in some places a stage to fire musketry from, through embrasures or loopholes. On the south side of the stockade towards the river is a ditch, over which there is a causeway. The ditch is about 20 or 30 yards from the banks of the river. In the interior of the stockade are three wide and clean streets running east and west, and three smaller ones crossing them and fronting the gates on the south face.

Two narrow roads, paved with brick, lead from the southern face of the stockade to the great pagoda, Shewi Dagong, and along the sides are built a number of *sidis*, or monuments in honour of Buddha. In form they may be compared to a speaking-trumpet standing on its base. The lower part is generally a polygon, and the shaft or upper part is round, the apex being ornamented with an iron net in form of an umbrella, called a *ti*. The Shewi Dagong is in the same style as the rest, but richly gilt all over. It is said to be about 278 feet high, and is surrounded by an enclosure, in which is an immense bell of very rude fabric. This pagoda is a place of pilgrimage, frequented by many strangers, especially Shans, who live in the country east of the river Saluen.

Rangoon is very convenient for ship-building, as the tide rises from 18 to 24 feet, and the great teak-forests are near it. The timber may be floated down the whole way from the forests near Sarwa to Rangoon. According to Crawfurd, not less than 111 square-rigged vessels of European construction were built there from 1786 to 1824. Some of them were from 800 to 1000 tons burthen.

Rangoon was built by Alompra, after the destruction of Pegu and Syrian in 1755, and the choice of the site shows the sagacity of the conqueror. Besides its advantageous situation for commerce, the elevated ground on which it is built secures it from being inundated by the tropical rains to which all the low lands of the delta of the Irawadi are subject. The climate is temperate, agreeable, and salubrious. The place at first rose slowly. Even at the beginning of the present century the number of vessels that cleared out was only from 18 to 25 annually. But between 1811 and 1817 the number increased to 35 and 36. From 1817 to 1822 the average was 40 ships, and in the last-mentioned year 56. Since the time of its occupation by the British (from 1824 to 1826) its commerce with Calcutta and other British possessions in India has been continually increasing. The most active commerce is carried on with Chittagong, Dacca, Calcutta, Madras, Masulipatam, the Nicobar Islands, and Pulo Penang; there is also some trade with Bombay and the Persian and Arabian gulfs. The articles exported are teak-wood, catechu, stick-lac, bees'-wax, elephants' teeth, raw cotton, orpiment, gold, silver, rubies, and horses. The most important of these articles is teak-timber, and Calcutta is the principal mart for it. Raw cotton of superior quality goes in great quancity to Dacca, where it is used in the fabrication of the finest muslins. The principal imports are cotton piece-goods, from Britain, Bengal, and Madras, British woollens, iron, steel, quicksilver, copper, cordage, borax, sulphur, gunpowder, saltpetre, fire-arms, coarse porcelain, English glass-ware, opium, tobacco, cocoa and areca nuts, sugar, and spirits. Crawfurd estimated the value of the imports before 1823 at 300,000*l.*, and that of the exports at the same sum. According to a census taken by Crawfurd in 1826 the town and suburbs contained a population of 8666 individuals, exclusive of strangers.

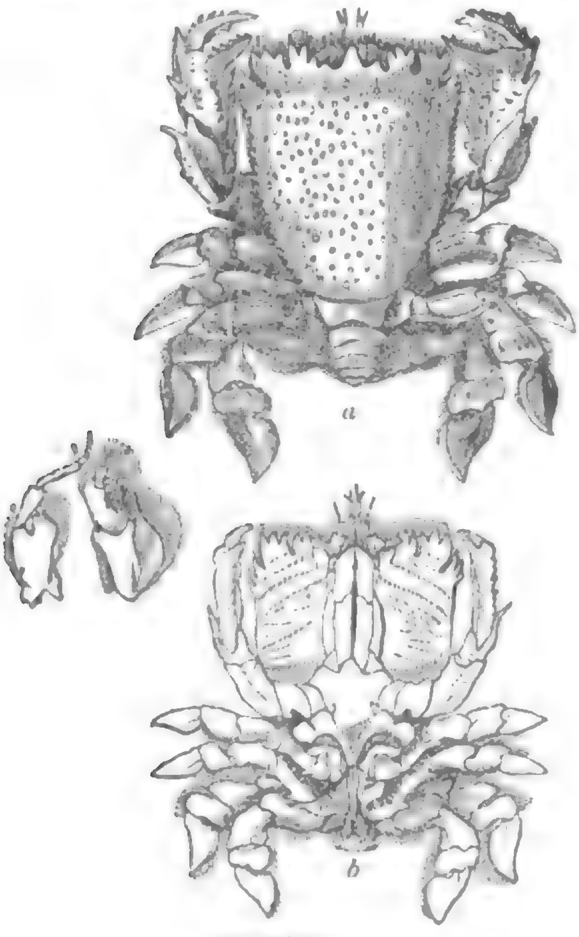
(Symes, *Account of an Embassy to the Kingdom of Ava;* Snodgrass's *Narrative of the Burmese War;* Crawfurd's *Journal of an Embassy to the Court of Ava.*)

RA'NIDÆ. [FROGS, vol. x.] The reader should refer to Mr. Bell's interesting *History of British Reptiles*, where the experiments of Edwards proving the existence of cutaneous respiration in the frog after the possibility of communication with the lungs was prevented, are recorded, and many very valuable remarks are concentrated.

RANINIANS, the name by which M. Milne Edwards designates the fourth tribe of the family *Apterura*, belonging to the section of Anomourous Decapod Crustaceans.

This tribe, in its general form and in the conformation of its feet, approaches very closely to the Hippians, and especially to the *Albuneæ*. [HIPPA.]

The *carapace* of the *Raninians* is convex laterally, nearly straight from before backwards, wide and truncated anteriorly, and gradually narrowed backwards. The ocular peduncles are lodged in the orbits, but are bent (coudés), and composed of three moveable pieces. The *internal antennæ* have no fossets, and are not capable of bending themselves back under the front; the external antennæ are very short and very stout at their bases. The external *jaw-feet* are very much elongated, but not pediform, and behind their insertion the pterygostomian regions of the carapace unite themselves to the sternal plastron, without leaving any aperture for the entry of the water into the branchial cavity. The sternal plastron is very large anteriorly, but becomes linear between the third or fourth last pair of feet. The anterior feet are very much compressed, and their immoveable finger projects but very little, so that the moveable finger is bent back against the anterior border of the hand, nearly as in the subcheliform feet. The succeeding feet are all flattened, very wide, and terminated by a great lamellar joint, like that of the natatory feet of the swimming *Brachyura*: the two last pair are inserted more or less high above the preceding, above which they bend themselves back. The abdomen is very small, and in the male does not even cover the appendages fixed near its base. (M. E.)



Ranina dentata.

a, as seen from above; *b*, seen from below.

M. Milne Edwards makes this tribe consist of three genera, thus characterized:—

Raninians having the sternal plastron.	Linear between the base of the feet of the second pair.	Carrying on the external border a great auriculiform prolongation.	Ranina.
	Second joint of the external antennæ	not enlarged externally.	Ranilia.
	Very wide between the base of the second pair of feet, which are widely separated from the third pair.		Raninoïdes.

Ranina dentata may be taken as an example of the tribe.

Locality.—The Indian Seas; Isle of France.

Habits.—Rumphius states that it comes to land, and creeps even to the tops of houses (sur le faîte des maisons). (M. E.)

M. Milne Edwards remarks that the *Cancer dorsipes*, figured by Rumphius, and confounded by most modern authors with *Raninoïdes lævis* and *Albunea Symnista*, appears to belong to this genus.

In the neighbourhood of this tribe M. Milne Edwards would place *Eryon Caribensis* of Fréminville (*Ann. des Sciences Nat.*, 1st series, tom. xxv., p. 275, pl. 8, B).

FOSSIL RANINIANS.

The fossil designated by Ranzani as *Ranina Aldrovandi* belongs, in the opinion of M. Milne Edwards, to the tribe of *Raninians*, and may be referred to the genus *Ranina*.

RANSOM, a word common to the French (rançon) and English languages, the sense of which is a sum of money paid for the redemption of a captive.

The paying of ransoms is an event of frequent occurrence in the middle-age history, and indeed may be traced in the history of the older nations. Nothing appears on the first view more reasonable, or would more naturally arise out of the relations of two parties in a state of hostility, than that compensation of some kind should be made for the restoration of prisoners, which compensation was most easily estimated and discharged by means of the common medium of exchange. In modern warfare we hear little of ransoms. It rarely happens that a person is taken captive whom it is of importance to redeem; and when prisoners are to be redeemed, it is usually done by way of exchange, and those who remain over, at the conclusion of a war, are usually delivered up as a part of the concession of the party in whose favour the difference is found to be.

In the indentures of military service in the middle-age period, as in the wars of Henry V. for instance, it was a usual stipulation that, while the ransom of persons of inferior condition taken in the war was allowed to those by whom they were captured, the ransom for persons of rank was to belong to the king.

The ransoms demanded for persons of eminence were often very large sums of money; so much beyond the power of any family, however great, to command by the ordinary resources, that the persons who held lands of them were called upon to contribute in proportion to the extent of land held. It was one of the three casual occasions of expense when this kind of extraordinary aid was demanded as of prescriptive right by the lord; the other two being on occasion of knighting the eldest son, and of marrying the eldest daughter. In France these casual payments were required of the tenant on other occasions.

The ransom paid for King Richard I., when he was a captive in the hands of the emperor Leopold, was no less a sum than 100,000*l.* To raise this sum an aid of twenty shillings was required of each knight's fee, and the clergy contributed liberally. This was the only occasion on which England had to pay for the redemption of its king. The ransom of David Bruce, king of Scotland, in the reign of Edward III., was 100,000 marks, which sum was paid by instalments, usually of 4000*l.* By the treaty of Bretigny it was stipulated that a sum equal to 500,000*l.* should be paid to King Edward III., which was in fact the ransom money for John, king of France, his prisoner. These three are the most remarkable ransoms in English history.

RA'NULA is a tumour formed beneath the tongue, and probably resulting from an obstruction of one or more of the ducts of the sublingual salivary glands. The tumour is usually of a rounded form, with a smooth polished surface similar to that of the adjacent mucous membrane. When small, such a tumour produces so little inconvenience, that it is usually not discovered till it has existed for some time. As they increase in size however, these growths, though seldom attended with pain, produce great inconvenience, by obstructing all the movements of the tongne. They usually burst when they have attained the size of a walnut, but they sometimes continue to increase beyond this size, and have been seen large enough to contain a pint of fluid. Their most usual contents are a transparent yellowish viscid fluid, resembling in consistence the white of an egg; sometimes however the material within them is much thicker, and sometimes mixed with portions of earthy matter, similar to the larger masses by which the salivary ducts are occasionally blocked up.

The treatment of Ranula consists in making a free incision into the front of the tumour, so as to let out all its contents. Means must then be adopted to prevent the edges of the wound from uniting again; and the best plan for this purpose is to rub the surface of the cyst with nitrate of silver (lunar caustic). If the wound be not prevented from uniting, the tumour will form again, and the same proceedings must again be adopted for its cure.

RANUNCULA'CEÆ form a tribe of plants founded on the common crowfoot, or buttercup, but embracing a large variety of different structures within its limits. The essential character of this order is to have numerous indefinite stamens growing from below the pistil, disjoined carpels, a minute embryo lying in abundant albumen, and an annual, or at least nearly herbaceous stem. Great numbers of species answer to this description, and, when combined, form a very natural assemblage. All are more or less acrid and poisonous, and some vehemently so, as aconite and hellebore; others are beautiful with their gay flowers, as the pæony, ranunculus, larkspur, and columbine: many however are mere weeds. The most striking variation that takes place from the usual form of this order is when the calyx or corolla becomes unusually formed, and more or less imperfect. When this occurs, as in larkspur and aconite, the general resemblance of such plants to the regular portions of the order is much obscured. Occasionally the petals are not present, as in clematis, and thus additional evidence is afforded of the comparative unimportance of petals in forming the great suborders of Exogens.

RANZ DES VACHES ('Kuhreihen' in German) is the name of certain simple melodies which are great favourites with the mountaineers of the Alps of Switzerland, and which are commonly played upon a kind of long trumpet called the Alp-horn. The sounds of these tunes, as well as the words which are set to them, are expressive of the scenes and business of pastoral life; the hut, the roaring torrent, the bellowing of the cattle, and the tinkling of the bells which are suspended from their necks; and the associations which they thus recall to the minds of the natives when they are in foreign countries, often produce that unconquerable longing for home which is said to have been especially remarked among the Swiss soldiers on foreign service; for this reason, the bands of the Swiss regiments in foreign service were forbidden to play the Ranz des Vaches. Theodore Zwinger, of Basle, wrote, in 1710, a 'Dissertation on Nostalgia,' in which he gave the music of the Kuhreihen of Appenzell, which is one of the oldest, and which was introduced into England in the time of Queen Anne, who had it often played by her band. The words begin thus: 'Wänder iha, wänder iha, wänder iha, Lo....ba, Alsamma mit nama, alsamma mit nama, die alten, die jungen, die alten allsamma, Loba, Loba, Loba.' Each of the various pastoral districts, the Oberland, the Emmenthal, the Entlibuch, the Appenzell, has its Kuhreihen. The western or Romand districts of Switzerland have their Ranz des Vaches in their respective patois or dialects. The following is a specimen of that of Gruyères in the canton of Fribourg: 'Lé-z-armailli dei Colombette—Dé bon matin sé san leha—Ha ah! Ha ah!—Liauba, Liauba, por arià—Vinidé tote—Bliantz et nairé—Rotz et motailé,' &c.

In recent times the words of the original Ranz des Vaches have appeared too rude to refined ears, and more sentimental expressions have been substituted. This is the origin of the pretty air which is often heard in the societies of the Swiss towns, 'Quand reverrai-je un jour—tous les objets de mon amour? nos clairs ruisseaux, nos coteaux, nos hameaux, nos montagnes,' &c., which reminds the English hearer of his own 'Home, sweet home.'

A collection of the various Ranz des Vaches and other Swiss airs has been published: 'Sammlung von Schweizer Kuhreihen and Volksliedern,' Bern, 1818. Tarenne has written 'Recherches sur les Ranz des Vaches,' Paris, 1813. See also Laborde, 'Essai de la Musique ancienne et moderne;' and Ebel, 'Schilderung der Gebirgsvölker der Schweiz.'

RAPA'CES, M. Temminck's name for the *Birds of Prey*. [RAPTATORES; RAPTORES.]

RAPE is defined to be the having unlawful carnal knowledge of a woman by force and against her will; and it is a capital felony. It is doubtful whether fraud is equivalent to force for the purpose of constituting this offence; as where a man takes advantage of circumstances which induce a woman to suppose he is a husband; but if he obtains her consent by menacing her with death, or by duress, it is clearly rape. A person under fourteen years of age is in law presumed to be incapable of perpetrating this offence: this presumption however is based on physical grounds entirely, so that such a person, by assisting others of maturer age, may render himself liable to the full penalty of the law as a principal in the second degree. In the case of a female under ten years of age, whether the act takes place with or without her consent, it is equally punishable as rape; if she be above ten and under twelve years of age, her consent reduces the act to a misdemeanour punishable by imprisonment and hard labour for such term as may be awarded.

An assault with intent to commit a rape is a misdemeanor punishable by imprisonment for any term not exceeding two years, and with or without hard labour, at the discretion of the court before which the offender is convicted. Upon a trial for the capital offence, where the evidence is incomplete, d prisoner may be convicted of a misdemeanor.

RAPE. This plant, which is of the cabbage tribe, is cultivated like cole, or colza, for the sake of its seeds, from which oil is extracted by grinding and pressure. It is also extensively cultivated in England for the succulent food which its thick and fleshy stem and leaves supply to sheep when other fodder is scarce.

The mode of cultivation of the colza and rape for seed is nearly the same. The colza takes a longer time to come to maturity, and produces more seed. The rape grows on less fertile soils, and may be sown in spring as well as in autumn. Both are hardy, and resist the winter's frost.

The colza (Brassica oleracea, or campestris) is a plant which grows with a strong branching stem, three or four feet high, and requires room to spread; the plants are therefore raised in a seed-bed, and transplanted when they have acquired a certain size. When rape (Brassica napus) is cultivated for the seed, it is treated in the same manner; one description will therefore serve for both.

The seed-bed, where the cultivation is on a small scale, is usually prepared by digging or trenching with the spade, in a good loamy soil, neither too sandy nor too wet. A large proportion of rotten dung is spread evenly over it, and dug in six inches deep, and the surface is raked fine. The seed is sown broad-cast or in drill; the latter is the best method: it is then slightly covered with the rake; and if the ground will allow of it, without risk of its being bound too hard in case of dry weather, it is well rolled or trod with the feet. The seed must not be sown too thick; and the plants, as soon as they have six leaves, must be thinned to a distance of four or five inches in the rows, which will make them stronger and better furnished with roots. One acre of seed-bed will furnish plants for ten acres or more. The seed is sown in July or August, that the plants may not run to seed the same year, which they are apt to do if sown early; and they are transplanted in September or October, on land which has already borne a profitable crop. As this crop is a substitute for a fallow on rich heavy land, too much pains cannot be taken to keep it free from weeds. Winter barley, and rye, which are reaped early in July, are very proper crops to be succeeded by rape or colza. The stubble should be ploughed two or three times, to pulverise and clean it. A good coat of rotten dung should be put on, and the land ploughed in ridges, as for turnips: the plants should be put in on the ridges ten inches apart. It requires great care in taking them up not to break the fibres of the roots: they should be raised with a fork, and placed gently, with the fine earth adhering to them, in flat baskets, and in a slanting position, so that the tops may be upwards. In planting, the holes should be made with a large thick dibble, that the plants may be introduced without doubling up the principal roots or breaking the fibres. The earth should be pressed to the root by a short dibble, inserted to the right or left of the hole made by the first dibble; or, which is better in stiff soils, a hole should be made with a narrow hoe of sufficient depth to allow the plant to be placed in it, and another hoe should follow to draw the earth to the plant. Thus two men with hoes, and one woman, will plant a row more rapidly than could be done any other way: the man who fills up the holes places his foot by the side of each plant as he goes on, to press the earth to the roots.

An expeditious mode of planting rape is used in Flanders. A spade ten inches wide is pushed vertically into the ground, and, by drawing the handle towards his body, the labourer makes a wedge-like opening; a woman inserts a plant in each side in this opening, and when the man removes the spade, the earth falls back against the plants. The woman puts her foot between the two plants, and they are then fixed in their places. In this operation the man moves backwards; and the woman, who puts in the plants, forward. Instead of the spade, an instrument is also used called a *plantoir*. It consists of two sharp-pointed stakes a foot or more apart, connected by a cross-handle at top, and a bar at about eight or ten inches from the points. The instrument is pressed into the ground by the handles, assisted by the foot placed on the lower bar, and makes two holes, a foot apart, into which the plants are placed, and earthed round as before. This is done when the land has not been laid up into high ridges.

When a large field is to be planted, a more expeditious mode is adopted; and this is the most usual practice in Holland and Germany. The land having been prepared, and the manure well incorporated, a deep furrow is drawn with the plough; women follow with baskets of plants, which they set, a foot apart, slanting against the furrow slice. When the plough returns, the earth is thrown against these plants; and a man or woman follows, who, with the foot, presses the earth down upon the roots. Sometimes plants are put into each furrow, which is then ten inches or more wide; but the best cultivators put them only in every alternate furrow. In this case also there are no ridges. The season of the year affords sufficient moisture in the north of Europe to ensure the growth of the plants; and if they have escaped the fly in the seed-bed, they are now tolerably safe. No further attention is requisite till spring. The weeds are then carefully extirpated by hand and hoe; and where the distance of the plants admits of it, the light plough stirs the ground between the rows, throwing the earth towards the stems; yet so as to leave each plant in a little basin to catch the water and conduct it to the roots. When the plants are invigorated with rich liquid manure, such as night-soil mixed with water, or the drainings from dunghills, they become extremely luxuriant; and every trouble or expense bestowed upon them is amply repaid. The difference between a crop partially neglected and another carefully cultivated often exceeds fifty per cent.

A moderate return of seed for colza is thirty bushels per acre, but it frequently exceeds fifty. The value on the Continent is nearly the same as that of wheat. In England it is somewhat less, owing to the quantity imported, on which there is a fixed duty of 10*s.* per quarter. It is usually sold by the last of ten quarters.

There is not much difference between the value of colza and rape-seed (called *navette* in French): but the latter produces less. When the rape is transplanted before winter, it is much more productive than when sown in spring. In the latter case it produces seed the same year. It is sown in drills, and thinned out by the hoe, and in favourable seasons a tolerable crop is obtained. It is generally sown on land which could not be brought into a proper tilth after harvest, and which would require the frost of winter to mellow it.

Great crops of cole-seed and rape have been produced in the fens of Lincolnshire and the alluvial soils in Essex, by merely paring and burning the surface and ploughing in the ashes; and these crops, alternating with oats, have in many instances so exhausted the soil as to cause a great prejudice against them in the minds of the landlords. Many leases have a clause prohibiting its cultivation, except to be eaten green by sheep. The principal cause however of the diminution of this crop in England is the inferior price obtained for the seed when compared with wheat, which can be raised on the same land, and is a more certain crop.

The rape and colza ripen their seed very unequally. The lower pods are ready to burst before those at top are full. If the season is wet at harvest, much of the seed is lost; and, without great attention, some loss is sustained in the most favourable seasons. It should be cut when the dew is on it, and moved as little as possible. If the weather permits, it is threshed out on a cloth in the field, and as many threshers are employed as can be conveniently collected, that no time may be lost, when the weather is fair. The seed is spread out on the floor of a granary that it may not heat, and is turned over frequently. It is then sold to the crushers, who express the oil. The pods and small branches broken off in threshing are much relished by cattle. This crop returns little to the land, and is of itself very exhausting. Not so however is the rape, when sown as food for sheep. It is, on the contrary, a valuable substitute for turnips, upon land which is too wet and heavy for this root. The Brassica oleracea is more succulent than the Brassica napus. Its stem is not so hard, and the soft pith which it contains is much relished by every kind of live-stock. To have it in perfection, the land should be prepared and manured as for turnips. The rape should be sown in drills ten inches apart, about the beginning or middle of August, which gives ample time for preparing the land, without interfering with the turnip crop. It will be sufficiently forward before winter, and it should then be hoed over once. If the crop is very forward, it may be slightly fed off: but, in general, it is best to let it remain untouched till spring. In the end of March and beginning of April it will be a great help to the ewes and lambs. It will produce excellent food till it begins to be in flower, when it should immediately be ploughed up. The ground will be found greatly recruited by this crop, which has taken nothing from it and has added much by the dung and urine of the sheep. Whatever be the succeeding crop, it cannot fail to be productive; and if the land is not clean, the farmer must have neglected the double opportunity of destroying weeds in the preceding summer and in the early part of spring. If the rape is fed off in time, it may be succeeded by barley or oats with clover or grass seeds, or potatoes, if the soil is not too wet. Thus, no crop will be lost, and the rape will have been a clear addition to the produce of the land. Any crop which is taken off the land in a green state, especially if it be fed off with sheep, may be repeated, without risk of failure, provided the land be properly tilled; but where cole or rape have produced seed, they cannot be profitably sown in less than five or six years after on the same land.

When the oil has been pressed out from the seed, the residue (which contains a portion of starch and mucilage not changed into oil) and the husk of the seed form a hard cake known by the name of rape cake. This is used on the Continent to feed cows and pigs with, as we use the linseed cakes: but it is also much used as a rich manure, and for this purpose it is imported in large quantities. When rape cake is ground to a powder and drilled with the seed on poor light lands, it supplies nourishment to the young plants, and greatly accelerates their growth; but if it be added in a large proportion in immediate contact with the seed, on heavy impervious soils, it often undergoes the putrid fermentation, which it communicates to the seed sown, and, instead of nourishing, destroys it. In this case it is useful to mix it with some dry porous earth or with ashes, which will prevent the too rapid decomposition. Dissolved in water and mixed with urine, it forms one of the most efficacious of artificial liquid manures. Hence it is probable that the most advantageous mode of using it on the land, after it has been dissolved in the urine-tank, is to apply it by means of a water-cart to the rows where the seed has been already drilled, or some time before it is put in. Where flax is to be sown, this mixture applied a few days before the seed is sown, so as to allow it to sink into the soil, is considered in Flanders as next in value to the emptyings of privies, which with them hold the first rank, for producing fine crops of flax. When a crop appears sickly, and not growing as it should do, owing to poverty in the soil, a top-dressing of rape-cake dissolved in water, if no urine is at hand, will in general excite the powers of vegetation; and it is highly probable that it may greatly assist the effects of saltpetre or of nitrate of soda, where these salts are applied. The cultivation of rape or cole for spring food cannot be too strongly recommended to the farmers of heavy clay soils.

RAPHAEL, or RAFFAELLO SANZIO, was born at Urbino, on Good Friday, March 28, 1483. He was the son of Giovanni de' Santi, a painter of merit in that city, some of whose works still exist. A specimen of them may be seen in the Berlin Gallery (No. 215, first division), bearing the name of Giovanni, and showing considerable beauty, but with weak colouring. Although Raphael lost his parents before he was twelve years old, he imbibed the rudiments of art from his father. Other artists of that peculiar school which fixed itself in Umbria, such as Nicolo Alunno of Foligno, and Andrea Luigi of Assisi, probably exercised some influence over the young painter. At what age he became the pupil of Perugino we know not, but traces of the scholar's hand are supposed to be visible in several of the works of the master; among others in the frescoes of the Cambio at Perugia, which where painted about the year 1500.

The career of Raphael is usually divided into three periods, of which the first terminates with his visit to Florence, in the autumn of 1504; the second comprises the time from that date until he was invited to Rome by Julius II., about the middle of 1508; and the third extends to his death, in 1520.

1. To begin with the works executed before Raphael's visit to Florence. One of the earliest of these now extant is probably the Virgin with the Book, in the Berlin Gallery (No. 223, first division), and a still more important picture of this period is the Adoration of the Magi, in the same collection (223 a). The latter is executed on linen, in size colours ('*al guazzo*'), and was originally intended for the high altar at Ferentillo; it was purchased by the late king of Prussia, from the Ancajani family at Spoleto, for the sum of 6000 scudi, and has suffered a good deal from the peeling of some of the colours.

The pictures painted at Citta di Castello were, the Coronation of St. Nicholas of Tolentino (said to have disappeared from the Vatican during the French occupation); the Sposalizio, or Marriage of the Virgin (now in the Brera at Milan), and the Christ on the Cross, in the collection of Cardinal Fesch. Lanzi, on the authority of mere tradition, states that the first of these three was painted when Raphael was only seventeen, that is, in 1500, and he assigns the last to about the same time. Both probably approach very nearly in time to the Sposalizio, which bears the date of 1504. The Coronation of the Virgin (now in the Vatican) clearly shows the struggle of new principles, although Vasari, whose contempt for the simplicity of the earlier style led him to content himself with very general resemblances, refers to this picture as one of those which prove how closely Raphael imitated the manner of Perugino. Notwithstanding Vasari's assertion to the contrary, it seems probable that both the Coronation of the Virgin and the Crucifixion belonging to Cardinal Fesch were posterior to the Sposalizio.

Raphael's share in the frescoes executed by Pinturicchio, in the Libreria of the Cathedral at Siena, has been much exaggerated. There is little doubt that he never worked there in person, although he furnished some drawings to his fellow-pupil; two of these are yet extant, one in the Florence Gallery, and the other in the Baldeschi collection at Perugia. Vasari's whole account of Raphael's first visit to Florence is confused in the highest degree. He describes him as induced to quit Siena by the report of Leonardo's Battle of the Standard and of M. Angelo's Cartoon, although the latter work was not exhibited till 1506, while the frescoes of Pinturicchio were probably completed in 1503, and the date of Raphael's journey is fixed to October, 1504, by the letter of recommendation for the Gonfaloniere Soderini from the duchess of Sora. Quatremère de Quincy tries to solve the difficulty by assuming a visit to Florence in 1503, and another in the following year, but a strong presumption against this supposition is furnished by the total absence of all trace of Florentine principles in the Marriage of the Virgin. Susceptible of new impressions in art as Raphael afterwards showed himself, it is impossible that the first introduction to his great Florentine contemporaries should have left no trace in his works. Now the pictures of 1505 exhibit clear traces of a new influence. In fact, at the time of his arrival at Florence, art had just reached the point which enabled him to reap the fullest benefit from the new field thus thrown open. He studied the works of Masaccio, and became the friend of Fra Bartolomeo and Ridolfo Ghirlandaio. [PAINTING.] In the following year we find him employed again at Perugia. The fresco in San Severo, and the altar-piece for the Ansidei family (now at Blenheim) were painted in 1505. Whether the picture executed for the nuns of St. Antonio of Padua at Perugia, which is at Naples, be of the same or of a later date, is a disputed point. The separate portions of the 'Predella,' or step belonging to the latter picture, are in England, in the respective collections of Mr. Rogers, Mr. Miles of Leigh Court, and Mr. White of Baron Hill.

Four pictures of the Virgin and Child of Raphael's Florentine period are distinguished by different characters, though all exquisitely beautiful. The Madonna del Gran Duca, in the Pitti palace, is the most simple, and, to our judgment, the most admirable of them all. It still breathes much of the spirit of the Umbrian school. The other three are the Madonna Tempi at Munich, the Colonna Madonna at Berlin, and the picture in the possession of Lord Cowper at Panshanger. To the same time must be attributed the Madonna del Cardellino, in the Tribune at Florence, the Belle Jardinière at Paris, and the Holy Family with the Palm, in the Bridgewater collection. The first of these three was painted for Lorenzo Nasi. Raphael's power and fidelity as a portrait painter are well shown in the beautiful portraits of Angelo and Maddalena Doni, in the Pitti palace, and in two heads of monks, in the Academia at Florence. The St. Catherine, which passed from the Aldobrandini collection into that of Mr. Beckford, and still more lately into the National Gallery, was executed in the latter part of the artist's residence at Florence. The two works which must be considered as closing this division are the Madonna del Baldacchino, or di Pescia, left unfinished when the painter started for Rome, and the Entombment of Christ. The former picture bears some resemblance in its technical details to the works of Fra Bartolomeo; it is now in the Pitti palace. The latter was painted by order of Atalanta Baglioni, for S. Francesco at Perugia, and forms part of the Borghese collection. It is an elaborate composition, of the greatest beauty and power of expression, proving how much Raphael had profited by his Florentine studies. The figures from the Predella are in the Vatican.

The invitation given by Julius II. to Raphael would be sufficiently accounted for by the celebrity of the artist himself, although it is very probable that his connection with the family Della Rovere, or the favour of his fellow-countryman Bramante, facilitated his introduction at the papal court. He seems to have left Florence, rather suddenly, towards the end of the year 1508.

The 'Stanze' decorated by the pencil of Raphael were the living-rooms of the papal court in the time of Leo X. His frescoes suffered during the occupation of Rome by the imperial troops, in 1527, and by subsequent neglect, when the popes had transferred their residence to the Quirinal. In the years 1702 and 1703 they were cleaned and restored, by Carlo Maratti, who re-painted the larger portion of the decorative framework.

The Camera della Segnatura was the first worked on by Raphael. The figures of Theology, Poetry, Philosophy, and Justice on the ceiling preceded in execution the large paintings on the walls. Of these last the Disputa del Sacramento, as it is commonly called, was the earliest. In simple beauty and severe dignity, in energy and individual character, this work has never been surpassed; in technical excellence, and the picturesque qualities of breadth, composition, and softness, it is certainly inferior to the Parnassus and the School of Athens, which came next. The allegorical figures of Temperance, Fortitude, and Prudence, in the semicircular division on the remaining side of the room, are among the most beautiful of Raphael's designs.

In the Stanza d'Eliodoro, the fresco of Heliodorus, together with that of the Mass of Bolsena and the scripture subjects in the ceiling were executed in the pontificate of Julius. It is impossible to show more complete understanding of the application of painting to a story than Raphael has displayed in the first of these compositions. The colouring of the Mass of Bolsena is admirable.

In 1513 Leo X. succeeded to the papal chair. The two remaining frescoes in the Stanza d'Eliodoro, that is to say, Attila repelled from Rome, and the Liberation of St. Peter, belong to his reign. The latter is supposed to allude to the pope's escape, when Cardinal de' Medici, after the battle of Ravenna, and the former to the retreat of the French from Italy.

In the third room, or Stanza del Incendio, the ceiling contains some paintings of P. Perugino, which were spared when those of other masters were destroyed to make room for the works of Raphael. The subjects on the walls are the Burning of the Borgo, or suburb of Rome, the Victory over the Saracens at Ostia, the Coronation of Charlemagne, and the Death of Leo III. The execution of all these was more or less left to pupils; those in the Sala di Costantino were wholly painted by Julio Romano and others, from designs by Raphael.

The loggie, or open colonnades, designed by Bramante, were decorated under the directions of Raphael by his principal scholars. The Cartoons for the tapestry to be hung round the Sistine Chapel were prepared in 1515 and 1516, at the desire of Leo X. These cartoons were cut into strips for the convenience of the workmen at Arras. By some unaccountable neglect they remained in Flanders, and seven of the ten were, after the expiration of a century, bought by Charles I. at the suggestion of Rubens. When the property of the crown was sold by the Commonwealth, they were valued at 300*l*., and purchased by Cromwell's order at that price for the nation. William III. caused these precious fragments to be properly mounted and put up at Hampton Court. In 1766 they were removed to Buckingham House; thence carried to Windsor; and in 1804 again restored to Hampton Court. The Cartoons have far greater pretensions to be considered as original works of Raphael than the paintings in the two last rooms of the Vatican just referred to. In composition they are unrivalled, and their whole conception is admirably adapted to the purpose which they were meant to fulfil. [CARTOONS.]

The Isaiah in San Agostino was probably painted in 1512 or 1513; and the Sibyls in Santa Maria della Pace shortly afterwards. Rumohr, on technical grounds, places the latter (one of the artist's most admirable works) about 1515. Their subjects and their mode of treatment sufficiently establish in a general sense that imitation of Michael Angelo of which so much has been said.

We must now return to the smaller works of Raphael.

Vasari says that his portrait of Julius II. was so like as to inspire fear, as if it were alive. The original thus spoken of is supposed to be in the tribune at Florence. Two copies of it are in the Pitti Palace, and one in our own National Gallery. The last came from the Borghese collection. On the subject of Raphael's own portrait a good deal of controversy has taken place. It is certainly difficult to detect much resemblance between the portrait in the Florence collection and that purchased by the king of Bavaria from the Altoviti family; and the expression of Vasari, 'à Bindo Altoviti fece il ritratto suo,' is ambiguous, but nevertheless we believe the picture now at Munich to be the work of Raphael, and his own portrait. Missirini and the Italians would probably have discussed the question with much less angry zeal if the picture had not been transferred to a foreign country.

Three portraits exist, which are believed to represent Raphael's mistress, the so-called Fornarina, painted by himself. One of these is in the Barberini, another in the Sciarra palace (at Rome), and the third is in the Tribune at Florence. This last picture bears the date of 1512, and was at one time attributed to Giorgione. Certain it is that the colour would be worthy of the Venetian master, and that the face and form are Venetian in their character.

The Madonna della Seggiola, the Madonna del Duca di Alba, and several others of somewhat similar feeling belong to the early part of Raphael's residence at Rome. The Madonna di Foligno, now in the Vatican, was painted for Gismondo Conti, probably about the time of the completion of the Camera della Segnatura. The Vision of Ezekiel is said to have been paid for in 1510; two pictures of the subject exist, one in the Pitti palace, and another, from the Orleans gallery, in the collection of Sir Thomas Baring. It is disputed whether either, and if either, which of these two is the original. Dr. Waagen prefers the claims of the Florence picture. The St. Cecilia at Bologna was ordered about 1510, and completed somewhat later; it has suffered greatly from restoration.

The four great altar-pieces of Raphael's later time are—

1. The Madonna del Pez, painted for San Domenico at Naples, and now (1833) in the Iglesia Vieja of the Escurial. It is a composition of the purest and simplest beauty.

2. The Madonna di S. Sisto, the well known pride of the Dresden gallery. This picture has had the good fortune to be engraved better than any other in the world. It is painted on canvas, and Rumohr conjectures that it was intended for a 'drapellone,' or large standard, to be carried in procession, attached to two poles. A picture, by Guido, painted on grey silk, and called 'il pallione,' from being used in this manner, is to be seen in the Pinacoteca at Bologna (No. 138). The most striking points in the Madonna di S. Sisto are the deeply meditative anticipation of future suffering in the Virgin, and the superhuman character imparted to the Christ by the union of a childish form with the severe thoughtfulness of maturer age.

3. The Spasimo di Sicilia, executed for Santa Maria dello Spasimo, at Palermo, is now in the public gallery at Madrid. There is something academical in the figure of the executioner, but the deep feeling in the right-hand group of women reminds us of the Borghese entombment. This picture has suffered much by restoration, and has acquired a sort of brickdust colour.

4. The Transfiguration, usually considered to be Raphael's masterpiece. It was left unfinished at his death.

Besides the above-named works, we must allude to the Visitation and the Perla, both in the Sacristy of the Escurial. The latter formed part of the collection of Charles I. of England.

The Archangel Michael, and the Holy Family, painted in 1518, for Francis I., are first-rate pictures of the artist's later time. In the portrait of Leo X., with the Cardinals de' Medici and Rossi (painted not earlier than 1518), Raphael has shown that he could rival the Flemish masters in the accurate imitation of ordinary household objects. The Violin-Player, in the Sciarra palace at Rome, also bears the date of 1518. The portraits of Joanna of Aragon, Baltasar Castiglione, and others, we have not space to dwell on.

Raphael occupied himself with architecture as well as painting, and seems to have felt a zealous interest in all remains of antient art. The Psyche and the Galatea, executed in the Farnesina at Rome for Alessandro Chigi, are his principal works which represent mythological subjects.

On the 6th of April, 1520, being Good Friday, this greatest of all modern painters died of an attack of fever, at the age of thirty-seven.

All that is recorded of his public and private character represents him as most amiable, and as the object of sincere affection on the part of his immediate friends. As an artist he was especially distinguished in two things. In the first place, whatever was the principle of art which he adopted at different periods of his life, in each and all successively he attained the greatest excellence. In his early pictures the spirit of Perugino and of the Umbrian school beamed with double purity and beauty; but his powers were not limited within the narrow circle which hemmed in his master and caused him to reproduce the same forms and the same expression through the course of a long life. Raphael came to Florence at a fortunate moment. The anatomical studies of Leonardo and M. Angelo, and the powers of Masaccio, had exactly provided the fresh food for which his genius was craving. The religious feeling of his earlier works became a little unspiritualised in the worldly city of Florence, but his technical power received a great accession of strength, while his capacity for seizing real life is sufficiently shown by the portrait of Maddalena Doni. His Madonnas at this time lose something of their thoughtful melancholy, and often acquire a smiling character, such as we find in the works of Leonardo. Still his pictures exhibit excellence peculiar to himself.

In his third period, many persons, like Monsieur Rio (*l'Art Chrétien*), may consider the 'Disputa' as the last gleam of primitive simplicity or beauty. It may be said that thenceforth the Christian painter became paganised by contact with the heathen courts of Julius II. and Leo. X It is true that at this particular time a change took place in the style of art adopted by Raphael. He had acquired a new sense for the effect of masses in his drapery and in his lights and shades, and he worked on principles more consonant with the modern notions of picturesque composition. Which of the two sources of pleasure from painting is the purest and the most genuine may be a subject of dispute; but there can be no dispute as to the fact that in each line, as he successively adopted them, Raphael attained the highest pitch of excellence of which they respectively admitted We cannot however allow that an artist who could execute the Cartoons had lost the power of conceiving and worthily embodying Christian subjects

The second consideration which seems to place Raphael before all other painters is the fact that of the large number of works attributed to him with any certainty, hardly one can be called ordinary or commonplace in its character. If we consider the early age at which he died, his pictures are very numerous. The best of them are confessedly superior to the finest productions of other masters, and their average quality is in a still greater degree superior to the average quality of the works of any other painter.

(Vasari, *Vita dei Pittori*, vol. iii.; Lanzi, *Storia Pittorica*; Quatremère de Quincy, *Vita di Raffaello, tradotta da Longhena*; Rumohr, *Italienische Forschungen*, vol. iii.; Bunsen, &c., *Beschreibung der Stadt Rom.*, vol. ii.; Waagen, *Kunstwerke und Künstler in England und Paris*; Passavant, *Rafael von Urbino*; *Quarterly Review*, No. cxxxi.; Rio, *L'Art Chrétien*.)

RA'PHANUS, a Brassicaceous or Cruciferous genus of plants, is only remarkable for containing the common radish, Raphanus sativus. This plant, a native of China, has been cultivated in this country for upwards of 250 years, and has given rise to numerous varieties, which are divided into long-rooted or spindle-shaped, and round or turnip-rooted. They are also denominated spring, summer, autumn, or winter radishes, according to the season in which the respective sorts are found best adapted for use.

The *Scarlet* or *Salmon-coloured*, and the *Radis rose demi-longue*, are the best for early sowing; the latter variety is very tender and of a fine bright colour. The purple, another early long-rooted variety, is sometimes sold under the name of *Salad Radish*, the seed-leaves being larger and consequently better adapted for small salading than those of the other varieties. With the colour of the preceding sorts, the *Long White Transparent* will form an agreeable contrast. Of the round or turnip-rooted varieties, the *Early White Turnip-rooted* and the *Purple Turnip-rooted* are the best. The *Yellow Radish* succeeds in hot weather, being fit for use when the earlier kinds are apt to run to seed; and it precedes the autumn and winter varieties, of which the following is the order of succession: *Round Brown*, *White Spanish*, *Oblong Brown*, *Black Spanish*, and *Purple Spanish*. None of these are however esteemed in this country, where they are generally unknown.

If the early white turnip-radish be sown in August, it will come into use in autumn. The principal sowings should however be made in January and February, and successionally till May. The winter varieties require to be sown in July. In cold frosty weather the beds should be protected by straw, as is commonly practised, or by such other efficient means as may be at command. The covering should be always dispensed with when the days are fine; but it ought to be replaced before the cold of night ensues. Radish seed-pods are sometimes pickled, whilst tender, and may be used instead of capers, when the latter cannot be obtained.

RAPHOE, a city in Ireland, in the parish and barony of Raphoe, in the county of Donegal in Ulster, 145 miles north-west of Dublin, through Drogheda, Monaghan, Omagh, and Lifford. The parish comprehends 34,356 statute acres, chiefly land of good quality. The population, in 1831, was 1408 for the town, and 4819 for the rest of the parish; making a total of 6227, chiefly agricultural. The town (which derived its early importance from a monastery, founded, it is said, by St. Columb, and afterwards made the seat of a bishopric) consists of three small streets meeting in the market-place. There is a neat market-house. The cathedral is also the parish church; it is a plain cruciform building, with a square tower, which was added about a century ago. The date of the erection of the church is not known. There is a handsome and spacious episcopal palace at a short distance from the town. The Presbyterians have a meeting-house in the parish.

There is a market on Saturday for provisions and occasionally a little linen-yarn: the markets on the first Saturdays in January, February, March, April, and December, are great markets: there are several yearly fairs. There are petty-sessions every fortnight, and a body of the county police are stationed here.

The population, in 1834, comprehended 1149 persons belonging to the Establishment, 2730 Catholics, and 2552 Presbyterians. The congregations at the church and the Presbyterian meeting-house were increasing. The benefice is a rectory, the average gross yearly income of which for the three years ending with December, 1831, was 1050*l.*, exclusive of fines on the renewal of leases the glebe, the value of which is included in the above return, comprehends about 209 or 210 statute acres: the average net income was 771*l.*: the living constitutes the corps of the deanery of Raphoe.

There were in the parish, in 1835, ten day-schools, with a total of 505 scholars, viz. 332 males and 173 females; and four Sunday-schools. Among the day-schools were a royal endowed school with 27 boys, a national school with 70 boys and girls, and four hedge-schools.

RAPHOE, DIOCESE OF, one of the bishoprics of the ecclesiastical province of Armagh. It is bounded on the north and west by the Atlantic, on the east by the diocese of Derry, from which it is separated in one part by Lough Swilly, and in another part by the river Foyle; and on the south by the diocese of Clogher. It comprehends part of the county of Donegal. The dimensions of the diocese, as given by Dr. Beaufort, are 44 Irish or 56 English miles in length, and 32 Irish or 40 English miles in breadth; the area at 515,250 acres Irish, or 827,779 acres (1293 square miles) English measure.

The time when the diocese was established is unknown. Bishops of Raphoe are mentioned in the ninth century. The cathedral has been already described. [RAPHOE.] The chapter consists of the dean, the archdeacon, and four prebendaries. The gross revenue of the bishopric for the three years ending with December, 1831, was 5787*l.* 8*s.* 2*d.*; the net revenue, 5052*l.* 11*s.* 2*d.* The bishop presents to one of the dignities, three of the prebends, and twelve other benefices.

In 1792 the number of parishes was stated by Dr. Beaufort to be 31, of benefices 25, of churches 32, and of glebe-houses 17. By the Returns made to parliament in 1835 by the Commissioners of Public Instruction (*Parl. Papers* for 1835, vol. xxiii.), the number of benefices was 34, two of them unions of two or more parishes; the number of churches 34, and of other places of worship of the Establishment 7. The diocese was estimated to contain 33,507 members of the Established Church, 145,385 Roman Catholics, 28,914 Presbyterians, and 24 other Protestant Dissenters. There were 36 Catholic chapels, 27 Presbyterian meeting-houses, and 14 other places of worship not of the Establishment, chiefly belonging to the Methodists, who, in the account of the population, are classed among the members of the Established Church.

By the Returns of the same Commissioners (*Parl. Papers for* 1835, vol. xxiv.) there appear to have been in the diocese 263 day-schools, with about 14,500 scholars: of these schools 127 were wholly supported by the payments of the children, and 136 were wholly or partly supported by endowment or subscription. Only four were in connection with the National Board. The number of children under instruction was 6·98 per cent. of the whole population; this was considerably under the average of the dioceses of the province of Armagh, and also below the average of all Ireland.

This diocese has, by virtue of the Act 3 and 4 Will. IV., c. 37, been united to the diocese of Derry. In the Roman Catholic division of Ireland, the diocese is co-extensive with that of the Established Church. The cathedral and the bishop's residence are at Letterkenny, not far from Raphoe.

RAPHUS, Brisson's name for the Dodo. [DODO.]

RAPI'N, PAUL DE, a younger son of Jacques de Rapin, Sieur of Thoyras, was born at Castres, in 1661, of a Protestant family which came originally from Savoy. He studied in the Protestant College of Saumur, and afterwards entered the profession of the law. But the revocation of the Edict of Nantes by Louis XIV., in 1686, drove him from his native country, and he went first to England and afterwards to Holland, where he entered the service of William of Nassau as a volunteer. He accompanied William to England in 1688, was made an officer in an English regiment, served in Ireland under General Douglas, and was wounded at Limerick. Not long after, he was appointed travelling tutor to the young duke of Portland, with whom he spent several years. Having completed his engagement, he retired with his wife first to the Hague, and afterwards, for the sake of economy, to Wesel, where he commenced his great work, the 'History of England,' which occupied him for seventeen years. The application requisite for this undertaking is said to have exhausted his frame, and he died at Wesel in 1725. His work is entitled

'Histoire d'Angleterre depuis l'Etablissement des Romains jusqu' à la Mort de Charles I.,' 8 vols. 4to., La Haye, 1724, and foll. It was continued by others down to the accession of George II. The work was translated into English by Nicholas Tindal. This translation went through various editions; that of 1757-9 consists of 21 vols. 8vo., and is enriched with additional notes and a biography of Rapin. Rapin writes with spirit and ease; he quotes his authorities; and his work was the only complete history of England existing at the time of its appearance. Some French critics have accused him of partiality and of being unjustly severe upon his native country, which they attribute to the impression produced upon him by the persecution of his fellow-Protestants by Louis XIV. But this is a vague assertion, unless substantiated by facts. Rapin wrote also a 'Dissertation sur les Whigs et les Torys.'

RAPTATO'RES, Illiger's name for his third order of birds, comprehending the *Birds of Prey*.

His *Raptatores* consist of the following families and genera:—

Nocturni.—*Strix*.
Accipitrini.—*Falco*, *Gypogeranus*, *Gypäetus*.
Vulturini.—*Vultur*, *Cathartes*.

This order is placed by Illiger between the *Ambulatores* and *Rasores*.

The *Accipitres*, Linné's first order, include the genera *Vultur*, *Falco*, *Strix*, and *Lanius*.

RAPTO'RES, the name assigned by Mr. Vigors to the *Birds of Prey*. [RAPTATORES.]

The *Raptores* of Mr. Vigors form his first order, and the following families are arranged by him under it:—VULTURIDÆ, FALCONIDÆ, STRIGIDÆ, *Gypogeranidæ*?

The *Raptores* of Mr. Swainson comprise the families of *Vulturidæ*, *Falconidæ*, and *Strigidæ*.

Mr. G. R. Gray also makes the *Raptores* consist of the families *Vulturidæ*, *Falconidæ*, and *Strigidæ*.

RAREFACTION is an augmentation of the intervals between the particles of aeriform fluids, so that the same number of particles are made to occupy a volume greater than that under which they were previously contained. The term is used in opposition to condensation, and in the same sense as dilatation, which last is applied both to fluids and solids. Rarefaction or dilatation is caused by a repulsive power existing either in the particles of bodies or in those of the caloric between them, by which power the particles are made to recede from one another when not prevented by some external resistance.

The experiments of Lavoisier and Laplace have shown that, between the temperatures of freezing and of boiling water, the dilatations of all metals and of the fluids called non-elastic are constantly proportional to the increments of temperature; but beyond the temperature of boiling water, the experiments of Dulong and Petit indicate that the dilatations increase in a higher ratio. A remarkable circumstance is observed in the state of water when near congelation. On being cooled to a temperature within the limits of 33·9° and 34·5° (Fahrenheit), its volume remains stationary, and in this state water seems to have attained its maximum of density; for, on continuing the cooling process, the water begins to expand, and it continues to do so until it is converted into ice.

From the experiments of M. Gay-Lussac and Dr. Dalton it has been ascertained that, under equal external pressures, the rarefactions of all dry gases and of the aeriform substances produced by the evaporation of liquids are equal at equal temperatures, between the points of freezing and boiling water, and that they vary in volume proportionally to the increments of heat expressed by the expansions of mercury in the thermometer. [HEAT, p. 89, col. 1; GAS, p. 84, col. 1; and PNEUMATICS, p. 295, col. 1.]

The density or closeness of the aerial particles in any given portion of the atmosphere depends on the pressure or weight of the column of air above the given point; and by the law of Boyle or Mariotte, whatever be the temperature, provided it be constant, the density is proportional to the pressure; or, conversely, the rarefaction is inversely proportional to the pressure. It has been proved [PNEUMATICS] that the densities of the strata of air decrease upwards in a geometrical progression when the altitudes of the strata increase by equal increments; and this is equivalent to saying that the rarefactions of the air at such altitudes increase in a geometrical progression. Now if A be any point on the surface of the earth, and C any point above it, the formula

$$\text{AC (in fathoms)} = 10670 \times \log. \frac{\textit{density at } \text{A}}{\textit{density at } \text{C}} \text{ [PNEUMATICS]}$$

will afford the means of computing the rarefaction of the air at any point C, when its height above A is given. But if the density at A be considered as unity (the temperature being $=55°$) the equation may be transformed into

$$\frac{\text{AC}}{10670}\left(=\log. \frac{1}{\textit{density at } \text{C}}\right) = \log. \textit{ rarefaction at } \text{C},$$

in which, substituting for AC any given value in fathoms, the rarefaction may be found. For example, let AC = 3212 fathoms (= 3·65 miles); then the second member of the equation will become ·30103 (= log. 2), which shows that at the height of about 3⅔ miles the rarefaction of the atmosphere is twice as great as at the surface of the earth; and by forming the progression of heights—

0 , 3·65 , 7·3 , 14·6, &c. in miles,

we have for the corresponding rarefactions—

1 , 2 , 4 , 8, &c.

A formula for the rarefaction of the air in an air-pump, after any number of strokes of the piston, is given near the end of the article PNEUMATICS.

The limits to which rarefaction may be carried are unknown, but the experiments of Mr. Boyle and others have proved that, by simply removing the external pressure, air may be so rarified that a given volume of the same density as at the surface of the earth will occupy a volume more than 13,000 times as great. It has been however discovered that at very high degrees of rarefaction the elasticity of the air decreases in a higher ratio than the density; and this may serve to prove that rarefaction cannot take place to an infinite extent.

RASAN. [RIASAN.]

RASA'RIUS, or, more properly, **GIAMBATISTA RASARIO**, an Italian physician, was born of a noble family, in 1517, in the province of Novara, in the Sardinian territories. After having studied at Milan and Pavia, he took the degree of doctor of medicine at the university of Padua. Upon his return to Milan, his learning soon gained him so great a reputation, that the republic of Venice invited him to their city, where he was professor of rhetoric and the Greek language for two and twenty years. Here he distinguished himself by his eloquence, particularly on occasion of the battle of Lepanto, 1571, when, at the command of the doge, and with a very short time for preparation, he pronounced in the church of St. Mark a public oration that has been several times printed. (See vol. iii., *Orat. de Bello Turcico per Nic. Reusnerum*, Lips., 4to. 1596.) He afterwards went to Rome, where the pope, Pius IV., made him the offer of some good appointments, which however he thought fit to decline, as he did not like a residence in that city. He chose rather to accept the office of professor of rhetoric at Pavia, where he died about four years after, in 1578, at the age of sixty-one. His works consisted principally of editions and translations of various Greek writers, such as:—'Galeni Comment. in Hippocr. libr. ii. et vi. Morb. Popular., De Alimentis, et De Humoribus,' Cæsaraugustæ (Saragossa), 1567, 4to.; 'Oribasii quæ restant Omnia, Tribus Tomis digesta,' Basil., 1557, 8vo.; 'Georgii Pachymeris Epitome Logicæ Aristotelis,' Paris, 1547, 8vo.; 'G. Pachym. in Univ. Aristot. Disserendi Artem Epitome,' with 'Ammonius in Porphyr. Inst.,' Lugd., 1547, fol.; 'Xenocrates de Alimento ex Aquatilibus,' in Fabricii 'Bibl. Gr.,' tom. ix., pp. 454-474; 'Joannis Grammatici (sive Philoponi), Comment. in primos iv. Aristot. de Naturali Auscult. Libros,' Venet., 1558, fol.

RASIS, or rather **AR-RA'ZI'**, is the patronymic of a celebrated Arabian writer, whose entire name was Ahmed Ibn Mohammed Ibn-Músa. He was denominated Ar-rází because his family was from Ray, a province of Persia. He was born at Cordova, about the middle of the third century of the Hejira (A.D. 864-70). His father Mohammed Ibn-Músa, who was a native of Persia and a wealthy merchant, was in the habit of travelling yearly to Spain with drugs and other produce of the East. Being a man of some learning and ability, he met with great favour and protection from the sultans of the house of Merwan, who then reigned in Cordova, and in one of his visits was prevailed upon to settle in that capital, where he filled offices of trust, being employed in various embassies. He died in the month of Rabi-l-akhar, A.H. 273 (October, A.D. 886). His son Ahmed, when still young, wrote some poems, which he dedicated to Abdu-r-rahman III., sultan of Cordova. He also distinguished himself by his early acquirements in theology and jurisprudence, on which sciences he is said to have left several excellent treatises. But it is in his capacity of royal historiographer that Ar-rází gained most renown. Besides many historical works, the titles of which have not reached us, he wrote a very voluminous history of the conquest of Spain by the Arabs, together with a geographical description of that country, and a few interesting details on its natural productions, industry, commerce, &c. He wrote likewise a history of Mohammedan Spain under the dynasty of the Beni-Umeyyah [Moors]; and a topographical description of Cordova, the seat of their empire. There is also a genealogical history by him of all the Arabian tribes who settled in Spain at the time of the conquest or soon after it. A portion of the first-mentioned historical work was translated into Spanish, about the end of the thirteenth century, by a converted Moor, named Mohammed, and by Gil Perez, a chaplain to King Dinis of Portugal, by whose orders the version was made. Both Casiri (*Bib. Ar. Hisp. Esc.*, vol. ii., p. 329) and Conde (*Hist. de la Dom.*, vol. i., p. 9) have asserted, without the least foundation, that the 'Historia del Moro Rasis'—for such is the title of the Spanish version—is apocryphal, but there can be no doubt that the work, though containing numerous interpolations, and abounding with blunders, like most translations from Eastern languages made during the middle ages, is an authentic one. Notwithstanding the great importance of the history of Ar-rází, it has never been printed; though manuscript copies are not uncommon. There is one in the library of the British Museum. The year of Ar-rází's death is not known; but as his history falls rather short of the reign of Abdu-r-rahmán, whose historiographer he was, we may safely conclude that he died before A.H. 350 (A.D. 961), the date of that sovereign's death.

RASKOLNIKI. [Russian Church.]

RASO'RES. The *Rasores* of Illiger contained the following families and genera:—

Gallinacei.—*Numida, Meleagris, Penelope, Crax, Opisthocomus, Pavo, Phasianus, Gallus, Menura, Tetrao*, and *Perdix*.
Epollicati.—*Ortygis* (*Turnix*), *Syrrhaptes*.
Columbini.—*Columba*.
Crypturi.—*Crypturus* (*Tinamus*, Lath.).
Inepti.—*Didus*.

The order, which is the fourth in Illiger's method, is placed between the *Raptatores* and *Cursores*.

The order (v.) *Gallinæ* of Linnæus was placed between the *Grallæ* and the *Passeres*, *Struthio* being the last genus of the former, and *Columba* the first of the latter order.

The genera of *Gallinæ* are *Didus, Pavo, Meleagris, Crax, Phasianus, Numida*, and *Tetrao*.

The *Rasores* of Mr. Vigors consist of the families *Columbidæ, Phasianidæ, Tetraonidæ, Struthionidæ*, and *Cracidæ*.

The *Rasores* of Mr. Swainson comprehend the families *Pavonidæ, Tetraonidæ, Struthionidæ, Columbidæ*, and *Megapodiidæ*.

The *Rasores* of Mr. G. R. Gray embrace the families *Cracidæ, Phasianidæ, Tetraonidæ, Chionidæ*, and *Tinamidæ*.

RASPBERRY. The species from which the varieties of this fruit have been derived is the *Rubus Idæus*, a native of Britain and also of various other parts of Europe. The wide dispersion of the species is easily accounted for from the fact of its seeds resisting the powers of digestion in an eminent degree. Favourable localities would consequently become supplied with seeds by the migration of birds and other subjects of the animal kingdom. Seeds of a raspberry found in the body of a person who had been interred in Dorsetshire in the time of Hadrian, were sown and vegetated some years since. On its fruiting, it proved very similar to the red raspberry commonly met with in woods at the present day; and from this type, it may be observed, the most improved varieties are not by any means so far removed, with regard both to size and flavour, as are the generality of cultivated fruits from their original species.

For a selection, the following varieties may be enumerated:—Red Antwerp, Yellow Antwerp, Barnet, Bromley Hill, Cornish, Superb, Woodward's Red Globe, and Double Bearing.

The best soil for raspberries is a light rich loam. They will thrive well in sandy peat, provided it is not too dry. In all cases the ground for a plantation should be well trenched and manured previous to planting. The plants from suckers, of which there are generally abundance, should be planted in rows four or five feet apart, and three feet from plant to plant in the row. When planted they should be cut to within six inches of the ground; for although this is not absolutely essential, yet by so doing the shoots for the following season are greatly strengthened.

Pruning should be performed in autumn. It consists in first clearing off all dead portions, and retaining only a few of the strongest summer shoots of each plant, which should be shortened according to their strength, generally at a bend, which indicates where the shoot becomes weak, near the extremity. In the following summer the shoots just mentioned bear the fruit, whilst others spring up at their base for a succession; and in all cases succession shoots should be disposed so as neither to crowd the fruiting portion nor each other.

The ground of a raspberry plantation should be kept loose and supplied with well-rotted manure, but in so doing a fork should be used in preference to a spade, in order to preserve the roots as much as possible, and the roots should not be at all disturbed after active vegetation takes place in spring. Notwithstanding the best management in these respects, it becomes adviseable to make a new plantation in fresh soil after four or five years; for the roots diffuse themselves so thoroughly in every portion of the soil near the stools, that it soon becomes exhausted.

The fruit of the raspberry is extensively used in a variety of ways, both by the cook and the confectioner, and also in the preparation of cordial spirituous liquors.

RASTADT is a town with a population of 5680 inhabitants, in the grand-duchy of Baden, on the river Murg, not far from the Rhine. It is regularly built. Among the public buildings is the Favorita, a fine palace, built on the model of that of Versailles, and till 1771 the residence of the margrave of Baden. There are three churches, the principal of which is reckoned very handsome; two chapels; a lyceum; and a Roman Catholic seminary for the education of schoolmasters. The manufactories of starch, succory (as a substitute for coffee), snuff, and tobacco are flourishing. A manufactory of papier-mâché produces very handsome articles, which are highly esteemed. The other manufactures are fire-arms, mathematical and philosophical instruments, and carriages. Rastadt has been the scene of important negotiations. In 1713, Prince Eugene and Marshal Villars commenced the negotiations which terminated the war of the Spanish succession by the peace of Rastadt, on the 6th of March, 1714. The German empire not being included in this peace, a separate treaty was concluded by Eugene and Villars on the 7th of September, 1714, which terminated the war between France and the empire.

On the 9th of December, 1797, a congress was assembled at Rastadt, under the mediation of Prussia and Austria, to negotiate a peace between France and the German empire, which was dissolved by the emperor on the 7th of April, 1799. The French ambassadors, Roberjeot, Bonnier, and Jean Debry, after the interruption of the negotiation, left Rastadt, on the 28th of April, at nine in the evening, provided with passports from Baron Albini, envoy of the elector of Mayence; but they were attacked, about five hundred paces from the suburb, by a troop of hussars of the regiment Barbaczi. Roberjeot and Bonnier were killed. Jean Debry, though wounded, and the secretary Rosenstiel, escaped to Rastadt, and were escorted to the frontier by Szekler hussars. Notwithstanding the strict investigation ordered by the Diet at Ratisbon, and conducted by the archduke Charles, no satisfactory evidence was obtained respecting the authors of this crime.

RASTALL, or RASTELL, JOHN, one of our early printers, is said by Bale to have been a citizen of London, and by Pits a native of that city. Wood says he was educated in grammar and philosophy at Oxford, and returning to London, set up the trade of printing. The first work which bears his name as printer, with a date, was published in 1517, the last in 1533. There are numerous others without dates. His residence was at the sign of the Mermaid, at Paul's Gate next Cheapside. He married Elizabeth, sister to Sir Thomas More, with whom Herbert supposes he became intimate in consequence of being employed to print Sir Thomas's 'Dyalogue' on the worship of Images and

Reliques, published in 1529; but, as will hereafter be seen, his eldest son was born in 1508.

Bale and Pits ascribe the authorship of various works to John Rastall; the most remarkable of which is his 'Anglorum Regum Chronicon, or Pastyme of People,' a work of extreme rarity, reprinted in 1811 in the 'Collection of English Chronicles.' He translated from French into English the Abridgement of the Statutes before the reign of Henry VII., and also abridged those of that reign which were made in English, as likewise those of Henry VIII., including the twenty-third and twenty-fourth of his reign. He also compiled several law-books. Of these, his 'Exposition of Law Terms and the Nature of Writs,' and the book called 'Rastall's Entries,' continued long in use.

Wood says that Rastall, by frequent conferences with Sir Thomas More, improved his knowledge in various sorts of learning, which is probable; but he omits to notice, what is more important, that Rastall became a convert to the reformed religion by means of a controversy with John Frith. Rastall published 'Three Dialogues,' the last of which treats of purgatory, and was answered by Frith. On this, Rastall wrote his 'Apology against John Frith,' which the latter answered with such strength of argument as to make a convert of his opponent. Rastall also wrote a book called 'The Church of John Rastall,' which, being in the list of prohibited books published by Bishop Bonner, annexed to his injunctions in 1542, is supposed to have contained some retractation of his former opinions, at least of what he had written concerning purgatory.

He died at London, in 1536, leaving two sons, William and John; the latter afterwards a justice of the peace. The notice of the former immediately follows.

RASTALL, WILLIAM, was born in London, in 1508, and about 1525 was sent to Oxford, which he left without taking a degree, and entered at Lincoln's Inn for the study of law. In the first of Edward VI. he became autumn or summer reader of Lincoln's Inn; but on the change of religion, he retired with his wife to Louvain, whence he returned on the accession of Queen Mary. In 1554 he was made a serjeant-at-law, one of the commissioners for the prosecution of heretics, and, a little before Mary's death, one of the justices of the Common Pleas. Queen Elizabeth renewed his patent as justice, but he preferred retiring to Louvain, where he died, August 27, 1565. His wife, who died in 1553, on their first going to Louvain, at the age of twenty-six, was the daughter of Dr. John Clement, one of the physicians sent by Henry VIII. to Cardinal Wolsey during his last illness.

From 1530 to 1534 (Dibdin, in his edition of Herbert's 'Ames,' thinks till 1554), William Rastall carried on the business of a printer, in conjunction with his practice as a lawyer. When Justice Rastall, he published 'A Collection (abridged) of the Statutes in Force and Use,' in 1557, often reprinted.

(Wood's *Athen. Oxon.*, edit. Bliss, vol. i., col. 100; Dibdin's edit. of Herbert's *Typogr. Antiq.*, vol. iii., pp. 81-110, 370-383; Chalmers's *Biogr. Dict.*, vol. xxvi., p. 51-54.)

RAT. [MURIDÆ, vol. xv., p. 506.] Few animals are more destructive of every kind of grain than rats. When a barn is infested with them, it is scarcely possible to get rid of them. They will leave it for a time, and the farmer imagines that they are all destroyed; but no sooner is the corn brought in than they resume their depredations. There are means however of destroying them, and some of these means are equally effectual and ingenious. The most obvious way of destroying rats is to poison them, which appears an easy matter; but it is not so without an accurate knowledge of the habits of these creatures. Their sense of smelling is more acute than we can well conceive, and their caution is not easily deceived. It is difficult to entice them with food when they have plenty of grain to satisfy their hunger. Patience and perseverance alone can lull their caution to rest.

The principle on which all rat-catchers proceed is to entice the rats to some particular spot, convenient for their future operations. There are some strong scents which these animals seem to delight in; and, by means of these, their natural sagacity is deceived. Oil of rhodium, of carraway, or aniseed, and musk, are great favourites with rats. Rags, impregnated with these, and which have not been in contact with any part of the body of a man, being laid, as if by accident, will induce them to come out of their hiding-places in the night, and frequent the spot where the smell attracts them. Gradually they will become familiarised with the place; and pieces of tallow or cheese or malt-dust may be placed near without exciting their suspicion. After they have been fed for a time, they will readily eat anything that may be thrown down, provided it has not been touched by the hand without the covering of a glove properly scented. It will take some time to accomplish this; and when they are to be poisoned, a quantity of poisoned food, similar to what they have been accustomed to feed on, must be prepared, sufficient to poison all those which are supposed to frequent the place. The poisons commonly used are arsenic, nux vomica, powdered Spanish flies, and cocculus indicus, which intoxicates them, so that they may be taken by the hand. A small chamber, or a large chest or box, is convenient to collect the rats; and in order to induce them to go in, pieces of toasted cheese or red-herring are trailed along the ground from the rat-holes to the place where it is wished that they should assemble. As soon as they have been accustomed to find food which they like, they will all come to it in the night; and they can be poisoned, or caught by some contrivance by which the only entrance to the place or box can be suddenly closed. When traps are set, they should be left open for a time, and the rats allowed to go in and out without hindrance, till they crowd together in them, and can be taken in great numbers. When rats have been caught in a trap, and have soiled it with their excrements, it should not be washed, nor much handled: it should be left in the same spot, as long as any rats are caught. Any change of position excites their caution. An ingenious trap is made by stretching a piece of parchment over the open end of a cask, and enticing the rats to eat the food laid upon the parchment. When they have evidently been there to feed, cross cuts, a few inches long, are made in the parchment with a penknife; and in the bottom of the tub, which has four inches of water in it, a brick is set on its edge, so as just to rise out of the water. The rats coming for food, as usual, some one soon slips through the parchment, and, falling into the water, seeks refuge on the brick: as more fall in, they fight for the possession of the brick, and their noise attracts all the rats within hearing. Thus it is said that a great number may be caught in one night. In the 'Cyclopædia of Agriculture,' by Loudon, there is a description of a very complicated trap for rats, which appears very ingenious; but whether it is effective we have not had an opportunity of proving.

RATANY, RHATANY, or RATANHI'A, is the Krameria triandra of botanists; a half-shrubby plant found on the dry gravelly soil of Peru, whose root is excessively astringent, and is exported to Europe on that account. The stem lies prostrate, is two or three feet long, and covered with silky hairs. It has oblong, sharp-pointed, undivided, hoary leaves, and solitary, dull brown flowers, succeeded by a bur-like fruit. The extract of this root is a powerful styptic and tonic. The bark is turned black by iodine, and contains much tannin. It is used medicinally in this country as an astringent medicine in passive bloody or mucous discharges, weakness of the digestive organs, and even in putrid fevers. Its powder, mixed with charcoal, forms excellent tooth-powder.

RATA'RIA. [CIRRHIGRADA, vol. vii., p. 201.]

RATE, an assessment levied upon property. Rates are of various kinds, and are denominated with reference to the objects to which they are applied.

Church-rates are payable by the parishioners and occupiers of the land within a parish, for the purpose of repairing, maintaining, and restoring the body of the church and the belfry, the churchyard fence, the bells, seats, and ornaments, and of defraying the expenses attending the service of the church. The spire or tower is considered part of the church. The duty of repairing and rebuilding the chancel devolves on the rector, or vicar, or both together, in proportion to their benefice, where there are both in the same church. But by custom the parishioners may be liable to repair the chancel; and in London there is a general custom to that effect. Church-rate exists in England by virtue of the common law; nothing is known as to its commencement or introduction. In the early period of the church there appears to have been a division of the tithes,—either tripartite, one portion to the clergy, one to repairs of the church, and one to the poor; or quadripartite, one to the bishop, the other three to the clergy, the church, and the poor. That period was before the existence of parishes, when the only ecclesiastical division was the episcopal district or diocese, then called parochia. At that time the bishop resided at the cathedral church, together with his clergy, and on him devolved the duty of repairing the church, caring for the poor, and supplying ecclesiastical ministry. It was then the duty of every Christian man to pay to the bishop not only the decimæ, or tithes, but also the ecclesiæ census, church-scot, and the nummus eleemosynarius (alms money). The object to which church-scot was devoted is not known. It was also the duty of the bishop to admonish even the king that the temples of God be properly furnished; so that some other contribution seems to have been expected from the laity. There is no symptom that any alteration of usage occurred when the local endowment of churches was introduced. Church-rates, or something equivalent, certainly appear to have been in existence as a payment by the laity, independent of tithes, in the time of Canute, whose 63rd law, 'de fano reficiendo,' states that all persons ought of right to contribute to the repair of churches.

Church-rates are imposed by the parishioners themselves, at a meeting summoned by the churchwardens for that purpose. Upon the churchwardens, conjointly with the minister, devolves the care of the fabric of the church and the due administration of its offices. With a view to provide a fund for such expenses, it is the duty of the churchwardens to summon parish-meetings for the purpose of levying rates; and if they neglect to do so, they may be proceeded against both civilly and criminally in the ecclesiastical courts. A mandamus also is grantable to compel such meeting to be held. If the parish fail to meet, the churchwardens may themselves impose a rate. But if the meeting should assemble, it rests with the parishioners themselves to determine the amount of the rate; and they also, it would seem, have authority to negative the imposition of a rate altogether.* The only mode of compelling the parishioners to impose one is by ecclesiastical censures and laying the parish under interdict. The existing poor-rate of the parish is generally taken as the criterion for the imposition of the church-rate. All property in the parish is liable except the glebe-land of that parish and the possessions of the crown. Stock in trade is not generally rated, but a custom may exist rendering it rateable in a particular parish. The ecclesiastical courts have the exclusive authority of deciding on the validity of a rate, and the liability of a party to pay it; but a rate-payer cannot by an original proceeding in those courts raise objections to a rate for the purpose of quashing it altogether. If he wishes to dispute it, he ought to attend at the vestry, and there state his objections; if they are not removed, he may enter a caveat against the confirmation of the rate, or refuse to pay his assessment. In the latter case, if proceeded against in the ecclesiastical court, he may in his defence show either that the rate is generally invalid, or that he is unfairly assessed. The consequence of entering a caveat is an appeal to the ecclesiastical judge, who will see that right is done. There appears some reason to doubt whether the grounds on which a poor-rate is held to be bad because retrospective, are on principle applicable to a church-rate. The ecclesiastical courts have however decided that a retrospective church-rate is bad. Previously to 53 Geo. III., c. 127, the only mode of recovering church-rates from parties refusing to pay was by suit in the ecclesiastical court for subtraction of rate. By that statute, where the sum to be recovered is under 10*l.*, and there is no question as to the validity of the rate, or the liability of the party assessed, any justice of the county where the church is situated may, on complaint of the churchwarden, inquire into the merits of the case, and order the payment. Against his decision there is an appeal to the quarter-sessions. By several statutes, principally the 58 Geo. III., c. 45, and 59 Geo. III., c. 134, acts passed for the promotion of building churches, the common-law powers of churchwardens have been varied, and extended so as to enable them to raise money on the security of church-rates, and to apply them for the enlargement, improvement, &c. of churches, and for the building of new ones, &c. &c. As to other rates, see SEWERS, SHIRE, WAY.

(Lyndwood; John de Athon; Selden's *History of Tithes*; Gibson's *Codex*; Burn's *Ecclesiastical Law*; Rogers's *Ecclesiastical Law*, 1840.)

RATEL. [URSIDÆ.]

RATHKEALE. [LIMERICK.]

RATIO. One of the most frequent mathematical terms has no other name in our language than a Latin word which is but a bad translation from the Greek of Euclid. The older English writers introduced the word *reason*, as a translation of ratio, which completed the confusion; for it is easier to attach any meaning we please to a word in a dead language than to the literal translation of it in our own.

The word ratio is the translation of λόγος, as used in the third definition of the fifth book of Euclid, which is Λόγος ἐστὶ δύο μεγεθῶν ὁμογενῶν ἡ κατὰ πηλικότητα πρὸς ἄλληλα ποιὰ σχέσις. This has been translated as follows:—By Athelard (in what is called Campanus's translation from the Arabic), 'Proportio est duarum quantecunque sint ejusdem generis quantitatum certa alterius ad alterium habitudo.' By Billingsley, in the earliest English translation; 'Reason is an habitude of two magnitudes of the same kind, compared the one to the other, according to quantity.' By various later English writers, 'Ratio is a mutual habitude of two magnitudes of the same kind with respect to quantity.' By Gregory, in his translation which accompanies the Greek, 'Ratio est duarum magnitudinum ejusdem generis secundum quantuplicitatem mutua quædam habitudo.'

The common translation partakes more of the confusion of the Arabic than of the clearness of the Greek; and it will be worth while to offer some remarks on the probable meaning of Euclid. In the first place, let it be observed that he never attempts this vague sort of definition except when, dealing with a well-known term of common life, he wishes to bring it into geometry with something like an expressed meaning, which may aid the conception of the thing, even though it does not furnish a perfect criterion. Thus, when in speaking of a straight line, he says that it is the line which lies evenly (ἐξ ἴσου κεῖται) between its extreme points, he merely calls the reader's attention to the well known term εὐθεῖα γραμμή, tries how far he can present the conception which accompanies it in other words, and trusts for the correct use of the term in the axioms which the universal conception of a straight line makes self-evident. Let us suppose him doing the same thing here, and we shall find that the definition before us, considered with reference to the place it is in, and the subsequent purpose which it serves, is as clear as the translation of it is confused.

The term λόγος contains (λεγ, λογ), a root the original meaning of which seems to have contained the idea of collection or bringing together. It is certain however that the secondary sense which it obtained in common usage was that of speaking; so that the first sense in which λόγος appears in writings is that of speech. Subsequently, speech being the distinctive character of reasoning beings, and their mode of communication, the word was applied to every sort of communication, not only with reference to the mode of communication, but also to its subject; thus explanation, defence, apology, teaching, assignment of cause or reason, &c., are among the recognised uses of the word. The Latin translators have taken the geometrical word as being properly translated by *ratio*, a word which may very well signify the technical meaning of λόγος, but has no reference to its primary meaning. For ratio, in its primitive sense, means rather computation or reckoning than reason.

But what has speech to do with the sense of ratio in geometry? Robert Recorde answers this question (NUMERATION, vol. xvi., p. 367) when he reduces his pupil to silence by forbidding him the use of number, and asking him questions. Numbers are but certain ratios, and ratio is a generalised idea of number. Our gift of speech with reference to magnitudes would be altogether annihilated if we did not consider a certain habitude or mode of existence which they have, or more correctly a certain conception of our own, which always accompanies the presence of two magnitudes, which prompts us to inquire how many times one is contained in the other. A foot being known, speech can carry a correct knowledge of other lengths all over the world; but let it be attempted to describe a foot in words without reference κατὰ πηλικότητα to some other magnitude, and all the powers of language utterly fail. We conceive then that in this definition Euclid simply conveys the fact that the mode of expressing quantity in terms of quantity is entirely based upon the notion of *quantuplicity* or that relation of which we take cognizance when we find how many times one is contained in the other.

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* In Burder v. Veley, the question was raised whether the churchwardens had power to impose a rate after the parishioners in vestry assembled had negatived the imposition. The Court of Queen's Bench, after hearing elaborate arguments, and taking time to consider, determined that they had no such power. The case has since been argued in error, and the court have not yet pro- d their decision.

The word πηλικότης has been translated 'quantity,' by many editors, which makes nonsense of the whole; for magnitude has hardly a different meaning from quantity, and a relation of magnitudes with respect to quantity may give clear ideas to those who want a word to convey a notion of architecture with respect to building, or of battles with respect to fighting; and to no others. Wallis, we believe, restored the true meaning of the word, and was followed by Gregory, as seen above: and Euclid himself, in another place, shows in what sense he used it. In the fifth definition of the sixth book (omitted by many editors), he says that a ratio is compounded of two other ratios when the πηλικότητες of the latter *multiplied* (πολλαπλασιασθεῖσαι) together, make the former. Now, this would be unmeaning if the Greek word meant simply quantities, unless they were quantities represented by numbers (though Gregory has here forgotten his own previous correction, and writes quantitas instead of quantuplicitas). The lexicographers generally give 'quantitas;' but they are not for the most part adepts in the mathematical use of terms implying relations of magnitude.

The first and rough notion of ratio being thus given, we may find a synonyme for the word in the more intelligible term *relative magnitude*. Six feet, though greater than three feet, is, relatively to four feet, a less magnitude than three feet is, relatively to one foot: the number of times which six feet contains four feet is less than the number of times which three feet contains one foot. The relative magnitude of six to four is less than the relative magnitude of three to one; or the ratio of six to four is less than the ratio of three to one.

Given two magnitudes, how are we to find the means of expressing the first in terms of the second? Euclid answers this question, when it can be answered, in the tenth book, by giving the rule for finding the greatest common measure of two magnitudes, in which he employs a process exactly the same as that of the arithmetical rule in common use. Let A and B be two magnitudes (say lines), of which B is the less. From A cut off a part equal to B, do the same again, and so on, until R_1, the part left, is less than B. Say it is found that A contains 5 times B and R_1. Measure R_1 upon B in the same way, and suppose B contains 4 times R_1 and R_2. Suppose now that R_1 contains 6 R_2 and R_3, and also that R_2 contains exactly 7 times R_3. We have then

$$R_2=7R_3,\ \ R_1=6R_2+R_3=43R_3$$
$$B=4R_1+R_2=172R_3+7R_3=179R_3$$
$$A=5B+R_1=895R_3+43R_3=938R_3.$$

We have then the same means of expressing A in terms of B that we have of expressing 938 in terms of 179: or we should give the power of deducing either when the other is known, by saying that the 179th part of the first is the same magnitude as the 938th part of the second.

But it may happen that the magnitudes have no common measure [INCOMMENSURABLE], in which case the preceding process would never have an end, and the means of expression would fail. We can describe the diagonal of a square as a part of a certain figure, and the description is perfect; but if we attempted a description *secundum quantuplicitatem*, we should never succeed; for no possible line exists of which it can be said that the diagonal of a square and its side both contain that line exactly. Such quantities are called by Euclid ἄλογοι, irrational, or having no ratio; and in the primitive meaning of the term this is correct, for there is no quantuplicitative mode of expressing one by the other. But the term ratio, both in Euclid and all other writers, immediately acquires another sense; and it is this new sense in which we proceed to speak of ratio. Since the relative magnitude of two quantities is always shown by the quantuplicitative mode of expression, when that is possible, and since proportional quantities (pairs which have the same relative magnitude) are pairs which have the same mode (if possible) of expression by means of each other; in all such cases sameness of relative magnitude leads to sameness of mode of expression; or proportion is sameness of ratios (in the primitive sense). But sameness of relative magnitude may exist where quantuplicitative expression is impossible; thus the diagonal of a larger square is the same compared with its side as the diagonal of a smaller square compared with *its* side. It is an easy transition to speak of sameness of ratio even in this case; that is, to use the term ratio in the sense of relative magnitude, that word having originally only a reference to the mode of expressing relative magnitude, in cases which allow of a particular mode of expression. The word irrational does not make any corresponding change, but continues to have its primitive meaning, namely, incapable of quantuplicitative expression. And it is worth noting that this of itself shows that the original meaning of λόγος referred to expression, not to the thing expressed; for ἄλογοι (not having a ratio) would have been absurd as applied to incommensurable quantities, if the primitive mathematical meaning of the first word had coincided with its modern one.

The idea of relative magnitude is one which strikes us in all cases in which we compare the parts of an original with the corresponding parts of any model or imitation. It does not closely connect itself with any mode of expression or measurement: if a part of the model were only in a slight degree too large or too small, the detection of the error might require a formal measurement, but anything which is very much out would be rejected by one glance of the eye. Let us suppose now that the formal measurement is attempted. The first and simplest notions of relative magnitude are gained from repetition; and the ideas of two, three, four, &c., originally used in their simple cumulative sense, soon become the representatives of those simple relative magnitudes which are suggested by pairs in which one is quantuple of the other. The next step is to those magnitudes in which neither is quantuple of the other but both are quantuple of a third: from which we learn how, admitting aliquot parts, to extend the mode of expression. Thus, of the magnitudes 10 R and 7 R, we see that every relation of quantuplicity can be derived from the simple numbers 10 and 7: the first number is $1\frac{3}{7}$ of the second, a mode of expression which equally applies to the magnitudes 10 R and 7 R. The preceeding would be unnecessarily laborious if it were not as an introduction to the remaining and most frequently occurring case of quantities, the relative magnitude of which cannot be expressed by that of number to number; or incommensurable magnitudes.

Let D and S be two incommensurable magnitudes: how are we to describe their relative magnitudes? That they have a definite relation is certain; suppose, for precision, that S is the side of a square, and D its diagonal; any alteration of D, or any error in D, S being given, would make the figure cease to be a square. There are many mathematical notions in which accuracy is not attainable in finite terms, but is the limit towards which we approach when number or magnitude, as the case may be, is increased or diminished without limit. In the present case the expression of ratio or relative magnitude, which is not accurately attainable by one or more relations, can be continually amended by adding one or more relations, until the inaccuracy of the mode of expression is rendered as small as we please: in such a case, accuracy must be imagined to reside in the supposition of an infinite number of given, or at least of attainable, relations.

To explain our meaning, suppose that the person whom we address is altogether ignorant of the relative magnitude of the diagonal D and the side S. He asks for a relation, and knowing the mode of dealing with the ratios of commensurables, naturally desires to know how many diagonals make an exact number of sides. If we could answer this question, if for instance we could say that 100 diagonals make 142 sides exactly, the question would be settled: for an arithmetical rule would always deduce the diagonal when the side is given. But we are obliged to reply, that no number of diagonals whatsoever will make an exact number of sides. He then asks how he is to form a perfect conception of the diagonal; we answer by placing two equal sides at right angles to one another, and joining the extremities. This, he replies, and properly, is not a mode of finding the relative magnitude, which is something connected with magnitudes only, and that the permission given by Euclid to join two given or determined points is not any real determination of the included length. We then tell him that it is at his pleasure to name a fraction of the side, and we can express the diagonal with an error not so great as that fraction; he names, say one-millionth of the side, and we give him the promised information in telling him that 1,000,000 of diagonals exceed 1,414,213 sides, but fall short of 1,414,214 sides. The consequence is, that the diagonal lies between 1·414213 and 1·414214 of the side: these differ from one another by one-millionth of the side, and the error of the diagonal is of course less. If he should ask how he is to carry this process yet further for himself, we give him the arithmetical symbol $\sqrt{2}$, and instruct him how to perform the arithmetical operation of approximating to its value. In this we show him how to find between what number of sides any number of diagonals lies; and in so doing we give the ratio of the diagonal to the side, as far as the nature of the case will admit of its expression.

The relative magnitude, then, of two magnitudes is given, when the place of any multiple whatsoever of the one among the multiples of the other can be found from the data. For example, we carry on the *multiple scale* of the side and diagonal of a square, in the power of extending which ad infinitum lies that of expressing the ratio, so far as expression is possible, and of absolutely comparing the ratio with others, in as accurate a manner as if expression had been perfect.

S, D, 2S, 2D, 3S, 4S, 3D, 5S, 4D, 6S, 7S, 5D, 8S, 6D, 9S, 7D, 10S, 11S, 8D, 12S, 9D, 13S, 14S, 10D, 15S, 11D, 16S, 12D, 17S, 18S, 13D, 19S, 14D, 20S, 21S, 15D, &c.

In this table we see, for instance, that 10 diagonals are more than 14 and less than 15 sides, and so on. The only doubt that can possibly remain may be thus expressed:—Is the preceding scale a property of the diagonal and of nothing else? May there not be a length so near to the diagonal that its multiples shall never fall out of the same intervals as those of the diagonal? Let K be a given quantity, no matter how small; we say that it is impossible that all the multiples of D+K can lie in the same places among the multiples of S as the multiples of D. Take m times both; then m (D+K) and mD differ by mK. Now however small K may be, it is possible to take m so great that mK shall exceed S, or any multiple of S previously named: whence the thing asserted is evident. The definition of the ratio of S to D lies, then, in this scale; or rather, whatever the definition may be, the mode of finding all relations between S and D lies in the formation of this scale, so far as may be necessary for the purpose in hand. The definition of proportion is then contained in sameness of multiple scales; that is, D is to S as A to B, when any multiple whatever of D is contained between the same two multiples of S, that the same multiple of A is contained between of B. We here come to the subject of **PROPORTION**, which the reader should now consult as a continuation of the present one.

The next step to be made is rather an abstract one: ratio itself is a magnitude, that is, the relative magnitude of one magnitude to another is itself a magnitude. To understand this, remember that by magnitude we do not mean merely physical magnitude, as size, weight, length, &c., but any conception of our minds as to which it is evident that either greater, equal, or less, must be a term applicable to every two such conceptions, and that a mode of measuring excess or defect, as also of ascertaining equality, can be found. This is easily done as follows, with which the considerations connected with greater and less ratio in the article PROPORTION may be read:—Which is the greater ratio, that of P to Q, or of A to B? that is, which magnitude is relatively greater, P as compared with Q, or A as compared with B? Chose any quantity, Z, and let the ratio of A to B be that of X to Z, while that of P to Q is that of Y to Z. The question is then reduced to the following: which is greatest, X considered relatively to Z, or Y relatively to the same Z? The answer obviously depends upon which is absolutely the greater of the two, X or Y. Let X be the greater, then the ratio of A to B is greater than that of P to Q. But in what relation is the ratio of A to B greater than that of P to Q? Repeat the transformation, and the ratio of X to Z is greater than the ratio of Y to Z, in exactly the same manner as X is greater than Y: that is, the ratio of X to Y is the ratio of the ratio of A to B to that of P to Q. To find the ratio of two ratios then, namely, A to B, and P to Q, let

$$A : B :: X : Z$$
$$Q : P :: Z : Y$$

and the ratio of X to Y is the ratio of ratios required. This process is called by Euclid the composition of the ratios of A to B and of Q to P; that is, he would say that the ratio of the ratios of A to B and of P to Q is the ratio compounded of the ratios of A to B and of Q to P. Later writers called this process of composition by the name of addition*; though it may easily be made to appear that where one of the ratios is that of number to number, composition is multiplication of the corresponding terms. Thus, to compound the ratio of the diagonal D and the side S with that of 7 to 3, we have

$$D : S :: 3D : 3S$$
$$7 : 3 :: 7D : 3D$$

whence the ratio of 7D to 3S is the compounded ratio. This term of addition was an anticipation, to a small extent, of the principle of logarithms. Thus, if

$$A : B :: V \cdot W$$
$$A : B :: W : X$$
$$A : B :: X : Y$$

the ratio of V : Y, compounded of the ratios of A to B, A to B, and A to B, was said to contain the ratio of A to B three times. Thus if any given ratio (as A to B) were taken as a measure, all other ratios might be measured by it, either exactly or approximately. Thus, if the ratio of V to Z were required to be measured by the ratio of A to B, there would be taken $V : V_1$, $V_1 : V_2$, $V_2 : V_3$, &c., all the same ratios as A : B; if V_n be the last of these which is less than Z, and V_{n+1} the first which is greater, it would be said that the ratio of V to Z contains that of A to B more than n times and less than $n+1$ times. Hence arise the use of the duplicate (or double) ratio, as being the ratio compounded of that of A to B with itself; of triplicate (a triple ratio) as that compounded of the ratio of A to B, A to B, and A to B, and so on. The following summary shows both the old and modern algebraical use of these terms, the capital letters representing magnitudes, the small letters numbers.

Duplicate ratio of A to B. The ratio compounded of those of A to B, and A to B. Do. of a to b is that of a^2 to b^2.

Triplicate ratio of A to B. The ratio compounded of the duplicate ratio of A to B, and of A to B. Do. of a to b is that of a^3 to b^3. And so on.

Subduplicate ratio of A to B. The ratio whose duplicate ratio is that of A to B. Do. of a to b is that of $\sqrt{a}$ to $\sqrt{b}$.

Subtriplicate ratio of A to B. The ratio whose triplicate ratio is that of A to B. Do. of a to b is that of $\sqrt[3]{a} : \sqrt[3]{b}$ And so on.

Sesquiplicate ratio of A to B. The ratio compounded of that of A to B and its subduplicate. Do. of a to b is that of $\sqrt{a^3}$ to $\sqrt{b^3}$.

We have not spent any space in drawing the analogies, which are very close, between the doctrine of fractions and that of ratios. The reader who understands what we have here said, will easily supply this part for himself, remembering that when A and B are numerical, the fraction A÷B is the expression of the ratio of A to B. Modern writers employ fractions instead of ratios, and with great advantage. But the student who leaves untouched that consideration of ratio which includes incommensurables as well as commensurables will never be more than a mathematician to a certain number of decimal places.

The older writers on geometry, and even algebra, are frequently unintelligible to a reader who is not versed in the language of ratios as used by the Greeks and augmented by the inquirers of the middle ages. Many a young reader has met for the first time with what purported to be an explanation of logarithms in Halley's celebrated paper, which was prefixed to Sherwin's 'Logarithms,' and, we believe, to others. The following is a sample:—

'But first it may be requisite to premise a definition of logarithms, in order to render the ensuing discourse more clear, the rather because the old one, *numerorum proportionalium æqui-differentes comites*, seems too scanty to define them fully. They may more properly be said to be *numeri rationum exponentes*, wherein we consider *ratio* as a *quantitas sui generis*, beginning from the *ratio* of *equality*, or 1 to 1=0; being affirmative when the *ratio* is increasing, as of unity to a greater number, but negative when decreasing; and these *rationes* we suppose to be measured by the number of *ratiunculæ* contained in each. Now these *ratiunculæ* are so to be understood as in a continued scale of proportionals infinite in number between the two terms of the *ratio*, which infinite number of mean proportionals is to that infinite number of the like and equal *ratiunculæ* between any other two terms, as the logarithm of the one ratio is to the logarithm of the other. Thus if there be supposed between 1 and 10 an infinite scale of mean proportionals whose number is 100,000, &c. *in infinitum*, between 1 and 2 there shall be 30,102, &c. of such proportionals, and between 1 and 3 there will be 47,712, &c. of them; which numbers therefore are the logarithms of the

* Euclid's words for compounding (συγκεῖσθαι and συντίθεσθαι) both imply addition.

rationes of 1 to 10, 1 to 2, and 1 to 3; and not so properly to be called the logarithms of 10, 2, and 3.'

The way in which the preceding would be put in our day is given in LOGARITHMS, p. 85. We leave it to the reader to satisfy himself that what is there said is a translation of the preceding into modern language.

For any one who would wish to see the manner in which the notion of ratio was formerly treated, we should recommend Meibomius 'De Proportionibus Dialogus,' Copenhagen, 1655, for the sake of the answer by Wallis, which is in the collection of his works (vol. i., p. 229), and was previously published in his 'Operum Mathem. pars prima,' Oxford, 1657.

RATIONAL. A quantity, algebraic or arithmetical, is rational when it can be expressed without the use of the signs of evolution, such as those of the square root, cube root, &c. [IRRATIONAL.]

RATIONALISM is a system of theology, which, as a system, began to be developed in Germany during the latter half of the last century. To understand the origin and character of this school of theology it will be necessary to take a glance at the state of theology previous to the appearance of Rationalism.

During the first half of the last century theology in Germany was what it had been during the seventeenth century; its literature was little more than a series of controversial writings, in which the disputed points were often discussed in a coarse and uninstructive manner, and most of the topics themselves were altogether unimportant. At the same time men of acknowledged talents in England and France abandoned Christianity altogether, and endeavoured by their writings to undermine its foundations. We allude to the numerous English deists, and to the school of Voltaire and his followers. These writers not only denied the historical authenticity of the biblical records, but declared them to be fabrications. Reimarus of Hamburg was the first German who adopted these and similar views, and he introduced them among his countrymen in a work called 'Die vornehmsten Wahrheiten der natürlichen Religion,' Hamb., 1754. Another still more important work by Reimarus consisted of several essays on various points in the New Testament. These essays were not printed, but distributed, in MS., among his most intimate friends. When Lessing was librarian at Wolfenbüttel, he obtained a copy of these essays, and, in 1773, began publishing them, under the title of 'Fragmente eines Ungenannten,' pretending that he had found them in MS. in the Wolfenbüttel library, whence they are generally called 'Die Wolfenbüttelschen Fragmente.' In these fragments, or essays, an attempt was made not only to show the improbability and impossibility of a revealed religion in general, but more especially to prove that the books of the Old and New Testaments were not of divine origin, and that the plan which Jesus endeavoured to realise was of a political nature. This scheme, it was further alleged, was thwarted by his execution, and his disciples, discouraged by this blow, are represented as having propagated a report of the resurrection of their master, and as having disguised their real object by cunningly introducing some modifications into their system. The publication of these fragments created an extraordinary sensation in Germany, and roused the theologians from their inactivity. The majority however remained faithful to their belief in the scriptures; but another class of German divines, though opposed to the views of the fragmentist and the deists, struck out a middle path. These were the Rationalists, who indeed went half way with their adversaries, in as far as they denied the divine origin of the scriptures, but they dissented from the deists, who affirmed that the Bible was the product of fraud, and they maintained that, notwithstanding all the apparent incongruities of the Bible, it was based on genuine historical foundations, to ascertain which was the problem of reason. The authors of the biblical books, according to the Rationalists, were not impostors, but men of moral purity, who, being deluded by the excited state of their imagination, considered things to be miraculous which were only natural occurrences. Other portions of the Bible, they said, which have hitherto been considered as recording supernatural events, need only to be divested of the figurative and allegorical mode of expression so peculiar to all Eastern nations, in order to appear as the records of ordinary occurrences. This mode of interpretation was the more readily adopted by a great number of theologians, as it had been and was then still applied to the fabulous stories of heathen antiquity. Attempts had been made to elicit real history from mythical traditions, by stripping them of their poetical embellishments and marvellous ingredients. But the skeleton which remained after such a process was generally imperfect and disjointed, and it could only be completed by supplying secondary and additional circumstances, which were thought necessary to make up something like a connected history, and which the writer himself was supposed to have overlooked or neglected, though the narrative did not contain any thing to justify such a supposition, and in many cases was even directly opposed to it. The history thus constructed out of the interpreter's imagination was offered as discovered truth, and this mode of interpretation, though in reality the most irrational, was called the rational method of interpreting the scriptures. To account for the way in which the supposed collateral circumstances and the minute details in the accounts of so many miracles arose, merely out of the psychological state of the beholder or reporter, would in most instances suggest to the mind of the reader of these rationalistic interpretations a greater miracle than that which they endeavour to explain away. This method moreover leaves such a wide field of speculation, that twenty expounders, each taking his own view of a case, and translating the supposed allegorical expressions into his own language, might possibly produce twenty different stories, all of which might with equal plausibility be elicited from the original report, and each might claim to be the true historical foundation. In fact, according to this theory, there is no end of probabilities and possibilities.

The theologians who first came forward as advocates of this new system were Semler, J. D. Michaelis, and J. G. Eichhorn. They directed their attacks against the deists as well as against the orthodox divines, but they confined the application of the rationalistic principle chiefly to the books of the Old Testament. Semler's principal works in this department are, 'Apparatus ad liberalem Veteris Testamenti Interpretationem,' Halle, 1773; 'Abhandlung von der Untersuchung des Kanons,' 4 vols., Halle, 1771-75, compare Semler's 'Leben, von ihm selbst verfasst,' 2 vols., Halle, 1781-82. The principal works of Michaelis are 'Einleitung in die göttlichen Schriften des alten Bundes,' 2 vols., Göttingen, 1750; 'Mosaisches Recht,' 6 vols., Frankfurt, 1770-75. Eichhorn was by far the most important writer of the school; he laid down and carried out the new principles in his 'Allgemeine Bibliothek der biblischen Literatur,' 10 vols., Leipzig, 1788-1801; 'Einleitung in das Alte Testament,' of which there appeared, in 1824, at Göttingen, the fourth edition, in 5 vols.; 'Einleitung in das Neue Testament,' in 2 vols., and several other works.

Eichhorn, whom we may consider as the representative of the new school, previous to the time when Dr. Paulus began to occupy a prominent position in it, sets out from the principle that the early history of the Jews should be considered in the same light and treated in the same manner as the early history of every other nation; and that a direct interference of the deity in the early affairs of all nations must either be admitted or denied. The reasons which led him to consider the fact of such a direct interference inadmissible in the case of other nations, led him to deny it in the case of the Jews also. Rejecting the views of the deists as unphilosophical and incompatible with the character of early history in general, he proceeds to state that it is natural to all nations in their primitive ages to speak of a divine interference in their affairs, wherever their ignorance conceals from them the real causes of the things which fall within their experience.

It is this belief, according to Eichhorn, which gives a form to all their ideas and expressions. But we, who live in a far more advanced and enlightened age, have neither reason to suppose that any miracles actually took place, nor that any kind of imposition was practised: we have only to translate the expression of those early ages into the language of our own time. In the infancy of mankind everything of which no direct cause appeared was referred to the intervention of supernatural powers; and accordingly all elevated thoughts, great determinations, useful inventions and institutions, and particularly dreams, were considered as the effects of a direct interposition of the deity; extraordinary knowledge and skill were looked upon by the people as proofs of supernatural power and of an intercourse with beings of a higher order. Moreover, not only the people, but the wise and great, were themselves fully convinced that they were acting under the immediate influence and were enjoying the especial favour of the Deity. Taking these premises for granted, and at the same time admitting that the biblical books were written by contemporaries, Eichhorn thought that all the facts of the Mosaic history might be explained as natural occurrences, without supposing, with the deists, that the writer was an impostor. The temptation and the eating of the forbidden fruit, the histories of Noah, Abraham, and Moses, are thus stripped of their supposed allegorical dress and of those features which it is supposed that they have received from the imagination of the writer, and are explained as natural events. According to Eichhorn, Moses was nothing but a great and benevolent patriot, who, after having long entertained the idea of delivering his countrymen from foreign slavery, was suddenly reminded of his scheme in a dream, and believing this dream to be from the deity, he represented it as a summons from Jehovah. The burning and smoking of Mount Sinai, according to this system of exposition, were only the effect of a fire which Moses kindled on the Mount for the purpose of keeping up the excitement of his people; and a storm with lightning, which fortunately happened at the same time, was a useful aid to him. The shining of his face was nothing but the consequence of great heat and excitement, which the lawgiver as well as his people, not knowing the real cause of it, believed to be the effect of a direct interference of the deity.

This system of interpretation was, as we have observed, principally applied to the Old Testament, but the New Testament also contains passages which were too tempting to be passed over by the Rationalists. It was at first chiefly the appearance of angels in the New Testament on which Eichhorn tried the rationalistic interpretation, and all passages of this kind ought, according to this critic, to be considered as figurative expressions or allegories: thus a happy chance is represented as a saving angel; an internal joy, as the salutation of an angel; and great calmness and peace of mind, as a comforting angel, &c.

The way being thus prepared, the number of rationalistic divines increased, and their influence became apparent in many other departments of knowledge. A Utilitarian school had at the same time acquired considerable power; and so far as it endeavoured to instruct the people in the so-called useful sciences, and to do away with everything which was deemed superstitious, it went hand in hand with and supported Rationalism, which now began to be carried out in its whole extent with regard to the New as well as the Old Testament.

Among the works which gained the greatest popularity, we may mention K. F. Bahrdt, 'Briefe über die Bibel im Volkston,' 1782; Eck, 'Versuch über die Wundergeschichten des Neuen Testaments,' 1795; 'Die Wonder des Neuen Testaments in ihrer wahren Gestalt für ächte Christusverehrer,' 1799; 'Natürliche Geschichte des grossen Propheten von Nazaret,' 1800. The two last works, which were published anonymously, were written by Venturini. Most of these, and the numerous other works of the same tendency, were written in a popular style; and those of Bahrdt had often a coarse and vulgar tone. But none of these writers equalled Dr. Paulus of Heidelberg, either in learning or ingenuity; and it is he who has most completely developed the whole system of Rationalism. His principal works are—'Philologisch-kritischer und historischer Commentar über das Neue Testament,' 4 vols., Lübeck, 1800-1804 (this work was republished in 1830-33, in 3 vols., with numerous alterations and corrections, under the altered title of 'Exegetisches Handbuch über die drei ersten Evangelien'); 'Das Leben Jesu, als Grundlage zu einer reinen Geschichte des Urchristenthums,' 2 vols., Heidelberg, 1828. Paulus first insists upon the necessity of distinguishing between those passages of the Bible in which the writers simply state facts and those in which they give their own opinions of them. A fact, according to him, is that which the writers describe as having taken place within their own experience; an opinion, on the other hand, is the manner in which they interpret an occurrence and trace it to what they conceive to be its cause. But as these two elements are in most cases interwoven and mixed up with each other in the biblical writings, Paulus conceives it to be the chief object of the biblical critic to separate them, and to discover the genuine historic truth in the various disguises with which the opinions of the age and of the writer have surrounded it, and he thinks, with Eichhorn, that this object may be accomplished if the critic transports himself as much as possible to the scene of the events, and supplies such accessory and explanatory circumstances as may have been neglected or overlooked by the reporter or eye-witness. Thus the New as well as the Old Testament is deprived of its divine character, and all supernatural interference in the affairs of the Hebrews and in the introduction and establishment of Christianity is denied. Christ is no longer the son of God, but a wise and virtuous man; his miracles are either acts of friendship and humanity, and manifestations of his skill in the healing art, or the effects of a happy chance. In short, the whole history of the Bible assumes an aspect totally different from that of the original records, and from that which their authors manifestly intended; in fact it becomes a romance without any foundation except the assertion of the Rationalist that things did actually happen thus and thus.

A reaction against the spirit of this school manifested itself during the first ten years of the present century. The dreadful ravages caused by the French Revolution created a general desire to restore or maintain the good old times by returning to the religious and political institutions of past times. But although this reaction was successful in other departments, it had very little effect in theology, as it manifested itself rather in passive and retired mysticism than in energetic efforts against the system of the Rationalists. A vigorous opposition however began in 1810, which was called forth by the publication of Reinhard's 'Geständnisse,' in which Rationalism and Supernaturalism were declared to be diametrically opposed and utterly irreconcilable with each other. This assertion was denied by other theologians, who endeavoured to reconcile the two schools. The contest which then commenced, was carried on in a calm and philosophic spirit till 1817, when the centenary anniversary of the Reformation was celebrated in Germany, and the supernaturalistic party, headed by Dr. Harms of Kiel, endeavoured to make the question a practical one, and to draw to it the attention of the governments and of the whole German nation. The Rationalists were now universally decried as infidels, and as men who had forfeited all right to be called Christians; and innumerable works were written by the theologians of both parties to defend their opinions. The principal champions on the supernaturalistic side, besides Harms, were Hengstenberg and Tholuck; on the side of the Rationalists, Gesenius, Wegscheider, and Paulus. In these controversies the rationalistic theory itself almost disappeared, and the question assumed the more general character, whether the Protestant church should allow freedom of thought or not. This turn of the question induced many of the moderate Supernaturalists, who could not sacrifice their liberty of conscience, to side with the Rationalists. Their wish however was merely to bring about some kind of a reconciliation, and not to allow the question to become a national one. Their opinion was that it should be kept strictly within scientific limits, and confined to the learned. Although willing to make concessions to the Rationalists on many points, they were yet anxious to prevent any practical innovations.

After this fierce contest, which led to no decisive results there followed a period of exhaustion and languor. The moderate party, consisting of men of both schools, increased, and repeated though fruitless attempts at reconciliation were made by them at different times. At last a complete indifference prevailed, and all hopes of producing any definite result seemed to be given up. Each party however continued to maintain its tenets. Some individuals from time to time endeavoured to renew the contest, but no lively or general interest was created on either side. One of the more important rationalistic works which appeared during this period was: 'Was heisst glauben, und wer sind die Unglaübigen?' by David Schulz, 1830.

Notwithstanding the wide breach between the two parties, approximations were made on both sides, so that the Supernaturalists as well as the Rationalists might each be divided into two parties. Some of the latter, such as Paulus, Wegscheider, Gesenius, Schulthess, Schulz, and others continued to consider reason as their only guide in matters of religion, and rejected every supernatural revelation: others, the so-called Supernaturalistic Rationalists, admitted indeed a supernatural revelation, but considered reason as the only means of recognising and acknowledging it: they thus still allowed reason to be the supreme judge in matters of religion. To this class of Rationalists belong Bretschneider, Von Ammon, Böhme, Hase, Köster, and others. A similar division exists among the Supernaturalists.

The view which the Rationalists had taken of the Scriptures contained some elements which have of late led to a new crisis in German theology. Some parts of the Scriptures, from which the Rationalists, with all their ingenuity, saw no hope of eliciting a genuine history, they had ventured to declare to be a mere legend, tradition, or mythus. This view was gradually applied to a great portion of the Old Testament, as in Bauer's *Hebräische Mythologie*, Leipzig, 1802. The various and profound investigations into antient profane history had led to similar results in other departments, and the hollowness of the Rationalist interpretation was either loudly proclaimed or tacitly acknowledged by all parties. The consequence was either a return to the supernaturalistic view, or further progress in the path which had been opened by the Rationalists themselves. Those Rationalists who could not do the former now applied the principle, to which they had formerly recourse only in cases of extreme difficulty, to the whole body of the early and miraculous portions of the Scriptures, which they placed on the same footing with the early and fabulous stories of antient Greece and Rome, and considered as a mythical history not written by eye-witnesses or contemporaries, and only recorded after it had been handed down by tradition through many generations. According to this view, all the events in the Bible are either natural events, such as occur in the history of other nations, and which must be examined according to the general principles of historical criticism, or they are of a miraculous and supernatural character, and must for this reason be rejected as not historical, like the fabulous accounts of antient mythology. As the rationalistic school directed its first attacks against the deists, so the mythical school, though diametrically opposed to the Supernaturalists, has hitherto directed its main efforts against Rationalism. We must nevertheless consider this last school as essentially rationalistic, or as a second form of Rationalism, in as far as, like Rationalism in its first form, it takes reason for its sole guide, and denies all supernatural revelation. The only difference is that it denies the Biblical records to be the works of eye-witnesses and contemporaries, and hence draws the conclusion that it is utterly impossible to elicit from those portions which are supposed to consist of mythical stories anything like a true and connected history.

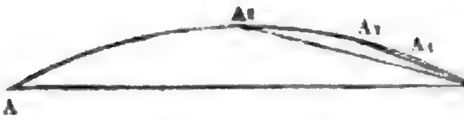
Up to the year 1835, this second form of Rationalism had been applied only partially, and chiefly to portions of the Old Testament; but it has lately been carried out in its full extent with reference to the books of the New Testament, by Dr. David Frederick Strauss, in his *Das Leben Jesu kritisch bearbeitet*, in 2 vols. The first edition appeared in 1835-36; a second was published in 1837, and a third in 1838, which is now out of print. This work, the production of a man of great learning, profound reflection, and critical skill, has called forth a host of polemical works, but the best efforts against it have been made by the supernaturalistic school. Rationalism in its first form seems to have received its death blow from this work and the various controversial writings of Strauss and others, while the new school is making rapid progress. The contest between it and the Supernaturalists is still going on, and is, with few exceptions, conducted in a calm and purely philosophic manner. Both parties have been honest enough to give way whenever any of their disputed points have been proved to be untenable. This is manifest from the 'Life of Christ' lately published by Neander, and from the different editions of the work of Strauss.

For a further account of the history of Rationalism the English reader may consult *The State of Protestantism in Germany*, by the Rev. Hugh James Rose, London, 1829; *An Historical Enquiry into the probable Causes of the Rationalist Character lately predominant in the Theology of Germany*, by Rev. E. P. Pusey, London, Part I., 1828; Part II., 1830; *Reply to the Rev. H. J. Rose's Work on the State of Protestantism in Germany*, by Dr. K. G. Bretschneider, tranlated by a Layman of the Church of England, London, 1828.

RATIOS, PRIME AND ULTIMATE. These terms were first introduced, at least in a system, by Newton, who preferred them to the terms suggested by his own method of fluxions. The first section of the Principia contains the development of their meaning, with various propositions enunciated in their language. In the articles LIMIT and INFINITE we have already had the same notions to consider, couched in different words; but when we remember that the only sure foundation of the differential calculus, that is, of all the higher part of mathematics, must rest upon these notions, it will be worth while to dwell a little upon Newton's form of expression, and his method of employing it. The notions in question actually form part of the knowledge of many persons who are not mathematicians, and all must in some degree possess and appeal to them whose occupations lead them to any considerations connected with measurement.

All who understand the term ratio must see that the ratio of two quantities does not depend on their actual magnitudes. If one line be to another in the ratio of 3 to 7, the halves, thirds, fourths, &c. of the two lines will have the same ratio; and the subdivision into aliquot parts may be continued without limit; thus the hundred-millionth part of one line will be to the hundred-millionth part of the other as 3 to 7. Ratio then always exists, as long as there is magnitude; but if magnitude should cease to exist, and if both lines should vanish, no idea of ratio can be formed. If however the diminution take place by continual subdivision, this evanescence of magnitude never takes place; for into how many parts soever a line may be divided, each part is a length, still subdivisible for ever.

The consideration here introduced is not an easy one at first, for there is a degree of smallness which evades the senses, and reason must come to their assistance. This makes a great difficulty, for many who think themselves rational geometers are not aware how much of their ordinary perception of geometrical truth is the consequence of what they see, not of what they deduce. All magnitude is relative, so far as the notion of great or small is connected with it; we know this when we stop to think, but we do not easily take it along with us in our thoughts; there is nothing absolutely great or small, but we are continually making an absolute greatness out of magnitude which is great compared with our own bodies, and an absolute smallness of that which is in the same sense comparatively small.



Take AO, an arc of a circle, A_2O its half, A_3O its third part, A_4O its fourth part, and so on; let the chords AO, A_2O, A_3O, &c. be drawn. The points A_1, A_2, A_3, A_4, &c. constitute a series continually approaching to O in position, but never reaching it, for no aliquot part of AO is absolutely nothing. Now it can be shown that A_xO, the chord of (A_xO) the xth part of the arc, will be nearer to a ratio of equality with (A_xO) the greater x is taken, so that any approach to equality may be attained and passed by making x sufficiently great. The beginner's notion is, almost invariably, that two small quantities must be nearly equal, because they are small; and the fallacy under which they proceed is the following:—quantities which are nearly equal to the same are nearly equal to one another; small quantities are all nearly equal to nothing, therefore small quantities are nearly equal to one another. The mistake here lies partly in the use of *nothing* as if it were a quantity, having all the properties of quantity, partly in the supposition that quantities which differ little must be nearly equal. If by differing little, be meant that the difference is trifling when compared with the quantities themselves, the notion is a good one: two microscopic animalculæ are nearly equal when they differ by a small portion of an animalcula; but if they differ by the size of a gnat, though their absolute difference is still small, compared with our usual standards, the larger is immensely greater than the other. But if the just notion of nearly equal be adopted, it is wrong to say that the chord and arc are nearly equal on account of their smallness, since their small difference may possibly itself be larger than one of them. And as to using *nothing* as a quantity in the fallacious syllogism above given, it must be remembered that, with reference to possibility of subdivision, any quantity, however small, is as distant from nothing as any other quantity, however great, is from infinity.

Nevertheless, as may be rationally shown, the chord and arc are the more nearly equal the smaller they are. The conception of this proposition may be aided as follows :—

however small a line may be, we may represent it by as great a number as we please, if we take the unit of measurement still smaller, and sufficiently smaller; now let the arc taken be the nth part of the radius; then if a unit be taken so small that the arc shall be represented by $24n^2$, the chord will be a fractional number extremely near to $24n^2-1$. Thus if the arc be one-thousandth of the radius, and a unit be taken to measure it which is its 24-thousandth part, so that the arc is 24,000, the chord will contain that unit a very small fraction more than 23,999 times. And if n be made still greater, the inequality will be made still less, being capable of being made a unit out of any number we may name, however great.

In the article Limit we should say that the limiting ratio of the arc and chord is unity; in Infinite, that an infinitely small arc is equal to its chord. Newton's phrase was that the arc and chord are ultimately equal, or that their ultimate ratio is one of equality. He strives to guard this language as much as possible in the Scholium which terminates the first section, and from which we now quote.

'I have premised these lemmas, that I might avoid the tedium of long demonstration, with reductions *ad absurdum*, after the manner of the antients. Demonstrations are shortened indeed by the method of indivisibles.' [Cavalieri.] 'But since this hypothesis is somewhat difficult, and the method is not thought very geometrical, I have preferred to make what follows depend upon the ultimate sums and ratios of vanishing quantities. . . . . I do not wish to be understood as using indivisibles, but divisible vanishing quantities; not sums and ratios of determinate parts, but limits of sums and ratios. . . . .

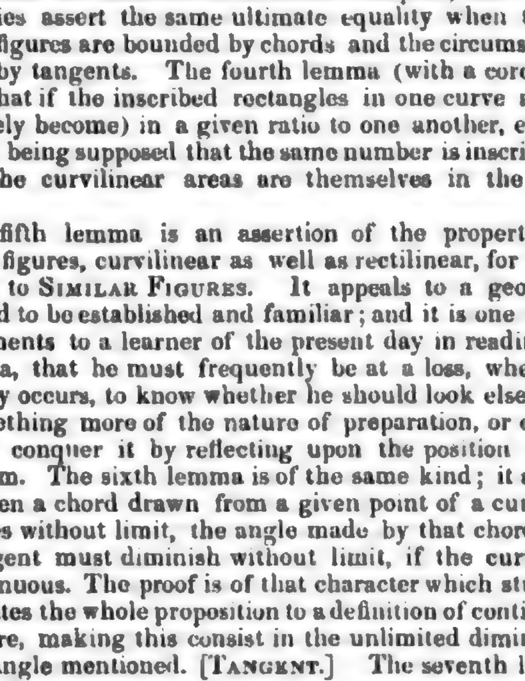
'It is objected that there is no ultimate proportion of vanishing quantities, because, before they have vanished the proportion is not ultimate, and after they have vanished there is no proportion. But by the same argument it could equally be contended, that there is no last velocity with which a body reaches the place where its motion stops; for before the body reaches its final position, it has not its last velocity, and when it reaches it, it has no velocity. And the answer is easy: by the last velocity I understand that which the body has, not before it reaches its last point and the motion stops, nor afterwards, but at the moment when it reaches, namely, that very velocity with which the body reaches its last position, and with which the motion ceases. And similarly, by the ultimate ratio of vanishing quantities, is to be understood the ratio of the quantities not before they vanish, nor after they vanish, but with which they vanish. Similarly the prime ratio of nascent quantities is the ratio with which they begin their existence (ratio quacum nascuntur). And the prime and ultimate sum is that with which (whether increasing or diminishing) they begin and cease. . . . It may also be contended, that if the ultimate ratios of vanishing quantities be given, the ultimate magnitudes will be given; and thus that every magnitude will consist of indivisible parts. . . . . But this objection proceeds on a false hypothesis. The ultimate ratios with which quantities vanish are not really the ratios of ultimate quantities, but the limits to which the ratios of quantities diminishing without limit perpetually approach, and which limits may be attained within any given difference, but can never be passed, nor even actually attained before the quantities are diminished in infinitum. The thing will be more clearly understood by speaking of infinitely great quantities. If two quantities with a given difference be increased in infinitum, the ultimate ratio will be given, that is to say, a ratio of equality, but the ultimate or greatest quantities of which this is the ratio will not therefore be given. In what follows therefore, if ever, thinking of making things more easily conceivable, I should talk of the last possible quantities, or of vanishing or ultimate quantities, do not understand thereby quantities of determinate magnitude, but think always of quantities diminishing without limit.'

This notion, whether of limiting ratios, of ultimate ratios, or of the ratios of infinitely small quantities, is a real and positive conception of our minds, but one of which, put it into what language we may, the mode of expression is liable to some objection. The ultimate magnitudes of the senses are not those of the understanding, but all our terms connected with the latter are derived from habits of thought matured by aid of the former. The ultimate arc of a curve which the eyes perceive is, to those eyes, really straight, all curvature being imperceptible. Indeed sensible straightness begins long before length vanishes. Continued reflection only will clear away the approximate truths of the senses, and enable the student to see how the ultimate truths of the theory of limits are to be established.

The first section of the Principia, consisting of eleven lemmas and the scholium from which we have quoted, opens with a lemma which should rather be the definition of the manner in which the word ultimate is used; and much objection has consequently been taken to it. 'Quantities,' says Newton, 'and the ratio of quantities, which constantly tend to equality during any finite time, and before the end of that time approach to each other within less than any given difference, become ultimately equal. If you deny it, let them be ultimately unequal, and let their ultimate difference be D, then they cannot approach nearer to equality than quantities having a difference D: which is against the hypothesis.' It is obvious that in this lemma Newton has a more decided opinion of the existence of an ultimate state of vanishing quantities, subject to all the relations of magnitude, than the expressions cited from the scholium would lead us to suppose; and the argument against those who would affirm ultimate *in*equality, is sound and conclusive. But those who would deny this lemma would oppose it on the ground that quantities which have vanished, and have ceased to be quantities, have neither ratio nor any relation of magnitude whatsoever, and the same opponents would deny inequality to such ultimate states as well as equality. A student who interprets Newton by his own subsequent expressions will consider this lemma as the definition of the sense in which *ultimate* equality is to be understood.

The second lemma asserts the ultimate equality of the area of a curve with the sum of the inscribed and of the circumscribed rectangles, and has been proved in the article Area. This lemma confines itself to rectangles standing on equal subdivisions of the base. The third proves the same on the supposition that these subdivisions are unequal; and its four corollaries assert the same ultimate equality when the inscribed figures are bounded by chords and the circumscribed figures by tangents. The fourth lemma (with a corollary) proves that if the inscribed rectangles in one curve are (or ultimately become) in a given ratio to one another, each to each (it being supposed that the same number is inscribed in both), the curvilinear areas are themselves in the same ratio.

The fifth lemma is an assertion of the properties of similar figures, curvilinear as well as rectilinear, for which we refer to Similar Figures. It appeals to a geometry supposed to be established and familiar; and it is one of the impediments to a learner of the present day in reading the Principia, that he must frequently be at a loss, when the difficulty occurs, to know whether he should look elsewhere for something more of the nature of preparation, or endeavour to conquer it by reflecting upon the position which stops him. The sixth lemma is of the same kind; it asserts that when a chord drawn from a given point of a curve diminishes without limit, the angle made by that chord with the tangent must diminish without limit, if the curvature be continuous. The proof is of that character which strongly assimilates the whole proposition to a definition of continuous curvature, making this consist in the unlimited diminution of the angle mentioned. [Tangent.] The seventh lemma (with 3 Cor.) proves that if AD be a tangent to the curve AB at A, and if BD and BE (and other such lines) be constantly drawn parallel to given lines; then, as B ap-



proaches to A, the ultimate ratio of any two of the set AE, AD, &c., the arc AB, and the chord AB, is that of equality: for a further consideration of this point, see TANGENT. The eighth lemma (with a corollary) proves that the ultimate forms of the triangles RAD and RAB (the latter whether bounded by the chord or the arc AB) are those of similar triangles: and the ninth proves that if any line AS (other than the tangent) be drawn from A, and PQ, RS be drawn parallel to any given line from points of the curve P and Q, the ultimate ratio of the curvilinear spaces APR, AQS, will be the duplicate ratio of the ultimate ratio of AR to AS.

In the tenth lemma (5 Cor. and Scholium) it is shown that the spaces described by a point acted on by a finite force (constant or variable) in different times from the beginning of the motion, are, when those times are diminished without limit, ultimately in the duplicate ratio of the times.

In the eleventh lemma (5 Cor.) it is shown that the subtense BD (or BE, &c.) is such that different subtenses drawn from different points of the curve are ultimately in the duplicate ratio of their arcs, or of the chords of these arcs, if the curvature be finite. [TANGENT.]

The study of the theory of ultimate ratios, as given by Newton, is desirable on several grounds. The mere acquisition of the language is a benefit; for subject as all terms in which the propositions can be expressed are to misapprehension, it frequently happens that the associations which one kind of language suggests are corrective of errors which another language has allowed, or even favoured. No student can be sure that his ideas on the subject are sound until, comparing together any proposition (as in DIFFERENTIAL CALCULUS) expressed by means of infinitesimals, limits, and ultimate ratios, the same proposition in the three different ways, he feels a perfect coincidence of meaning between the three statements, and that each expresses as much as, and no more, than the others. Again, the consideration of ultimate ratios puts vividly before the mind of the student who is used to the algebraical methods, a picture of the truth which is meant to be stated, and prevents his resting upon the abstract symbols of the Differential Calculus. For want of such an accompaniment to the latter study, many have found it repulsive, more, unintelligible, at least for a long time, and some have even never arrived at any rational comprehension of its meaning.

RATISBON (in German, Regensburg), the capital of the circle of the Regen, in the kingdom of Bavaria, is one of the most antient towns in Germany, having been built by the Romans, by whom it was called Reginum, Castra Regia, and subsequently Augusta Tiberii. In the second century it was already a place of trade. Under the Agilolfingers it was the capital of Bavaria, and after the deposition of the last duke of that line by Charlemagne, towards the end of the eighth century, it was governed, under the immediate protection of the German kings, by a Count or Grave, and, like other towns which carried on considerable trade, it received the denomination of a royal city. The bishopric is said to have been founded in 740. From 1663 to the dissolution of the German empire in 1806, it was the seat of the Diet.

Ratisbon is situated in 49° N. lat. and 12° 22′ E. long., in an extensive and fertile valley, on the south side of the Danube, opposite to its confluence with the Regen. The Danube here forms two small islands, called Oberwörth and Niederwörth, which are laid out in agreeable promenades. These islands are connected with each other and with the two banks of the Danube by a remarkable stone bridge, 1100 feet in length and 23 feet wide, which was built in the years 1135-1140, and connects Ratisbon with its suburb Stadt-am-Hof on the north bank. The town is surrounded with ramparts, but not capable of defence against an enemy. The ditches have been filled up. Most of the houses are built of stone, but they are very old-fashioned, and their great height adds to the gloominess of the streets, which are narrow and crooked, but cleanly and well-paved. The most remarkable buildings are the large antient town-house, containing the hall in which the German Diet held its sittings, the Gothic cathedral, St. Peter's church, the Lutheran church of the Holy Trinity, the palace of the Prince of Tharn and Taxis, the antient abbeys of St. Emmeran, Niedermünster, and Obermünster. The first abbey comprises a great number of buildings, resembling a little town, and has a library, a fine collection of paintings, and an excellent collection of mathematical and philosophical instruments, the new theatre, and the antient Jesuits' college. There are in all one cathedral and twenty-seven other churches and chapels, of which there are thirteen Roman Catholic and three Lutheran principal churches. Besides the library in the town-house, there are some other considerable libraries and collections of works of art; also a botanical society, a united Roman Catholic and Lutheran gymnasium, an ecclesiastical seminary, a school for the blind, and a school of design. There are extensive bleaching-grounds and celebrated breweries; and manufactories of leather, tobacco, wax candles, soap, cutlery, earthenware, porcelain, fire-arms, and carriages. The inhabitants carry on a considerable trade in salt, timber, corn, and their own manufactures, and do extensive business on commission. The population is about 21,000. Stein's Lexicon (1820), Hassel (1819), and Cannabich (1830) say that two-thirds are Roman Catholics and one-third Lutherans, which the relative number of churches seems to confirm; but Hörschelmann (1834) and the 'Conversations Lexicon' say the majority are Protestants. We believe the latter to be mistaken.

Near the city is a monument, erected in 1817, in honour of Kepler, who was born here, and on a rock on the banks of the Danube stands the Walhalla, a marble temple erected in honour of the great men of Germany. In 1809 there were great battles, for five days, between the French and the Austrians, near Ratisbon, in which the city suffered severely.

RATTLE is a term applied to a common agricultural weed, and derives its name from the dry parchment-like seed-vessels rattling, if shaken, when ripe. It grows a foot high, has narrow lanceolate serrated leaves, dilated and heart-shaped at the base, and a yellow ringent flower enclosed in a bladdery calyx. It is an annual, in many cases very common in bad pastures and meadows. We have in this country two species, the smaller and the larger; the former can scarcely be said to be injurious to the farmer, but the latter sometimes overruns corn-fields to such an extent as almost to destroy the crop, especially in parts of the country where the soil is peaty. Careful fallowing seems the only means of extirpating this kind of weed.

RATTLESNAKE. [VIPERIDÆ.]

RATZEBURG is a small principality belonging to the grand-duchy of Mecklenburg Strelitz, but entirely separated from it by Mecklenburg Schwerin, being situated between the latter and the territory of Lübeck, and the duchy of Lauenburg, which belongs to Denmark. The area is 136 square miles, and the population between 14,000 and 15,000. It is traversed by the river Trave, and is bounded on the west by the lake of Ratzeburg, by means of which, and of the Wackenitz, it has a constant communication with Lübeck for the exportation of timber, corn, pulse, flax, and cattle. The inhabitants are likewise much employed in the fisheries. They have paper-mills, lime-kilns, copper and brass founderies. Ratzeburg was formerly a bishopric, but was secularised in 1648, at the peace of Westphalia.

RATZEBURG, the chief town of the principality, belongs to the duchy of Lauenburg (with the exception of the part comprehending what is called the Domhof (the close) and the Palmhof, containing 36 houses, 250 inhabitants, the cathedral school, and the hospital, which belongs to Mecklenburg Strelitz), and is the seat of the government of the principality. [LAUENBURG.]

RAUHE ALP. [GERMANY.]

RAUCHWA'CKE (in Geology), one of the calcareous members of the zechstein formation of Germany, the equivalent of the magnesian limestone formation in England. It is either compact, or cellular, or dolomitic. Associated with gypsum and with beds called stinkstein, asche, zechstein, and kupferschiefer, it makes a series of five terms which may be classed and arranged in comparison with English types and names. This is done by Von Meyer, after Sedgwick, thus:—

German.	*English.*
Asche (friable marl), and Stinkstein (thin-bedded fetid limestone).	Thin bedded limestone of Knottingley.
	Coloured marls and gypsum.
Rauchwacke (limestone).	Yellow magnesian limestone.
Zechstein (limestone).	Compact limestone.
Kupferschiefer (copper-slate).	Marl-slate.

We may perhaps prefer to view the asche, stinkstein, and rauchwacke, as altogether only one feeble upper group, comparable with the upper laminated and cellular limestones of Knottingley, and the zechstein as equivalent to our yellow magnesian limestone, in which case the kupferschiefer is on the parallel of our marl-slates (both full of fishes of the genus Palæoniscus).

(See Daubuisson's *Traité de Géologie*, vol. ii.)

RAVAILLAC. [HENRI IV.]

RAVEE. [HINDUSTAN.]

RAVELIN, a work constructed beyond the main ditch of a fortress, and in front of the curtain between two bastions. It usually consists of two lines of rampart, which meet in a salient angle on a line drawn perpendicular to and bisecting the curtain; and its form on the ground-plan may be seen at Q, *fig.* 1, BASTION, and at QQ, FORTIFICATION. Its profile, or the figure of a vertical section of its rampart, is similar to that of the enceinte. [BASTION, *Fig.* 2.]

The ravelin was probably first constructed in the place of the more antient barbacan by the Italian engineers of the sixteenth century, when, on account of the general employment of cannon in sieges, the antient towers and walls of masonry were either replaced or covered by ramparts of earth. Its original name, *rivellino*, indicates a derivation from *vegliare*, 'to watch;' and both by Maggi (1584) and Errard (1594), rivellino, or ravelin, and bastion, are used as the names of a work beyond the walls of a fortified place. In some cases the rivellino appears to have been merely a parapet of earth covering a small place of arms in which were stationed the men appointed to guard the head of the bridge leading from a postern to the counterscarp of the ditch; and a work of this kind, of a semicircular form, still exists on the exterior of the ditch on one side of Carisbrooke Castle. It can scarcely be doubted that a semicircular form was very frequently adopted for such parapets, and this circumstance may have given rise to the name of demi-lune, or half-moon, by which, even now, the ravelin is often designated. It ought to be observed however that Errard and other writers of that age apply the word ravelin to a work placed immediately in front of the salient angle of a bastion, where the counterscarp of the ditch (which is there in the form of a segment of a circle) constitutes the gorge of the work; and that the name of half-moon may, on this account, have been applied to the work, though its faces were rectilinear. A piece of fortification thus situated is now invariably called a counterguard; and the term ravelin, or demi-lune, is confined to the principal outwork in front of the curtain.

When the necessity of increasing the strength of fortresses by means of works beyond the enceinte, in consequence of the superior means employed in the attack, was strongly felt, the ravelin was made more capacious, and was provided with artillery; and, in order to prevent it from being taken by surprise, its ditch was enlarged, and the covered-way was continued on the exterior of the latter along both the faces of the work. Before the middle of the seventeenth century the ravelins were so small, that the exterior lines (the cordons) of their faces, if produced towards the rear, fell upon the curtain of the enceinte, and the lengths of the faces did not exceed 30 yards. Count Pagan then enlarged the works so that the produced faces fell at the shoulders of the bastions; but Vauban apparently, in what has since been denominated his first system, made the faces of the ravelins about 110 yards long, and directed them towards points on the faces of the bastions at 10 yards from the shoulders [Q, *fig.* 1, BASTION]. The magnitude of the work was then such as to render it capable of making a good defence: it covered the curtain and flanks of the enceinte, so that the enemy could not demolish their parapets by means of artillery in his distant batteries; and, one being placed on each front of the fortress, every two afforded not only a crossing fire on the approaches of the enemy towards the intermediate bastion, but they seriously impeded the formation of the counter-batteries on the crest of the glacis.

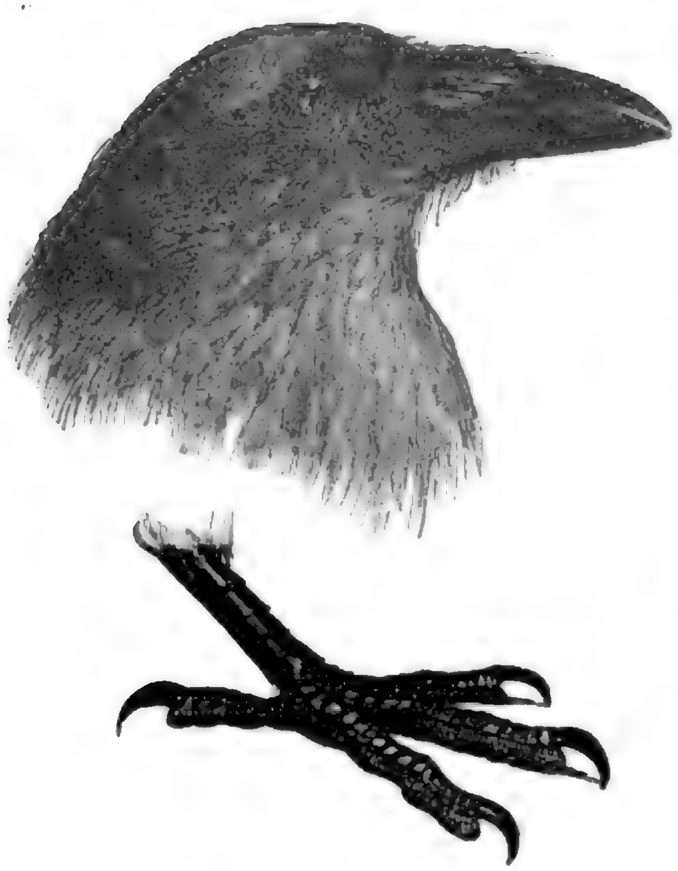
It was subsequently perceived that great advantages would arise if the faces of the ravelins were made still longer, and if they were directed to points at a greater distance from the shoulders of the bastions: by the first, a reverse fire, as it is called, might be directed from the angle of the work upon the enemy's lodgments on the glacis before the bastions; and by the other, the power of breaching the shoulders of the bastions by means of a battery on the glacis, before the salient angle of the ravelin, would be taken away from the enemy. At Landau and other places, Vauban, without increasing the lengths of the faces of the ravelins, directed their exterior lines to points at 20 yards from the shoulders of the bastions; while at Neuf Brisac he not only made the lengths of the faces above 120 yards, but he directed them to points at 30 yards from the shoulders. It should be observed however that at about 20 yards from the counterscarp of the main ditch he changed the directions of the faces, and made the portion between this point and the ditch nearly perpendicular to a line joining the salient angles of the collateral bastions, as in the work Y, FORTIFICATION; by which means the second advantage, above mentioned, was lost. The intention of Vauban in thus giving flanks to the ravelin was that, by a fire from thence, the difficulty of forming a lodgment on the glacis in front of the bastion might be increased so much as to oblige the enemy to take the ravelin before he could execute such lodgment: but experience has shown that this is not the fact; for the flanks, as he has formed them at Neuf Brisac, having no work to cover their prolongations, are enfiladed, and their guns dismounted, at an early period of the siege.

Cormontaigne (1736) greatly improved the ravelin by giving it the figure represented at QQ, FORTIFICATION, making the length of each face about 130 yards, and directing that line to a point between 20 and 30 yards from the shoulders of the bastions. He reduced the terreplein, or space between its parapet and the counterscarp of the reduit Y, to 27 feet, in order that the enemy might not find room on it to form batteries for the purpose of breaching the reduit; and the faces being unbroken in direction, not only are the shoulders of the bastions covered, but the enemy is prevented from breaching any part between the shoulder and the retrenchment X. The gorge, or rear line, of the ravelin, instead of coinciding with the general direction of the counterscarp of the main ditch, is made parallel to the curtain of the place, in order to take away a part of the terreplein which would have been seen by the enemy from his counter-batteries on the glacis of the bastion. It appears that Cormontaigne wished to give the ravelins a greater length of face than that which has been mentioned, and that he was prevented from doing so through the opposition of his cotemporaries. For the advantages to be derived from very salient ravelins, see FORTIFICATION, p. 376 col. 2.

The only change which has since been made in the position of the ravelin is that which was proposed by Bousmard (1803), and followed in the works executed by order of Napoleon about Alessandria (1807). It consists in placing the work beyond the glacis of the enceinte, at the foot of which glacis its ditches terminate: the covered-way and glacis before the bastions being continued uninterruptedly along the exterior of the main ditch. It thus becomes impossible to breach the enceinte by artillery placed anywhere on the glacis of the ravelin; and, when the direction of each face is broken, as that engineer recommended, the probability of the rampart being enfiladed is much diminished. It might perhaps be objected that the ravelin so detached is liable to be attacked at the gorge; but if the covered-way of the ravelin be made to join that of the collateral bastions, and if its flanks, or those of the reduit, are disposed so as to allow a fire of musketry to be kept up in the direction by which the enemy must approach the gorge, this danger may be obviated.

The relief of the ravelin, or its elevation above the level of the ground should be two or three feet less than that of the enceinte, in order that the defenders of the curtain may be able to direct a plunging fire into the work when it is occupied by the enemy. But if in the interior of the ravelin there should be a reduit, this last ought, for the same reason, to have less relief by two or three feet than the curtain; and then, in order to afford a plunging fire from the reduit into the ravelin, the latter should be two or three feet lower than the former. It ought however to have a command of six or seven feet over the glacis in its front, that the fire of its artillery may not annoy the defenders on the banquette of its covered-way. Therefore, if the command of the enceinte over the ground is 18 feet, and that of the glacis is seven feet, the differences between the heights of the enceinte and reduit, and of the reduit and ravelin, may be two feet successively.

RAVEN. [CORVIDÆ, vol. viii., p. 68.] We subjoin a cut of the head and foot of this species as belonging to an eminently omnivorous form.



Head and Foot of Raven.

RAVENGLASS. [CUMBERLAND.]

RAVENNA, LEGAZIO'NE DI, a province of the Papal State, is bounded on the north by the province of Ferrara, on the west by that of Bologna and by the grand-duchy of Tuscany, on the south by the province of Forli, and on the east by the Adriatic. The area is about 935 square miles, and the population 149,000. (Neigebaur; Calindri.) The eastern part of the province, which lies near the Adriatic, is low and marshy, but the western or inland part, which stretches to the foot of the Tuscan Apennines, in the neighbourhood of Imola and Faenza, is healthy, well cultivated, and thickly inhabited. The chief products of the country are corn, wine, silk, hemp, and cattle. A considerable quantity of sea-salt is derived from the lagoon of Cervia, which belongs to the government, and is a source of revenue. The principal towns of the province are RAVENNA, FAENZA, IMOLA; Cervia, a small town, in an unhealthy situation, near the sea-coast, has about 1000 inhabitants; Brisighella, near the borders of Tuscany, has about 7000 inhabitants, including its territory; and Castel Bolognese, a bustling town, in a fertile district, has about 4000 inhabitants.

The province of Ravenna is crossed by numerous streams, which rise in the Tuscan Apennines, and flow in a north-east direction to the Adriatic. The principal are — the Santerno, which flows by Imola; the Senio; the Lamone, which flows near Faenza; the Montone, which enters the sea below Ravenna; and the Ronco, which joins the Montone above its mouth.

The province is divided, for administrative purposes, into three districts:—Ravenna, Faenza, and Imola. A road leads from Faenza to Tuscany by ascending the valley of the Lamone, and, after crossing the Apennines above Marradi, descends into the valley of the Sieve, north of Florence.

RAVENNA, situated in 44° 26′ N. lat. and 12° 12′ E. long., is an antient city, once a seaport, but now five miles from the sea, which has receded all along this coast, owing to the accumulation of sand thrown up by the waves, and of the alluvial earth brought down by the rivers. The town is now in the midst of a marshy desolate plain covered with ruins, which recalls to the mind of the traveller the Campagna of Rome. Between Ravenna and the sea is the 'Pineta,' or forest of pines, which extends about fifteen miles in length along the sea-coast, and which has been noticed by Dante, Boccaccio, Dryden, and Byron (*Don Juan*, c. iii.). Ginanni has written a description of the various kinds of pines and other trees of which the forest consists: *Storia civile e naturale delle Pinete Ravennati*, 4to., Rome, 1774, with plates.

Ravenna is an archbishop's see, and the residence of the legate of the province: it has a college, and civil, criminal, and commercial courts. The population is about 18,000 (Calindri.) The cathedral, built in the fourth century, but since that time almost completely rebuilt, retains several sculptures and other remains of its early age: the baptistery, detached from the church, is still in its original state. The church of Santa Vitale was built by Justinian in imitation of Santa Sophia of Constantinople: it has some handsome pillars of granite, and a large mosaic, in good preservation, representing the emperor Justinian with his courtiers, and his empress Theodora attended by her ladies. The mausoleum of Placidia, daughter of Theodosius, and sister of Honorius, and that of her second husband Constantius, are in the vaults beneath. Ravenna has many Byzantine monuments and recollections, which give it the appearance of a Greek rather than an Italian city. The church of St. John the Baptist, was built by Placidia, as well as that of St. John the Evangelist, with its altar, made of porphyry and other valuable marbles. The mausoleum of Theodoric, which is outside of the town, has a monolithic dome, nearly 100 feet in circumference, which has been transformed into a church, called Santa Maria Rotonda. There is a portico, supported by eight granite columns, and other remains of the splendid palace of Theodoric, which was inhabited by his successors the Exarchs. Charlemagne stripped it of its ornaments, which he carried into France. The church of St. Apollinaris in Classe, so called because it was built on the site of the old port, is a magnificent structure, raised also by Theodoric, with twenty-four large columns, each of a single piece of marble, which were brought from Constantinople; and a fine mosaic, representing a view of Ravenna in the sixth century, with numerous figures of saints. The great altar is made of porphyry, verde antico, and oriental alabaster; and the pulpit, which is of marble, is of curious workmanship. Ravenna, next to Rome, is the city of Italy which abounds most with valuable and rare marbles from Greece, Asia, and Africa. The church of St. Apollinaris contains the tombs of many of the old archbishops of Ravenna, and a series of their portraits.

The other remarkable churches of Ravenna are—Santa Maria in Porto, built in the sixteenth century; St. Romuald, which now belongs to the college of Ravenna; Santa Agatha; St. Theodore; St. Domenico; St. Michele, which was transformed under the French into a fish-market; and St. Francis, which has the tombs of the Polenta lords of Ravenna. All these churches are adorned with rich marbles, valuable paintings, mosaics, and sculptures. The church of St. Lorenzo, outside of the town, built by the emperor Honorius, was destroyed in 1553, and the marble columns were carried to Rome.

The public library of Ravenna contains 40,000 volumes and 700 MSS., among which are a MS. of the plays of Aristophanes, written in the tenth century, of which Bekker made use for his edition, London, 1829. There is also a cabinet of antient medals and inscriptions, and a gallery of paintings.

The mausoleum of Dante, who died at Ravenna, was raised in the fifteenth century, by Bernardo Bembo, a Venetian podesta, and father of Cardinal Bembo: it has been repaired several times. The names of Honorius, Placidia, Theodoric, Narses, Justinian, and Dante are all associated with Ravenna.

The antient town of Classis, the port of Ravenna, which stood two or three miles south of the city, was destroyed in the year 728 by Luitprand, king of the Longobards: it is now a marsh, four miles distant from the sea. (See the antient topography of the coast about Ravenna, in Bertoldi, 'Memorie del Po di Primaro,' Ferrara, 1785.) Ravenna is 18 miles north-east of Forli, and 30 miles north-west of Rimini. A road leads from Ravenna to Rimini along the shore of the Adriatic, passing by Cervia and Cesenatico.

Ravenna is said to have been originally a town of the Umbri. It was afterwards possessed by the Boii, and formed part of Cisalpine Gaul. It is not particularly noticed in Roman history till the time of the Empire, when the port of Ravenna became one of the two great stations for the Roman fleet, Misenum being the other. Tiberius surrounded Ravenna with walls, of which the gate, or arch, called 'Porta Aurea,' is a remnant. But it was after the separation of the Eastern and Western empires that Ravenna attained its greatest importance. The harbour became the chief means of communication between the two empires; and several emperors of the West, Honorius I., his sister Placidia, and her son Valentinianus III., made Ravenna their place of residence. Afterwards Glicerius, Nepos, Orestes, and other ephemeral puppets, who succeeded each other on the throne of the West, resided likewise at Ravenna. After the fall of the empire, Theodoric made Ravenna the capital of his kingdom, and he greatly embellished the town. When Narses, the general of Justinian, having overthrown the kingdom of the Goths, A.D. 553, was appointed by the emperor, exarch or governor-general of Italy, he fixed his residence at Ravenna, which continued under his successors to be the centre of the Imperial administration in Italy, till Astolphus, king of the Longobards, took Ravenna, A.D. 752. In 755, Pepin, having defeated Astolphus, obliged him to give up Ravenna and the district called the Pentapolis to the see of Rome. But the cession was merely nominal, and the archbishops of Ravenna appear to have had the civil administration of the town and its territory, which was still called the Exarchate for a long period under the Carlovingian dynasty. [PAPAL STATE.]

In the middle ages, Ravenna, like the other towns of North Italy, was a republic, and, like them, it had its factions, which were headed by two powerful families, the Traversari and the Polenta. In the latter part of the 13th century the Polenta drove away the Traversari, and usurped the supreme power. Guido da Polenta, lord of Ravenna, was the father of the beautiful Francesca, who married Lancelot Malatesta, lord of Rimini, and, being detected by her husband in adultery with his brother Paul, was killed by him together with her paramour. This catastrophe has furnished Dante with the subject of one of his most affecting episodes (*Inferno*, v.). Dante in his banishment was the friend and guest of Guido da Polenta, who protected him in his old days and bestowed on him funeral honours after his death. The successors of Guido remained in possession of Ravenna till the year 1440, when the Venetians took it. The Venetians kept it until 1509, when it was taken from them by the French under Louis XII. In 1512 the French army under Gaston de Foix, duke of Nemours, fought a desperate battle near Ravenna against the Spanish and Papal troops. The French won the battle, but lost their commander, and soon after they were compelled to retire from Italy. Nearly 20,000 men lay dead on the field of battle, where a small marble pillar was raised on the banks of the river Ronco, and is still called 'the pillar of the French.' By the treaty of Bologna in 1530, Ravenna and its territory were given up to the pope. (Rubeis Hieronymus, *Historiarum Ravennatum Libri XI.*, fol., Venice, 1590.)

RAVENSCROFT, THOMAS, a composer and editor much esteemed at the commencement of the seventeenth century, was born in 1592, educated in St. Paul's choir, and admitted to the degree of Bachelor in Music, by the university of Cambridge, it is supposed, when only fifteen years of age. In 1611 he printed a collection of twenty-three part-songs, under the title of *Melismata, Musical Phansies*, &c., in which is his justly admired four-voiced song, 'Canst thou love and lie alone?' In 1614 appeared his *Brief Discourse*, &c., another collection of twenty part-songs, to which is prefixed a discourse or essay on the old musical proportions, a vain endeavour to rescue them from the neglect into which they had deservedly fallen. In 1621 he made some atonement for this absurd and abortive attempt, by publishing 'The whole Book of Psalms, &c. composed into four parts by sundry authors, to such several tunes as have been and are usually sung in England, Scotland, Wales, Germany, Italy, France, and the Netherlands.' Among the 'authors' appear the names of Tallis, Morley, John Milton (father of the poet), &c. Many are by Ravenscroft, who, had he only produced St. David's, Canterbury, and Bangor tunes, would have ensured the respect and gratitude of his country. The work contains a melody for each of the hundred and fifty psalms, many newly composed, and all harmonised by the above-mentioned persons. (*Supp. to Mus. Lib.*) This, we believe, is the first collection of the kind that had appeared, and, judging from the specimens that have come under our view, it is a most valuable work. [PSALMODY.] Tradition ascribes to Ravenscroft the merit of having been compiler of two other works, similar in character to the *Melismata*—namely, *Pammelia* and *Deuteromelia*, both well known to musical antiquaries, highly valued by them, and now exceedingly rare: and the tradition receives support from an allusion in the 'Apologie' to his 'Brief Discourse,' to 'Harmonies by divers and sundry authors,' formerly published by him, the errors in which, he says, are 'corrected in this (i.e. *The Discourse*) *fourth* and last work.' The *Pammelia*, comprising one hundred pieces, is dated 1609; the *Deuteromelia*, containing thirty-two, bears the same date. A selection from the four above-named secular works was privately printed in 1822, for the use of The Roxburghe Club, by the Duke of Marlborough, who unhesitatingly ascribes the *whole* to Ravenscroft, though it might have been seen at a glance that this composer was author of but a few, while he may have been editor of all.

RAWITSCH. [POSEN.]

RAY. [LIGHT.]

RAY, JOHN, or WRAY (as he at one time spelt his name), who may be considered as the founder of true principles of classification in the vegetable and animal kingdoms, was the son of a blacksmith, and was born at Black-Notley near Braintree in Essex, on the 29th of November, 1627. He received a good education, being sent first to the grammar-school at Braintree, and afterwards to the university of Cambridge, where he entered at Catherine Hall, but subsequently removed to Trinity College, of which he was elected a fellow in 1649, together with Isaac Barrow. At the age of twenty-three he was appointed Greek lecturer, and two years afterwards mathematical tutor to his college. He was also private tutor to several gentlemen of rank, and among others to one who possessed a kindred spirit to himself, and whose name afterwards became closely associated with his own in the paths of science, Francis Willughby. Ray was always fond of the study of natural history, but it is recorded by his biographers that the circumstance which chiefly gave rise to his cultivation of the science of botany (in which he afterwards became so distinguished) was an illness, for the removal of which he was recommended to take frequent exercise out of doors. Being compelled to remit his drier studies, he collected and investigated the different wild plants which he met with in his walks about Cambridge, and in 1660 published a 'Catalogus Plantarum circa Cantabrigiam nascentium,' 1 vol. 8vo., which he says took him ten years to compile.

During his residence at the University he travelled over the greater part of England, Wales, and Scotland, in the pursuit of botanical and zoological information, and was generally accompanied in these excursions by his friend and pupil Mr. Willughby. At the Restoration he took orders, but never held any church preferment, nor performed regular parochial duty; and two years afterwards he was obliged to resign his fellowship in consequence of the passing of the Act of Uniformity, to which he could not conscienciously subscribe. After leaving the University he resided chiefly with Mr. Willughby at Middleton Hall in Warwickshire, and devoted the remainder of his life solely to the pursuit of natural history. In 1663 he embarked for the Continent with Mr. Willughby, where they remained for three years travelling through the Low Countries, Germany, Italy, Switzerland, and France; and collecting information respecting the animals and plants which inhabit these different countries. Willughby attended chiefly to zoology, and Ray to botany. An account of this tour was published by Ray in 1673, 1 vol. 8vo. In 1667 he was elected a fellow of the Royal Society, to the Transactions of which learned body he contributed some valuable papers. In 1672 he had the misfortune to lose his friend Mr. Willughby, who died at the age of 37, leaving him guardian to his two sons (the younger of whom was afterwards created Lord Middleton) and a legacy of 60*l.* per annum. After superintending the education of Mr. Willughby's children for some time at Middleton Hall, he removed to Sutton Coldfield, in Warwickshire, and then to Falkbourn Hall, Essex, and lastly he settled in 1679 at Black-Notley, his native place, where he remained till his death, which took place January 17, 1704-5, at the age of 77. In 1673 he married a young lady 24 years younger than himself, by whom he left three daughters. Ray was not more respected for his scientific acquirements than for his benevolence, which was combined with high moral and religious worth.

Ray left many works, among which the botanical and zoological hold such a conspicuous place in the history and literature of those sciences, that they demand a brief notice. His first publication was the 'Catalogue of the Plants growing in the neighbourhood of Cambridge,' which we have already mentioned. This work contains a description of 626 species arranged alphabetically, and accompanied with the synonyms of the principal botanical authors who had preceded him: it is curious, from its being the first production of a man who afterwards attained to such great celebrity, and it exhibits traces of those singular powers of observation which he afterwards so eminently displayed. In the preface, which in this, as in most of his other works, contains much interesting matter, he describes the difficulties which he had to overcome in the prosecution of his botanical studies, the principal of which was the want of some acknowledged guide which he might follow in the determination of species. Many curious notes are introduced into this catalogue, which have not only reference to the structure and properties of the plants themselves, but to other parts of natural history, particularly entomology, to which he appears to have already paid considerable attention: among other facts he observed the hermaphroditism of the snail. A supplement to this catalogue appeared in 1663, and a second in 1685.

In 1682 appeared his 'Methodus Plantarum Nova,' 1 vol. 8vo., in which he proposed a new method of classifying plants, which, when altered and amended, as it subsequently was by himself at a later period, unquestionably formed the basis of that method which under the name of the system of Jussieu is universally received at the present day. In the formation of the principal groups into which he divided the vegetable kingdom, Ray derived his characters sometimes from the fruit, sometimes from the flower, and sometimes from other parts of the plant, as each in its turn seemed to offer the most strongly marked points of distinction. He first proposed the division of plants into dicotyledons and monocotyledons. 'Floriferas dividimus,' he says, 'in *dicotyledones*, quarum semina sata binis foliis anomalis seminalibus dictis quæ cotyledonum usum præstant è terra exeunt, vel in binos saltem lobos dividuntur quamvis eos supra terram foliorum specie non efferant; et *monocotyledones*, quæ nec folia seminalia bina efferunt nec lobos binos condunt.'[*] He extended these divisions both to trees and herbs, stating that palms differ as much in this respect from other trees, as grasses and lilies do from other herbs. Though he made these great discoveries and improvements, Ray obstinately continued in the old error of separating woody from herbaceous plants, or trees from herbs, and he held a long controversy with Rivinus on this point: he even went so far as to state that one of these divisions might be distinguished from the other by the presence of buds, which he says are only developed in woody plants. To him is due however the honour of the discovery of the true nature of buds, for he says that they are points at which new annual plants spring up from the old stock, but he stopped short in his discovery in not extending them to herbaceous plants. In the first edition of the 'Methodus' he formed 25 classes, taking the woody plants first, which he divided into trees and shrubs. In this system he fell into many errors, one of the most glaring of which, as he himself afterwards observed, was the separation of the different species of corn from the other grasses. He subsequently altered this, and revised the whole arrangement, making 34 groups instead of 25; many of which are almost exactly the same as are adopted by botanists of the present day under the name of natural orders. The following table, taken from the second edition of his 'Methodus,' published in 1703, will give an outline of his system:—

Herbaceous plants and undershrubs not bearing buds	Imperfect or without visible flowers	1. Submarine plants.
		2. Funguses.
		3. Mosses.
		4. Capillary.
	Perfect or flowering plants:—	
	Dicotyledones	5. Stamineous, *i.e.* Apetalous.
	Flower compound	6. Planipetalous, milky.
		7. Discoid with pappus seed.
		8. Corymbiferous.
		9. Capitale.
	Flower simple:—	
	With 1 naked seed	10. Monospermous.
	With 2 naked seeds	11. Umbelliferous.
		12. Stellate.
	With 4 naked seeds	13. Rough leaved.
		14. Verticillate.
	With many naked seeds	15. Polyspermous.
	Seeds coated with pulp	16. Pomiferous.
		17. Bacciferous.
	In several distinct vessels	18. Multisiliquous.
	In a single vessel	19. Monopetalous and dipetalous plants.
		20. Siliquose.
		21. Leguminose.
		22. Pentapetalous.
	Monocotyledones, or grass leaved:—	
	Bearing flowers	23. Bulbous or not bulbous.
	Without proper flowers	24. Stamineous grasses.
		25. Anomalous plants.
Trees or shrubs bearing buds.	Monocotyledones: with arundinaceous leaves	26. Palms
	Dicotyledones:—	
	Flowers remote from fruit	27. Coniferous.
	(Monœcious or diœcious)	28. Not coniferous.
	Flowers contiguous to fruit:—	
	Fruit	29. Umbilicated.
		30. Not umbilicated.
		31. Dry, not siliquose.
		32. Siliquose.
	Flower	33. Papilionaceous.
		34. Anomalous plants.

This arrangement was too far in advance of the knowledge of the day, and the consequence was that it was little appreciated or adopted by his contemporaries and immediate successors, who, instead of improving the arrangement so ably sketched out, set about establishing others on artificial principles, all of which are rapidly sinking into oblivion, while the principles of Ray are tacitly admitted, and many of his fundamental divisions adopted in that beautiful but still imperfect natural system which has been formed by the labours of Jussieu, Brown, De Candolle, Lindley, and others.

While he made these important improvements in classification, this great botanist did not neglect the study of species; his 'Catalogus Plantarum Angliæ' first appeared in 1670, arranged alphabetically, and has been the basis of all subsequent Floras of this country. A second edition appeared in 1677, and in 1690 he published a third, entitled 'Synopsis Methodica Stirpium Britannicarum,' which is arranged according to his natural system. Another edition of the 'Synopsis' came out in 1696, and it was again republished by Dillenius in 1724. This work, of which the edition of 1696 is the best, is very accurate. Ray examined every plant described in the work himself, and investigated their synonyms with great care.

In 1694 he published 'Stirpium Europæarum extra Britannias crescentium Sylloge.' This work contains a description of all those plants which he had himself collected on the Continent, as well as many which had been described by others. The synonyms are here very exact,

His largest botanical work was a general 'Historia Plantarum,' the first volume of which came out in 1686, fol.; a second appeared in 1688; and a third, which was supplementary, in 1704. In this vast work he collected and arranged all the species of plants which had then been described by botanists; he enumerated 18,625 species. Haller, Sprengel, Adanson, and others speak of this work as being the produce of immense labour, and as containing much learning and acute criticism; but from its nature it was of course principally a compilation.

Ray made many researches in vegetable physiology. H published a very interesting paper in the 'Philosophical Transactions' (No. 68), on the mode of ascent of the sap, and we find many observations on the structure and functions of plants scattered through his various works. In the first volume of the 'Historia Plantarum' he collected together, under the title of 'De Plantis in Genere,' all the principal discoveries which had been made on the structure and properties of plants by Cesalpin, Grew, Malpighi, and others, as well as by himself; so that he thus published by far the most complete introduction to botany that had then appeared.

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[*] 'Methodus Plantarum,' edit. 2, p. 2.

In zoology Ray ranks almost as high as in botany; and his works on this subject are even more important, as they still in a great measure preserve their utility. Cuvier says, that 'they may be considered as the foundation of modern zoology, for naturalists are obliged to consult them every instant, for the purpose of clearing up the difficulties which they meet with in the works of Linnæus and his copyists.' Mr. Willughby, at the time of his death, left to his friend Ray the task of arranging and publishing the various materials which he had collected for an extensive work on the animal kingdom. Ray exhibited as much zeal as fidelity in the execution of this trust, for he might have called the works partly his own without much injustice, as he had assisted in the first collection of the materials, and had the entire task of arranging and classifying them; besides which, it is easy to observe, as Cuvier has remarked, that the histories of plants and animals are both written by the same hand.

The 'Ornithologia' of Willughby, which was the first part of the work that appeared, was published in 1676, one vol. fol., with seventy-seven plates. An English translation of it, by Ray, appeared the following year. The remaining part, which is the most complete, was the 'Historia Piscium,' and did not come out till 1686, 2 vols. fol. These works contain a great number of new species of birds and fishes, which had been discovered by Willughby and Ray in Germany and Italy, as well as those which had been previously described. Cuvier says, 'the fishes of the Mediterranean are described with rare precision, and it is frequently easier to find species in Willughby than in Linnæus.' Many of the figures in these works are original, and very good.

Ray published several works of his own on zoology. He undertook to form a classical arrangement of the whole animal kingdom, as he had of the vegetable; and, in 1693, he published his 'Synopsis Methodica Animalium, Quadrupedum, et Serpentini Generis,' one vol. 8vo. Similar volumes on birds and fishes were also prepared by him, but were not published till after his death, by Dr. Derham, in 1713. The two last are principally abridgments of the great works published under the name of Willughby. He also left a history of insects, which was likewise published by Dr. Derham, at the expense of the Royal Society, and contains an appendix on beetles, by Dr. Lister. This last work is remarkable for the numerous and accurate descriptions of insects which it contains, part of which, he says, had been prepared by his friend Mr. Willughby. The author here rejects the theory of spontaneous generation. The most important character of the zoological works of Ray is the precise and clear method of classification which he adopted. The primary divisions of his system were founded on the structure of the heart and organs of respiration. His arrangement of the classes of quadrupeds and birds has been followed by many naturalists. Both Linnæus and Buffon borrowed largely from the works of Ray. Buffon extracted from Willughby's 'Ornithology,' almost all the anatomical part of his history of birds; and Cuvier says that the 'Dictionnaire d'Ichtyologie,' by Daubenton and Haüy, in the 'Encyclopédie Méthodique,' consists in great part of translations from Ray's works on fishes.

In addition to his numerous scientific writings, Ray composed several works on divinity and other subjects: the best known of these are, 'A Collection of Proverbs,' which came out in 1672, and went through several editions; 'The Wisdom of God in the Creation,' 1690, which also had an extensive sale; 'A Persuasion to a Holy Life,' 1700; and three 'Physico-Theological Discourses concerning Chaos, the Deluge, and the Dissolution of the World,' 1692.

(*Life*, by Dr. Derham; Haller's *Bibl. Bot.*; *Life*, by Cuvier and Du Petit Thouars, in the *Biog. Univer.*; and *Life*, by Sir J. E. Smith, in Rees's *Cyclop.*)

RAYED or RADIATED ANIMALS, *Radiaria* or *Radiata*, Lamarck's name for a class of invertebrate animals, which he divides into the *Radiaires Molasses* and the *Radiaires Echinodermes*. Of the former, the *Medusæ* are an example [Pulmograda]; the latter consist of the Echinodermata. The class is treated of under the article Stelliridians.

RAYMOND, Counts. [Languedoc.]

RAYMUND LULLY. [Lully.]

RAYNA'L, GUILLA'UME THOMA'S FRANÇOIS, born in 1711, at St. Geniez, in the province of Rouergue, now the department de l'Aveyron, studied in the Jesuits' College at Pézénas, and took orders as a priest. He afterwards left the Jesuits, and came to Paris, where he was made assistant-curate of the parish of St. Sulpice, in 1747. It is stated, in the 'Biographie Universelle,' that he was dismissed from the service of that parish in consequence of simoniacal practices; among others for exacting illegal fees for performing the office of the dead. He next turned to literary pursuits, and having made himself acquainted with several influential men, he became editor of the 'Mercure de France.' He also wrote 'Histoire du Stathouderat,' 12mo., 1748, which has been reprinted several times: the last edition is that of Paris, 1819, with additions. It is a superficial work, and written in a declamatory style. His 'Histoire du Parlement d'Angleterre' is equally superficial and inaccurate. From these and his 'Anecdotes Littéraires,' 'Anecdotes historiques, militaires, et politiques,' and other similar light works, he derived a considerable profit. At the same time Raynal speculated in mercantile affairs, and, it is said by Désessart, in his 'Siècles Littéraires de la France,' that he employed capital in the slave-trade. At Paris he frequented the society of Helvetius, Holbach, and Madame Geoffrin.

In 1770 he published his great work, by which he is chiefly known, 'Histoire Philosophique des Etablissemens des Européens dans les deux Indes,' 4 vols. 8vo., La Haye, without the author's name. The work was reprinted several times, both in France and out of France, with additions by the author; and although many passages were written in a very violent tone against monarchy, and especially the French monarchy, and against Christianity, the French government allowed the book to circulate undisturbed. In the meantime Raynal travelled in Holland and England, and collected fresh materials for his work, of which he published a new and enlarged edition at Geneva, 10 vols. 8vo., 1780, with his name and his portrait.

The French authorities now took notice of the book. In May, 1781, the parliament of Paris condemned it to be burned by the hand of the executioner, and ordered the author to be arrested and his property sequestrated, but his friends in office gave him timely notice to quit France and to place his property in safety. Raynal repaired to Spa, where a young Belgian addressed to him a laudatory epistle, 'La Nymphe de Spa à l'Abbé Raynal,' which drew upon the author the censure of the prince bishop of Liege, the sovereign of the county. Raynal replied by another letter, in which he abused the clergy, and bishops in particular, in the most virulent manner. He had long since openly renounced his priestly character, and spoke of himself as 'having been once a priest.' From Spa he repaired to Saxe-Gotha, and from thence to Berlin, where he sought an audience of Frederic the Great, who, being displeased at some passages of his work which reflected upon himself, declined seeing him for a long time, until at last, Raynal having made a written application, Frederic gave him an audience at Potsdam, made him sit down, and talked to him about his former histories of the Stathouderat and of the parliament of England. Raynal eagerly said that he had written more important works since. 'I am not acquainted with them,' replied Frederic drily, thus putting an end to further remarks on that topic. (Thiébault, *Mes Souvenirs de Vingt Ans de Séjour à Berlin.*) Frederic afterwards wrote to D'Alembert concerning his interview with Raynal, who, he said, spoke much about the wealth, the resources, and the power of nations, and in so positive a manner, 'that, in listening to him, I almost fancied that I was listening to the voice of Providence.' In 1787, Raynal was allowed to return to France, but not to Paris. His friend Malouet, who was intendant-general of the navy at Toulon, received him hospitably in his house. Raynal marked his residence in the south of France by several acts of beneficence and philanthropy, as he had done previously during a journey in Switzerland. Droz, in his 'Histoire du Regne de Louis XVI.,' says: 'Raynal was a good-hearted man, easy and mild in his manners; but the obscurity in which his former works had left his name irritated his vanity

Fearing that the valuable materials which he had collected in his principal work on the trade of the East and West Indies might not be sufficient to attract public attention to himself, he interspersed his narrative with republican disquisitions, licentious descriptions, and contradictory assertions, which he lived to regret. It is well known that the most reprehensible passages of this compilation belong to Diderot, but Raynal shared the responsibility by adopting them as his own.' Turgot, in a letter which is found in the 'Mémoires de l'Abbé Morellet,' thus characterises Raynal's history:—'Whilst I admired the talent of the author, I have been somewhat shocked at the inconsistency of his ideas, and at seeing so many conflicting paradoxes put forward, and all supported with a like warmth, a like eloquence, and a like fanaticism. He is at times immoral, like Helvetius, and at others a rigorist, like Richardson; now he speaks with enthusiasm of mild virtues, and now he extols with an equal warmth savage courage and lust; he pretends to detest slavery, and yet he thinks there must be slaves; he reasons badly in physics, badly in metaphysics, and also often in politics. You gather no fruit from his book: you perceive that the author is a very clever man, possessed of extensive information, but who has no fixed ideas, and is carried along by an enthusiasm worthy of a young rhetorician.'

Raynal's work is a fair sample of that species of composition which was known in the last century by the name of 'philosophical history,' the specimens of which have been greatly multiplied, especially in France, and have largely contributed to lead astray the minds of the people on subjects of morality and politics by confounding their ideas of right and wrong. It is one of those works which, by glowing descriptions of wrongs inflicted in ages past, accumulated as it were in one view, are apt to excite feelings of indignation and revenge against whole classes of living persons who are innocent of those evils, but who are considered as the representatives of the former perpetrators, such as kings, nobles, and priests, and which, by stimulating all the passions and removing all checks upon self-gratification, are calculated to loosen the bonds of society; leaving to the chances of futurity the task of reconstructing something on the desolation which they have helped to effect.

The distribution of Raynal's work is as follows:—Book i. is on the discoveries of the Portuguese, and their conquests in and trade with India; ii., on those of the Dutch; iii., of the English; iv., of the French; v., of the Danes, Swedes, and other northern nations; vi., vii., and viii., Conquests of the Spaniards in America; ix., of the Portuguese in Brazil; x. to xiv., Colonization of the West India Islands; the eleventh book treats of the slave-trade; xv. to xviii., Settlements of the French and English in North America; book xix. consists of general reflections on the state of society, on religion, government, war, commerce, agriculture, manufacture, population, taxation, public debt, the fine arts, sciences, philosophy, and morality, terminating with a summing up of the good and the evil derived to Europe from the discovery of America. [COLONIES.]

Raynal's work has been the subject of many strictures, refutations, and corrections. A Virginian wrote 'Recherches Historiques et Politiques sur les Etats Unis de l'Amerique Septentrionale,' 4 vols. 8vo., Paris, 1788. A Dutchman published, in 1791, one volume of extracts from Raynal's book concerning the commerce of the Dutch colonies. The duke of Almodavar extracted and translated into Spanish the part concerning the colonies of Spain, and refuted several fallacies. An anonymous writer published 'Observations sur plusieurs Assertions extraites littéralement de l'Histoire Philosophique des établissement des Européens dans les deux Indes,' 8vo., Amsterdam and Paris, 1776.

When the first symptoms of the French Revolution showed themselves, Raynal was elected by the city of Marseille as their representative in the states-general. He declined the honour on the plea of old age; but the fact was that his opinions had undergone a great change. In December, 1790, a letter appeared in the papers, purported to be addressed by Raynal to the National Assembly, expressive of his altered sentiments on political subjects. This however was disavowed by Raynal's friends; but on the 31st of May, 1791, Raynal did address an eloquent letter to Bureau de Puzy, president of the National Assembly, in which, after drawing a gloomy sketch of the state of France, of the persecutions of the clergy, of the inquisitorial power exercised against opinions, of the disorders and violence of every sort which were daily perpetrated by mobs with impunity, and all in the name of liberty, he stated his regret that 'he was one of those who, by expressing in his works a generous indignation against arbitrary power, had perhaps been the means of putting weapons into the hands of licentiousness and anarchy.' This letter, being read publicly by the president, occasioned a violent storm in the Assembly. Roederer called the president to order for reading the letter. ('Moniteur,' 31st May, 1791.) Journals and pamphlets vied with each other in abusing Raynal as a renegade and a dotard. Raynal however remained quiet in the neighbourhood of Paris; he passed unmolested through the period of terror; and he died in March, 1796, at the house of a friend at Chaillot. Just before his death the Directory had named him member of the National Institute, and his 'éloge' was read by Lebreton at one of the first sittings of that body.

A new edition of Raynal's 'History' was published at Paris in 11 vols. 8vo., 1820-21, with a biographical notice and reflections on the works of Raynal, by M. A. Jay.

The following works have been erroneously attributed to Raynal: 1, 'Inconvénients du Célibat des Prêtres' (by the Abbé Gaudin); 2, 'Des Assassinats et des Vols Politiques sous le Nom de Proscription et de Confiscations' (by Servan).

RAZOR-SHELL, the vernacular name for the shells of some species of the genus *Solen*. [PYLORIDEA, p. 146.]

RAZZI, CAVALIERE GIOVANNI ANTONIO, called **IL SODOMA**, an eminent painter, was born about the year 1479, according to some, at Verceil in Piedmont, and as stated by others at Vergelli, a village near Siena. It is certain however that he received the right of citizenship at the latter place. He was instructed, according to Vasari, by Giacomo dalle Fronte, but he chiefly formed his principles by an attentive study of the works of Leonardo da Vinci. M. Périès, in the 'Biographie Universelle,' observes that his flesh-colours, his style of chiaroscuro, and other qualities inherent in the old Milanese school and in that of Girolamo Giovenone, who flourished at Verceil, during the earlier years of Sodoma, leave traces of the manner of that master, especially in the works which were executed in the earlier period of his career of celebrity. Among his earliest performances were the pictures he painted in 1502, at Monte Oliveto, representing the history of S. Benedetto. He was employed at Rome, in the pontificate of Julius II., to decorate part of the Vatican; but his works, with those of some other artists, not being to the taste of his holiness, were removed to make way for the frescoes of Raffaello. Some grotesques however from his hands were preserved. In the Chigi Palace, now called the Farnesina, are some of his pictures, representing the history of Alexander the Great, the most noted of which is the Marriage of Roxana, which were executed by order of Agostino Chigi, and which Mr. Fuseli considers to possess much of the chiaroscuro though not the dignity and grace of Leonardo da Vinci, and to be remarkable for beauties of perspective and playful imagery. At Siena he painted many works. The Adoration of the Magi, which is in the church of S. Agostino, resembles the style of Leonardo da Vinci, and some amateurs prefer the Scourging of Christ, his chef-d'œuvre, which is in the convent of S. Francisco, to the same subject by Michael Angelo; nor is the Swoon of St. Catherine of Siena, painted in fresco, in one of the chapels of S. Domenico, unworthy of the pencil of Raffaello. The St. Sebastian, in the gallery at Florence, is supposed to be painted from an antique torso. M. Périès also mentions a picture of the Sacrifice of Abraham, painted for the cathedral of Pisa, which was in the Louvre in 1814, and was returned to Tuscany in 1815, in which, although the light is distributed in too small masses and somewhat scattered, the forms exhibit great knowledge of art, and there is an admirable expression of truth in the figures.

He is said by Lanzi to have frequently painted in a hurried manner, without any preparatory study, especially in his old age, when, reduced to poverty at Siena, he sought employment at Pisa, Volterra, and Lucca; but still, though careless of excellence, Sodoma never painted badly, and in all his pictures the traces of an able artist are visible; and Mr. Fuseli observes, when alluding to the same circumstance, 'in all his works we trace the master-hand, which, in spite of negligence, performs with power.' Vasari seems to have been a systematic opponent of Sodoma, and generally styles him a buffoon, 'but,' says Lanzi, 'Giovio has written of Razzi in a different manner; when speaking of the death of Raffaello, he subjoins: 'plures pari pene gloriâ certantes artem exceperunt, et in his Sodomas Vercellensis.' He who objects to the testimony of this eminent scholar, will receive that of a celebrated painter Annibale Caracci, passing through Siena, said, 'Razzi appears a master of the very highest eminence and of the greatest taste, and (speaking of his best works at Siena) few such pictures are to be seen.'

He seems to have had many pupils, the principal one of whom was Bartolommeo Neroni, generally called Maestro Riccio. Sodoma died in the year 1554, and is placed by Lanzi in the second epoch of the Sienese school. (Lanzi, *Storia Pittorica*, i. 280; *Biographie Universelle;* Pilkington's *Dictionary*, by Fuseli; Bryan's *Dictionary*.)

RE, in Music, the name given by the Italians and French to the second note of the diatonic scale, and generally throughout Europe to the second of the syllables used in SOLMIZATION.

RE', or RHE', ILE DE. [CHARENTE INFERIEURE.]

READING, the county town of Berkshire, situated in the hundred of Reading, but with separate jurisdiction, on the river Kennet, just above its junction with the Thames, 38 miles in a direct line west of St. Paul's, or 42 miles from the General Post-office by Brentford, Hounslow, and Maidenhead.

The first mention of Reading is in the year 871, when it was occupied by the Danes, who had thrown up an intrenchment between the Kennet and the Thames, to defend the tongue of land on which the town stands. They repulsed an attack of the West Saxons, under their king Ethelred and his brother Alfred, but quitted the town towards the close of the year. In A.D. 1006 it was burnt by the Danes, who destroyed an abbey of nuns, on the site of which a new abbey was erected by Henry I., who was buried here. In the civil war of Stephen and Maud, the town and castle changed hands more than once. It is supposed that the castle was demolished soon after that time. In the following reigns the kings frequently resided at Reading, and parliaments were held here. On the dissolution of the abbey, the buildings were appropriated as a royal palace. In the civil war of Charles I. Reading was made a parliamentary garrison; but Henry Marten, the governor, with the garrison, fled on the approach of a party of royalist cavalry (November, 1642), and the town was garrisoned by the king. In April, 1643, the Parliamentarians, under the Earl of Essex and General Skippon, besieged the town, and took it, after a faint resistance. The Royalists, under Prince Rupert, who had attempted to relieve it, were repulsed, at Caversham Bridge, near the town. Sir Arthur Aston, who had the command of the garrison, was wounded, and Colonel Fielding, who took the command, was condemned to death for the surrender, but pardoned. After the first battle of Newbury (September, 1643), the town was again occupied by the king, who left a garrison under Sir Jacob Astley, but in May, 1644, the Royalists quitted the town, which was finally occupied by the Parliamentarians. Reading suffered severely from being so long a garrison town. In the Revolution of 1688, the troops of James II. occupied the town a slight skirmish took place here, and the king's forces speedily retired.

The town lies partly between the Kennet and the Thames, partly on the south side of the Kennet; it comprehends the three following parishes:—

	Area in Acres.	Population in 1831.
St. Giles . .	480	4749
St. Lawrence .	340	4048
St. Mary . .	1260	6798
	2080	15,595

The town altogether is very irregularly laid out. The parish of St. Lawrence, which is on the north-east side of it, occupying the point of land at the junction of the Kennet with the Thames, is probably as much covered with buildings as ever it will be, the unoccupied part consisting of low marshy meadows along the bank of the Thames; it contains the market-place, and two of the best streets in the town for business. The parishes of St. Mary on the west, and St. Giles on the south-east, contain portions of the trading part of the town. A large portion of the poorer classes reside in St. Mary's. St. Giles contains the residence of most of the gentry and persons of independent fortune. It is the favourite part of the town for building on, and several new streets and squares have been laid out along the London road. The town is well-paved, and lighted with gas, and amply supplied with water from the Kennet. The houses are in general substantial, and built of brick; but there are some old ones of lath and plaster, with high gables. St. Lawrence's church appears to have been considerably repaired in 1434, but there are some portions of the original structure of Norman character; it consists of a nave and north aisle, separated from each other by a row of octagonal pillars, supporting five elliptical arches with ogee mouldings, and a chancel. There is a fine tower at the west end, of perpendicular character, and of checquered flint-work; it has a peal of ten bells. St. Mary's church consists of a nave, south aisle, a small north aisle, and a chancel: it was rebuilt about 1551, chiefly from the materials of the abbey church, then pulled down; it has a tower of similar character to that of St. Lawrence, but not equal to it. A large part, if not the whole, of the exterior part of the church is of checquered work. St. Giles's contains little that is remarkable. The town-hall is a modern building, over a part of the free-school; and there is a building termed (for what reason is not known) 'the oracle,' erected by Mr. John Kendrick, a great benefactor to the town, early in the seventeenth century, for the employment of the poor; the principal gateway, which is the most striking portion, is of mingled Gothic and Grecian architecture. As the river Kennet has a divided channel, there are many bridges; that over the main stream, in Duke Street, is a handsome stone bridge of one arch, with balustrades. There are some ruins of the abbey, especially one of the gates, and also some interesting remains of the abbey mill.

The trade of the town is considerable. There was antiently a large manufacture of woollen cloth, but it has become extinct. Some silk ribands and galloons are woven, and some floor-cloth and sail-cloth is made. There are iron foundries, breweries, and yards for boat-building. Trade is carried on in corn, seeds, malt, timber, bark, hoops, wool, cheese, and beer. There are markets on Wednesday and Saturday, the latter chiefly for corn; and four yearly fairs, one a large cheese-fair. The Kennet is navigable to the Thames, and the Kennet and Avon canal affords a water-communication with the west of England. The Great Western railway passes the town, and the main road from London to Bath and Bristol runs through it.

Reading claims to be a borough by prescription; the earliest known charter is of 37 Henry III., A.D. 1253. The corporation, by the Municipal Reform Act, consists of six aldermen and eighteen councillors; the town is divided into three wards. The spring assizes, and the Epiphany, and occasionally, though rarely of late years, the Michaelmas sessions for the county, are held here; and there are quarter-sessions for the borough, a court of record for causes not exceeding 10*l.* in amount, and a court leet, holden by the corporation as the lords of the manor. Petty-sessions are held here weekly for the division. There is a small borough gaol, altogether unfit for its purpose; and a county gaol, of very defective construction, so as to preclude the carrying into effect of many arrangements which the good discipline of the prison requires.

Reading is one of the polling-stations for the county. Two members of parliament are returned by the borough. It has possessed the right of election from 23 Edward I.; it was a scot and lot borough. The number of electors in 1835-6 was 977.

The living of St. Giles is a rectory, of the clear yearly value of 522*l.*, with a globe-house; that of St. Lawrence is a vicarage, of the clear yearly value of 276*l.*, with a glebe-house; and that of St. Mary a vicarage, of the clear yearly value of 661*l.*, with a glebe-house. There is a chapel-of-ease in St. Mary's parish, and there are several dissenting chapels and a Catholic chapel in the town. Reading is in the archdeaconry of Berks, which the Ecclesiastical Commissioners have proposed to transfer from the diocese of Salisbury to that of Oxford.

There were in the borough, in 1833, two infant-schools, with 193 children; thirty-five day-schools or boarding and day schools, with 720 boys, 406 girls, and 80 children of sex not mentioned; three day and Sunday schools, with 502 scholars in the week and 651 on Sundays; and sixteen Sunday schools, with 698 boys and 630 girls. One of the day-schools is a free grammar-school, of which the late Dr. Valpy was for many years master. Several of the other schools are supported, at least in part, by endowments or subscription.

There are a public library and news-room, called the Reading Institution, a subscription news-room, a small theatre, and baths. There are several almshouses, and a dispensary.

REAL ESTATE. [Property.]

REALEJO, a seaport on the Pacific, in Central America, in the republic of Nicaragua, and in the department of Leon, in 12° 30′ N. lat. and 87° 7′ W. long. The harbour is formed by a small bay, at the entrance of which are two islands, called El Cardon and El Castanon. Vessels enter the harbour by the strait which separates these two islands. The harbour is spacious and safe, and has good anchoring-ground. The town is built on the northern shores of an inlet near the bay: it contains a population of less than 3000, but if that of the neighbouring village of Chinandego is included, it hardly falls short of 15,000. The inhabitants are chiefly merchants and persons occupied in ship-building, for which the neighbouring forests supply abundance of timber. Ship-building is a large branch of industry, and there are docks for that purpose. The commerce with the other republics of South America is considerable. The principal articles of trade are cacao, indigo, sugar, timber, mahogany, cedar-wood, tar and pitch, sail-cloth, and hides. Realejo may be considered as the port of the town of Leon, which is only about twelve miles distant, and connected with it by a carriage-road, the whole intervening distance being nearly on a level.

(Juarros, *Statistical and Commercial History of Guatemala*, translated by Baily; and Haefken's *Central America*.)

REALGAR. [Arsenic.]

REALISTS. [Nominalists.]

REAPING (or cutting the corn when it is ripe) is one of the most important operations of harvest. It requires many hands to accomplish it in proper time, so that the corn which is ready for the sickle may not be too ripe and shed, nor the fair weather be allowed to pass before all the corn is secured in barns or stacks. The labourers who are required all the year for the common purposes of husbandry seldom suffice for the harvest, especially on extensive farms, and recourse is usually had to the assistance of mechanics and artisans from the neighbouring towns and villages where the population is considerable, or labourers are induced by good wages to come from a distance. As the harvest is later in those parts of every country which have a more northern situation, or are higher above the level of the sea, bands of reapers from these come to assist in the harvest of those tracts whose produce is earlier. To encourage the annual return of so desirable assistants, every encouragement is given them, not only by wages, but also by food and drink, and amusements after the toil of the day. Thus the time of harvest is a time of rejoicing both to the labourers and the master.

The common reaping-hook, or sickle, with which the corn is usually cut, is one of the oldest instruments of husbandry; and the goddess Ceres was generally represented by the antients with a sheaf of corn and sickle in her hand. In reaping with the sickle, a portion of the stems is collected with the left hand, and held fast; while the sickle in the right hand is inserted below the left, taking the stems in its semicircular blade, and cutting them through by drawing the sickle so as to act as a saw, for which purpose the edge is finely serrated in a direction from the point to the handle. The heads of the corn, with the upper part of the straw, are then laid on the ground in quantities which may readily be collected into a sheaf. Practice soon gives dexterity to the reaper; and he finds it more expeditious to cut small quantities in succession until he has filled his hand, than to attempt to cut through a large handful at once. Severe wounds are often inflicted on the fingers of the left hand by beginners, even to the loss of a finger; but this soon makes them cautious and expert. The division of labour is introduced with advantage amongst a band of reapers. A certain number cut the corn, while others follow to gather the sheaves; some only preparing the bands, and others tying them and setting up the sheaves into stooks or shocks, which usually consist of ten or twelve sheaves. The smaller the sheaves are, the less injury the corn sustains in a wet harvest; as the moisture in a thick sheaf does not so readily evaporate. Hence it is the interest of the farmer to see that the reapers do not make the sheaves too large. In many places there is a regular measure for the circumference of a sheaf, which should never exceed thirty inches. The bands are made by taking two small handfuls of the cut corn, and crossing them just below the ears into a knot. The sheaf is then pressed with the knee, and the band drawn tightly around it. The ends are twisted together like a rope, and inserted under the band, which effectually fastens it. This operation is soon learnt, and is done very rapidly. The sheaves should be so tied that there may be no danger of their falling loose when pitched into the cart or stacked, without being so tight as to prevent the moisture in the straw from evaporating. They should not be tied too near the ears, but rather nearer to the butt. The sheaves, when tied, are placed two and two on the butt-ends, with the ears leaning against each other: sometimes they are placed in a circle, all the ears being together, and the butts slanting outwards; a sheaf is then opened, by inserting the band into the middle of the ears, and reversed over the tops of the preceding, forming a cone, and covering all the other ears, while it hangs down around them. In this position they will bear much rain without injury. It is a good practice to place the shocks across the furrows between the stitches or lands, so as to allow the air to circulate more freely around them. In this case four or five sheaves are placed in a row, leaning against as many in a parallel row; and two sheaves, being opened, are reversed over them to protect the ears. Whatever be the mode adopted in reaping the corn, the same kind of sheaves are formed, and set up in shocks.

Wherever the sickle is used for reaping, the straw is cut at a certain height from the ground, and the remainder forms a long stubble, which is usually mown at leisure after harvest, and carried into the yard for litter; but in the neighbourhood of large towns, where straw is sold at a good price, or exchanged for stable dung, it is important that as much as possible of it should be cut with the corn. This has introduced the practice called fagging, and sometimes bagging, the origin of which provincial expressions is not well known. The instrument used for this purpose partakes of the nature of a scythe, as well as of a reaping-hook. It is shaped like a sickle, but is much larger and broader; and instead of being indented like a saw, it has a sharp edge like a scythe, which is renewed when blunt by means of a stone or bat. The fagging-hook cuts the straw close to the ground by a stroke of the hand; and its curved form is only useful in collecting stray stems, and holding a certain quantity of them between it and the left hand of the reaper when he makes up a sheaf. A certain quantity is cut towards the the standing corn, the left hand pressing it down at the same time. When as much is thus cut as would make half a small sheaf, the reaper comes backwards, cutting in a direction at right angles to the first, and rolling together the two parts, which he carries in the bend of his hook and places on the band which has been prepared for him. A full-sized sheaf is usually composed of two cuttings. Two men will fully employ a third to make bands for them, tie up the sheaves, and set them up. This method of reaping is laborious, on account of the stooping required to cut near the ground. The Hainault scythe, which has been described in most agricultural works, does the work better, and with less fatigue. It is in fact a fagging-hook, not quite so curved, of which the handle is longer, and placed at an angle with the plane of the blade. It requires some practice to give the proper swing to it by a peculiar motion of the wrist; but when this is once acquired, a considerable saving of labour and time is effected. Many attempts have been made to bring it into use in England; but, from the obstinacy of the labourers, or the want of perseverance in the masters, without much success. A better instrument however on extensive farms is the cradle-scythe, which, in the hands of an expert mower, will do more work and more effectually secure all the straw than any other instrument.

The objection to the great barn-room required for so much straw is obviated by the practice of stacking the corn in the open air on proper stands to keep it dry and out of the reach of vermin. The additional trouble in threshing is not so great as that of mowing or raking the stubble, which is generally deferred till half of it is lost by decomposition by the air and moisture. The advantage of mowing extensive crops is clearly shown in a paper in the fourth number of the 'Journal of the Royal Agricultural Society of England,' by Mr. Rodwell of Alderton Hall, Suffolk, who has found by experience that the crop of wheat which was mown by the scythe and tied up in sheaves was fully as soon fit to be carried as that which had been reaped. When the saving of time is considered as well as the saving of expense, there seems to be no doubt that on an extensive farm the scythe is far preferable to the sickle for cutting every kind of grain. Barley and oats are usually mown and carried without tying them into sheaves, but this is a slovenly and wasteful practice: by means of the cradle-scythe they may be mown so regularly as to be readily tied into sheaves; and the additional expense will be fully compensated by the saving of all the corn which, being on the outside of the stack, is lost by the depredations of small birds.

Beans are usually reaped by the sickle, the stems being too strong and too wide apart to admit of the scythe. Where it can be done conveniently, without the soil adhering too much to the roots, it is better to pull them up, and tie them in bundles with straw bands, or tar-twine, which will be found both a convenient and economical method.

Peas are generally reaped by means of two large hooks similar to the fagging-hooks, one of which is held in each hand; and the stems, which are generally much interwoven, are partly cut and partly torn from the roots, and so rolled up into a small bundle laid loose in order that it may dry. Tares are reaped in the same way.

The expense of reaping corn is considerable, especially where the population is scanty. In the eastern counties men are engaged for the whole harvest, which, in favourable weather, is supposed to be completed in a month. During this time they have their usual daily wages, with or without food, and a certain sum besides, as harvest money. In other districts the labourers reap the corn by the acre, with a certain allowance of beer, or money instead of it. The price of fagging in Middlesex and within 30 miles around London varies from nine to twelve shillings per acre, according to the crop, and if it is lodged, as much as fifteen shillings is often paid, including beer. The use of the scythe considerably diminishes the expense, as fewer labourers are required.

There have been many attempts to introduce machinery for reaping corn. Some of the inventions were ingenious and promised well. but none, when put to the test, answered the expectations formed. The various inclinations of the straws prevent any regular mode of cutting. A patent is at this moment obtained for an invention for reaping corn and mowing grass, of which the particulars have not yet been published: whether it will be more successful than its predecessors remains to be proved. The principle of most reaping-machines, is that of a revolving edge to cut the straw, and a drum to lay the cut corn down regularly. Wherever the corn is laid or lodged, it is evident that no machine can collect straws lying in every imaginable direction and interwoven with each other. Till some better invention appears, the scythe will probably be found the cheapest and most expeditious instrument for reaping the corn. [Harvest.]

REASON, according to the common notion, is the highest faculty of the human mind, by which man is distinguished from brutes, and which enables him to contemplate things spiritual as well as material, to weigh all that can be said or thought for and against them, and hence to draw conclusions, and to act accordingly. A man may therefore be said to possess reason in proportion as he actually exercises that power, that is, reasons and acts according to the conclusions or results at which he has arrived. In such expressions as 'We have reason to believe such an account,' or 'He has no reason to be dissatisfied,' the word 'reason' does not signify the mental power itself, but the conclusion or result of the process of reasoning, in contradistinction to motives, which are never the results of mental operations, but merely outward circumstances by which our actions are influenced.

Thus far reason is of a purely practical nature, and Kant therefore divided reason (if we may venture to translate his word *Vernunft* by the English word *reason*) into practical and theoretical. The latter, which is also called pure, ideal, or transcendental reason, is, according to him, the mind's power of producing ideas *à priori* from its own resources, or the power of conceiving things and their attributes which lie beyond the sphere of our experience, such as infinity, the absolute, God, the supreme good, &c. How far our knowledge of these things can extend is shown in the work of Kant, entitled 'Kritik der reinen Vernunft,' or 'Criticism of Pure Reason.' Reason, in its practical acceptation, forms ideas *à posteriori*, in as far as it derives them from a consideration and comparison of the phenomena of the external world, endeavours to discover unity in variety, and traces all phenomena to one source, a supreme reason, of which human reason is only a reflex.

Schelling defines reason to be the identity of the subjective and the objective, that is, the identity of the power which knows and that which it knows, which includes the knowledge of this identity. As the original identity, says he, exists in God, or is God, reason is a direct knowledge or an intellectual perception of God, of whom no indirect knowledge is possible. Hence God and reason are essentially of the same nature; they are identical: God is in reason, and reason is in God.

(G. M. Klein, *Beiträge zum Studium der Philosophie als Wissenschaft des All.*, p. 218, &c. There are some good remarks on this subject in S. T. Coleridge's *Aids to Reflection*, p. 157, &c.)

RE'AUMUR, RENE'-ANTOINE FERCHAULT DE, was born at Rochelle in 1683. He was brought up to the law, but being much attached to scientific pursuits, and possessing an independent fortune, he gave up his profession and went to Paris in 1703, where he determined to devote his life to his favourite studies. In 1708 he read some geometrical observations before the Academy of Sciences, which were so well received that he was admitted a member at the age of 24. He belonged to that learned body for fifty years, and contributed a vast number of interesting papers to their Memoirs.

The chief objects of his attention were the improvement of the arts and manufactures of his country, and natural history. In 1711 he made some experiments relative to the manufacture of cordage, and he proved that the strength of a cord is less than the sum of the strengths of the threads of which it consists; whence it follows that the less a rope is twisted, the stronger it is. In 1715, while examining the process of colouring artificial pearls, he discovered the nature of the singular substance which gives the brilliancy to the scales of fishes, and he investigated the mode of formation and growth of these scales. He also made some researches of a similar kind on the development of the shells of testaceous animals. When describing, in 1715, the turquoise-mines which he discovered in Languedoc, and the means which are employed to colour these stones, he found that the substances of which these gems consist are portions of the fossil teeth of an extinct animal since named the mastodon.

The most important of Réaumur's labours in the department of the arts were the experiments which he made on the manufacture of iron and steel. He published his researches on this subject in a separate work (those which we have before mentioned appeared in the Memoirs of the Academy), entitled 'Traité sur l'Art de convertir le Fer en Acier, et d'adoucir le Fer Fondu.' He here described the process of making steel, which was then unknown in France (that metal being solely obtained from abroad), and he made his discovery public, for which national benefit the Regent duke of Orleans settled on him a pension of 12,000 livres. He also discovered the art of tinning iron, which was likewise unknown in France. During his experiments on metals Réaumur first observed that these substances in passing from a fluid into a solid state have a tendency to assume certain definite crystalline forms. Among his other useful labours he greatly improved the manufacture of porcelain in France. He also made a number of experiments on artificial incubation, which has been practised from time immemorial in Egypt. He endeavoured to introduce the art into common use in France, but was not successful, owing principally to the greater coldness of the climate than in Egypt. In 1711 he discovered a species of mollusk from which a purple dye might be prepared analogous to the purple of the antients.

In general physics the name of Réaumur is celebrated from the thermometer which he invented in 1731. He took the freezing and boiling points of water as two fixed points, and then divided the interval into 80 degrees, the freezing point being zero. The centigrade thermometer now in more general use in France was only an improvement on Réaumur's, the interval between the freezing and boiling points being divided into 100 instead of 80 degrees. [Thermometer.]

Though many of the researches which we have mentioned (most of which will be found in the Memoirs of the Academy, together with many papers on other subjects by the same author) were very useful and important, yet his labours in the field of natural history were much more novel and interesting. In 1710 he described the means by which many shell-fish, echinodermata (sea-stars), and other mollusks and zoophytes, execute their progressive movements, and in 1712 he observed the curious phenomenon of the reproduction of the claws of lobsters and crabs.

Of all the works of Réaumur, 'the most remarkable,' as Cuvier says, 'and those which cannot fail to be studied with the most vivid interest by those who wish to have just ideas of nature, and of the marvellous variety of means which she employs to preserve the most fragile of her productions, and those which are in appearance the least capable of resistance,' are his 'Mémoires pour servir à l'Histoire des Insectes,' of which 6 volumes 4to. appeared between 1734 and 1742. Cuvier adds, 'The author here carries to the highest point his acuteness of observation in the discovery of those instincts, so complicated and so constant in each species, which maintain these feeble creatures. He unceasingly excites our curiosity by new and singular details. His style is a little diffuse, but clear, and the facts which he relates may always be depended on.' While collecting materials for this work we find it recorded that he kept numerous insects of all kinds in his garden, for the purpose of observing their habits and instincts. Unfortunately this work is not finished, and the 7th volume, which came into the hands of the Academy of Sciences after the death of the author, was left in such an imperfect state that it was not capable of publication. The six volumes which were completed include all the winged insects, except the crickets (*gryllus*), grasshoppers, and beetles. The first two volumes comprise the various kinds of caterpillars, with a description of their forms, mode of life, metamorphoses, &c., as well as the different insects which attack them or live parasitically within them. The third volume includes the clothmoths, aphides, &c. The fourth embrances the gall insects and the various two-winged flies. The fifth contains the history of bees, and Réaumur made many interesting discoveries concerning the habits of these curious insects, which however have been greatly added to since by the labours of Huber and others. The smaller communities of wasps, hornets, &c., together with an account of the different kinds of solitary bees, occupy the sixth and last volume, which is one of the most curious of the whole.

Réaumur formed a large collection of objects of natural history, of which Brisson was the conservator, and the principal materials for that naturalist's works on quadrupeds and birds were collected from it. Many of Buffon's plates were also taken from objects in his museum, which, after his death, went to the 'Cabinet du Roi.' Réaumur passed a quiet retired life, and his private history is unmarked by any important incident. He is said to have died from the effects of a fall which he received while riding in the country. His death took place in October, 1757, in his 75th year. (*Life*, by Cuvier, in *Biog. Univ.*)

REBEC (*Rebec*, Fr.), a musical instrument of the violin kind, which had three strings tuned in fifths, played on by a bow. This, which has long been in disuse, was small in size, something between the modern violin and the dancing-master's *kit*, or pocket-fiddle, and seems to have been the primitive violin. Laborde says that it was the favourite instrument of the minstrels; and the *ribible*, of which Chaucer and Gower speak, is supposed to have been the rebec. It was much used at festive entertainments. Milton, in *L'Allegro*, mentions it as the 'jocund rebec.'

REBELLION. [Sovereignty.]

REBOLLE'DO, BERNARDINO, COUNT OF, a distinguished Spanish officer and writer, and one of the heroes of the latter period of the thirty years' war in Germany, was born of illustrious parents at Leon, the capital of the province of that name, in 1597. From his early youth he embraced the profession of arms, and joined the Spanish army of Italy, where he so much distinguished himself as to obtain soon after (1622) the command of a galley, with which he assisted in the taking of Port Maurice and the castle of Ventimille from the Genoese. After this he served in the army, and was present at the taking of Nice (1626) and the storming of the fortress of Casal, where he was severely wounded. In 1632 he commanded a considerable body of Spanish infantry in the Low Countries. Having, in 1636, received orders from his government to march to the assistance of the emperor Ferdinand II., who was closely pursued by the Swedes, he succeeded in extricating that monarch from his perilous situation, and was by him rewarded with the title of Count of the Germanic Empire and the government of the Low Palatinate. At the conclusion of the war, Philip IV. rewarded Rebolledo's services by appointing him his ambassador to the court of Denmark; and rendered signal service to the king of Denmark when Charles Gustavus marched his army across the frozen sea and bombarded Copenhagen. Though a zealous Catholic, Rebolledo felt for the royal house of Denmark a kind of personal devotion, which he seized every opportunity of manifesting in his writings. He had early evinced some talent for poetry, and his taste for military and political affairs had not prevented him from successfully cultivating literature. He had whilst in Germany composed a sort of didactic poem on the art of war and state policy, entitled 'Selvas Militares y Politicas,' which he afterwards published at Copenhagen in 1652, 16mo. But it was not until his mission to that capital, when he had attained the age of maturity, that Rebolledo found leisure to prosecute with assiduity his poetic studies. He seems to have taken particular interest in the history and geography of Denmark, a compendium of which he put into verse, which was printed at Copenhagen, under the title of 'Selvas Danicas,' 1665, 4to. After a residence of several years at the court of Denmark, Rebolledo was recalled to Madrid, where he was soon after appointed president of the Board of War in the council of Castile. He died in 1676, in the eightieth year of his age. Besides the two above-mentioned works, Rebolledo wrote—1, 'La Constancia victoriosa y Trinos de Jeremias,' Colonia (Copenhagen), 1665, 4to., being a paraphrase of the Book of Job and the Lamentations of Jeremiah; 2, 'Selvas Sagradas,' Ib., 1657, and Antwerp, 1661, 4to. [These are sundry poems on moral and religious subjects, and chiefly translations of the Psalms, where the author displays some poetic feeling, though much disguised under the pedantic forms of the Gongorine school.]; 3, a play entitled 'Amor despreciando Riesgos' (Love dreads no Danger), possesses considerable interest. Rebolledo was particularly successful as a writer of madrigals, some of which are so good as to remind the reader of the best times of Spanish poetry, which in Rebolledo's time was fast on its decline. His lighter poems appeared at Antwerp, 1660, 16mo., under the title of 'Ocios' (Leisure Hours). An edition of Rebolledo's works was collected in his lifetime, and appeared at Antwerp, 1660, in 3 vols. 4to. But the best and most complete is that of Madrid, 1778, 4 vols. 4to.

REBUTTER. [Pleading.]

RECAPTION. [Replevin.]

RECAPTURE. [Prize.]

RECEIPT is when, in an action between others, a stranger whose rights or interests may be compromised by the result of the suit, prays to be received as a party to it for the purpose of defending them.

This was a remedy partly existing at common law, partly created by statute. The object of it was to prevent the tenant of the freehold, or the termor, &c. respectively, by means of an action collusively brought against him, from defeating the rights of the termor, or the tenant of the freehold, &c. by offering no real defence to the action. In such case the party sought to be thus defrauded was allowed to come and defend his own rights himself. (2 *Inst.*, 233; Com. *Dig.*, tit. 'Receipt.') Something analogous to this has been provided by stat. 11 Geo. II., c. 19, § 11, 12, under which, in case of ejectment against a tenant, the landlord, heir, mortgagee, &c. is allowed to come in and defend in his stead. [Ejectment.] In actions of a personal character, by the statute of Interpleader, 1 & 2 Will. IV., c. 58, a defendant who has no interest in the matter for which he is sued, may substitute in his place a third party who claims an interest in it.

In its more general and popular sense receipt means a written discharge of a debtor on the payment of money due. When given for sums greater than five pounds, it must be stamped. The amount of the stamp duty varies with the sums for which it is given, from 3*d*. up to 10*s*. A receipt, though evidence of payment, is not absolute proof, and this evidence may be rebutted by showing that it has been given under mistake, or obtained by fraud. (Impey's *Stamp Act*; stat. 55 Geo. III., c. 184; 3 & 4 Will. IV., c. 23.)

RECEIVER. A Receiver is a person appointed by the Court of Chancery to receive the rents and profits of land, or the produce of other property, which is in dispute in a cause in that court. He is an officer or agent of the court, and as such under its general control.

A receiver is never appointed unless a suit is pending concerning the property in question; and he can only be appointed upon motion in court, after notice has been given to the proper parties. The motion is generally made after answer; under special circumstances it may be made before answer, but the motion must be supported by sufficient affidavits. The cases in which a receiver is appointed are those in which there is great danger of property being wasted or lost, owing to the want of a proper person to look after it. The following are some instances in which a receiver will be appointed: when an infant is entitled to real estate, especially if it be of considerable magnitude: in suits between partners in trade for the purpose of winding up the concern, when a partner is grossly misconducting himself, disposing of the partnership property, or excluding his copartners from the management of the partnership affairs: when the representation to a person deceased is in dispute in the ecclesiastical courts, and no person has been appointed executor; but if probate has been granted, and there is a suit in the ecclesiastical courts for recalling probate, a receiver will not be granted on that ground only (Watkins *v.* Brent, 1 M. and C., 97): when there is danger of the assets of a testator being lost or wasted through the misconduct of an executor. A manager of West India estates has power to set and let them, and to expend money in repairs; but a receiver has not such power, except as hereafter mentioned.

Certain persons are disqualified from being receivers, such as a solicitor in the cause, the next friend of the infant plaintiff, a peer of the realm, and a receiver-general of a county. The order which is made on motion for the appointment of a receiver, refers it to the master to appoint a proper person, and the master's appointment is conclusive, unless it can be shown to the court that he has appointed an improper person. The receiver must find sufficient sureties, according to the value of the property of which he is appointed receiver; and on the sureties being approved by the master, they and the receiver enter into recognizances before him, and he makes his report of the appointment, which is filed in the report-office.

It is the duty of the receiver, when his appointment is completed, to inform the tenants of the estate in question of his appointment, by the production of the order and the master's report appointing him receiver, that they may pay the rents to him. In every order which directs the appointment of a receiver of landed property, there must be inserted a direction that such receiver shall manage as well as set and let, with the approbation of the master, who is to receive any proposal for the management or letting of the estate from the parties interested, but he must make his report thereon to the court for confirmation in the usual way.

A receiver may distrain for rent, but he must distrain in the name of the person who has the legal estate. If there is a receiver of the rents of an estate under an appointment of the court, an action of ejectment cannot be brought against the tenants in possession, nor against him, if he is actually in possession, without the leave of the court (Angel *v.* Smith, 9 Ve., 335); nor can a receiver defend an ejectment, and charge the expense of the defence in his account, without leave of the court.

A receiver is paid by a per centage on the sum which he receives, usually a shilling in the pound; and sometimes, in the case of large estates, by a fixed salary. But the court, on making an order for a receiver, may refuse to allow a salary; and it often happens that one of the parties in the suit, with the consent of the others, undertakes the office of receiver without a salary. He must annually pass his accounts of receipts and payments before the master, who prepares a report of passing the account, which is filed in the report-office, and does not require confirmation. It is directed in the order or decree for the appointment of a receiver, that the receiver shall from time to time pay the balances which shall be reported due from him into the Bank, with the privity of the accountant-general, to the credit of the cause. A receiver who does not pass his accounts and pay in the balances may be deprived of his salary. (15 Ve., 273.) If he make default in payment of his balances, the recognizances may be put in suit, or an order of the court may be obtained, upon motion and notice to the receiver, that he pay in the balance by a certain day, or stand committed. A receiver of rents and profits has to pass yearly or half-yearly accounts, as the rents and profits are received, and he is chargeable with interest at 5 per cent. on balances in his hands which he neglects to pay at the times fixed for that purpose. A receiver of personal estate retaining balances in his hands will lose his salary but in respect of interest he is only to be charged as an executor would be, who had received personal estate. (Potts *v* Leighton, 5 Ve., 273.)

When the receiver has passed his final account before the master, procured the master's report thereof, and filed it, and paid the balance into the Bank, or to the person entitled to receive the money, to whom the order directs him to pay it, he may apply by petition to the court for the vacating of the recognizances and his own discharge, and an order will be made accordingly, upon all the facts being proved to the court, which are the foundation of the receiver's right to his discharge.

A receiver is not liable to make good unavoidable losses.

RECEIVER. [RETORT.]

RECESS. This word is so familiar as to need no explanation, and it can hardly be classed among architectural terms; but that the subject of recesses should hitherto hardly have been treated of at all by professional writers, is somewhat remarkable, because there is nothing which contributes more to effect, or affords greater scope for design and fresh combinations in interior architecture. We shall here briefly notice the several circumstances which belong to recesses, and which tend to modify their character. Besides those of *plan*, *elevation*, and *section*, there are others, one of which is that of *relative size*, as compared with the rest of the plan. Ordinary shallow recesses—which kind might be distinguished by the name of *blank recesses*, since they are little more than breaks in the wall, and do not at all affect the general plan of a room—hardly belong to the subject, since they admit of scarcely any variety. By recesses we here mean those which come under the denomination of exhedræ, tribunes, alcoves, and afford considerable additional space. In plan these may be either curved or rectilinear, that is, semicircular (like the tribune of a Roman basilica) or segmental; or else polygonal, or rectangular, in which latter case the plan may be either a parallelogram, or so deep as to be a perfect square. Neither are these the only varieties of plan, for in each instance the recess may be either simple or *expanded*, that is, wider within than the breadth of the opening towards the room. If the plan be curved, it is usual to make the elevation in the form of an arch, either plain or decorated; in which latter case, it is sometimes the practice either to continue the archivolt without any impost, or to make it rest upon the entablature or capitals of pilasters. Elevations of this class however are only *astylar:* it is when columns come to be introduced into them, that alcoves admit of so many combinations and so much variety of design. The usual mode indeed is merely to separate the recessed part of the plan from the rest by a single line of columns, or rather, by only two columns, forming a *distyle in antis*,—that number being seldom exceeded; but it is by introducing columns behind and within—by extending the recess either laterally or in its background—by admitting light into it from above—that novel and scenic effects may here be produced almost without number. As regards utility and convenience, it is unnecessary to point out the advantage attending a deep alcove for the side-board in a dining-room, communicating immediately with a staircase for the attendants,—of which kind the tribune in the dining-room at Holkham furnishes one of the earliest and best examples; but alcoves and recesses add also to the commodiousness of other apartments—libraries, drawing-rooms, &c., affording nooks for study, or conversation apart, similarly to the spacious bays and recesses of that kind in Gothic mansions.

RECIPROCAL, a mathematical term mostly applied to the fraction made by inverting another fraction; thus $\frac{4}{3}$ is the reciprocal of $\frac{3}{4}$, and $\frac{1}{7}$ of 7 or $\frac{7}{1}$. The term arises from the common meaning of the adjective reciprocal, and would be properly applied in every case in which A has to B the same sort of relation that B has to A. Custom however confines the absolute use of the term to that above-mentioned. A reciprocal property is one which each of two things has with reference to the other; thus if A and B be what are called conjugate diameters of a conic section, the tangent at either extremity of A is parallel to B, and that at either extremity of B is parallel to A. Hence these lines are reciprocally connected with each other, and are therefore called conjugate; for the word conjugate, which denotes joined, generally means joined by a reciprocal property.

RECITATIVE (*Recitativo*, It.), language delivered in musical tones, that is, in the sounds of the musical scale.

It differs from air in having no fixed time or measure, the lengths of the notes depending on the singer, who regulates them according to his own notion of the emphasis and expression required; and it is not governed by any principal or predominant key, though its final cadence or close must be in some cognate key of the air which follows, or, at least, in no very remote key. Recitative is of two kinds—*Unaccompanied* and *Accompanied*. The first is when a few occasional chords are struck by the piano-forte, or by a violoncello, to give the singer the pitch, and intimate to him the harmony. The second is when all, or a considerable portion, of the instruments in the orchestra accompany the singer, either in sustained chords or in florid passages, as the composer may deem expedient, in order to give the true expression or colouring to the passion or sentiment to be expressed. Perhaps the Italian definition of Recitative, *musica parlante*—speaking music—is the best, as it certainly is the most concise, that can be offered.

There can be no doubt that the language of the antient drama, both Greek and Roman, was delivered in a kind of recitative. [MUSIC; OPERA.]

RECKONING AT SEA is the process of computing the several elements which relate to the determination of the ship's place at any time. The term may include the operations which are performed in finding the latitude and longitude of the ship, the variation of the needle, &c., from celestial observations; and the part which is independent of these is called the *dead-reckoning*. It is this last only which we purpose here to explain.

When a ship crosses the seas towards the place of its destination, its path, on account of the various winds, currents, &c. by which it is impelled, is always indirect, and generally consists of numerous zig-zags, whose portions are lines of a few miles in length. The length of each of these lines, and the angle which it makes with the terrestrial meridian passing through one of its extremities (all necessary corrections having been made) are the data obtained by the *log-line* and *compass;* and the earth being supposed to be a sphere, those lines might be considered as arcs of great circles. Hence the rules of spherical trigonometry might be employed to find the length of an arc joining the two extremities of the series of indirect lines, and the angle which it makes with the meridian passing through either of those extremities; and, from these, the geographical position of the ship. But, because this process is considered laborious, others possessing greater facilities are, according to circumstances, employed, and these will be described after it has been shown what are the corrections which the observed elements require before they can be used in the computations.

The reckoning may be said to commence when the ship is on the point of quitting a harbour or road; and the first circumstances to be recorded are the observed bearing and the estimated distance of some remarkable object on the coast whose geographical position is known, together with the bearing of the ship's line of motion at the time, and her velocity on that line.

Let it be here observed that the said object on the coast is called the point of *departure*, and that the angle which the line of a ship's motion at any time makes with the meridian passing through the actual position of the ship is called her *course*. Now, while the angle indicated by the compass remains the same, the ship's path, except when it coincides with the meridian, or with a line tending due east and west, is a portion of that which is called the *loxodromic curve* [RHUMB-LINE]; yet, to the extent of a few miles, it is the custom to consider it as a right line, and, therefore, as making a constant angle with the meridian passing through one of its extremities. The deviation of the magnetic from the true meridian (the declination or variation of the needle) differing in different places, the amount of that variation (ascertained by celestial observations as often as possible) must be added to or subtracted from the angles observed with the compass, in order to have the bearing, or course, from the true meridian. But while a ship is sailing with the wind in a direction oblique to the line of her keel, she is compelled, by the force of the wind and the resistance of the water against her side, to move in the direction of a line which makes some angle with her keel on the side opposite to that from which the wind is blowing; this angle is called the *lee-way*, and as it differs for different ships, it must always be determined by trial in some one of the ways proposed in treatises on navigation. The estimated amount of the lee-way is a second correction, which must be applied to the course observed with the compass, in order to obtain the correct angle with the meridian.

The velocity of the ship is ascertained by means of the log-line [LOG-LINE], which at once indicates the number of geographical miles (equatorial minutes) she has passed over in an hour; and consequently, supposing her motion to be uniform, the space through which the ship has sailed on a particular course in a given number of hours is known. This is technically called the *distance*.

Again, when a ship is sailing either in a current of the ocean, or in a tide near a shore, her velocity and the direction of her motion will be affected by those of the current or tide. First, if the ship is impelled by the wind in the same direction as the current is moving, it is evident that the velocity given by the log will be only the difference between the ship's real velocity and that of the current, and consequently the latter must be added to the velocity given by the log in order to have the true velocity. On the other hand, if the ship is impelled by the wind in a direction contrary to that of the current, the velocity of the latter must be subtracted from that given by the log, in order to obtain the true velocity of the ship. Again, if the direction of the current is oblique to the line of the ship's motion according to the compass, the true path and velocity of the ship will, by the *composition of motions*, be the diagonal of a parallelogram formed on lines representing the observed directions and velocities of the ship and current; consequently, since this rule is the same as that by which is found a path of the ship which shall be equivalent in length and direction to any two successive paths whose lengths and directions are given, it is evident that among the registered courses and velocities of a ship it will be only necessary to insert the observed direction and velocity of the current, as if the ship had actually moved in that direction, and with that velocity during the time that she continued to sail in the current. The like remark may be made respecting the deviation of a ship from the course on which she appears by the compass to have sailed, in consequence of a swell of the sea, by which she may be driven in some other direction. This direction must be observed, and the velocity estimated according to the judgment of the seaman.

Now, in order to show how all the corrections may be applied to the observed elements, let it be supposed that at the noon of some day a remarkable object A on the shore was observed by the compass to bear W. by N., and that its estimated distance from the ship was 20 miles. At the same moment let the ship begin to sail on a course which is S.W. by the compass; and let the velocity by the log be 3 knots, or 3 miles per hour. Also let the following table express the several memoranda in the order in which they may be supposed to have been made in the course of one day; that is, according to the practice of seamen, between the noon of one day and the noon of the next.

The bearing of the ship from the point of departure being corrected for the variation of the needle becomes N. 78° 15′ E.; the distance is 20 miles.

The first course corrected in like manner becomes S. 21°

Day of Month.	Hour.	Knots.	Wind.	Course.	Lee-Way.	Remarks.
	Noon.	3	W.N.W.	S.W.	0.	The point A of departure bore W. by N., distant 20 miles; its lat. ——, and long. ——.
	2 P.M.	4½		(or S. 45° W.)		
	8	5¼				
	10	5	W. by N.	S.E. by S.	¼ E., or	A swell setting towards E.N.E. from 2 P.M. to 8 P.M.: velocity 6 miles per hour.
	12	4½		(or S. 33° 45′ E.)	2° 49′ E.	
	6 A.M.	5¾				
	8	6	W.	S.S.W.	1 E., or	A current setting towards S.S.E from 10 P.M to 10 A.M.: velocity 2 miles per hour. Variation N. 24° W.
	10	6½		or S. 22° 30′ W.)	11° 15′ E.	

W.; and the distance run between noon and 10 P.M. is 43·5 miles.

The third course corrected for lee-way and variation becomes S. 60° 34′ E.; and the distance run between 10 P.M. and 8 A.M. is 50·5 miles.

The fourth course corrected in like manner becomes S. 12° 45′ E.; and the distance run between 8 A.M. and noon is 25 miles.

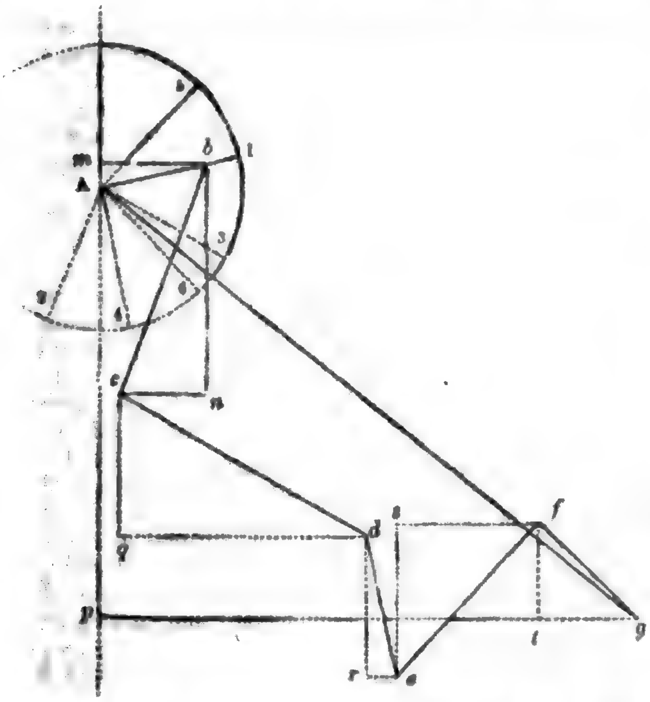
The direction of the swell corrected for the variation of the needle becomes N. 43° 30′ E.; and the distance is 36 miles. Lastly, the direction of the current corrected also for the variation becomes S. 46° 30′ E.; and the distance is 24 miles.

These corrected courses and distances are then inserted in order, as in the first and second columns of the following table:—

Courses.	Distances	N.	S.	E.	W.
N. 78° 15′ E.	20	4·07 (= A*m*)	. . .	19·58 (=*bm*)	. . .
S. 21° W.	43·5	. . .	40·7 (=*bn*)	. .	15·59 (=*cn*)
S. 60° 34′ E.	50·5	. . .	24·82 (=*cq*)	43·98 (=*dq*)	. . .
S. 12° 45′ E.	25	. . .	24·38 (=*dr*)	5·52 (=*re*)	. . .
N. 43° 30′ E.	36	26·11 (=*se*)	. . .	24·78 (=*sf*)	. . .
S. 46° 30′ E.	24	. . .	16·52 (=*ft*)	17·41 (=*gt*)	. . .

Now, if the navigation is comprehended within about ten degrees on each side of the equator, such a zone of the earth may be supposed to be projected on the interior surface of a circumscribing cylinder, and then developed on a plane; in which state the meridians and the parallels of latitude become right lines parallel to themselves respectively, and the length of a degree of longitude on every parallel equal to that of a degree on the equator or on the meridians. This is called the *plane chart*, and the projection of a ship's path on it is called *plane sailing*.

Let the several directions in which the ship has moved, and the distances passed over in each direction, be represented in the subjoined diagram, the construction of which, agreeably to the nature of the plane chart, is as follows:—



Draw the lines A 1, A 2, A 3, &c., making with A*p*, the meridian of the point of departure, angles equal to the several courses as they occur successively in the preceding table (col. 1), and draw the lines *bc*, *cd*, &c. parallel to A2, A3, &c. respectively; the distances A*b*, *bc*, *cd*, &c. being laid down according to the successive numbers in col. 2 by a scale of equal parts representing geographical miles (or equatorial minutes). At the end of the day the ship is arrived at the point *g*; therefore if A and *g* be joined, and *gp* be drawn perpendicularly to A*p*, the angle *p*A*g* is the resulting course, A*g* the resulting distance, A*p* the difference of latitude between A and *g*, and *pg* is what is called the *departure*, which, in plane sailing, is identical with the difference of longitude between the same points A and *g*.

By drawing lines perpendicular and parallel to A*p*, as in the above diagram, there will be formed the several right-angled plane triangles A*bm*, *bcn*, &c., in each of which there are given the hypotenuse and the angles; and consequently by the rules of plane trigonometry the several sides A*m*, *bm*, *cn*, *bn*, &c. may be computed. Now, let these computed values be placed in the third and succeeding columns of the above table in the following order:—those which are parallel to A*p* in the column N. or S., according as the lines which represent them lie towards the north or towards the south of that extremity which is first, in order of sailing, on the corresponding hypotenuse; and those which are perpendicular to A*p* in the column E. or W., according as the lines which represent them lie towards the east or west of that same extremity. Then the sum of the numbers in the column N. being subtracted from the sum of those in S. will be found to leave 76·24, and this will be the value of A*p* in geographical miles (or equatorial minutes); consequently 1° 16′ 14″ will express the extent in latitude to which, on the whole, the ship has sailed southwards during the day. Again the number in W. being subtracted from the sum of those in E will leave 95·68 (=1° 35′ 41″), and this will be the value of *pg*, or the extent in longitude which, on the whole, the ship has sailed eastward during the day. Thus the position of A being known, we have that of *g*. In the right-angled plane triangle A*pg*, having A*p* and *pg* in miles, as above, we may compute A*g* and the angle *p*A*g*, that is, the resulting distance and course. The former will be found to be =122·35 miles, and the latter S. 51° 27′ E. The series of zig-zag lines which a ship may describe is called a *traverse;* the preceding table is called a *traverse table*, and the whole operation of finding the resulting course and distance is called *traverse sailing*.

In practice, both the construction and calculation above indicated are superseded by the use of the table of *difference of latitude* and *departure*, which is given in treatises on navigation. The numbers in the table are nothing more than the computed values of the sides of right-angled triangles; the hypotenuse, or the distance, and the adjacent angle, or the course, being given. Thus by referring to such a table, the courses and distances being used as arguments, the numbers in the columns N. S. E. W. above, might have been found sufficiently near the truth. And, conversely, seeking in the table the difference of latitude (=76) and the departure (=96), the corresponding distance (=122) would be seen in its proper column, and the angle or course (=51°) at the bottom of the page.

The logarithmic or Gunter's scale [SCALE] was formerly, for the sake of expedition, much used in the resolution both of plane and spherical triangles for the purposes of navigation. If, for example, it were required by that instrument to find the values of *cq* and *qd* in the triangle *cqd*, the following proportions

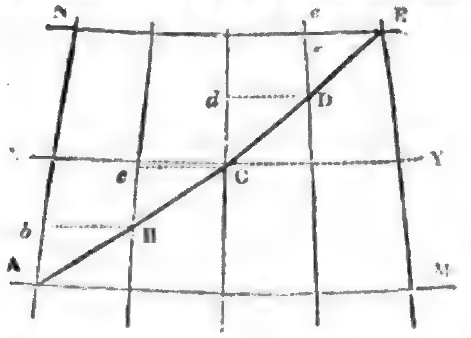
Rad. : sin. *qcd* (60° 34′) : : *cd* (50·5) : *qd* (=44)
Rad. : sin. *cdq* (29° 26′) : : *cd* : *cq* (=25)

might be worked by taking in the compasses the distance from 90° to 60° 34′ on the line of sines, and applying that distance on the line of numbers from 50·5 towards zero; the other foot of the compasses would fall on 44, which is the value of *qd;* again by taking the distance from 90° to 29° 26′ on the line of sines, and applying it on the line of numbers, from 50·5, as before, the other foot of the compasses would fall on 25, which is the value of *cq*. But it is evident that when the angle is small, or nearly a right angle, the instrument must be very inaccurate.

Should a ship, on any part of the earth's surface, sail for a short time in a direction either due east or due west, so that during that time it might be considered, without sensible error, as sailing on the circumference of a parallel of latitude, the determination of its place is obtained by a different process. Thus, the earth being supposed to be a sphere, the length, in miles, of any arc of the equator between the meridian circles passing through its extremities is to the length, in miles, of the arc between the same meridians on any given parallel of latitude as radius is to the cosine of the latitude of the parallel. Therefore, when the number of geographical miles passed over on any parallel of latitude is known by the log (all due corrections being supposed to be made), the difference of longitude corresponding to that distance may be found at once by the above proportion. Evidently also, if any three whatever of the terms are given, the fourth can be found; and thus every variation of the case may be resolved. This is called *parallel sailing*.

But the tables of difference of latitude and departure may be rendered available for finding the required term if we consider the latitude of the parallel on which the ship is sailing to represent what is called the *course* in those tables; the distance in miles on the parallel as the *difference of latitude*, and the difference of longitude in geographical miles as the *distance* in the tables; and then, by inspection as before, the required term may be found.

The third method of operating, which is called *middle latitude sailing*, has been defined under LONGITUDE AND LATITUDE, METHODS OF FINDING, and we have here only to point out its application. Let AE be a portion of the rhumb-line which a ship describes while her motion continues to coincide with the direction of one point of the compass, that is to say, while it makes a constant angle with the meridians of her successive places. Let this curve be divided into any parts, AB, BC, &c. of small extent, so that each part may, without sensible error, be considered as a straight line; and imagine both meridians and parallels of latitude to be drawn through A, B, C, &c. Then the several triangles BAb, CBc, &c. being considered as plane triangles, if the constant angle BAb, CBc, &c. be represented by A, we shall have—



$\text{AB} \cos. \text{A} = \text{A}b$, $\text{BC} \cos. \text{A} = \text{B}c$, &c.; also

$\text{AB} \sin. \text{A} = \text{B}b$, $\text{BC} \sin. \text{A} = \text{C}c$, &c.; whence, by addition,—

$(\text{AB} + \text{BC} + \&c.) \cos. \text{A} = \text{A}b + \text{B}c + \&c.$, and

$(\text{AB} + \text{BC} + \&c.) \sin. \text{A} = \text{B}b + \text{C}c + \&c.$

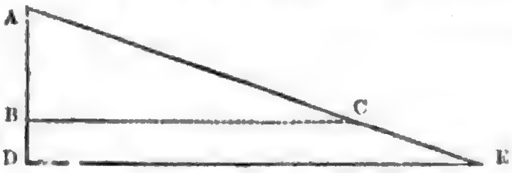
It is evident therefore that the sum of all the distances multiplied by the cosine of the course will be equal to EM, the difference between the latitudes of A and E as in plane sailing; but the sum of all the distances multiplied by the sine of the course (that is, the sum of all the departures, Bb, Cc, &c.) will be less than AM and greater than NE. Therefore, as an approximation to the truth, we may consider the sum of all these departures as the length, in miles, of the arc XY (between AN and ME) of a parallel of latitude equally distant from AM and NE; that is, of a parallel whose latitude is an arithmetical mean between the latitudes of A and E. Consequently, as in the theorem for parallel sailing, the difference between the longitudes of A and E will be obtained from the proportion

Cos. *mid. lat.* (= lat. of XY) : Rad. :: (AB + BC + &c.) sin. A : diff. of long.;

and, instead of working the proportion, the tables of difference of latitude and departure may be used as before.

If we imagine the earth's surface to be developed on a plane so that the meridians and parallels of latitude may be respectively parallel to themselves as in the plane chart; and if the lengths of infinitely small portions of the circumference of the equator have to the lengths of corresponding portions of a meridian, in any latitude, the ratio that the radius bears to the secant of that latitude [MERCATOR'S PROJECTION; RHUMB-LINE], there may be formed a species of chart which will afford a general and at the same time a sufficiently easy method of determining the elements relating to a ship's place. This method is called *Mercator's sailing*. In the chart just alluded to, the length of a degree, minute, &c. of longitude, on any parallel of latitude, is constant, being the same as the length on the equator, on account of the parallelism of the meridians; but, in any latitude, the length of a small meridional arc (which, without sensible error, may be of one minute) varying with the secant of the latitude of the arc, the distance, on the map, of any parallel of latitude from the equator will be equal to the sum of the secants of all the minutes in the degrees, &c. expressing the latitude of the parallel. Now, in the tables of *meridional parts* which are given in treatises on navigation, the numbers under the arguments 1 min., 2 min., 3 min., &c. express the values of such sums of secants, the length of an equatorial minute (or geographical mile) being unity. Hence the difference between the numbers, in the table, corresponding to the latitudes of two given points will express the number of such minutes or miles on the map between these points.

By the help of this table a triangle may be always constructed with the data of the problem; and the terms required may be obtained by measurement. In the subjoined figure, let AD be the direction of the meridian passing through the ship at A, and BAC be her course; then, if AC be made equal to the distance in miles by a scale of equal parts, and BC be drawn perpendicular to AD, AB and BC measured on the same scale will be the difference of latitude and departure as in plane sailing. Now, if AD be made, by the same scale, equal to the difference between the meridional parts which, in the table, correspond to the latitudes of the point A and C, and DE be drawn parallel to BC, DE on the same scale will express, in miles or minutes, the true difference between the longitudes of A and C.



What has been said may serve as an example of the manner of constructing the triangle, when the course, the distance, and the latitudes of the two extremities of the distance-line are given, and it is required to find the difference between the longitudes of those extremities. Again, let the ship's course and distance from any point A, and also the latitude of that point, be given, to find the differences both of longitude and latitude. The formation of the triangle ABC is the same as that just mentioned, and AB being measured on the scale of equal parts is the true difference of latitude (in miles or minutes); this being added to or subtracted from the latitude of A, gives the latitude of C. Then, with these latitudes, find from the table the difference between the meridional parts, and proceed as before to find the difference of longitude. If the latitudes of the ship at two places were given and also the distance between those places, and it were required to find the course and the difference of longitude:—on the meridian line passing through one of the places A, make AB equal to the difference of latitude in miles by the scale of equal parts, and make AD by the same scale equal to the difference between the meridional parts, in the table, corresponding to the latitudes; then draw the indefinite perpendiculars BC and DE, and from A as a centre with a radius equal to the given distance describe an arc intersecting BC in C. Join A and C, and produce the line to E; then ∠BAC will be the course, and DE, measured as before, the difference of longitude.

It is easy to perceive that the table of differences of latitude and departures may be used in Mercator's Sailing in the same way as it would be employed in Plane Sailing, if the meridional difference of the latitudes, from the table of meridional parts, be made to hold the place of the simple difference of latitude. Thus, in the second of the above examples, with the given course and distance, find by inspection in the first-mentioned table the difference of latitude; then, having got by addition or subtraction the latitude of the place at which the ship is arrived, find in the table of meridional parts the numbers corresponding to those latitudes, and take their difference. Lastly with this difference, as a simple difference of latitude, and with the course, find the departure by inspection in the first table; this departure is the required difference of longitude.

When a ship is in a high latitude, it is necessary to determine the difference of longitude, either by middle latitude or by Mercator's sailing, for every particular course on which the ship may have sailed.

The daily differences of latitude and longitude being thus obtained, the seaman knows, within the degree of accuracy of which his data admit, the latitude and longitude of the ship on any day; but it is easy to perceive that the uncertainties respecting the estimates of the distances run, the variations of the needle, the effects produced by currents, &c. must, in time, render the results of the reckoning very erroneous; and therefore it is of the utmost importance to correct them frequently by celestial observations. The determination of the latitude by meridional or other altitudes is easy; and that of the longitude by lunar distances or by chronometers should be made as often as possible. Every geographical position thus determined with precision serves, by comparison with the results of the dead-reckoning, to lead to a knowledge of the causes of the errors which exist in the latter, and becomes a point of departure for the next succeeding portion of the voyage.

RECOGNIZANCE is an obligation of record, entered into before some court of record, or magistrate duly authorized, by which the party entering into it (the cognizor), whose signature is not necessary, acknowledges (recognizes) that he owes a sum of money to the king, or to some private individual, who is called the cognizee. This sum is named the amount of the recognizance. The acknowledgment is generally followed by an undertaking on the part of the cognizor to do some act, such as to keep the peace, to pay a sum of money, to attend to give evidence, &c. On the performance of this act, the cognizor is discharged from his recognizance. On his default, the recognizance is forfeited, and he becomes indebted absolutely to the amount of the recognizance. A debt on recognizance takes precedence of other debts, and binds the lands of the cognizor from the time of its enrolment. If the recognizance is made to a private individual in the nature of a statute staple, &c., he may on its forfeiture, by virtue of process directed to the sheriff, obtain delivery of the lands and goods of the cognizor till the debt is satisfied, or proceed against the cognizor in an action of debt, or by scire facias. If the recognizance is made to the king, it was formerly, in all cases of forfeiture, estreated into the exchequer, and afterwards recovered by process from that court to the use of the treasury. But now, in the cases of forfeited recognizances taken before the court of quarter-sessions, or justices of the peace, provision is made by stats. 3 Geo. IV., c. 46, and 4 Geo. IV., c. 37, for their enrolment among the sessions records, and their immediate recovery by the sheriff. A list of the amounts, &c. is yearly returned by the clerks of the peace and town-clerks for their districts respectively, to the lords of the treasury. A power of appeal by the cognizor against the forfeiture is given to the sessions, and the sheriff is not to levy on the cognizor till the appeal has been decided. Where a recognizance has been estreated into the exchequer, that court may discharge or compound it according to the justice of the case. (Com., *Dig.*, 'Recognizance;' Dalton; 2 Bl. *Com.*; Burn's *Justice*.)

RECONNOISSANCE is an examination of a tract of country or of the sea-coast; the latter previously to a disembarkation of troops, and the former preparatory to the march of an army in order either to meet that of the enemy or to take up quarters for the season.

The *military reconnoissance* of a country is a duty appertaining to the officers on the staff of the quartermaster-general; and if the enemy is in the neighbourhood, it is performed under the protection of an armed force. It is considered as one of the most essential operations connected with the tactics of the field, and serves as the basis of every movement or combination which it may be proposed to make.

A general knowledge of a country which is or may become the seat of war, that is to say, a knowledge of the positions of its fortified places, the directions of its mountains, rivers, and great roads, may be obtained from maps or from geographical descriptions; but that which is necessary for the immediate purposes of a campaign can only be acquired by an actual survey of the ground in detail, and by inquiries made on the spot respecting the means which the country may afford for supplying the wants of the army.

The Maréchal Puysegur (1690) appears to have been the first in modern warfare who regularly performed this duty by examining personally the tract through which the army was to march or in which it was to encamp, and of deciding beforehand on the best routes and positions. He observes (*Art de la Guerre*) that before his time it had been customary to trust, for a knowledge of these points, to the reports of the country-people, or of officers who might accidentally have been on the ground. He adds that disasters frequently occurred by the lines of march being improperly chosen, and that sometimes, after fatiguing marches, and after all the labour of encamping had been undergone, the troops had been compelled to abandon the positions on account of their unfitness. Since that time armies being more numerous and more widely disseminated, consequently requiring more vigilance in the communication of one part with another, and a greater extent of country for their support, the reconnoissances have been made on a greater scale, and in the military establishments of every nation officers are now particularly instructed in all the details of that branch of service.

Those who are charged with this duty should be habituated to the performance of topographical surveys: in the first place by the most accurate methods and with the best instruments; and, secondly, by such methods as admit of being practised rapidly on foot or on horseback. In these cases a compass held in the hand must be used for observing the angles, and the distances must be obtained by pacing, or be merely estimated by the eye. A facility in representing on the plan the inequalities of the ground is also highly necessary.

In making the reconnoissances previously to the march of an army, the whole of the ground between the actual position of the latter and that which is intended to be occupied should be surveyed if the enemy is near and there is danger of his attacking the columns by surprise; otherwise it may be sufficient to survey the ground within a few hundred paces on each side of the roads by which the columns are to march. A complete plan of the tract of country in which the reconnoissance is made may therefore be required; or it may suffice to represent on paper the line or lines of march. In either case, the officer may be provided with a general map, or an itinerary of the intended route as an outline for his guidance; and his survey, when completed, should be accompanied by a report or memoir, stating in detail what cannot be conveniently represented on the plan. In this report should be expressed, with all necessary references to the plan of the ground, the distances, by the different routes, between the two positions, and the places where troops may halt for repose or to form in order of battle; distinguishing particularly the plains where cavalry may act, and the heights on which artillery may be placed. The nature of the roads should be described, with indications denoting that they are passable for artillery, for cavalry, or merely for infantry; and if defective, estimates should be made of the materials and time requisite for repairing them. It is particularly necessary to state whether the ascents and descents are gentle or abrupt; and, when the road is on the side of a hill, whether it is sufficiently level to allow artillery or carriages to pass safely: it should also be noticed whether or not, at places where roads run through towns, they are reduced to narrow and winding streets. The breadths and velocities of rivers, streams, and canals which cross the lines of march should be ascertained, and a statement made whether the beds are rocky, gravelly, or muddy; also whether the banks are high or low. Mention should also be made of the means which exist for passing them; of the places where they are fordable, where there are ferries or bridges, or where boats may be procured; descriptions should also be given of the bridges or boats, and the manner of working the latter. The situations and extent of marshes should also be shown, and it should be stated whether they are passable or can be made so. In contemplating rivers and marshes as means of retarding an advance of the enemy, it should be ascertained and reported whether, by being dry in summer or frozen in winter, they may not at times cease to be obstacles: it should also be stated how, on a retreat, the roads may be blocked up, the fords rendered impassable, or the bridges destroyed.

Should a sufficient number of roads for the different columns not exist, the officer is to ascertain whether or not others may be made by cutting through hedges, walls, or woods, by forming causeways over marshes, or by constructing or repairing bridges over rivers or streams; and also whether the country affords the materials necessary for these purposes. The rates at which it is possible for troops to march in the several roads, defiles, &c. must be estimated according to the breadth of the latter or the degree of their practicability; for on a right estimate of such rate, together with the known length of the road, depend the number of battalions and the class of troops which ought to be appointed to follow each particular route, when it is required that the different columns should arrive at the same time in some given position. The plan should show the situations of farms, mills, houses, &c. which may be capable of being defended or of affording quarters for the troops; and on it should be indicated, by some scale of numbers or otherwise, the relative heights of the ground, that it may be ascertained what positions can be occupied with advantage for offensive or defensive operations. The representation of a simple line of march should also indicate the places where roads diverge from or cross the route, with the distances of the nearest towns or villages from thence; and any particular survey of the ground for an encampment should extend to at least a mile every way beyond the supposed chain of outposts. [Military Positions; Piquet.] The report must state what are the resources of the country in corn, cattle, and forage; and the number of carriages, horses, and other draught animals that it may furnish for the conveyance of artillery and stores. If the line of march is in the direction of a navigable river which may be available for the last-mentioned purpose, it will be necessary to ascertain its breadth and rapidity, and also the obstructions which may be met with from shallows, weirs, &c. Marshal Suchet caused his artillery to be conveyed by the Ebro from Mequinenza to Xerta, in 1810, preparatory to forming the siege of Tortosa.

An open country presents the greatest facilities for reconnoitring, since the positions of its towns or villages, and the directions of its roads and rivers, can then be easily distinguished and represented on paper. A tract covered with wood is not only surveyed with difficulty, but it imposes on the officer, in addition, the necessity of ascertaining all the directions in which it is capable of being penetrated by the enemy, and in what manner the passes may be blocked up or defended. Open plains intermingled with wood, fields surrounded by hedges, ground intersected by streams of water, ravines, and hollow ways, demand great exactness in the survey, since such tracts afford the most important advantages, both in the higher and in the secondary operations of warfare, to the army which is best acquainted with their details. They allow troops to pass unseen from one point to another when a surprise is attempted or a rapid retreat is to be made; they also afford cover from whence the enemy may be annoyed with little loss. In mountainous districts it is important to ascertain the forms and directions of the chains of heights, with their acclivities on both sides; and, if the line of march is between them, the collateral ravines should be examined to a considerable distance: the commencements and directions of the ravines should also be shown, and all the defiles by which the valleys communicate with each other. Through these defiles troops detached from the army are enabled to fall suddenly on the enemy during his march, to separate his columns, and intercept his supplies or cut off his retreat; and, on the other hand, since the enemy may attempt the like measures, it becomes necessary that the officer employed to reconnoitre should ascertain by what means the passes may be barricaded either to impede the enemy or enable the troops to defend themselves.

In reconnoitring a country, when it is intended to act on the defensive, it should be well known by what roads the enemy can penetrate, and where are the best situations for forming intrenched camps or establishing posts in order to be enabled to keep the field and cover the magazines. Again, if it be intended to carry the war into an enemy's country, it is necessary to discover the position occupied by his army; to find the tract of country most proper for the march, and the spots where the localities permit encampments to be formed with due support on the flanks and security in the rear. If it be intended to besiege a fortress or to attack the enemy's position, the reconnoissance may be made quite up to the glacis of the place, or to the works which protect the position. In the former case it is necessary to ascertain the nature of the fortifications, and the fitness of the ground about them for the operations of the siege; and in the latter, to find out the strength and dispositions of the enemy's troops. An armed force is generally required on these occasions, as, in order to approach near enough for the purpose, it may be necessary to drive in some of the outposts. During the war which ended in 1814, the English and French out-sentries appear to have entertained a mutual understanding not to molest each other, and to retire to their supports before they commenced firing when either army was about to make a movement. Colonel Napier relates that Lord Wellington, being once desirous of reconnoitring the enemy's position at Bayonne, ordered his escort to fire upon some of the enemy who occupied the top of a hill which he wished to ascend; but one of the men going up to the French soldiers and tapping his musket in a particular way, the latter, who understood the signal, quietly withdrew.

In a *maritime reconnoissance* the circumstances which it is of most importance to ascertain are: whether the coast is rocky or bordered by downs, and what is the state of the bays or roads with respect to shelter from the prevailing winds; the seasons in which winds blow off and on the shore, and whether the anchorage is secure or otherwise; the nature of the tides, the hours of high and low water, and the depth at either of those times. Precise information should also be obtained of the places at which troops might land, and where there exist rising grounds on which artillery may be disposed to protect them. Rivers should be ascended to a considerable distance if possible, in order to ascertain their depths and the nature of the vessels employed on them by the people of the country. On the other hand, if it were required to examine the coast preparatory to putting it in a state of defence, it would be necessary to find out what points of land are convenient for the situations of forts or batteries by which the enemy may be prevented from landing, and where beacons may be established for the purpose of giving timely alarm. If there are islands on the coast, it would be proper to include them in the survey, since they might be fortified and made to serve as advanced works; and all places should be indicated which are capable of being converted into military posts to prevent the enemy from penetrating into the interior of the country.

RECORD, a memorial in rolls of parchment of the proceedings and acts of a court of law, upon whose proceedings error will lie. An act of a party which is put on record cannot be varied even in the same term, but a judicial act of the court may be altered during the same term. If a record is lost, the court may order a new entry to be made at any time. In order to prove a record the existence of which has not been denied on the pleadings, an examined copy is sufficient. But if the existence is denied on the pleadings, it can only be proved upon inspection by the court of the record itself; and that is conclusive not only as to the existence of the record, but as to all matters stated in it. For the record of a court of competent jurisdiction is legally considered as the indisputable proof of all those proceedings having taken place which the record sets forth; and no averment to the contrary in pleading can be made. A record found in the proper office is legally assumed to have been always in the same plight in which it is found. The effect of a reversal of a judgment in error is to annul the previous record from the commencement. (*Co. Litt.*, 117 b., 260 a.; Com. *Dig.*, tit. 'Record.') It seems doubtful whether in all cases a record must necessarily be on parchment. (Reg. *v.* Yeovely, 8 A. and E., 806.) As to what constitutes a Court of Record, see Courts, and Recorder.

RECORDE, ROBERT, an eminent mathematician of the sixteenth century, was the first native of Great Britain who introduced the study of analytical science into this country. There is no memorial of the exact time of his birth, though it must have been somewhere about the year 1500. We know that he was a native of Tenby in Pembrokeshire, that he entered himself a student at Oxford about the year 1525, where he publicly taught rhetoric, mathematics, music, and anatomy, and that he was elected a fellow of All-Souls College in 1531. Making physic his profession, he repaired to Cambridge, and in 1545 he received the degree of M.D. from that university, and, says Wood, was highly esteemed by all who knew him for his great knowledge in several arts and sciences. He afterwards returned to Oxford, where, as he had done previously to his visit to Cambridge, he publicly taught arithmetic and other branches of the mathematics with great applause. According to Fuller, he was of the Protestant religion. He afterwards repaired to London, at which place he resided in 1547, and in that year published a medical work entitled 'The Urinal of Physic,' which passed through several editions. He was also chosen physician to Queen Mary and Edward VI., to both of whom he dedicates some of his works. With the knowledge of this latter fact, it is scarcely possible to account for the circumstances in which he was at the time of his decease, a prisoner in the King's Bench. He died in the year 1558, probably soon after the date of his will (June 28), in which he styles himself 'Robert Recorde, doctor of physicke, though sicke in body yet whole of mynde.' This document is preserved in the Prerogative Office, and furnishes some facts: to Arthur Hilton, under-marshal of the King's Bench, his wife, and the other officers and prisoners, he gave small sums amounting to 6*l.* 16*s.* 8*d.*; to his servant John, 6*l.*; to his mother, and his father-in-law, her husband, 20*l.*; to Richarde Recorde, his brother, and Robert Recorde, his nephew, his goods and chattels, out of which his debts and the expenses of his funeral were to discharged. This last item leads us to think that debt was not, as commonly stated, the real reason for his imprisonment; although, indeed, the amount of property enumerated does not constitute a large sum even for those days. In a codicil to his will, made on the 29th of June, 1558, he gives directions that his law books should be sold to Nicholas Adams, a fellow-prisoner, for 4*l.*

The works of Recorde are all written in dialogue between master and scholar, in the rude English of the time. They are enumerated by the author himself at the end of his work called 'The Castle of Knowledge;' and there is reason to think that two of his works mentioned in that place are irrecoverably lost, at least no trace of either of them has yet been discovered in print or manuscript. One of them appears to have been entitled 'The Gate of Knowledge,' and the other 'The Treasure of Knowledge.'—Recorde's most popular work appeared as early as 1540, under the title of 'The Grounde of Artes, teachinge the worke and practise of Arithmeticke, both in whole numbers and fractions, after a more easier and exacter sort than any lyke hathe hitherto been set forth.' We have taken this title from the edition of 1573, the earliest we have yet met with. 'The Grounde of Artes' was dedicated to Edward VI., and continued to be repeatedly reprinted until the end of the seventeenth century, the latest edition we have seen being that edited by Edward Hatton in the year 1699. This work contains numeration, addition, subtraction, multiplication, division, reduction, progression, the golden rule, a treatise on reckoning by counters on a principle much resembling that of the Chinese abacus, a system of representing numbers by the hand like the alphabet of the deaf and dumb, a repetition of all the rules for fractions, with the rules of alligation, fellowship, and false position. On the last rule he remarks that he was in the habit of astonishing his friends by proposing difficult questions, and working the true result by taking the chance answers of 'suche children or ydeotes as happened to be in the place.' 'The Pathway to Knowledge,' a brief compendium of geometry, translated and abridged from the Elements of Euclid, was published at London in 1551.

'The Castle of Knowledge' was published in 1556, dedicated in English to Queen Mary, and in Latin to Cardinal Pole. This work is written in the form of a dialogue between master and scholar on astronomy, and from the preface we gather that Recorde had not altogether abandoned astrology. It begins with an account of the Ptolemaic system, and afterwards proceeds in an apparently concealed passage to unfold the elements of the Copernican system of the universe. This passage has already been given in the *Companion to the British Almanac for* 1837, and more latterly in the *Philosophical Magazine*; we do not therefore consider it necessary to repeat it in this place. Recorde appears to have been one of the earliest persons in this country who adopted the Copernican system, if not the earliest person who introduced it among us. All that is cited from Euclid and Proclus is in Greek and Latin, usually both, and Linacre's edition of the latter author is referred to; but the edition of Euclid is not mentioned.

In the 'Whetstone of Witte,' which was published in 1557, Recorde has amassed together the researches of foreign writers on the subject of algebra, then in its infancy, and has also incorporated several improvements of his own. In algebra we recognise Recorde as the inventor of the sign of equality, and of the method of extracting the square root of multinominal algebraic quantities. In perception of general results connected with the fundamental notation of algebra, he shows himself superior to others, and even, we may say, to Vieta, although of course immeasurably below the latter in the invention of means of expression. All his writings considered together, Recorde was an extraordinary genius; and it must be remembered he was a lawyer, a physician, and a Saxonist, as well as the first mathematician of his day.

(Principally taken from a pamphlet by J. O. Halliwell, Esq., on *the Connexion of Wales with the early Science of England*, 8vo., 1840, and from an article in the *Companion to the British Almanac for* 1837, by Prof. De Morgan.)

RECORDER (*Recordator*), a judicial officer, described by Cowell as 'he whom the mayor or other magistrate of any city or town corporate having jurisdiction, or a court of record, within their precincts by the king's grant, doth associate unto him for his better direction in matters of justice and proceedings according to law.' The Norman term, *recordeur*, appears to have originally been applied to every person who was present at a judicial proceeding, and to whose remembrance, or record, of what had taken place the law gave credit in respect of his personal or official weight and dignity. Of this we perceive a trace in the ordinary writ of Accedas ad Curiam, by which the sheriff is commanded to go to some inferior court (which, not being the king's court, is not a court of record), taking with him four knights, and there to record the plaint, which is in that court; the remembrance of the four knightly recordeurs of what they saw existing in the inferior court, in obedience to the king's writ, being treated as equivalent to their actual presence at the proceeding to be recorded. So if the proceedings are in the sheriff's court, he is ordered by the writ of Recordari facias loquelam to cause the plaint to be recorded by four knights. And by a record of the eighth year of King John, we find that a judgment of battle in the court of the archbishop of Canterbury being vouched in the king's courts, four knights were sent to inspect the proceedings, who returned 'quod recordati sunt.' (*Placitorum Abbreviatio*, 54.) The practice of certifying and *recording* the customs of London *by the mouth of the recorder*, which is antecedent to the charters granting or recognising the practice, appears to be referrible to the same source. Where criminal or civil jurisdiction was exercised by citizens or burgesses, it would add to the importance of the court if its proceedings took place in the presence of an officer to whose *record* the superior courts would give credit, either in respect of his personal rank, as a peer or knight, or on account of his connection with those courts, as a serjeant or barrister-at-law. [SERJEANT.]

Since 1835 the duties of recorders in the cities and boroughs enumerated in the schedules of the Municipal Corporations Act (5 and 6 Will. IV., c. 70) have been regulated by the provisions of that and of subsequent statutes.

The jurisdiction of the recorder in places of minor importance than those mentioned in the schedules, being taken away, will not require to be noticed. Nor do these acts affect the city of London.

I. The recorder of London is a judge having criminal and civil jurisdiction. He is also the adviser and the advocate of the corporation. In respect of the duties performed by the recorder in the assemblies of the corporation, in the courts of mayor and aldermen, of common council, and of common hall, his office may be said to be ministerial. He is by charter a justice of the peace within the city of London, and a justice of oyer and terminer, and a justice of the peace, in the borough of Southwark.

The first charter of Edward IV. to the city of London grants that the customs of the city be certified and *recorded* by word of mouth, and that the mayor and aldermen of the city and their successors do declare by the recorder whether the thing under dispute be a custom or not.

The business of the mayor's court, in which the recorder ordinarily presides alone, comprehends a court of equity. In the mayor's court the recorder tries civil causes, both according to the ordinary course of common law and the peculiar customs of the city. The amount for which such actions may be brought is unlimited. In London, causes depending in the superior courts at Westminster for sums under 20*l.*, writs of trial are occasionally ordered to be executed by a judge of a court of record in London under statute 3 and 4 Will. IV., c. 42, s. 17. Such trials sometimes take place before the recorder, and sometimes before the judges of the sheriffs' court.

Cases of felony and misdemeanour, and appeals against poor-rates and convictions, arising in the borough of Southwark, are tried before the recorder at the quarter-sessions held for that borough. All the duties of a justice of the peace, including those of chairman, devolve upon the recorder at the quarter and other sessions held at Guildhall for the city of London. At the eight sessions which are held in the year at Justice-hall in the Old Bailey for the metropolitan district, the recorder acts as one of the judges under her majesty's commission of oyer and terminer, and general gaol delivery. At the conclusion of each session he prepares a report of every felon capitally convicted within the metropolitan district, for the information and consideration of the queen in council, and he issues his warrant for the reprieve or the execution of the criminals whose cases have been reported.

The fixed annual salary of the recorder is 1500*l.* The Common Council have added 1000*l.* annually to the salary of the present recorder, and to that of his immediate two predecessors. Besides this, the recorder has fees on all cases and briefs which come to him from the corporation. He is also allowed to continue his private practice.

The recorder is elected by the court of aldermen, most commonly at a special court held for the purpose. Any alderman may put any freeman of the city in nomination as a candidate for the office, but an actual contest seldom takes place. The recorder elect is admitted and sworn in before the court of aldermen. The appointment is during good behaviour, that is, in contemplation of law, for life. The recorder has always been a serjeant-at-law or a barrister. The office has been held by men of considerable eminence: of eleven persons who filled the situation during the last century, one became lord chancellor; another, master of the rolls; another, chief justice of the Common Pleas; and two, barons of the Exchequer. Latterly however, as the duties of the office have occupied a large portion of the recorder's time, counsel in extensive practice have not been desirous of the situation.

By an order made by the court of aldermen in the reign of Philip and Mary, the recorder, common-serjeant, and under-sheriff were directed to be chosen 'from old and learned officers of the city or out of the number of the six learned counsellors,' that number comprehending, in addition to the ordinary city counsel, the attorney and solicitor-general, who were always retained for the city. Three persons by whom the recordership of London has been held during the present century, have previously filled the office of common-serjeant. [Serjeant.] But no similar instance occurred during the eighteenth century.

The recorder of London deriving his authority from charters, and not being appointed by commission (except temporarily as included with other judges in the commission of oyer and terminer, &c. at the Old Bailey), he is not, like the judges of the superior courts, liable to dismissal by the crown upon an address by both Houses of Parliament. But all recorders may be removed for incapacity or misconduct by a proceeding at common law.

Deputy recorders have in some instances, but not very lately, been appointed by the court of aldermen on the nomination of the recorder. (*Report on Municipal Corporations.*)

II. In cities and boroughs within the Municipal Corporations Act, the recorder (who must be a barrister of not less than five years' standing) is a judicial officer appointed under the sign manual by the crown during good behaviour, having criminal and civil jurisdiction within the city or borough, with precedence next to the mayor.

Criminal jurisdiction is given to recorders by the Municipal Corporations Act, explained by subsequent statute. The 105th section of that Act provides that the recorder shall hold once in every quarter of a year, or at such other and more frequent times as he shall in his discretion think fit, or as the crown shall think fit to direct, a court of quarter-session of the peace, at which the recorder shall sit as the sole judge, and such court shall be a court of record, and shall have cognizance of all crimes, offences, and matters whatever cognizable by any court of quarter-session of the peace for counties in England, provided nevertheless that no recorder shall have power to make or levy any rate in the nature of a county-rate, or to grant licence to keep an alehouse or victualling-house, to sell exciseable liquors, or to exercise any of the powers by that act specially vested in the town council.

The jurisdiction of the county sessions extends, under 34 Edw. III., c. 1, to the trying and determining of all felonies and misdemeanours. The commission under which county justices are appointed however directs that if any case of difficulty arise, they shall not proceed to judgment but in the presence of one of the justices of the courts of King's Bench or Common Pleas, or of one of the justices of assize; and courts of quarter-session in counties have latterly treated every case in which judgment of death would be pronounced upon conviction, as a case of difficulty, and have left such cases to be tried at the assizes; and though no such direction is contained in the grant of the office of recorder or in the Municipal Corporations Act, it has been the invariable practice of recorders appointed under the Act to refrain from the exercise of jurisdiction in such cases. [Sessions.]

In the session of 1839 a bill was introduced into the House of Commons for confining the jurisdiction of courts of quarter-session, both for counties and for boroughs, to certain minor offences,—but the bill did not pass.

The civil jurisdiction given to recorders by 5 and 6 Wm. IV., c. 76, § 118, is to try actions of assumpsit, covenant, or debt, whether by specialty or by simple contract, and all actions of trespass or trover for taking goods or chattels, provided the sum or damages sought to be recovered do not exceed 20*l.*, and all actions of ejectment between landlord and tenant wherein the annual rent of the premises does not exceed 20*l.*, and upon which no fine has been reserved, with an exception of actions in which title to land, or to any tithe, toll, market, fair, or other franchise is in question in courts, which before the passing of the Act had not authority to try actions in which such titles were in question. This enactment does not take away the more extended civil jurisdiction which previously existed in particular cities and boroughs by prescription or by charter.

The practice, or mode of proceeding, and also the course of pleading, in courts of civil jurisdiction in cities and boroughs is governed by rules made by the recorder and allowed by three judges of the superior courts.

RECORDER, a musical instrument formerly in use; 'a flageolet or small English flute, the mouthpiece of which, at the upper extremity of the instrument, resembled the beak of a bird; hence the larger flutes so formed were called *flutes à bec.* The recorder was soft in tone, and an octave higher than the flute. Milton speaks (*Par. Lost*, i. 550) of

> "The Dorian mood
> Of flutes and *soft recorders*."

It would appear, from Bacon's *Sylva Sylvarum*, cent. iii., 221, that this instrument was larger in the lower than in the upper part; and a wood-cut of the flageolet in Mersenne's *Harmonie Universelle* leads to the same conclusion. On the etymology of the word much ingenuity has been bestowed, but without any satisfactory result.' (*Note in Pict. Shaksp.*, 'Hamlet,' Act iii., Sc. 2.)

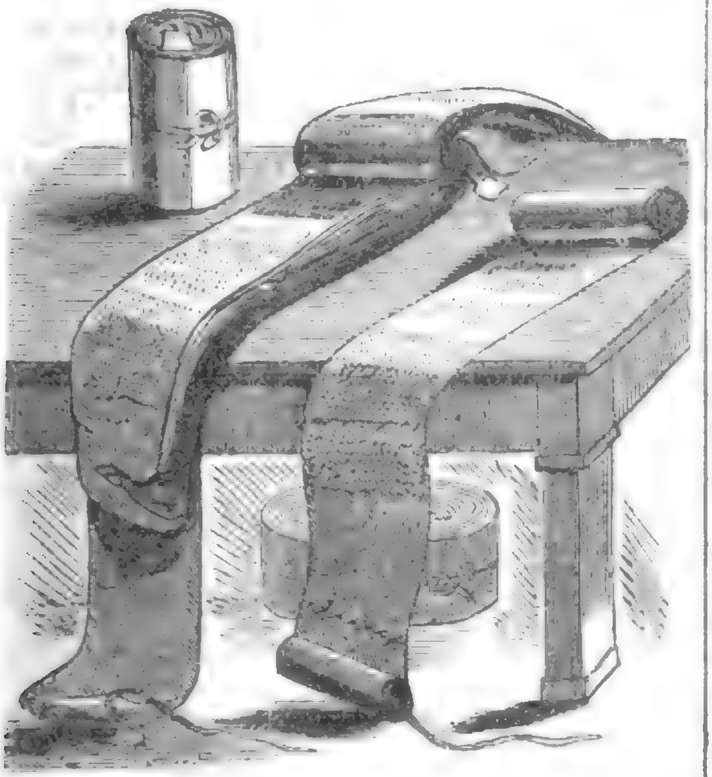
RECORDS, PUBLIC. Authentic memorials of all kinds, as well public as private, may be considered in one sense as records. Thus the Metopes of the Parthenon are indisputable records of Grecian art; the journal stamp on a letter is a record that it has passed through the post-office; a merchant's ledger is a record of his business; and every lord of a manor may keep written records of his courts, as the chancery, the exchequer, and other courts do of their proceedings. But our present purpose is to give some general account of the public records, properly so called, understanding by the term the contents of our public record offices.

Records, in the legal sense of the term, are contemporaneous statements of the proceedings in those higher courts of law which are distinguished as courts of record, written upon rolls of parchment. (Britton, c. 27.) Matters enrolled amongst the proceedings of a court, but not connected with those proceedings, as deeds enrolled, &c., are not records, though they are sometimes in a loose sense said to be 'things recorded.' (2 Sell., *Abr.*, 421.) In a popular sense the term is applied to all public documents preserved in a recognised repository; and as such documents cannot conveniently be removed, or may be wanted in several places at the same time, the courts of law receive in evidence examined copies of the contents of public documents so preserved, as well as of real records. [Courts; Record; Recorder.]

The course we propose to take, is to treat that as a record which is thus received in the courts of justice. The act, for instance, which abolished Henry VIII.'s court of augmentation (of the revenues obtained from the suppression of the religious houses), declared that its records, rolls, books, papers, and documents, should thenceforth be held to be records of the court of exchequer; and accordingly we have seen many a document, originally a mere private memorandum, elevated to the dignity of a public record, on the sole ground of its official custody, and received in evidence as a record of the Augmentation-office. On the other hand, numbers of documents which were originally compiled as public records, having strayed from their legal repository to the British Museum, have thereby lost their character of authenticity. (*Proceedings of the Privy Council*, vol. v., p. 4, edited by Sir Harris Nicolas.)

'Our stores of public records,' says Bishop Nicolson, and, we believe, with perfect accuracy, 'are justly reckoned to excel in age, beauty, correctness, and authority, whatever the choicest archives abroad can boast of the like sort.' (Preface to the *English Historical Library*.) Yet rich as our own country is beyond all others of modern Europe in the possession of antient written memorials of all branches of its government, constitutional, judicial, parliamentary, and fiscal, memorials authenticated by all the solemn sanctions of authority, telling truly though incidentally the history of our progress as a people, and handed down in unbroken series through the period of nearly seven centuries—the subject of its public records now appears, we believe, for the first time in a work like the present. The amount of public care given to this subject during the last forty years, is shown by the appointment of successive commissions and parliamentary committees of inquiry, by a cost in one shape or another amounting to little less than a million of pounds sterling, and by the passing of an act of parliament designed to effect a thorough change in the system of keeping and using the public records.

By far the greater part of records are kept as rolls written on skins of parchment and vellum, averaging from nine to fourteen inches wide,* and about three feet in length. Two modes of fastening the skins or membranes were employed, that of attaching all the tops of the membranes together bookwise, as is employed in the exchequer and courts of common law, whilst that of sewing each membrane consecutively, like the rolls of the Jews, was adopted in the chancery and wardrobe.



The solution of the reasons for employing two different modes has been thought difficult by writers on the subject. It appears to have been simply a matter of convenience in both cases. The difference in the circumstances under which these rolls were formed, accounts, we think, satisfactorily for the variation of make. In the first case, each inrolment was often begun at one time and completed at another. Space for the completion of the entry must have been left at hazard. Besides several scribes were certainly engaged in inrolling the proceedings of the courts, and the roll was liable to be unbound, and to receive additional membranes after it had once been made up. In the other case, the business of the chancery being simply registration, the scribe could register the documents before him, with certainty that nothing in future would at all affect their length, and he was enabled to fill every membrane, and perfect the roll as he proceeded.

In the *volumina*, or *scapi*, of the antients, the writing was carried in equal columns, as in the pages of a book, along the length of the skin, whilst the inrolment in both sorts of our rolls was written across the width of the membrane. Both these kinds of rolls are still used. The rolls of the common law, after the time of Henry VIII., contain so many skins that they cease to be rolls, but become simply oblong books, and, unlike the early rolls of the same series, are exceedingly ill adapted for preservation and inconvenient for use. There are many of these miscalled rolls of the reign of Charles II., which in shape, size, and weight resemble the largest of Cheshire cheeses, often requiring two men to lift them from the rack. Membranes may be fastened together after the chancery fashion in any numbers, and yet remain a legitimate roll, though imposing much bodily labour in the consultation. The land-tax commissioners' Act of 1 Geo. IV. extends, it is said, 900 feet when unrolled, and employs a man three hours to unroll the volume. Other records have the shape of books. Doomsday Book, called both 'Rotulus' and 'Liber,' the oldest and most precious of our records, counting eight centuries as its age, and still in the finest order, is a book; and as occasions presented themselves for adopting this shape without infringing on antient precedent, the far more accessible shape which we now call a 'book' seems to have been employed. A considerable part of the records of the courts of surveyor-general and augmentations, in the reign of Hen. VIII., of wards and liveries, and requests, are made up as books. Other documents, those relating to Fines, the 'Pedes Finium or Finales Concordiæ,' the writs of 'Dedimus Potestatem,' and acknowledgments and certificates, writs of the several courts and returns, writs of summons and returns to parliament, inquisitiones post mortem, &c. &c., by tens and hundreds of thousands are filed, that is, each document is pierced through with a string or gut, and thus fastened together in a bundle.

The material on which the record is written is generally parchment, which, until the reign of Elizabeth, is extremely clear and well prepared. From that period until the present, the parchment gradually deteriorates, and the worst specimens are furnished in the reigns of George IV. and William IV. The earliest record written on paper, known to the writer, is of the time of Edward II. It is one of a series entitled 'Papirus magistri Johannis Guicardi contra-rotulatoris Magnæ Costumæ in Castro Burdegaliæ, anno domini M°. ccc°. viii°.' These records are in the office of the queen's remembrancer of the exchequer.

Tallies were records of wood. [TALLY.]

The handwriting of the courts, commonly called court-hand, which had reached its perfection about the reign of our second Edward, differs materially from that employed in chartularies and monastic writings. As printing extended, it relaxed into all the opposites of uniformity, clearness, legibility, and beauty which it once possessed. The ink too lost its antient indelibility; and, like the parchment, both handwriting and ink are the lowest in character in the latest times: with equal care, venerable Doomsday will outlive its degenerate descendants.

All the great series of our records, except those of parliament, are written in Latin, the spelling of which is much abbreviated, and in contractions, there can be little doubt, derived from Latin manuscripts. The reader who desires to be further informed on the subject may consult the collection which Mr. Hardy has inserted in the preface to his 'Close Rolls of King John,' and Mr. Hunter, in his preface to the 'Fines of Richard I. and John.' During the Commonwealth, English was substituted; but soon after the Restoration, Latin was restored, and the records of the courts continued to be kept in Latin until abolished by act of parliament in the reign of George II. In certain branches of the Exchequer, Latin continued in use until the abolition of the offices in very recent times. Many of our statutes from Edward I. to Henry V., and the principal part of the rolls of parliament, are written in Norman French. Petitions to parliament continued to be presented in Norman French until the reign of Richard II., whose renunciation of the crown is said to have been read before the estates of the realm at Westminster first in Latin and then in English. After this period we find English, which had doubtless always remained in use among the lower classes, often used in transactions between the people and government--a sure sign that the distinctions of Norman origin were nearly absorbed among the people at large.

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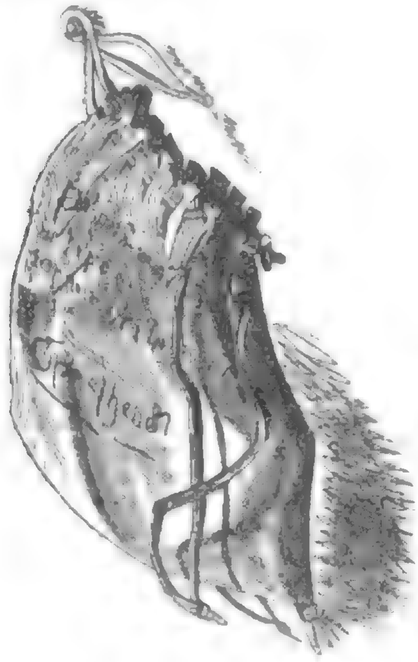
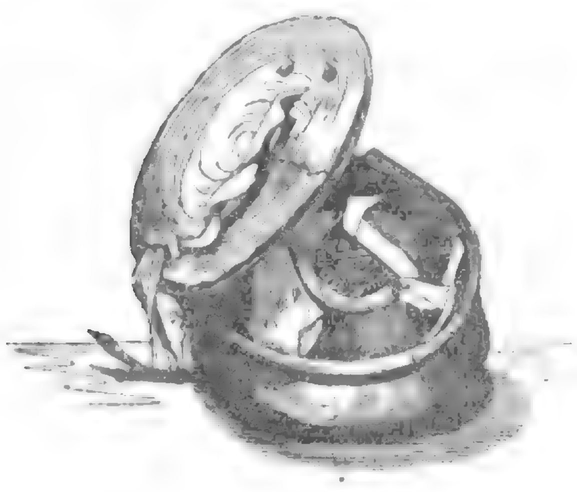
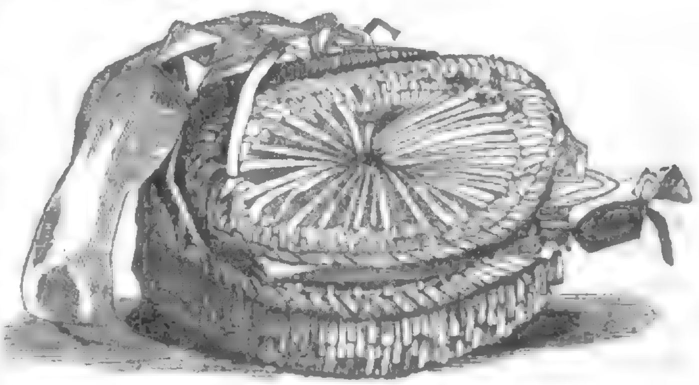
* The rolls of the Great Wardrobe exceed eighteen inches in width.

Sir Francis Palgrave edition of the 'Calendars and Inventories of the Treasury of the Exchequer,' some of which were compiled as early as the fourteenth century, are extremely interesting in exhibiting the antient modes in which records were preserved. Whilst reading them we may imagine ourselves groping in the dark and damp vaults of the 'treasury' of the Exchequer, among the coffers, chests, boxes, and hampers filled with records, and the walls around us covered with small bags and pouches. No uniform system of arrangement seems to have been employed, but a different expedient was used for the preservation of nearly every separate document. Great numbers, judging from the quantity found in arranging the miscellaneous records of the king's remembrancer of the Exchequer, were kept in pouches or bags of leather, canvas, cordovan, and buckram, a mode which is still used in this department of the Exchequer. These pouches, which fasten like modern reticules, are described by Agarde, who was keeper of the treasury of the Exchequer, 'as hanging against the walls.' The following drawing represents a leathern pouch containing the tallies and the account of the bailiff of the manor of Gravesend in the 37 and 38 of Edward III.



When they have escaped damp, they have preserved their parchment contents for centuries in all their pristine freshness and cleanliness. Chests, coffers, coffins, and 'forcers' bound with iron and painted of different colours, cases or 'scrinia,'* 'skipprets,' or small turned boxes, and hanapers, or 'hampers of twyggys,' were also used.





These two last illustrations are about one-third of the size of the originals, which remain in the 'treasury' of the Exchequer.

Inscriptions on labels, letters, and 'signs' furnished the means of reference. We owe the following specimens of these 'signs' to the kindness of Sir Francis Palgrave, who has obliged us with the loan of the blocks, cut for his calendars of the Exchequer before mentioned. These signs in most cases bear some analogy to the subject of the documents which they are intended to mark.

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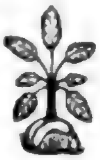
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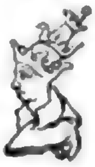
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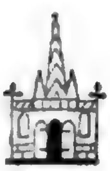
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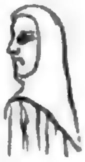
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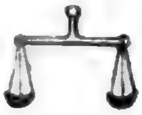
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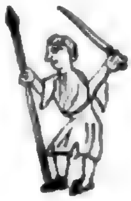
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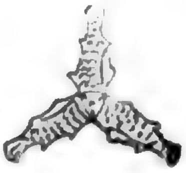
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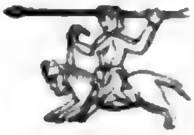
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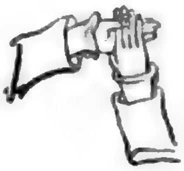
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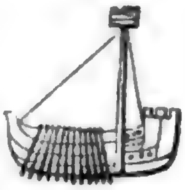
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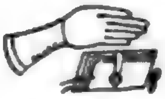
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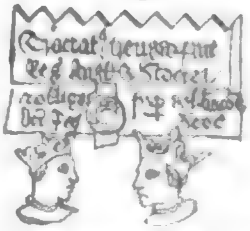
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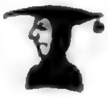
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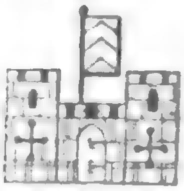

The rolls of the justices of the forest were marked by the sapling oak (No. 1). Papal bulls, by the triple crown. Four canvas pouches holding rolls and tallies of certain payments made for the church of Westminster were marked by the church (3). The head in a cowl (4) marked an indenture respecting the jewels found in the house of the Fratres Minores in Salop. The scales (5), the assay of the mint in Dublin. The Briton having one foot shod and the other bare, with the lance and sword (6), marked the wooden 'coffin' holding the acquittance of receipts from Llewellin, Prince of Wales. Three herrings (7), the 'forcer' of leather bound with iron, containing documents relating to Yarmouth, &c. The lancer (8), documents relating to Aragon. The united hands (9), the marriage between Henry, Prince of Wales, and Philippa, daughter of Henry IV. The galley

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* The Romans kept their records in 'Scrinia,' respectively distinguished as 'Scrinia Viatoria; Scrinia Statalia; Scrinia Palatii; Scrinia Sacra; Scrinia Augusta.'

(10), the recognisance of merchants of the three galleys of Venice. The hand and book (11), fealty to kings John and Henry. The charter or cyrograph (12), treaties and truces between England and Scotland. The hooded monk (13), advowsons of Irish churches. And the castle with a banner of the Clare arms (14), records relating to the possessions of the earl of Gloucester in Wales.

Our ancestors before the Norman conquest pursued no system of public registration, though there are numerous charters of the Anglo-Saxon kings and deeds between private individuals still existing, and historical events are found chronicled in monastic chartularies.

The Anglo-Saxons, whose judicial proceedings were conducted orally, had no records except the 'land-bocs' or charters. The transactions of the folk-moots were not registered or *recorded*, and in the administration of justice no reference was made to written precedents. In such a state of society, though the actual possession of land constituted one of the best titles to real property, still the 'land-boc' furnished evidence of it also. And so important were these 'land-bocs' considered, that when the monks of Ely purchased seven hydes and a half of land, they gave three hydes besides thirty 'aurei' to recover the charter or 'cyrograph' of the title. Duplicates and triplicates of these 'land-bocs' were made, and one 'part' was delivered into the custody of the Burthegn, or chamberlain, to be preserved in the 'horde,' or royal treasury.

When a written account is made of any act, it is clear that it is made not for the exclusive benefit of one party only. In the Doomsday-book of the Norman conqueror, we see evidence that his power was far from absolute. The financial registrations (Rotuli Pipæ) of Henry I., in whose reign the earliest example is found—the records of the judicial proceedings of the 'Curia Regis,' which begin with Richard I.—and the special acts of the monarch himself enrolled on the 'close,' 'patent,' and 'charter' rolls commencing in the reign of John—are all so many irresistible proofs how gradually larger interests were trenching on the will of the king, who formally recognised no other power than his own in the government of the kingdom. The judicial records of the King's Bench and Common Pleas, and the parliamentary records beginning with Edward I., are further evidence of the increasing influence of the nobles and commonalty of the realm.

The king was legally considered as possessing the sovereign power. His peace was broken when the subject fell by the hand of the murderer; his parliament was to be summoned; his honour to be vindicated; and his army to be levied. It was the king's exchequer, the king's wardrobe, the king's court, and essentially the king's chancery; for the chancellor's functions were originally those of a private secretary, combining duties both spiritual and temporal. Holding the keepership of the king's conscience, the chancellor was necessarily of the clerical body, and the chief of the king's chapel. The great seal was in his custody, and the scope of his secretarial duties embraced all those of modern times performed by our secretaries of state for the home and foreign departments; and of all the business transacted a systematic and orderly registration was preserved in the several inrolments called 'patent,' 'close,' 'charter,' &c. All records of these several departments formed part of the king's treasure; and, like the practice of the antient Persians five hundred years before the Christian æra, when Darius caused a search for the decree of Cyrus to be 'made in the house of the rolls, where the treasures were laid up in Babylon' (*Ezra*, 6, i.), were deposited in the king's 'treasuries.'[*] The mutual interest of all parties naturally made the preservation of the records an object of general solicitude; to the king, as they furnished indisputable precedents for his calls of military service and taxation; to the nobles in protecting them in their feudal rights and various privileges; and to the commons most of all, in limiting the powers both of king and nobles, sheltering them from capricious extortion, and securing to them a certain amount of consistency in the administration of justice.

The chamberlain of the exchequer was called 'une grand office, car il gardera le treasour del roy, s. les recordes.' In Henry III.'s reign there were treasuries in the Tower of London and the New Temple. From the latter place, in the 20th of Edward I., out of a chest secured by nine keys, certain records of the Chancery were taken by the king's orders. (*Rot. Claus.*, 20 Edward I., m 13 d.) The Tower had certainly become a permanent treasury for records in the 33rd of Edward I., when a transfer to it was directed to be made of all the papal privileges touching the crown or kingdom, from the treasury of the exchequer at Westminster. (*Rot. Claus.*, 33 Edward I., m. 3.) Another 'treasury' is described by certain 'memoranda, made 19 Edward III., as within the cloister of Westminster Abbey, near the Chapter-House (thesauraria Regis infra Claustrum Abbatiæ Westmonasterii juxta Capitulum). This 'treasury' still remains. A single pillar supports the vaulted chamber, which is yet to be seen, with its double oak doors grated and barred with iron and locked with three keys, and its drawers and 'tills' labelled by Arthur Agarde, who was custos of the records it contained. In his 'Compendium of the Records in the Treasury,' compiled 1610, he says that 'the recordes of the kinge's majesties threasury at Westminster, under the custodie of the lord-threasurer and the two chamberlaines, were lay'd up for their better preservacion in fower severall threasauries under three severall kayes, kept by three sondry officers, distinct the one kay from another, and uppon each dore three lockes. The first in the Court of Receipt; the seacond in the Newe Pallace at Westminster, over the Little Gatehouse there; the third in the late dissolved abbey of Westminster, in the Old Chapter-House; the fourth in the cloister of the sayd abbey.'

The contents of several 'treasuries' at various periods seem to have been consolidated in the Chapter House of Westminster Abbey, which was fitted up in its present state for the reception of records by Sir Christopher Wren. The only existing depositories of records besides the Chapter-House which preserve the appellation of 'treasury,' are the rooms in the Rolls-House, being the 'treasury' of the King's Bench Records, and a portion of the Carlton Riding-House as the 'treasury' of the Common Pleas Records.

The demolition of the old 'treasuries' adjoining Westminster Hall scattered their contents in all quarters of the metropolis. Thus the records of the king's remembrancer, of the Exchequer, and the Common Pleas, migrated from Westminster Hall to the late Mews at Charing Cross; and thence, to make room for the National Gallery, to Carlton Riding-School. The records of the late lord-treasurer's remembrancer and Pipe-Office are entombed two stories deep in the vaults of Somerset House. Those of the King's Bench for a time rested opposite St. Margaret's Church, but were shifted to the Rolls-House in Chancery Lane to make room for the present Rolls Court at Westminster.

Thus from time to time have repositories, as well undignified with the antient title of 'king's treasury' as deficient in that careful superintendence which originally accompanied the title, arisen in all parts of London; and in 1837 a committee of the House of Commons reported that it had seen the Public Records, the most precious part of the king's 'treasure,' deposited at the Tower over a gunpowder-magazine, and contiguous to a steam-engine in daily operation; at the Rolls, in a chapel where divine service is performed; in vaults two stories underground at Somerset House; in dark and humid cellars at Westminster Hall; in the stables of the late Carlton Ride; in the Chapter-House of Westminster Abbey; in offices surrounded by and subject to all the accidents of private dwellings, as the Augmentation Office and First Fruits.' At the present time, besides the offices for modern records attached to each court, we may enumerate the following repositories, with their different localities, as containing the public records:—

The Tower, in Thames Street.
Chapter-House, Westminster Abbey.
Rolls Chapel, Chancery Lane.
Rolls House, Chancery Lane.
Duchy of Lancaster, Lancaster Place, Strand.
Duchy of Cornwall, Somerset House.
Common Pleas, Carlton Ride and Whitehall Yard.
Queen's Remembrancer's Records, in Carlton Ride and tower of Westminster Hall.
Augmentation-Office, Palace Yard, Westminster.
Pipe-Office, Somerset House.
Lord-Treasurer's Remembrancer, Somerset House.
Land Revenue, Carlton Ride.
Pell-Office, 1, Whitehall Yard.

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[*] Certain records of the Chancery followed the king in his migrations over the kingdom as late as Richard II. Religious houses were called upon to provide horses for the conveyance of them. Edward I., by writ, tested the 4th July, in the twenty-eighth year of his reign, commanded the abbot of Furness to provide a strong horse to carry the Chancery Rolls to York.

Exchequer of Pleas, 3, Whitehall Yard.
First-Fruits Office, Temple.

It would seem that as early as the commencement of the fourteenth century the officers charged with the custody of the records were found to be either insufficient or neglectful of the performance of their duties. Since the time of Edward II. scarcely a reign has passed without a special temporary agency being appointed to restore the public records to good order. The necessity probably arose from the functions of the officer charged with the care of the records being altogether changed, as in the instance of the master of the Rolls, who was the *bonâ fide* 'gardein des roules' in early times.

In the 14th Ed. II., the barons of the Exchequer were directed to employ competent clerks to methodise the records, which were 'not then so properly arranged for the king's and the public weal as they ought to be.' Again in the 19th year of Ed. II., certain commissioners were appointed for a similar purpose. In Edward III.'s reign, at least three like commissions were issued (*Rot. Claus.*, Annis 34 and 36; and *Rot. Parl.*, Anno 46). Statutes for the protection of records from falsification, erasure, and embezzlement were passed 8 Rich. II., c. 4, and 11 Hen. IV., c. 3. Other measures were taken by Hen. VI., Hen. VII., and Hen. VIII. Inquiries into the state of the Parliamentary, the Chancery, and Exchequer Records were prosecuted in Queen Elizabeth's reign. James I. proposed 'an office of general Remembrance for all matters of record,' and a State Paper Office, which Charles II. established. Nor were the reigns of Anne and the two first Georges wanting in investigations into the subject. Committees of both Houses of Parliament from time to time visited the several repositories, and the fire of the Cottonian Library in 1731 produced a report which describes the condition of most of the public repositories at that period. But the fullest examination into the state of the public records which has been made in recent times was effected by a Committee of the House of Commons, in 1800, conducted by lord Colchester, then Mr. Abbot, and the report of that Committee presents by far the most perfect and comprehensive account which has yet appeared of our public records, to which a period of forty years has added very little. This Report originated a commission for carrying on the work which its authors had begun. The Record Commission was renewed six several times between the years 1800 and 1831, and altogether suspended at the accession of the present queen. All the several record commissions during thirty years recited, one after another, that 'the public records of the kingdom were in many offices unarranged, undescribed, and unascertained;' that they were exposed 'to erasure, alteration, and embezzlement,' and 'were lodged in buildings incommodious and insecure.' The commissioners were directed to cause the records to be 'methodized, regulated, and digested,' bound and secured; to cause 'calendars and indexes to be made and 'original papers' to be printed. The present state of the Record Offices affords abundant evidence, that the record commissioners interpreted their directions in an inverse order; expending the funds entrusted to them rather in printing records than in arranging or calendaring them. And it is an undoubted fact that notwithstanding these commissions, records were 'embezzled'—and are still lodged in most 'insecure' buildings. A very full investigation into the proceedings of the record commission was made by a Committee of the House of Commons in 1835, and the reader who is curious to know more than our space allows us to state, may consult its Report. Certainly during the last half-century there has been no niggard expenditure in one shape or another in respect of the public records. It is not very easy to ascertain its total amount or the precise appropriation of it; but the following may be received as an approximation to correctness:—

Parliamentary Papers show that grants were made on behalf of the Record Commission between 1800 and 1831, to the amount of	£362,400
Between 1831 and 1839 inclusive . . .	125,700
Salaries, &c. for the custody of Records .	120,000
Fees, estimated on an average of the years 1829, 1830, and 1831, at least . . .	120,000
Removals of Records, estimated at . .	30,000
	758,100
Irish Record Commission, estimated at .	120,000
	£878,100

Of the grants made to the record commission, by far the greater part was spent in printing and the expenses connected therewith. At the conclusion of this paper we have given a list of the works that they published, many of which are undoubtedly of great utility.

A very important step has recently been taken by the legislature to provide for the better custody and preservation and more convenient use of the public records. An act was passed (1 and 2 Vic., c. 49) calculated to remedy effectually what preceding efforts had in vain attempted, by constituting a special agency for the custody of the records; to the want of which and a sufficient responsibility, all the defects of the old system are attributable. By this act the Master of the Rolls is made the guardian of the public records, having powers to appoint a deputy, and, in conjunction with the treasury, to do all that may be necessary in the execution of this service. The act contemplates the consolidation of all the records, from their several unfit repositories, into one appropriate receptacle; their proper arrangement and repair; the preparation of calendars and indexes, which are more or less wanting to every class of records; and giving to the public more easy access to them. Lord Langdale, the present master of the rolls, to whose influence the change of system is greatly due, has already brought the above act into as full operation as circumstances have allowed. The old custodyship of most of the offices has been superseded, and the offices are constituted branches of one central depository, the Public Record Office, which, until a proper building is ready, is at the Rolls House in Chancery Lane. The Victoria Tower of the new Houses of Parliament has been named as a likely repository for the public records. The arrangement and repair as well as the making of inventories of records have been generally begun in most of the offices.

Preparations are also making for a uniform system of calendaring, a gigantic work which a century will hardly see completed. To select what is useful from the judgments of a single court, the Common Pleas for instance, at least 1200 miles of parchment nine inches wide must be patiently read through; and yet, without the performance of this labour, these records can scarcely be consulted.

The principal changes which have been made for the better accommodation and access of the public may be seen in the following table:—

System before July, 1840.

Office.	Hours of Attendance.	Charges for			*Present System.*
		Search.	Inspection of Record.	Copy of Record.	
Tower . .	10 till 3	10s.	6s. 8d.	1s. per folio	Attendance 10 till 4. Search in all Indexes, Calendars, &c. 1s. Inspection of a Record 1s. Copies 6d. per folio. The public may make extracts or copies in pencil, hitherto forbidden or allowed as a favor.
Rolls Chapel .	10 till 3	1s. a year ea. name	2s 6d. ea. Roll	5s. 6d. a sheet	
Chapter House	10 till 1	3s. 4d.		1s. per folio	
Carlton Ride (Common Pleas)	10 till 4 In term-time only	3d a term 2s. 6d. in Index		6d. per folio	
3, Whitehall Yard Common Pleas	No attendance				
Exch. of Pleas	No attendance	3d. a term		6d. per folio	
King's Bench (Rolls House)	No attendance	2s. 6d. in Index			

We can only find space to glance at the particular classes of the public records, noticing in the fewest words the more antient and valuable. No enumeration we could give would enable the reader to dispense with reference to the inventories, repositories, calendars, catalogues, and indexes which are printed, or those existing in manuscript in the various Record Offices. The best work of general reference is the 'Report of the Select Committee in 1800,' from which we have taken a brief analytical list of the subjects to which the public records relate. Though this list is not altogether what is to be desired, it is the best within moderate limits that we know of, and is sufficient to prove that there is perhaps no branch of the public administration of our country which is destitute of its authentic memorials. The subjoined list consists merely of the headings of a much fuller analysis of the public records, which shows also their age and place of deposit. It was compiled by Mr Luders, and is printed in the above Report.

ENGLAND.

I. *The King, Royal Family, and Household.*

1. The King. 2. The Queen. 3. The Prince of Wales. Household Privy Seals and Correspondence. Principality of Wales. Duchy of Cornwall. 4. Custos Regni, Lieutenant, Protector, Regent, Lord Justices. 5. Household. 6. The King's Chamber.

II. *The Royal Councils.*

1. Parliament. The House of Lords. The House of Commons. 2. Privy Council.

III. *The Royal Prerogative.*

1. In Ecclesiastical Affairs. Before and after the Reformation. Proceedings of the Commonwealth. 2. In Civil Affairs. General Administration of the Realm. Honours and Offices. Trade and Coin. 3. In Military and Naval Affairs. 4. In Foreign Affairs.

IV. *The Royal Revenues.*

1. Ordinary. Land Revenues. Casual Revenues. 2. Extraordinary.

V. *Courts of Justice.*

1. Of Abolished or Obsolete Jurisdiction. Curia Regis. Placita de Assisis. Placita Itineraria. Placita Forestæ. Placita Coronæ. Placita Aulæ Placita de Quo Warranto. Star Chamber Proceedings. Court of Requests. Court of Wards and Liveries. Court of Augmentations. Surveyor General's Court. Court of Chivalry: viz. Constable and Marshal. 2. Of Occasional Jurisdiction. Special Commissions. Court of Judicature for determining Differences after the Fire of London. High Court of Justice. 3. Of Established Jurisdiction. Chancery. Its Ordinary and Extraordinary Jurisdiction. King's Bench. Pleas of the Crown and in Civil Suits. Common Pleas. Exchequer of Account—The Queen's Remembrancer's Office, The Lord Treasurer's Remembrancer's Office. Exchequer of Receipt—Tellers, Tally Court, Auditor or Tally Writer, Pell Office, Auditors of Imprest, Commissioners for auditing the Public Accounts. Exchequer of Pleas and of Error. Marshalsea and Palace Courts. Session of Oyer and Terminer and Gaol Delivery for London, and Gaol Delivery for Middlesex. Great Sessions of Wales. Duchy of Lancaster. Counties of Palatine. Stannary Courts. Cinque Ports. Commissioners of Sewers. Quarter-Sessions and Clerks of the Peace. Maritime Courts—Admiralty Instance Court, Admiralty Prize Court, Court of Appeal in Prize Causes. Ecclesiastical Jurisdiction—Episcopal, Archiepiscopal, Appellate Jurisdiction, Deans and Chapters. Courts for offences in India.

VI. *Universities and Colleges, Schools, &c.*

1. Universities and Colleges. 2. Royal Schools, Chauntries, Hospitals, Colleges, Free Chapels, Fraternities, and Guilds.

VII. *Alienation of Private Property.*

SCOTLAND.

1. *The King.*

Title, Great Seal, Privy Seal, Signet, Chancery, Revenues, and Expenses. Acts of Civil Government. Ecclesiastical Government. 2. Parliament. 3. Privy Council. 4. General Registers. 5. Courts of Justice. Court of Session. Justiciary Court. Court of Exchequer. Admiralty Court. Commissary Courts. Court of Teind. Sheriff Court. 6. Universities.

IRELAND.

The principal Record Repositories in Dublin are the *Bermingham Tower*, which contains Plea Rolls, Pipe Rolls, Summonisters' Rolls, Sheriffs' Tot Rolls, &c.; the *Parliamentary Record Office;* the *Rolls Office;* the Statute Rolls from Hen. V. to the Union; Patent and Close Rolls from 31 Ed. I. to the present time; Inquisitions post Mortem; Fiants from 21 Hen. VIII. to the present time: Decree Rolls; Recognizance Rolls from 21 Hen. VIII; the *Chief Remembrancer's Office*, Memoranda Rolls from 6 Ed. I. to the present time; the *Auditor-General's Office*, Rolls of Public Accounts from Hen. VIII.; the Receiver-General, Vice-Treasurer's, Pell's, and Chamberlain's Books, the Debenture Exchequer Bills, and other Loan Books, the Vouchers of Public Accounts, the Collector's Accounts from every district in Ireland; the Quit-Rent Receipt Books, the Sheriffs' Accounts, with some Ancient Accounts of the Hanaper, First Fruits, Farmers of Revenue, Subsidies, Poll Tax, &c. The *Prerogative Office;* the *First Fruits Office: Surveyor-General's Office.* (*Reports of the Commissioners on the Public Records of Ireland.*)

The most important Public Records may be enumerated as follows:—

Great Roll of the Exchequer, from Hen. II., 1154, to Geo. III., 1760.
Comptroller's or Chancellor's Roll, 11 Hen. II.—Geo. III., 1760 (now deposited in the British Museum).
Rotuli Curiæ Regis, Ric. I., 1194 - Hen. III., 1216.
Fines, Concords, Writs of Covenant, Feet of Fines, &c., 25 Hen. II., 1179—Wm. IV., 1833.
Charter Rolls, John, 1199—Hen. VIII., 1509.
Norman Rolls, John, 1200—Hen. V., 1412.
Patent Rolls, John, 1201—present time.
Close Rolls, John, 1204—Geo. II., 1727.
Liberate Rolls, John, 1200—Edw. IV., 1460-1.
Fine Rolls, John, 1204—Chas. I., 1625.
French Rolls, Hen. III., 1232—Edw. IV., 1460-1.
Gascon Rolls, Hen. III., 1242—Hen. VI., 1422.
Scotch Rolls, Edw. I., 1291—Edw. IV., 1460-1.
Roman Rolls, Edw. I., 1305—Edw. IV., 1460-1.
Statute Rolls, (afterward the Parliament Roll,) Edw. I., 1277—Edw. IV., 1460-1.
Rolls of Parliament, Edw. I., 1272—Ric. III., 1483; Statutes, Hen. VII., 1485—Geo. II., 1727.
Petitions in Parliament, Edw. I., 1272—Edw. IV., 1460.
Journals of the House of Lords, Hen. VIII., 1509—to present time.
Journals of the House of Commons, Hen. VIII., 1509.
Summons and Returns to Parliament, Edw. I., 1288—Hen. VI., 1422; 33 Hen. VIII.—present time.
Original Acts of Parliament, 12 Hen. VII.—Wm. IV., 1830.
Inquisitiones post Mortem, or Escheats, Hen. III., 1216—Chas. I., 1625.
Inquisitiones ad quod damnum, Edw. II., 1307—Hen. VI., 1422.
Coronation Rolls, Edw. II., 1307—(series imperfect)—Geo. II., 1727.
Treaty Rolls (irregular series), Edw. V., 1483—James II., 1684-5.
Confirmation Rolls, Ric. III., 1483—Commonwealth, 1649.
Dispensation Rolls, 37 Eliz.—Geo. II., 1727.
Rolls of Pardons, Ric. III., 1483—Eliz. 1558.
Judgment or Decree Rolls of Chancery, 25 Hen. VIII.—Geo. II., 1727.
Surrender and Specification Rolls, Chas. II., 1648-9—present time.
Privy Seals and Signet Bundles, Bills, and Writs, Edw. I., 1272—present time.
Signed Bill Bundles, Hen. VII., 1485—present time.
King's Bench Judgments, &c. inrolled, Edw. I., 1272—present time.
Common Pleas Judgments inrolled, Edw. I., 1272—present time.
Placita Terræ of the Common Pleas, Eliz., 1558—present time.
Pleas of the Forest, Hen. III., 1216—James II., 1684-5.
Memoranda Rolls of King's Remembrancer, Hen. III., 1216—present time.
Originalia, Hen. III., 1216—Geo. III., 1760.
Miscellaneous Records of the King's Remembrancer, Ric. I., 1189—Geo. III., 1760.
Court of Augmentations, Ministers' Accounts, Hen. VIII., 1509—Chas. II., 1648.
Inrolments of Judgments, &c. in the Exchequer of Pleas, Hen. III., 1216—present time.
Placita de Assisis, 6 Ric. I.—Edw. V., 1483.

The preceding list exhibits generally, with a few exceptions hereafter noticed, the commencement of the chief and most valuable of our national records, and the periods over which they extend, from the time of Richard I., the boundary of 'legal memory.'

In the above list we have not included Domesday Book, the choicest of all our record treasures, and the cornerstone of our topographical history. The record itself has been most faithfully printed, and copiously described by Sir Henry Ellis. [DOMESDAY BOOK.] There are two abridgements of Domesday Book among the exchequer records, made probably about the time of Henry III. Subsequent territorial surveys, the Hundred Rolls, Extenta Manerii, Testa de Nevill, and Pope Nicholas' Taxation temp Ed. I., the Domesday of Wales, and Nonæ Rolls temp. Ed. III., King Henry VIII.'s Surveys, and Parliamentary Surveys of the Commonwealth, are excluded, because they form no consecutive series like the above.

The Great Roll of the Exchequer, or Pipe Rolls, or Rotuli Annales, being yearly accounts of the king's revenue, are conjectured to have begun with the Conqueror. Some evidence exists to establish that they probably extended over the whole reign of Henry I., though we know at present but of a single roll, the thirty-first year of that reign, which the Record Commission published under the editorship of Mr. Hunter. Excepting the rolls for the 1st of Henry III. and 7 Henry IV., the series from the 2nd of Henry II. is complete. Madox speaks of them as 'Recorda omnium quæ in Archivis Regis usquam me memini, splendidissima, post Rotulum censualem quem Librum Domesday vocant; quin ei æquiparanda.'

The series of Fines, being records of the transfer of lands, &c., extends unbroken, and almost unchanged in form, from the 25 Henry II. to the end of the year 1833, when this species of conveyance was abolished. [FINES.] Since the 18 Edward I. they have been delivered from time to time into the 'treasury' of the exchequer. Those in the Chapter-house and those lately kept by the Custos Brevium of the Common Pleas will shortly be united, and will present a series of records, like the Pipe Rolls and Rolls of the Curiæ Regis, unrivalled in all Europe. The Cartæ Antiquæ in the Tower are transcripts of charters descending from the Saxon times to Henry III. They are hardly to be considered as part of the splendid series of chancery rolls commencing in King John's reign. In noticing the chancery rolls it is quite superfluous to do more than refer the reader to the prefaces which Mr. Thomas Duffus Hardy has attached to his editions of the earliest close and patent rolls. If we were to continue to particularise documents of age and interest, such as the Norman pipe-roll of Henry I., the 'Rotulus de Dominabus, temp. Henry II.' (which was printed by Mr. Stacey Grimaldi, in 1830), the Red Book of the Exchequer, containing the laws of the Conqueror and those ascribed to Henry I. (which has been fully catalogued by Mr. Hunter, in the *General Report of Commissioners on Public Records*, 1837, p. 165), the Misæ and Præstita rolls of King John, or the Magnæ Chartæ of our kings, which were not inrolled in a systematic series until 1278, we should never conclude the subject. We therefore refrain from further specifications, and conclude this article with a list of the various publications of the Record Commissioners.

1. Domesday Book: seu Liber censualis Willielmi Primi, Regis Angliæ.
   Domesday Book, 2 vols. folio, 1783.
   Additamenta, consisting of the Exon Domesday, Inquisitio Eliensis, the Winton Domesday and the Boldon Book, and Indices, 2 vols. folio, 1816.
2. Statutes of the Realm, 9 vols. fol.; Alphabetical Index, 1 vol.; Chronological Index, 1 vol.: in all eleven volumes.
3. Fœdera, Conventiones, Litteræ, et cujuscunque generis Acta Publica, inter reges Angliæ, et alios quosvis Imperatores, Reges, Pontifices, Principes vel Communitates (being a new edition of Rymer's Fœdera).
4. Calendarium Rotulorum Patentium in Turri Londinensi (from John to Edward IV.), 1 vol. fol.
5. Calendarium Rotulorum Chartarum et Inquisitionum ad quod damnum (from John to Henry VI.), 1 vol. fol.
6. Calendarium Inquisitionum ad quod damnum (from 1 Edward II. to 38 Henry VI.).
7. Placitorum, in domo Capitulari Westmonasteriensi Asservatorum—abbreviatio, temporibus regum Richard I., Johannis, Henry III., Edward I. et Edward II., 1 vol. fol.
8. Testa de Nevill; sive liber Feodorum in Curia Scaccarii, temp. Henry III. et Edward I., 1 vol. fol.
9. Rotulorum Originalium in curia Scaccarii abbreviatio temporibus regum Henry III., Edward I., II., et III., 1 vol. fol.
10. The Parliamentary Writs, and Writs of Military Summons; together with the Records and Muniments relating to the suit and service due and performed to the King's High Court of Parliament and the Councils of the Realm, or affording evidence of attendance given at Parliaments and Councils, vol i.; vol. ii. divisions 1 and 2 and 3, fol.
11. Rotuli Hundredorum, temp. Henry III et Edward I. in Turri Lond., et in Curia receptæ Scaccarii Westm. Asservati, 2 vols. fol., 1812
12. Placita de Quo Warranto, temporibus Edward I. II., et III. in Curia Scaccarii Westm. Asservata, 1 vol. fol., 1818.
13. Calendarium Inquisitionum post Mortem, sive Escaetarum, 4 vols. fol. (from Henry III. to Edward IV.).
14. Nonarum Inquisitiones in Curia Scaccarii temp. Regis Edwardi III., 1 vol. fol., 1807.
15. Taxatio Ecclesiastica Angliæ et Walliæ, Auctoritate P. Nicholai IV., circa A.D. 1291, 1 vol. folio.
16. Valor Ecclesiasticus, temp. Henry VIII., Auctoritate Regia institutus, 6 vols., folio.
17. Calendars of the Proceedings in Chancery in the Reign of Queen Elizabeth; to which are prefixed Examples of earlier Proceedings in that Court, namely, from the Reign of Richard II. to that of Queen Elizabeth inclusive, from the originals in the Tower, 3 vols., folio.
18. Ducatus Lancastriæ Pars Prima:—Calendarium Inquisitionum post Mortem, &c., Temporibus Regum Edward I., Edward III., Richard II., Henry V., Henry V., Edward IV., Henry VII., Henry VIII., Edward IV., Reginæ Mar., Phil. et Mar., Eliz., Jac. I., Car. I.
   Pars Secunda:—A Calendar to the Pleadings, &c. in the reigns of Henry VII., Henry VIII., Edward VI., Queen Mary, Philip and Mary, and Elizabeth, 3 vols., fol.
19. A Catalogue of the Manuscripts in the Cottonian Library deposited in the British Museum, 1 vol., folio, 1802.
20. A Catalogue of the Harleian Manuscripts in the British Museum, 4 vols., fol., 1808-1812.
21. A Catalogue of the Lansdowne Manuscripts, 1 vol., fol.
22. The Acts of the Parliament of Scotland, vol. ii. to vol. xi.; from 1424 to 1707.
23. Registrum Magni Sigilli Regum Scotorum, in Archivis Publicis asservatum, A.D. 1306-1424, 1 vol. fol., 1814.
24. Rotuli Scotiæ in Turri Londinensi, et in Domo Capitulari Westmonasteriensi Asservati, 2 vols., fol.
25. Inquisitionum ad Capellam Domini Regis retornatarum quæ in Publicis Archivis Scotiæ adhuc servantur Abbreviatio, 3 vols., fol.
26. A General Introduction to Doomsday Book, 2 vols., 8vo.
27. Rotulus Litterarum Patentium 7 John: Transcripta Litt. Pat. Hiberniæ, temp. Henry V. and VI. Placita 52 Henry III., 8vo.
28. Rotuli Litterarum Clausarum ab anno 1204 ad annum 1224, 1 vol.
29. Rotuli Litterarum Patentium, A.D. 1201-1216, fol.
30. The Chancellor's Roll, or Antigraph of the Great Roll of the Pipe, 3 John, 8vo.
31. Rotulus Magnus Pipæ de anno 31 Henry I., commonly called the Roll of Stephen, 8vo.
32. Proceedings and Ordinances of the Privy Council in the reigns of Richard II., Henry IV., V., VI., 7 vols., 8vo.
33. Rotuli Normanniæ: John and Henry V., 8vo.
34. Excerpta e Rotulis Finium; Henry III., 2 vols., 8vo.
35. Rotuli de Oblatis et Finibus; John, 1 vol., 8vo.
36. Fines sive Pedes Finium, sive finales Concordiæ in Curiâ Domini Regis, A.D. 1195-1214, 8vo.
37. Rotuli Curiæ Regis Ric. I. et John, 2 vols., 8vo.
38. An Account of the most important Records of Great Britain, by C. P. Cooper, 2 vols., 8vo.
39. Selections from the Miscellaneous Records of the King's Remembrancer of the Exchequer, fol. (not yet issued).
40. Docquets of Commissions, Grants of Honors, Pardons, and other patents of Charles I. while at Oxford, 1642-46, 8vo. (not yet issued).
41. Antient Inventories and Calendars of the Treasury of the Exchequer, from Edward III. to Henry VIII., 3 vols., 8vo.
42. Documents elucidating the Ancient History of Scotland, Alexander III. to Robert I., 1 vol., 8vo.
43. The Charter Rolls of John, 1 vol., fol.
44. Antient Laws and Institutes of England, comprising laws enacted under the Anglo-Saxon kings from Æthelbert to Canute, with an English translation of the Saxon; the laws called Edward the Confessor's; the laws of William the Conqueror; and those ascribed to Henry I. Also Monumenta Ecclesiastica Anglicana, from the seventh to the eleventh century; and the antient Latin version of the Anglo-Saxon Laws, 1 vol., fol., 1840.

The printing of a considerable number of other work was in progress when the Record Commission dropped. What these were may be seen in the Commons' *Report on the Record Commission, App.*, p. 782.

RECOVERY, COMMON. A common recovery was a judgment in a fictitious suit, in which the tenant of the freehold was the defendant; and the judgment was given in consequence of default made by the person who was last vouched, that is, summoned to warranty in such suit. It was used for the purpose of barring estates tail and all remainders and reversions expectant thereon.

A common recovery was in the form of a judgment obtained in a real action, and accordingly the mode of proceeding was the same as in an action not fictitious. The plaintiff in the action, or demandant, who sought to recover the lands, sued out a writ or præcipe, at it was called, from the words of the writ (Praecipe A, the tenant, quod juste, &c. reddat B, the lands in question) against the person who had the freehold of the estate, and who was called the tenant to the præcipe. When the recovery was suffered by a tenant in tail in possession, he might himself be the tenant to the præcipe. The tenant of the freehold appeared to the writ by himself or by his attorney; but instead of defending his title, he vouched (vocavit) some other person who was supposed to be bound to warrant the tenant's title, and he prayed that the person so vouched (the vouchee) might defend the title so warranted, or that, if he could not, he might give the tenant lands of equal value with those which he might lose by failure of the warranty. The vouchee, having appeared, undertook the defence of the tenant's title, but he purposely failed to do so, and on his default the court gave judgment, which was that the demandant or recoveror should recover the lands against the tenant, and that the tenant should recover against the vouchee lands of equal value. Such lands were called the recompense or recovery in value. By the first judgment the demandant obtained the fee simple of the estate. The whole proceeding being a fiction, it was usual to make the common crier of the Court of Common Pleas the vouchee, who was hence called the common vouchee. This proceeding was called recovery with single voucher; but there might be recovery with double or treble voucher, in which case judgment was given against the several vouchees. In the case of double voucher, the tenant in tail conveyed an estate of freehold to some person, against whom the demandant brought the writ or præcipe. The tenant to the præcipe vouched the tenant in tail, who vouched over the common vouchee, who of course made default, and judgment was accordingly given for the demandant against the tenant to the præcipe, for the tenant to the præcipe against the tenant in tail, and for him against the common vouchee.

On judgment being given, a writ of habere facias seisinam was sued out, which was directed to the sheriff of the county, who was thereby ordered to put the demandant in possession of the lands in question. In practice the writ of seisin was not executed, but it was necessary that it should be returned, and when it was returned the recovery was complete.

The principal circumstances have been mentioned which were necessary to make a good recovery, and a defect in any one of them, or in any of the proceedings, might vitiate the recovery. One of these circumstances of the greatest practical importance was the making a good tenant to the præcipe; for unless the person against whom the writ was brought was actual tenant of the freehold, there could be no good recovery. It was however sufficient if he acquired the freehold at any time before judgment was given in the suit; and by 14 Geo. II., c. 20, § 6, it was sufficient if he acquired the freehold after judgment and the award of the writ of execution.

When the person who wished to suffer the recovery was tenant in tail in possession, the writ might be directed to him (as already observed), and he would be the tenant to the præcipe. But it was usual for the tenant in tail to be vouched, in which case some other person must be the tenant to the præcipe; and for the following reason:—The validity of the recovery was founded on the doctrine that the estate which the tenant in tail obtained by virtue of the warranty in lieu of that which he lost by the vouchee's default, would descend to the heirs in tail, just as the estate would have done which the tenant in tail had lost. It is true that the recompense could not extend to the person entitled to the reversion, nor to contingent interests; but this defect, which would have been fatal if the transaction had been real, was never considered to impair the efficacy of the fictitious proceeding. But it was a settled principle that the estate obtained by way of recompense would only follow the course of descent of that estate of which the tenant in tail was seised at the time of the recovery; and therefore if the tenant in tail at the time of the recovery was not seised of an estate tail according to the form of the original gift, the recompense in value would descend according to the estate which he had at the time of the recovery, and not according to the original gift; and consequently those who claimed under the original gift would not be barred because they obtained no recompense in value. It might happen in various ways that the estate which the tenant in tail had at the time of the recovery was not the estate tail according to the original gift. To prevent this inconvenience, the tenant in tail gave an estate of freehold to some person in order to make him a good tenant to the præcipe. This was done in various ways, but generally by bargain and sale enrolled, or by lease and release. The instrument which transferred the estate of freehold generally contained the declaration of the uses of the recovery, as hereinafter mentioned. The action being brought against the tenant to the præcipe, he vouched the tenant in tail, who vouched over the common vouchee. As the tenant in tail confessed the warranty, and undertook the defence of the action, he was considered to submit all his rights in the land to the effect of the recovery, which was called a recovery with double voucher. If the tenant in tail had only a vested estate in remainder, he could not make a tenant to the præcipe, and it was therefore necessary, in order to suffer a recovery, that the first person who had an estate of freehold in the lands should consent to make a tenant to the præcipe. But by 14 Geo. II., c. 20, it was not necessary for the tenant in tail to have the concurrence of the immediate freeholder, if he was merely a lessee for life subject to the payment of a rent; but if the estate tail was preceded by any estate or estates of freehold, besides that of the lessee for life, the concurrence of the holder of such estate, or of the first of such estates was necessary. In many of the questions which have arisen on the validity of recoveries, the question has been whether there was a good tenant to the præcipe.

A common recovery was generally suffered in the Court of Common Pleas only; but common recoveries of lands in the counties palatine of Durham and Lancaster were suffered in the respective courts of those counties. A recovery of lands held in antient demesne was suffered in the courts of the manors of which such lands were held; and in many manors a recovery might be suffered in the customary courts of such manors of which the copyholds were parcel.

The writ of entry, as appears from its form, was not generally adapted to incorporeal hereditaments, yet such hereditaments were supposed to be included in it for the purpose of suffering a recovery. Though a rent charged on lands might be the subject of a recovery, a rent charged on personal estate could not. The interest, of which a recovery was suffered, might be an undivided share. As an equitable estate may be entailed, it was held that a common recovery suffered by a cestui que trust in tail in possession would bar such estate tail and all equitable remainders and reversions dependent upon it. In recoveries of this kind it was necessary that there should be an equitable tenant to the præcipe.

The effect of a common recovery differed in several respects from that of a fine. A fine was originally introduced as a mode of alienation by record, and its effect in barring entails was owing to the stats. 4 Hen. VII., c. 24, and 37 Hen. VIII., c. 19, which were not made till several centuries after the introduction of fines. A common recovery had no absolute effect after a fixed number of years, as a fine had; but inasmuch as the recoveror acquired an estate in fee simple, it had effects very different from those of a fine. A common recovery duly suffered defeated all the remainders and reversions expectant on the estate tail, and also all shifting uses and executory devises expectant upon it, provided the recovery was suffered before the contingency happened on which the executory devise was to take effect. A fine had the effect of destroying the estate tail by converting it into a determinable fee. Accordingly if the tenant in tail who had the immediate remainder or reversion in fee barred his estate tail by a fine, he acquired a base fee, which was merged in the remainder or reversion, which thus became an estate in possession, and subject to all the charges and estates made and created by the person from whom the tenant in tail derived his remainder or reversion. Besides this, it would be necessary for such person on any occasion of selling his land, to make out his title to the remainder or reversion. A common recovery operated by enlarging the estate tail into a fee, and thus absolutely destroying all remainders and reversions, but it confirmed all prior estates or charges made by the tenant in tail who suffered the recovery. Thus if a tenant in tail made a lease not permitted by the stat. 32 Henry VIII., or acknowledged a judgment, and then suffered a common recovery, this would be a confirmation of those charges, which, if there had been no recovery, would have had no effect against the issue in tail.

The origin of recoveries is referred to the decision in Taltarum's case, 12 Edw. IV., in which, though it was declared that the estate tail in question was not barred by the recovery suffered, the reason that was given for the decision admitted that it might have been barred by a recovery. In Taltarum's case, the tenant who suffered the recovery was not seised of the estate tail under which the issue in tail claimed, but he was seised of a different estate at the time of the recovery being suffered.

Those persons only were barred by a common recovery who were parties to it, and also the issue in tail, remaindermen, and reversioners, and all persons who claimed under any limitations expectant on or to take effect after the determination of the estate tail. But no estates or interests prior to the estate tail were affected by the recovery.

Recoveries were impeachable for various reasons, such as defect of jurisdiction in the court in which they were suffered, informality in the proceedings, and the want of a good tenant to the præcipe.

The immediate object of the recovery, as above observed, was to give an estate in fee simple to the recoveror; but the ultimate object was to commonly settle the estate to new uses, which were generally declared by the instrument which gave the estate of freehold to the tenant to the præcipe.

By 3 & 4 Will. IV., c. 74, fines and recoveries are abolished, formal defects in those already levied or suffered are cured, and more simple modes of assurance are substituted. The substitution provided by this Act for the barring of an estate tail and all estates and interests to take effect after the determination of or in defeasance of the estate tail, is an assurance by deed to be enrolled in the court of chancery within six calendar months after its execution.

RECRUITING is the act of raising men for the military or naval service, either to augment the numerical strength of an army or fleet by new levies, or to make good the complement of any regiment or ship. The term may be used when men are obtained in any of the ways which the customs of nations have sanctioned or the necessities of certain times may have required; but among military men it is employed when officers, especially appointed for the purpose, engage men by the offer of bounties to enter as private soldiers into particular regiments. The officers, commissioned and non-commissioned, while so employed, are said to be on the recruiting service; but the actual engaging of men as recruits is called enlistment; and the laws relating to this subject have been already noticed. [ENLISTMENT.]

Formerly private persons were allowed to enlist men for the army in any way that they might think best; but these having sometimes adopted, in order to procure recruits, violent and illegal means by which the public indignation was excited, the government in 1802 took the management of the recruiting department into its own hands; and now, by a clause in the Mutiny Act, any person advertising or opening an office for recruits without authority in writing from the adjutant-general or the directors of the East India Company is liable to the penalty of twenty pounds.

In order to produce uniformity in the system of recruiting, and to ensure the employment of legal means only in obtaining men, the supreme control of this branch of the military service was vested in the adjutant-general of the army, and both Great Britain and Ireland were divided into several recruiting districts. To each of these was appointed an inspecting field-officer; an adjutant, whose duty it is to ascertain, in respect of stature and bodily strength, the fitness of any recruit for the service; a paymaster, and a surgeon, the latter of whom is to report concerning the health of the recruit. Under the inspecting field-officer there are several regimental officers, who are stationed in the principal towns of the different districts in order to superintend the non-commissioned officers appointed to receive the applications of the persons who may be desirous of entering the service.

England and Wales together are, for the recruiting service, divided into five districts, of which the first comprehends all the counties lying north of the Humber; the head-quarters for this district are at Leeds, which is the station of the field-officer, and there are superintending officers in that town, and also at York and Bradford. The second district comprehends North Wales and the inland counties eastward as far as Derbyshire inclusive; the head-quarters are at Liverpool, and there are superintendents at that place, and also at Manchester and Sheffield. The third district comprehends South Wales and the inland counties eastward as far as Lincolnshire inclusive; the head-quarters are at Coventry, and there are superintendents at Leicester, Birmingham, Shrewsbury, Nottingham, Lincoln, and Stamford. The fourth district includes the south-western counties of England as far as Hampshire; its head-quarters are at Bristol, and there are superintendents at Gloucester, Salisbury, and Exeter. Lastly, the fifth district comprehends all the eastern counties south of Lincolnshire; the head-quarters are at Westminster, and there are superintendents in London, at Reading, Ipswich, and Norwich.

The head-quarters of the recruiting department in Scotland are at Glasgow, and there are superintending officers in that city, at Edinburgh, Perth, Aberdeen, and Inverness.

Ireland is divided into three recruiting districts. The head-quarters of the first or northern district are at Newry, and, besides the superintendent at that place, there are others at Enniskillen, Belfast, and Derry. The head quarters of the central district are at Dublin, and there are superintendents also at Athlone and Cavan. Lastly, the head-quarters of the third or southern district are at Cork, and there are superintending officers at Limerick and Kilkenny.

The chief recruiting depôt for the East India Company's forces is at Chatham, and there are superintending officers in London, at Liverpool, Dublin, and Cork.

In order to procure recruits, a serjeant or other non-commissioned officer mixes, in country places, with the peasantry at their times of recreation; and, in towns, with artisans who happen to be unemployed, or who are dissatisfied with their condition; and, by address in representing whatever may seem agreeable in the life of a soldier, or by the allure of a bounty, occasionally induces such persons to enter the service.

The reports concerning the fitness of a recruit for military service are finally submitted for approval to the inspecting field-officer of the district, except when the distance of the head-quarters from the place where the recruit is enlisted is such that it would be more convenient to send the latter to the depôt of the regiment to which he is to belong: in that case the officer commanding at the depôt is especially authorised to sanction them.

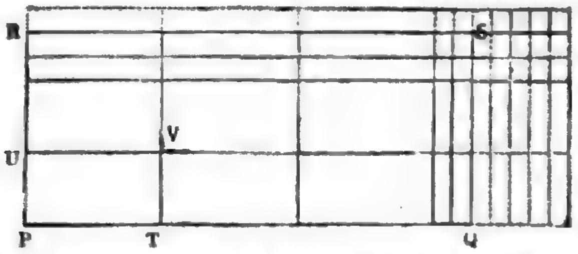
Officers employed on the recruiting service are not allowed to interfere with one another in the performance of their duties; particularly, no one is permitted to use any means in order to obtain for his own party a man who has already taken steps by which he may become engaged to another.

RECTANGLE (or right angled), the name given to any figure of which all the angles are right angles. Hence the figure, having as many right angles as sides in the sum of its angles, must be foursided; for none but a foursided figure has the sum of its angles equal to four right angles. It is unnecessary to give a diagram of the most common of all the forms of art; the page of this book may serve as an instance.

The properties of the rectangle, to which it owes its importance in a mathematical point of view, consist of one which it shares in common with all parallelograms, and one which marks it as the most simple of parallelograms. Every parallelogram, and the rectangle among the rest, may be divided in an infinite number of ways into parallelograms having the same angles as the original parallelogram; and if any parallelogram be divided into others by lines drawn parallel to one only of the sides, the smaller parallelograms bear to the whole the same proportion as their several bases bear to the whole base. Also, the area of a rectangle may be immediately deduced from nothing but the length of its two sides. If as a superficial unit we choose a rectangle having the sides A and B, it may immediately be told how many times and parts of times any other rectangle contains the unit. Measure one side, and see how many times it contains A (say 2⅓); measure the other side, and see how many times it contains B (say 3$\frac{2}{7}$); then the product of 2$\frac{2}{3}$ and 3$\frac{2}{7}$, or

$$\frac{8}{3}\times\frac{23}{7}, \text{ or } \frac{184}{21}, \text{ or } 8\frac{16}{21},$$

is the number of times which the rectangle to be measured contains the unit rectangle. This may be shown as follows:—



Let PQRS be the rectangle to be measured, and PTUV the unit rectangle, PU being A, and PT being B. The rectangle RQ is so drawn that PR contains 2$\frac{2}{3}$ of A, and PQ contains 3$\frac{2}{7}$ of B. The whole rectangle is obviously divided into six rectangles of the size of PV: six at the top, each of which is one-third of PV; four on the right, each of which is one-seventh of PV; and four higher up on the right, each of which is the twenty-first part of PV. We have then, on the whole, PV repeated

$$6+\frac{6}{3}+\frac{4}{7}+\frac{4}{21}, \text{ or } \left(2+\frac{2}{3}\right)\left(3+\frac{2}{7}\right) \text{ times.}$$

In practice it is most convenient to make PT and PU equal to one another, and equal to the unit used in measuring lengths. Hence the rule for finding the area of a rectangle is: multiply together the number of linear units in the two sides, and the result is the number of square units (or squares on the linear unit) in the rectangle. This rule is abbreviated as follows: the product of the sides of a rectangle is the area; an abbreviation which often confuses the mind of a beginner, who imagines that two *lines* can be multiplied together [Multiplication], and that the rectangle, that is, the very shape of the rectangle, is the product; a mistake precisely that of a person who should imagine that the very silver of ten shillings could be multiplied by seven yards of stuff, and that the product could be seventy shillings. Now seven yards of stuff at ten shillings a yard certainly cost as many shillings as there are units in 7 × 10; and a rectangle whose sides are seven and ten feet certainly contains as many square feet as there are units in 7 × 10; but seven feet can no more be multiplied by ten feet than seven shillings by ten yards of silk.

When however given words imply a false proposition, there are two modes of proceeding, either to alter the words or to alter the meaning of the words. If a person should be so accustomed to talk of multiplying concrete quantities together that he cannot avoid it, he must learn to define multiplication as the finding of a fourth proportional to three concrete quantities, the first of which is a concrete unit. If this be the meaning of multiplication, then six yards and three yards can be multiplied together; for as one yard is to three yards so is six yards to eighteen yards, and eighteen yards is the product. But this product is a line, not an area.

The pertinacity with which some writers still persist in calling the product of two lines the area of a rectangle (not only as a practical rule of mensuration, in which it is a desirable mode of expression, but in matters of reasoning) is the result of a long-continued habit formed in the first instance by the study of the Greek writers. For though these do not confound the product with the area; yet, on account of the deficiencies of their algebraical system, they used the area instead of the product, and gave the names of spaces to the results of numbers. Thus the product of two numbers was called plane, that of three equal numbers solid, that of two equal numbers a square, that of three equal numbers a cube, and the difference of two square numbers a gnomon. To these we may add the titles of polygonal, pyramidal, &c. numbers [Numbers, Appellations of], and others which it is needless to mention. All arithmetical propositions were made to take the form of geometrical ones: thus to multiply two numbers was to form the rectangle of two given lines; to divide one number by another was, given the area of a rectangle and one of its sides, to find the other side. We have seen it stated that the word παραβολή (parabola) was sometimes used for quotient, and, it was said, in Diophantus. We cannot find it there, though it may be used by the scoliast, whom we have not examined. But most certainly the explanation of the meaning of parabola, as applied to the well-known curve, comes from some such signification. The term parabola means a thing laid near to or by the side of another: for comparison, for instance, as in the common word parable, or for any other purpose. Now in the conic section in question the square on the ordinate being converted into a rectangle one of whose sides is the abscissa, the remaining side (being that which must be laid by the first side before the figure can be drawn, or the παραβολη) is always of the same length. If modern writers had applied the term parabola to this remaining side, they would probably have called the curve an isoparabolic section; but the Greeks, who called the curve in which a certain defect is always in the same proportion to the whole by the simple name of defect (ellipse), and one having the same sort of excess by the simple name of excess (hyperbola), called the isoparabolic curve simply a parabola. Montucla supposes that as ellipse means defect, and hyperbola excess, parabola must mean equality; but even supposing that an etymological justification of this meaning could be made, that which is defect in the ellipse and excess in the hyperbola does not become equality in the parabola.

Of the geometrical system which pervaded the Greek arithmetic, we have permanently retained only the words square and cube; rectangle was frequently used for product, but is rarely at present. These words are the causes of much confusion to students who begin to apply arithmetic to geometry. Thus in algebra the square of a sum is equal to the sum of the squares of the two quantities, together with twice their product. In geometry the square of the sum of two lines is equal to the sum of the squares on the lines, together with twice their rectangle. Those who are not made to see clearly the distinction of these propositions confound them together. A sufficient distinction might be made by a little variation in phraseology: speak of the square *on* a line, and the square *of* a number. Thus 49 is the square of 7: erect two perpendiculars each equal to AB at the two extremities of AB, and joining their other extremities completes the square *on* AB. It is already customary to speak of the rectangle whose contiguous sides are AB and AC, as the rectangle *under* AB and AC.

The second book of Euclid is devoted to the properties of the rectangle, as they arise from subdivision into other rectangles. Some persons advocate what is called the arithmetical proof of these propositions, namely, the substitution of the analogous properties of numbers for those of rectangular spaces. This question must be settled in the same manner as that of Proportion, and the remarks in that article apply. If all pairs of lines were commensurable, no objection could be taken against the rigour of the substitution; but unless a theory of incommensurables, and a modification of the definition of multiplication to suit them, be formally introduced, the method of Euclid is sound, and the substitute for it unsound; though proper enough for the adoption of those who, as explained in the article cited, only wish to become mathematicians to a certain number of decimal places.

RECTIFICATION means the finding of a straight line equal in length to an arc of a curve [Arc], and is analogous to the term quadrature, as applied to finding its area; for in like manner as an area is considered to be known when a square equal to it is exhibited, so the length of an arc is known when a straight line equal to it is exhibited.

Of the celebrated problem of the rectification of the circle we have said enough under Quadrature of the Circle, in which article it appears that the rectification gives the quadrature; so that the latter problem was generally attempted through the former.

RECTOR, RECTORY. [Benefice.]

RECULVER. [Kent.]

RECURRING SERIES. By a recurring series is meant one of the form

$$a_0+a_1x+a_2x^2+a_3x^3+a_4x^4+\ldots.$$

ad infinitum, in which the coefficients a_0, a_1, &c. can each be expressed by means of certain preceding coefficients and constants in one uniform manner; and it is usual to consider only such series as will admit of a linear relation (or one in which only first powers of coefficients enter): thus the series

$$1+x+4x^2+13x^3+53x^4+172x^5+\ldots.$$

follows the linear law $a_n=3a_{n-1}+a_{n-2}$ (4 = 3.1 + 1, 13 =

3.4+1, 53=3.13+4, &c.), and is what is commonly called a recurring series, though the following—

$$1+x+2x^2+5x^3+29x^4+866x^5+\text{ \&c.},$$

in which $a_n = a_{n-1}^2 + a_{n-2}^2$ is equally recurring, according to the definition. The recurrence alluded to is not that of terms, but of method of determining terms; and it would be desirable that the series which are usually called recurring should be *linearly* recurring series, while any in which there is really recurrence (of law) should be called recurring.

Every linearly recurring series is the development of an algebraic function with a rational and integral numerator and denominator, and every such function can be developed into a linearly recurring series. Thus, taking the first series mentioned, in which $a_n = 3a_{n-1} + a_{n-2}$, we have

$$a_2 x^2 = 3a_1 x^2 + a_0 x^2$$
$$a_3 x^3 = 3a_2 x^3 + a_1 x^3$$
$$a_4 x^4 = 3a_3 x^4 + a_2 x^4, \text{ \&c.}$$

Let S be the sum of $a_0 + a_1 x +$, &c., ad infinitum. Then the preceding obviously gives

$$S - a_0 - a_1 x = 3x\,(S - a_0) + x^2 S;$$

$$\text{or, } S = \frac{a_0 + (a_1 - 3a_0)\,x}{1 - 3x - x^2}$$

We have here the value of any series in which this law of recurrence prevails for all terms after the second; and it cannot prevail before, since two terms must exist before a third can be expressed. In the case we chose, $a_0 = 1$, $a_1 = 1$, whence the function of which the series was the development is $(1-2x) \div (1-3x+x^2)$.

Generally, a linear recurring series having the law of recurrence

$$a_n = p_1 a_{n-1} + p_2 a_{n-2} + \ldots\ldots + p_t a_{n-t}$$

is the development of the function

$$\frac{A_0 + A_1 x + A_2 x^2 + \ldots\ldots + A_{t-1} x^{t-1}}{1 - p_1 x - p_2 x^2 - \ldots\ldots - p_t x^t}$$

where $A_0 = a_0$, $A_1 = a_1 - p_1 a_0$, $A_2 = a_2 - p_1 a_1 - p_2 a_0$, ...

$$A_{t-1} = a_{t-1} - p_1 a_{t-2} - p_2 a_{t-3} - \ldots\ldots - p_{t-1} a_0,$$

from which the inverse theorem may easily be derived, namely, that

$$\frac{A_0 + A_1 x + A_2 x^2 + \ldots\ldots + A_{t-1} x^{t-1}}{B_0 + B_1 x + B_2 x^2 + \ldots\ldots + B_{t-1} x^{t-1} + B_t x^t}$$

can be developed into $a_0 + a_1 x + a_2 x^2 +$ &c., in which the law of recurrence (n not being $< t$) is as follows:—

$$B_0 a_n + B_1 a_{n-1} + B_2 a_{n-2} + \ldots\ldots + B_t a_{n-t} = 0,$$

and the terms up to a_{t-1} are determined by

$$A_0 = B_0 a_0, \; A_1 = B_0 a_1 + B_1 a_0, \; A_2 = B_0 a_2 + B_1 a_1 + B_2 a_0$$
$$\ldots\ldots A_{t-1} = B_0 a_{t-1} + B_1 a_{t-2} + \ldots\ldots + B_{t-1} a_0.$$

Those who understand the theory of generating functions will see that the generating function can thus be found to the solution of any linear equation of differences. Some use may thus be made of recurring series in various questions of the theory of probabilities; but, generally speaking, this species of series is not of the most useful kind, connected as it is with the rational and integral function of algebra, which is of little application compared with the irrational and transcendental function. [SERIES.]

The most simple mode of finding the law of the terms of a recurring series is by the solution of the equation of differences, which expresses the relation of the coefficients. This may be verified by decomposing the function which is developed into the series into fractions with denominators of the first degree, according to the common method used in the integral calculus, and expanding each fraction separately.

RECURVIROSTRA. [AVOSET.]

RECUSANTS are persons who refuse or neglect to attend divine service on Sundays and holidays, according to the forms of the Established Church. Before the Reformation, ecclesiastical censures were directed at different times by provincial councils against those who absented themselves from the services of the church. But the noticing of recusancy in the temporal courts, and probably the use of the term itself, cannot be traced higher than the sixteenth century. By the 1 Eliz., c. 2, it is enacted 'that all persons shall diligently and faithfully, having no lawful or reasonable excuse to be absent, endeavour to resort to their parish church or chapel accustomed, or upon reasonable let (hindrance) thereof, to some usual place where common prayer, &c. shall be used, in time of such let, upon every Sunday and other days ordained and used to be kept as holy days, and then and there to abide orderly and soberly during the time of the common prayer, preaching, and other service of God there to be used and ministered, upon pain of punishment by the censures of the church, and also upon pain that every person so offending shall forfeit for every such offence twelve pence.' By 23 Eliz., c. 1, it is enacted, 'that every person above the age of sixteen years who shall not repair to some church, chapel, or usual place of common prayer, but forbear the same, contrary to the tenor of the statute of 1 Eliz., c. 2, and being thereof lawfully convicted, shall forfeit for every month which he or she shall so forbear, twenty pounds.' This statute has been held not to dispense with the forfeiture imposed by the former statute. By 35 Eliz., c. 1, it is enacted, that if recusants, within three months after conviction, refuse or neglect to submit, they may, upon the requisition of four justices of the peace, be compelled to abjure and renounce the realm; and if they do not depart, or if they return without licence from the crown, they are guilty of felony, and to suffer death as felons without benefit of clergy.

The law recognised four classes of offenders under the statutes against recusancy:—those who absented themselves from the public service of the church from indifference, irreligion, or dissent, were termed 'recusants' simply—after conviction they were styled 'recusants convict;' those absentees who professed the Roman Catholic religion were called 'Popish recusants;' and those who had been convicted in a court of law of being Popish recusants were called 'Popish recusants convict.'

The laws against Popish recusants convict were of a very severe character. Montesquieu characterises them as so rigorous, that though not professedly of the sanguinary kind, they did all the hurt which possibly could be done in cold blood. The answer of Blackstone to this charge is rather a strange one, namely, that these laws were seldom executed to their utmost rigour, or, in other words, that they were enacted principally in terrorem. The truth appears to be that the first penal statutes passed for the purpose of compelling the adherents of the old religion to adopt the new, provoked resistance on their part; and this resistance caused severer enactments, producing in their turn increased resistance, followed by the imposition of still more rigorous penalties.

Popish recusants, in addition to the general penalties enacted against recusants, were disabled from taking lands, either by descent or by purchase, after eighteen years of age, until they renounced their errors. They were bound at the age of twenty-one to register the estates which they had already acquired, and were bound also to register all future conveyances and wills relating to them. They were and are [QUARE IMPEDIT] incapable of presenting to any advowson, and of making a grant of the right of presenting at any avoidance of the benefice. They could not keep or teach any school, on pain of perpetual imprisonment. For the offence of saying mass, the Popish recusant forfeited 200 marks, or 133*l* 6*s*. 8*d*. For the offence of wilfully hearing mass, he forfeited 100 marks (66*l*. 13*s*. 4*d*.), and was in each case subjected to a year's imprisonment.

Popish recusants convict incurred additional disabilities, penalties, and forfeitures. They were considered as persons excommunicated: they could not hold any public office or employment; they were not allowed to keep arms in their houses; they were prohibited from coming within ten miles of London, under the penalty of 100*l*.; they could bring no action at law or suit in equity; they were not permitted to come to court, under pain of 100*l*., or to travel above five miles from home except by licence, upon pain of forfeiting all their goods. Severe penalties were imposed in respect of the marriage or burial of the Popish recusant convict, or the baptism of his child, if the ceremony were performed by any other than by a minister of the Church of England. Such a recusant, if a married woman, forfeited two-thirds of her dower or jointure, was disabled from being executrix or administratrix of her husband, and from having any part of his goods, and she might be kept in prison, unless her husband redeemed her at the rate of 10*l.* per month, or by the profits of the third part of all his lands.

Protestant dissenters were relieved from the penalties of recusancy at the Revolution, by the Toleration Act, 1 William & Mary, c. 18. This statute contained a proviso (s. 17) that nothing therein contained should extend to give any ease, benefit, or advantage to any Papist or Popish recusant, or to any person that should in his preaching or writing deny the doctrine of the Trinity. But in 1791, by 31 Geo. III., c. 32, Roman Catholics taking a certain oath therein presented (altered in 1829, by the Catholic Relief Act, 10 George IV., c. 7) were exempted from prosecution, for being Papists and for not resorting to church; and in 1813, by 53 George III., c. 160, the exemption in the Toleration Act, as to persons denying the doctrine of the Trinity, was repealed. The statutes against recusancy, though seldom enforced, are still subsisting with respect to persons who, not being Roman Catholics or Protestant dissenters, absent themselves from the service of the Established Church.

RED. [Calico Printing; Dyeing; Enamel; Painting, House.]

RED BREAST. [Sylviadæ.]

RED DEER. [Deer, vol. viii., p. 358.]

RED LEAD. [Lead, p. 370.]

RED MARL. An argillaceous red portion of the series of rocks between the coal and lias is thus termed in geology. Almost identical marls, similarly associated with red sandstones lie also in the upper part of the coal, and below the coal and mountain limestone. Nor would it be always easy to distinguish in specimens or even in sections on a large scale the upper red marls immediately below the lias of the Trent or the Avon from the red marls above the non-magnesian limestone of Knottingley, those above the magnesian limestone of Pontefract, those below the same limestone near Wetherby, those in the upper part of the coal formation of Manchester, or below the whole of the coal and mountain limestone in Monmouthshire. The phenomena attending the red colour in these deposits are entirely similar to those mentioned under Red Sandstone.

RED RIVER. [Mississippi, River.]

RED SANDSTONE. In geology this term is used in a variety of senses, partly with reference to the mere colour of certain rocks, and partly as expressing rocks of certain geological periods. Thus we have in the latter sense new red sandstone, lower red sandstone, and old red sandstone; and on the Continent, alter rother sandstein, neuer rother sandstein, le vieux gres rouge, le nouveau gres rouge, &c. The red sandstone also means, in some geological works, either the upper part or the whole system of the rocks, calcareous, argillaceous, and arenaceous, which occurs in the series of strata between the coal formation and the lias. If we regard the analogy of the geological nomenclature most generally used, this latter sense will appear too inconvenient to be adopted, as substitutes we have the Pœcilitic system, from the various colours of the component masses; and the Saliferous system, from its frequently containing salt. Under Saliferous System and in the article Geology will be found some general views. Our intention at present is to speak of red sandstones as mineral aggregates and as single terms which occur in several parts of the great series of stratified deposits.

Sandstones or gritstones, generally speaking, consist of abraded and worn pieces of quartz, felspar, mica, and other minerals, such as commonly occur in granite, gneiss, or mica schist, and other rocks associated with these. The size of these pieces is sometimes such as cause the mass to deserve the title of conglomerate (as part of the millstone-grit of Derbyshire), and sometimes the grains are so fine and confluent, that the mass is not unlike some sorts of quartz rock (as the ganister of the Yorkshire coal field). In regard to induration, there is every degree from uncoherent sand, through friable and argillaceous sandstones, to compact grits and indurated quartzose rocks. In colours they admit of every shade from whiteness, through grey tints by carbonaceous admixture, through yellow and brown hues by admixture of carbonate and oxide of iron, and through reds, blues, and purples of different kinds by diffusion of oxides of iron, manganese, &c.

In this most complex series of detrital deposits, red sandstones present some remarkable characters when regarded as to the *nature* and *diffusion* of red colour, the *association* of this with other tints, the *relation* of their hues to organic life, and to other geological phenomena.

Red sandstones occur in the basin of the Allier in France, in tertiary strata; in the plastic clay group of the Isle of Wight; generally in the strata below the lias and above the coal; in the upper parts of the coal formation of Derbyshire and Lancashire; in the millstone-grit series of Lancashire; in the mountain limestone of the north of England; generally in the strata called old red sandstone, above the strata of the Silurian districts; in the midst of the green and purple slates of north and south Devon; in the midst of older rocks in the Lammermuir, Cavan, and Longmynd ridges; but the most perfect and abundant types are in those parts of the series which lie above and below the carboniferous rocks, and constitute the new and old red sandstone groups.

The essential peculiarity of these reddened rocks is apparently a general diffusion in their mass, and especially round their constituent grains of quartz, of red peroxide of iron (with also often some oxide of manganese?). If by means of muriatic acid the iron be removed from the red sandstone of Manchester, what remains is a mass of mostly white and even translucent quartz grains, which had been invested by the red oxide of iron. Singularly enough, amidst a great series of such red sandstones and red clays, nothing is more common and even characteristic than to find oval, round, or irregular patches of light green colours, apparently due to the protoxide of the same metal. Nor is it at all rare to find perfectly white bands alternating with red or green stripes; and this applies almost equally to the sandstones, clays, gypsum bands, and salt layers.

A very remarkable and general fact observed in studying these red rocks is the paucity of the remains of animals of every grade. The new and old red sandstones of England were once believed to contain no such remains; a mistake certainly, yet founded on an important truth, which is even illustrated by the exceptions. Perhaps a more striking proof of the reality of the inverse relation here indicated, is given in the fossiliferous districts of north and south Devon, where the slaty rocks often do contain, and in particular layers abundantly, remains of zoophyta, conchifera, crustacea; but the bands of red sandstones, hard or soft, massive or laminated, argillaceous or gritty, appear almost utterly devoid of these reliquiæ. Thus in North Devon we have the following series of phenomena in a descending order:—

Blue, green, &c. slates of Ilfracombe	Partially fossiliferous.
Red sandstones of Martinhoe .	No fossils.
Green, grey, &c. slates of Linton	Very fossiliferous.
And in South Devon—	
Blue and grey slates of Bovisand .	Fossiliferous.
Red sandstones of Staddon . .	No fossils.
Blue and grey slates and limestone of Plymouth	Fossiliferous.

(See De la Beche, *Report on Geology of Cornwall, Devon, and West Somerset.*)

The explanation which seems most probable is that water in which by any cause abundance of peroxide of iron has been diffused, is rendered thereby unsuitable for the due performance of the vital functions of aquatic creatures, especially such as take the water into their bodies for respiration, or are nourished by the flowing of currents to the mouth. We have been informed that experiments lately made by Mr. De la Beche, by putting red oxide of iron into water in which branchiferous mollusca were living, have justified the inference, and it seems desirable that such should be prosecuted and extended.

The last point on which it seems here necessary to remark is the frequent concurrence of red sandstones and clays, fibrous and lamellar gypsum, fibrous and lamellar rock salt. Most of the rock salt, of Europe at least, is associated with red earthy deposits; but there are great exceptions, as at Salzburg and Wieliczka. This frequent concurrence will be found of great importance in reasoning on the physical agencies whereby the peculiarities of red sandstones were occasioned.

As building materials, few of the red sandstones are to be recommended, and even the white layers which accompany them are seldom of much value. The cathedrals of Carlisle and Chester, and the noble old churches of Coventry, offer a striking warning to the architect; though on the other hand, part of the antient wall of Penrith Castle, still standing and in good preservation, shows that even among these justly suspected strata, some portions, either by their freedom from salt, or some other cause, are to be excepted from censure.

RED SEA. This sea resembles in form those large inlets of the ocean which in the mountainous regions of Scotland are called friths and in Norway fiords. It is a portion of the Indian Ocean, with which it is connected by the Gulf of Aden and the strait of Bab-el-Mandeb. [BAB-EL-MANDEB.] It extends from this strait (12° 40′ N. lat.) in a north by west direction to 30° N. lat. It lies between 32° 20′ and 43° 30′ E. long.

The length of this immense inlet is little short of 1400 miles: but the width varies, though in the greatest part of it the variation is not considerable. From the strait of Babel-el-Mandeb, which is only sixteen miles wide, it gradually enlarges; and at the distance of 160 miles from the strait it is 180 miles across: this breadth may be considered as the average width from Ras Essah or the island of Camaran to Jiddah, a distance of nearly 500 miles. Off Jiddah it is not much more than 120 miles wide; and this width continues to Ras Mohammed, south of 28° N. lat., where the sea divides into two arms: this distance considerably exceeds 500 miles. Of the two arms, into which the Red Sea branches off at Ras Mohammed, the eastern is called Bahr-el-Akaba, and the western Bahr-el-Suez, or Kolsum. Between these two gulfs is the mountain-region of Mount Sinai or Jibbel Musa (Mount of Moses). The Bahr-el-Akaba branches off in a north-eastern direction, and extends more than 100 miles, with an average width of less than 15 miles. Near its entrance is the island of Tiran, which is 800 feet above the level of the sea, and between it and the continent are two straits, of which only the western, called the strait of Tiran, is navigable for large vessels. The entrance of the Bahr-el-Suez is called the Straits of Jubal or Jublah, and is about fifteen miles across. The gulf itself runs in a north by west direction to its extremity at the town of Suez, a distance exceeding 180 miles; its average width is twenty miles. The surface of the Red Sea amounts to nearly 180,000 miles, according to an estimate.

The Red Sea is of great depth. The shallowest part is the Gulf of Suez, which in the middle, towards the Straits of Jublah, is from 40 to 50 fathoms deep; farther north its depth decreases to 30 fathoms; and approaching the harbour of Suez, it shoals to 20 fathoms, and by degrees to 3 fathoms, which is the depth of the harbour itself. The Gulf of Akaba varies in its middle part between 100 and 200 fathoms. The main body of the sea is still deeper, and in most parts a bottom cannot be found at the depth of 100 fathoms; in some places it is 230 fathoms deep. Towards the southern extremity, south of 16° N. lat., it grows much shallower, the depth in general not exceeding 40 or 50 fathoms.

This depth of water would be favourable to navigation, as the sea generally shoals to soundings near the shores; but the navigation is rendered difficult by islands, banks, and the prevailing winds. Small rocky islands are tolerably numerous, especially along the eastern shores, but as they usually contain small harbours, they would be rather advantageous were it not for the adjacent reefs. The islands are generally isolated, except between 15° and 17° N. lat., where the group of the Farsan Islands occurs along the eastern shore, and on the western that of the Dhalak Islands, each of which consists of a larger island and a great number of smaller islands, between which there are numerous reefs. South of these groups there are some islands dispersed in the middle of the sea, as Jibbel Teer, the Zebayer Islands (Jezayer es Seba, or the Seven Islands), and others. Two of these islands are volcanic, and on Jibbel Teer there is an active volcano, 900 feet above the sea.

The Red Sea is the most northern portion of the ocean in which coral reefs occur, and they are more numerous than in any other part of the sea of equal extent. They differ in their form from those which are found in the Pacific Ocean, never having a round figure, but almost always extending in a tolerably straight line, and parallel to the coast; the interior is filled up, so that they never contain a lagoon, as is almost invariably the case with those in the Pacific. These coral-reefs are frequently united with the adjacent continents, and render the shores almost inaccessible, as the water near them is very deep, and the reefs themselves have only from 3 to 6 feet water, which gradually shoals on approaching the beach, so that even boats are stopped at the distance of a quarter of a mile from the dry land. The reefs which are unconnected with the shores are still more numerous, and frequently several miles from them. Their edges towards the open sea are very steep, and the sea itself is of great depth. But the edge which is opposite the mainland has usually a gradual and gentle slope, and affords good anchorage to vessels. The sea between this inner edge and the mainland is generally not very deep, and the small vessels of the country navigate these straits in preference to the open sea, as the water is less agitated by the winds, and they are always in the neighbourhood of some place which offers anchorage in case a gale should rise. The winds, which commonly are very strong in the open sea, can hardly be said to extend to these straits, so that small vessels can take advantage of the sea and land breezes, which regularly set in at certain hours of the day, at least during the greatest part of the year. These advantages however are lost by the necessity of putting into some harbour during the night. The isolated small coral-reefs, though numerous, are easily avoided in the day-time, the water of the sea being so clear that they can be distinguished at a great distance. In addition to this, vessels are obliged to follow the shores, which nearly doubles the length of their voyage. The reefs are much more numerous along the Arabian than on the African coast. South of the groups of the Dhalak and Farsan Islands only a few small ones occur on each shore. Both groups are surrounded with and intersected by reefs. North of the Dhalak Islands, as far as the entrance of the Bahr-el-Suez, they are neither large nor numerous, except for several miles south of the harbour of Suakin (near 19° N. lat.), and between Ras Erba (Elba) (22° N. lat.) and Ras Bornass (24° N. lat.), where they are numerous and extensive. In the Strait of Jublah many small ones occur, and several are found in the Bahr-el-Suez. Hardly any reefs occur in the deep inlet called Bahr-el-Akaba, but reefs are numerous in the Straits of Tiran; in fact the eastern strait, which is formed by the island of Tiran, is quite locked up with them. From this point southward to the parallel of Jiddah (21° 30′ N. lat.) the coast is nearly blocked up with them, except between Ras Barcedy and the harbour of Yambo. Between Jiddah and 20° N. lat. the Arabian shores are remarkably free from reefs; but from that latitude to the Farsan Islands they are so numerous and large as to render the navigation extremely dangerous.

The reefs are more dangerous to the unwary navigator as a heavy surf is never observed on them, whatever may be the state of wind and weather. Lieutenant Wellsted thinks that the absence of surf may be accounted for by the porous nature of the coral which constitutes the outer part of the reefs, by which the force of the sea is broken in the same manner as that of a body of water would be broken, if dashed against a sieve.

The Red Sea occupies the lowest portion of a deep valley which lies between the elevated table-land of Arabia on the east, and the high lands of Abyssinia, Nubia, and Egypt on the west. The outer edge of these table-lands is generally from 10 to 30 miles from the shores, and has the appearance of a continuous mountain-range, varying in height between 3000 and 6000 feet. These mountains approach much nearer to the shores north of 24° N. lat. than south of that parallel. The space between them and the shores is partly occupied by hills, which skirt the edges of the table-land, and partly by a low and level tract along the sea, which is generally sandy, but sometimes swampy. This tract, as well as the hills between it and the mountains, is far from being sterile, and it has also the advantage of rains in November, December, and January; but it is nearly uncultivated, as the inhabitants, who consist of several tribes of Bedouin Arabs, are averse to industry, and make no other use of these tracts than as pasture-grounds when the grass on the table-land is dried up.

The peculiar position of the sea between two elevated table-lands has a great influence on the direction of the winds. During the warm season, from May to October, northern breezes prevail throughout the whole extent of the sea. They blow not without interruption, but frequently for several days with considerable force. During this period the reefs have about two feet less water on them than in the remaining months of the year, a circumstance which may be attributed to the continual current which at that time sets through the Straits of Bab-el-mandeb into the Gulf of Aden. In the winter, from October to May, northern winds are prevalent in the northern part of the sea; but in the southern, they blow from the south, and generally with great constancy. The currents then change, and flow back with great rapidity; and, as the whole body of water has no means of escaping, it is collected towards the northern parts of the sea, and becomes considerably elevated. As the winds always blow in the direction of the length of the sea, they affect only the open parts, and not the straits between the reefs and the mainland, in which, as already observed, a regular change of land and sea breezes prevails.

The principal harbours on the Arabian shores are Mokha, Hodeidah, and Jiddah; and on the African, Suez, Cosseir or Cosire, Suakin, and Massowah. There is a pretty active communication kept up between these places, especially by the numerous pilgrims who visit Mecca and Medina from the eastern countries of Africa. The country vessels bound from Cosire to Jiddah cross the sea to the nearest point of the opposite coast, and then sail along shore to Jiddah. Those from Jiddah to Cosire follow the coast as far north as Moilah, or Râs Mohammed, and cross from thence with the northerly winds. Ships bound from Suakin to Jiddah proceed along shore as far as Salakah (20° 30′ N. lat.), and thence stretch across the sea to Jiddah. When they are bound from Suakin to Mokha, they generally proceed southward along the African coast till they reach Massowah, whence they cross over to the Arabian shore. These vessels, perhaps exceeding four hundred in number, are of various descriptions, and most of them are between 50 and 200 tons burden. The greater number are employed in the transport of pilgrims, whose number annually exceeds 20,000; and of grain and slaves, which constitute nearly the whole of the exports from Africa to Arabia. As Arabia does not produce sufficient supplies for the pilgrims who visit Mecca, and annually amount to above 120,000 individuals, the transport of grain from Cosire to Jiddah employs a great number of vessels. The grain is procured from Upper Egypt; and after being collected in the granaries of Kenneh, is forwarded by camels to Cosire. This trade is now carried on entirely on account of the pasha of Egypt. Hardly any merchandise is brought from Suakin and Massowah to Arabia, except slaves.

As the countries along the shores of the Red Sea do not produce many articles of export, they are not much visited by foreign vessels. The few which navigate this sea go to Mokha and Jiddah. They come from the Persian Gulf, Hindustan, and the Indian Archipelago. The vessels from Basra and Abu-shehr import wheat, tobacco, dates from Basra and the Bahrein Islands, and Persian carpets, which are mostly purchased by the Bedouin sheikhs: they bring also some rich pilgrims from Persia. From Calcutta, and occasionally from Bombay, are brought rice, sugar, and Dacca muslins: also coarse and fine blue cloths, cambric, and indigo; with teak timber, palm-oil, cocoa-nuts, and the spices of the coast of Malabar. The vessels from the Indian Archipelago bring spices (especially those of Malabar), rice, and a number of young females, who are sold to the Turks at the price of 150 to 300 dollars. Besides this commerce, which is carried on in square-rigged vessels, a considerable number of large bagalos from Hindustan, especially from Mandaree in Kutch, bring to Arabia the produce of India. The returns for the foreign goods imported into Jiddah are generally cash, which is brought by the pilgrims, to whom nearly all the goods are sold; but coffee, Arabic gum, myrrh, and frankincense are exported from Mokha. The coffee grows on the hilly declivity of the table-land north of Mokha; but the other three articles are imported from Africa, where they are collected in the countries along the southern shores of the Gulf of Aden, and in the vicinity of Cape Guardafin.

The first mention of the Red Sea occurs in the Bible, on the occasion of the Israelites passing through it. Soon after that time, if not before, it seems to have been navigated. In the time of Solomon the advantages of such a navigation were well understood; for after the conquest of Idumæa by David, and the acquisition of the country near the Bahr el Akaba, Solomon established at Elath and Ezion Geber, on the shores of that gulf, a colony of Phœnician navigators. It is however uncertain if the navigation then extended to India. According to the authority of several Greek authors, the most antient intercourse between India and the countries on the Mediterranean was carried on by means of the Persian Gulf. Modern writers have had some doubt of this fact, on account of the difficulty of transporting the goods through that extensive desert which intervenes between El Katif, the supposed emporium on the Persian Gulf, and the Mediterranean. But this doubt has been removed, since it has been discovered, in the course of the wars of the pasha of Egypt with the Wehabites, that a series of extensive oases stretch across the Arabian peninsula between 24° and 26° N. lat.; and that through the western of these oases the road passes by which the haji, or caravan of pilgrims, passes from Damascus to Medina. This route seems to have been the most frequented up to the time of Alexander. It is however probable that before his time some connection existed between the Red Sea and India, though it was not the most common channel by which the exports of India reached the Mediterranean. But when the wars subsequent to the death of Alexander rendered the transport of commodities through Syria dangerous, and the policy of the kings of Egypt favoured the navigation and commerce of the Red Sea, it became soon the principal channel of commerce between Europe and India. This intercourse continually increased, though slowly, as the exports of India at that time consisted only of articles which were consumed by the rich. But in the first century of the Christian æra the trade was so considerable, that, according to Strabo, 120 vessels annually departed from Myos Hormos to India. The true situation of that harbour is not known, but it is supposed to be near 25° N. lat. The conquest of Egypt by the Arabian khalifs, in the seventh century, does not seem to have diminished the intercourse between the two countries, as it is certain that in the ninth century the Arabs extended their navigation from the Red Sea through the Indian Ocean to Canton in China. Soon after that time the Venetians established factories in Alexandria; and the goods of India passed by the Red Sea to that town, and thence to Europe, during the period between the twelfth and fifteenth centuries, until the discovery of the route round the Cape of Good Hope directed the whole commerce of India into a different channel. The commerce and navigation of the Red Sea were nearly annihilated by this event, and recovered only a little in the seventeenth century, owing to the cultivation of coffee in the southern districts of Arabia. It has recently somewhat increased, mainly in consequence of the tranquil condition of Egypt under Mohammed Ali and his authority among the Bedouin tribes which inhabit the Arabian coast. In addition to this, steam-boats from India have recently navigated the sea as far north as Suez, and thus a much shorter communication between Europe and India has been established. But the progress of the steam-boats is slow, on account of the heavy gales which blow, with short intermissions, in the northern part of the sea. It has therefore been proposed to employ only small steam-vessels, so that when impeded in their course by these gales, they may, like the Arabian vessels, sail in the narrow straits between the Arabian coast and the reefs. We do not know if this plan has been adopted.

The name Red Sea is a translation of the Latin Rubrum Mare, and the Greek term ('Ερυϑρὰ ϑάλασσα) used by Strabo. Herodotus calls the Red Sea the Arabian Gulf, and also includes it in the general term of Erythræan Sea, which comprises the Indian Ocean and the Persian Gulf.

(Lord Valentia's *Voyages and Travels to India, Ceylon, the Red Sea, &c.*; Burckhardt's *Travels in Nubia*; Rüppel's *Reise in Abyssinia*; Wellsted's *Observation on the Coast of Arabia, &c.*, and *Notice of the Ruins of Berenice*, in 'London Geog. Journal,' vol. vi.; Burnes and Dickinson, *On the Maritime Communication of India*, in 'London Geog. Journal,' vol. vi.; Ehrenberg, *Ueber die Natur und Bildung der Coralleninseln, &c. im Rothen Meere*; *Chart of the Red Sea, according to the Survey of Elven, Pinching, and Moresby*, by Carless.)

REDAN is the simplest kind of work employed in field fortification, and it consists generally of a parapet of earth, divided on the plan into two faces, which make with one another a salient angle, or one whose vertex is towards the enemy. Existing alone, the work is capable of making but a feeble defence, since its faces are not defended by any flanking fire; and, being open at the gorge or rear, the enemy may easily enter it in that direction. It can therefore be of use only at an outpost, to afford a momentary cover for troops who are to retire when a superior force advances against them. A redan may however be advantageously placed to cover the head of a bridge, the entrance into a village, or defend the ground in front of some strong redoubt; a series of them may also be constructed along the front of an army, in order to strengthen the position and cover the artillery; and, in all these situations, the defects above mentioned cease to exist, since in the first case the gorge is protected by the river, and in the others the faces and gorges are defended by the works or by the troops in the rear.

When it is required to defend any pass immediately on the right or left of redans, flanks, making salient angles with the faces at points near the extremities of the latter, are given to them, so that they then become what are also called bastions or lunettes; and the necessity of having a crossing fire for the defence of the ground in front, when the redans are not flanked by other works, has at times induced engineers to break the lines of parapet near the gorges, so as to form re-entering bends, and thus constitute a wing on each side at a right angle with the face.

Among the works constructed, in 1810, for the defence of Lisbon, redans were frequently placed on projecting knolls, in front of the great redoubts, in order to flank the ground which was unseen from the latter: their gorges were protected by palisades, or by parapets, sufficiently slender to have been demolished by the artillery of the principal work, had the enemy succeeded in capturing them; and good communications, covered by the inequalities of the ground, or by earth purposely thrown up, were formed in order to allow the defenders, if necessary, to retire in security. The strong stone windmills, which in that country are often built on salient knolls of ground, were occasionally covered by redans of earth; and thus were formed good defensive posts, to each of which the mill served as a reduit or keep. During the struggle in the south of France, in 1813, Marshal Soult caused redans to be constructed as outworks, one below another, on the descending tongues of land which project from the main chains of heights whose summits he had crowned by strong redoubts.

Two redans connected together, so as to leave one re-entering angle in front, form a queue d'hyronde; and the name of bonnet de prêtre has been sometimes applied to a work consisting of three redans so placed.

REDEMPTION. [ATONEMENT.]

REDEMPTION, EQUITY OF. [MORTGAGE.]

REDI, FRANCESCO, born at Arezzo in 1626, studied at Florence and Pisa, and took his degree of M.D. in the last-named university. He afterwards proceeded to Rome and Naples, where he applied himself to the study of natural history, and made several curious physiological experiments. On his return to Tuscany, he practised medicine with great reputation, and wrote several works concerning that science. Redi was also a poet, and wrote a dithyramb, 'Bacco in Toscana,' in which he extols the various produce of the Tuscan vineyards: it is a splendid specimen of that species of composition. His other works are:—1, 'Esperienze intorno alla Generazione degli Insetti,' Florence, 1668; 2, 'Osservazioni intorno alle Vipere,' 1664; 3, 'Esperienze intorno a diverse Cose Naturali particolarmente a quelle che ci sono portate dall' Indie,' 1671, 4to.; 'Osservazioni intorno agli Animali viventi che si trovano negli Animali viventi,' 1684; 5, 'Lettera intorno all' Invenzione degli Occhioli,' 1678: 6, 'Consulti Medici,' 1726-9. 7, 'Lettere Familiari,' 1724-7; 8, 'Sonetti' and other poetry. There are some other of his minor works inserted in the general collection, 'Opere di Francesco Redi,' 3 vols. 4to., Venice, 1712. Redi was a most correct and elegant Italian writer, and also one of the most learned men of his age and country. He was a great favourite with the court of Tuscany, and was physician to the grand-duke Ferdinand II. Redi died at Pisa, in 1698.

RE'DON. [ILLE ET VILAINE.]

REDONDA. [MONTSERRAT.]

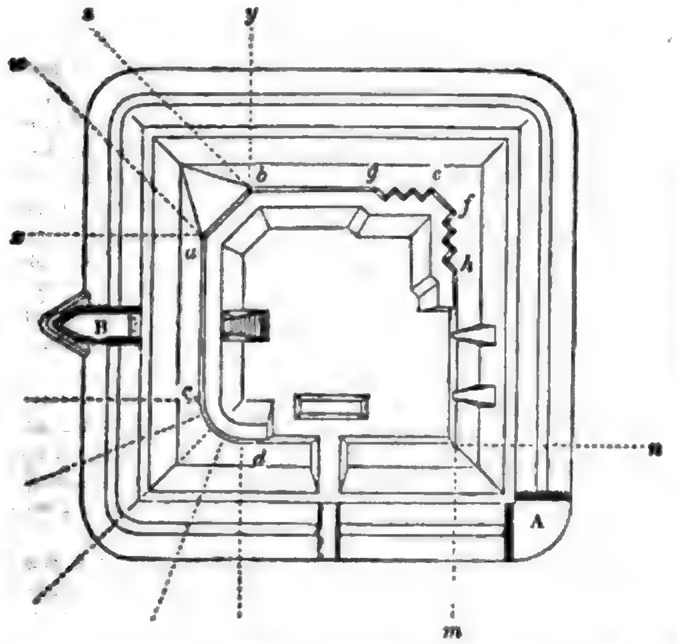
REDOUBT is a general name for nearly every kind of work in the class of field fortifications; thus a redan with flanks, a parapet enclosing a square or polygonal area, a work in the form of a star [STAR FORT], and a fort with bastions at the angles, like the enceinte of a fortress, are occasionally so called; but the second of these is the work to which the term is more particularly applied, and it is that which we purpose now to describe.

When a work to be constructed on level ground is intended to contain troops and artillery for the purpose of preventing the enemy from occupying the spot, and when there is an equal probability that the work may be attacked on any side, that spot should be quite enclosed by the parapet; also if the defence is to continue only till succour can arrive from the army in the vicinity, flanking defences being then scarcely necessary, a quadrangular figure may suffice for the plan of the work, and there can be no reason why one side should be longer than another, or why the sides should form with each other any but right angles. But when the redoubt is to occupy an eminence whose figure on the plan is irregular, the faces of the work, whatever be the form thus produced, must necessarily be traced so as to correspond to the different directions assumed by the brow of the height; and if the fire of the work is intended to defend some fixed object, as a pass leading towards it, one of the faces must be perpendicular to the direction of that pass. It may be observed however that in general the number of faces, though not less than four, should be as few as possible. The ditches of all polygonal works without re-entering angles, are incapable of being defended by the fire from the parapets above, on account of the height and thickness of the latter, which prevent the soldiers from seeing them; and a curvilinear redoubt has, besides, two defects which are irremediable; the fires from its parapets are diverging, therefore they produce little effect while the enemy is advancing up to the work; and the ditch, on account of its form, is incapable of being defended from stockades within it. These objections apply with nearly equal force to redoubts formed on regular polygons of more than five or six sides. The French however made a circular redoubt of casks for the purpose of strengthening the defence of the isthmus at St. Sebastian previously to the siege of that place in 1813; and circular redoubts of masonry are supposed to be useful on the sea-coasts. In the latter situation they are not liable to be attacked by infantry; and their artillery, which is mounted on traversing platforms, may be fired in any direction against ships or boats, should an enemy attempt a debarkation of troops. [MARTELLO TOWERS.]

Every work in field as well as in permanent fortification is surrounded by a ditch, from whence is obtained the earth for the parapet, and by which the difficulty of carrying it by assault is increased. The ditch is generally crossed directly opposite the entrance by a bridge of timber, which should be capable of being drawn into the work, or re-placed at pleasure. The entrance into a redoubt is at a re-entering angle, if there is one, otherwise it may be about the middle of one of the faces on the side which is least exposed to the view of the enemy; and, besides being barricaded, it is defended by the fire from a traverse, which is raised in the interior, and perpendicular to the direction of the passage.

Redoubts for the defence of positions are in general intended to contain only about fifty men with three guns; but works in the form of irregular polygons have sometimes been constructed of a magnitude sufficient to contain 1600 men and twenty five pieces of artillery; and such were the two principal redoubts (on Mount Agraça and at Torres Vedras), formed in 1810, in order to protect Lisbon. These were expected to make a vigorous defence in the event of being attacked; but it is admitted that their *trace*, or ground-plan, was defective on account of the want of flanks, and perhaps they would have been prevented from falling only by the strong divisions of troops who were daily under arms in their vicinity. The redoubt constructed by the British in the neighbourhood of Toulon, in 1793, for the protection of the town and fleet, was a large work well furnished with artillery; yet, on being attacked by the republican troops, it was taken, after a gallant resistance, in which the enemy was twice repulsed. The ditches being undefended by flanks, the assailants, on being driven into them, re-formed their order with little molestation; and at the third attack they succeeded in getting possession of the work.

It is admitted among military men that in firing over a parapet, the soldier doing the duty as rapidly as possible, and fearing to expose himself while adjusting his musket, places the latter mechanically in a direction nearly perpendicular to the line of the face behind which he is stationed. It follows that in front of every salient angle of the work there must be an undefended sectoral space, as *mn*, in the subjoined cut, which represents the plan of a square redoubt, in which space, in order to avoid the direct fire from the faces, the enemy may advance to the attack; and on this account it is recommended that the faces of the work should be disposed so that the angles may be turned towards ground which is impassable, or which will not permit the enemy to establish batteries for the purpose of enfilading those faces. When this disposition is not possible, various methods may be adopted by which the troops who man the work might direct some of their fire within those sectors. The simplest of these, and that which is generally put in practice, is to form the crest of the parapet near the angle, perpendicularly to the *capital* (the line bisecting the angle) as at *ab*; by which means the space between *w* and *z* may be directly defended, and the sectors *xw* and *zy* being small,



very little attention on the part of the men about *a* and *b* will enable them to give their muskets an oblique direction so as to fire upon an enemy advancing within those spaces. A second method is that of rounding off the interior of the parapet at the angles, as at *cd*; but this has been objected to on account of the divergency of the lines of fire. The third method, which is much dwelt on by writers on fortification, consists in forming the interior of the parapet with indentations, as at *cg* and *fh*, alternately parallel and perpendicular to the capital, each indent being three feet long; and a parapet of this kind is said to be *en cremaillère*. It is evident that by placing men contiguously to the sides of these indentations, a fire may be kept up in either of the directions just mentioned; and by placing them at the angles, they may fire perpendicularly to the general face of the work. It must be observed however that the men cannot fire in these different directions at the same time, because, the muskets crossing one another, that of one man might be injured by the fire of the next. The only objections to this method are, that the parapet can be so formed only by men belonging to the corps of sappers and miners, who are regularly trained to the construction of fortifications, but who may not be present when wanted; and that the unsteadiness of the soldiers in firing almost always renders such precision in the formation of the work useless.

The ditch of a redoubt having no flanks, being unseen and incapable of defence from the parapets, it has been proposed, in order to have some means of annoying the enemy when in the ditch, to form an enclosed space A, at one or more of the angles of the ditch, by planting a line of palisades across the latter on two contiguous faces of the work; the enclosure may have a roof of timber covered with earth, and loop holes, three feet asunder, must be cut in the palisades, that the defenders may be enabled to fire along the ditches.

Another method, which may be advantageously adopted when a face of the work has considerable length, is to form, as at B, what is called a palisade caponnière, by planting across the ditch, at the middle of the face, two rows of palisades about eight feet asunder; each row being pierced with loop-holes. The entrance into the caponniere is by steps in the interior of the redoubt and a gallery under its parapet; and this work, as well as that at A, may have a roof, but in no case should such roof be above the level of the natural ground, in order that it may be concealed as long as possible from the view of the enemy. One of the redoubts which was executed near Lisbon, being commanded by a height in its front, from whence the parapets might have been destroyed and the interior ploughed by shot, there was formed a gallery behind the counterscarp, and opposite one of the angles of the work, with loop-holes, from whence the ditch along each face might have been defended by musketry if the enemy had penetrated into it. The soil being chalk, no timber-frames were necessary for the support of the sides or top; and between this recess and the interior of the redoubt there was a gallery of communication passing under the bottom of the ditch.

A row of palisades is frequently planted quite along the ditch of a redoubt. Sometimes also the escarp of the work is fraized, or furnished with palisades planted in an inclined position, and a line of chevaux-de frize is disposed upon the berme. In order to retard the advance of an enemy, the work is generally surrounded, at a distance not exceeding the range of musket-shot, by a single or double abatis, and often by two rows of pits called *trous de loup*.

The magnitude of a redoubt, whatever be its form, is determined by the strength of the garrison and the quantity of ordnance by which it is to be defended; all the men being supposed to be lodged within it. It was formerly the practice to allow on the area of the terreplein, within the foot of the banquette, ten square feet for each man, and 324 square feet for each piece of artillery; consequently when the redoubt is of a square form, the breadth of the banquette being known (about 11 feet), the length of the crest-line on each face could be easily determined. In order that the defenders may conveniently use their arms on the banquette, it has been customary to allow three feet along the crest of the parapet for each man, who is to stand contiguously to the interior slope; and it was once considered that a redoubt intended to make a considerable resistance when attacked on all sides, would be adequately garrisoned if the number of men in it were equal to the number of feet in the whole length of the crest of the parapet; that is to say, if there were three ranks of men along each face, the work being supposed to be capable of containing such a number. It is said that each side of the square redoubts which Marshal Saxe caused to be constructed at the siege of Maestricht in 1748 was above 100 feet long, measured on the crest of the parapet, and that each redoubt was garrisoned by 500 men; and it will be found by computation that, consistently with the above rules, a square redoubt, each of whose faces is sixteen yards long, is the least that ought to be constructed; for if less, the interior within the banquette would not contain the number of men necessary to line its parapet with one rank. But the rule relating to the area within the banquette has been objected to as an unnecessary affectation of mathematical precision. The British engineers who constructed the works for the protection of Lisbon observe that, except at night, or at the moment of being attacked, part of the garrison will be on watch, or otherwise occupied outside of the work; and even at those times, at least one-third will be under arms on the banquette. Colonel Sir John Jones states that the strengths of the garrison were finally determined by allowing two men per yard in the length of the parapet for the exterior works, and one man per yard for the interior works; deductions being made for the spaces where artillery was to stand. Each gun takes up about eighteen feet of the length of a parapet.

The crest of the parapet of a redoubt may be about 8 feet above the natural ground, unless the work is to be defiladed from some commanding ground in the neighbourhood, in which case it must be higher. The form of a section or profile of the parapet is similar to that which is used for permanent fortification [LINES OF INTRENCHMENT, *fig.* 4], but the breadth of the superior slope may vary with the nature of the arm which the enemy can bring against it; three feet will suffice if the work can be attacked by infantry only, but it may be as much as 10 or 12 feet if it is to resist field artillery of the heaviest calibre. The superior surface of the parapet should slope down towards the exterior, so that the defenders may see the top of the counterscarp of the ditch in front; and when, from the great relief of the work, this is impossible, the counterscarp should be raised by earth obtained from the ditch to the height necessary for this purpose; taking care however to give the raised earth a gentle slope towards the exterior, that the enemy may not be screened by it. The exterior of the parapet and the escarp of the ditch are covered or reveted with sods when the earth has not sufficient tenacity to stand unsupported; and when the work is to resist the fire of heavy artillery, the revetment might consist of stout logs of timber planted obliquely in the ground or in the bottom of the ditch, and leaning against the face of the work. The interior of the parapet is usually reveted with sods or fascines.

Redoubts are intended to fortify military positions, for which purpose they usually occupy the heights and command the defiles; and their magnitude or number must depend upon the time afforded for their construction. [LINES OF INTRENCHMENT; MILITARY POSITIONS.] It sometimes happens that they are thrown up during a night to protect artillery on the wings, or in some important situation in front of the army, in expectation of an engagement taking place the next day; and then they are necessarily few and small. When Marshal Soult was reduced to defensive operations in the south of France, in 1813 and 1814, he strongly entrenched the heights on all the frontier between the sea about Bayonne and St. Jean-de-Luz, and the mountains at St. Jean-Pied-de-Port; an extent of above 16 miles. The works, which were executed in three months, were generally irregular polygons; and some of them were constructed for 500 men. More than a year was spent in raising the redoubts which covered Lisbon; and consequently these were not only strong, but numerous beyond any other example. [ENCAMPMENT.] They were of every trace, but mostly irregular polygons, whose sides sometimes formed re-entering angles, as the ground required: the two great redoubts before mentioned were retrenched by interior parapets, which also served as traverses, and each salient point of the redoubt at Torres Vedras constituted an independent post.

Attack and Defence of a Redoubt.—In the attack of a small redoubt unprovided with artillery, light infantry or riflemen, keeping for a time as much as possible covered by the inequalities of the ground, endeavour to surround the work, and, by a fire of musketry, directed towards the crest of the parapet, to diminish that of the defenders. The assailing troops then gradually close in upon the redoubt, and, while one division remains on the counterscarp to continue the fire, should the defenders show themselves upon the parapets, the rest descend into the ditch, where, having collected themselves in parties or small columns, they mount the parapet on each side of a salient angle; then developing themselves on the summit, they make a general discharge and enter the work. In order to avoid accidents in descending into the ditch, or in ascending the escarp, it is recommended that the bayonets should not be fixed by the assailants till they have gained the berme of the work.

But if the redoubt is of considerable magnitude, if it is furnished with artillery, and moreover protected by palisades in the ditches, and abatis or other obstacles in the front, the attack must be conducted with more powerful means. It should commence by a fire of artillery directed partly so as to enfilade the parapets, break down the palisades and derange the abatis, and partly to destroy the merlons which cover the artillery of the work. The fire of the latter being thus in some measure silenced, the light infantry, as in the former case, endeavour by musketry to prevent the defenders from manning the parapets; and in the mean time columns of troops advance towards the angles, being preceded by parties of sappers and miners, who make openings for them in the line of abatis, or cover with timbers the trous de loup, if such there be. If the ditch is deep, the descent into it, and the subsequent ascent of the escarp, must be facilitated either by placing scaling-ladders or by throwing in fascines or bags of hay; and any palisades or other obstacles which may not have been displaced by the artillery, must now be cleared away by the working-parties which accompany the troops. The fire of the covering parties must cease while the assailants are mounting the parapet, but it must recommence if they should be repelled: in the latter case the storming troops reform their order in the ditch, and again attempt to enter the work. It may be supposed that at length they will succeed, when the defenders, if not provided with a redoubt to which they may retire for the purpose of capitulating, must surrender at discretion. In 1793 the French camp under Valenciennes was protected by works which, though furnished with artillery, were open at the gorge; and in an attack, the British cavalry, having entered those works at their rear, made prisoners of all the defenders.

When a redoubt is threatened with an attack, the officer commanding it endeavours to provide against the event by disposing in front of the work all possible obstacles to the advance of the enemy, and by placing sand-bags on the parapets in order to cover the defenders, who are to fire through small intervals left for the purpose: these measures should be taken, if not before, during the night preceding the attack; since the latter generally takes place early in the morning. On the advance of the assailants, the artillery of the work is made to play upon their columns; and the fire of musketry commences as soon as the latter are within the proper range. These fires are kept up vigorously while the assailants are clearing away the obstacles, and until they have descended into the ditch. Should the work have flanks, and the guns behind them be not dismounted, a fire of grape-shot and of musketry must now be directed along the ditches; while hand-grenades and stones are thrown, and live shells are rolled into them from the parapets of the faces. The storming troops may however persevere, and may at length mount upon the parapet, in which case they must be received by a fire of musketry from the defenders on the terreplein; and the latter, if overpowered, must endeavour to retire or capitulate.

Any works constructed within others, in order to prolong their defence, or to afford a retreat for the troops who occupy them, are also called redoubts; but by the French engineers, reduits or retrenchments. [RETRENCHMENT; BLOCKHOUSE.]

REDRUTH, an unincorporated market-town in the hundred of Penwith, in the county of Cornwall, 268 miles from the General Post-office, London, by the Southampton railroad to the Andover-road station (55 miles), and from thence by Andover, Salisbury, Dorchester, Bridport, Exeter, Launceston, Bodmin, and Truro. It is supposed to be a very old town; the original name was Dredruith, interpreted to mean Druids' town; but it did not possess any importance till modern times, when its copper-mines have given it wealth and population.

The area of the parish is 3770 acres. The population, in 1831, was 8191. The town stands on the brow of a hill, and consists for the most part of one long street, running north-east and south-west, indifferently paved, and lighted with gas. The church, dedicated to St. Uny, is about half a mile south-west of the town; it was rebuilt A.D. 1770. There are the remains of an antient chapel in the town, and there are meeting-houses for Baptists, Quakers, and Primitive and Wesleyan Methodists. There are a market-house, shambles, a small theatre, and a spacious handsome savings' bank, which, there being no town-hall, is used upon the revision of lists of county voters and for other public purposes. Near the entrance to the market-place is a clock-tower with an illuminated clock.

The wealth of the town is derived from the valuable tin and copper mines in this and the adjacent parishes. There are weekly sales of copper-ore, and stores of such articles as the miners require are kept in the town. There are two weekly markets; the Friday market is a considerable corn-market; there are three yearly fairs, chiefly for cattle.

The living is a rectory, in the archdeaconry of Cornwall and diocese of Exeter, of the clear yearly value of 432*l.*, with a glebe-house. There were, in 1833, one infant-school, with 154 children of both sexes; seventeen day-schools, with 372 male and 190 female scholars; and three Sunday schools, with 394 male and 301 female scholars. There is a subscription reading-room.

There are several villages in the parish; at one of them, called Plaingwary (that is, in Cornish, plân an guare, the plain of sport or pastime), are the remains of one of the 'rounds' in which plays were antiently performed. These rounds are described in the article CORNWALL [vol. viii., p. 38].

The Redruth and Chasewater (or, as it is more commonly called, Redruth and Deveron) railway extends from Redruth to Deveron, a shipping-place, on a creek running up from Falmouth harbour. It traverses the great mining parish of Gwennap, and communicates by branches with other mining districts, and also with Portreath, a seaport on the North Channel. The carriages are drawn by horses, at a rate of three or four miles per hour. This railway is used chiefly for the conveyance of ores from the mines to the places of shipment; coals, timber, &c. from the wharfs to the mines; and flour and merchandise to Redruth and the intervening villages. By means of a short branch it joins the railway from Redruth to Hayle, the waggons or carriages being loaded and unloaded from one railway to the other. The length of the main line is about fourteen miles. This railway, which was formed under an Act passed in 1824, has been open about fifteen years, and has proved very profitable.

The Hayle railway, which was also constructed by a joint-stock company, under Acts obtained in 1834 and 1836, affords communication by its main line between the town of Redruth, the adjacent mines, and the port of Hayle, its extreme length being about twelve miles. It has several branches, the principal of which is about three miles and a half in extent, and communicates with the seaport of Portreath. The line is worked by locomotive and stationary steam engines, at a speed of from twelve to twenty miles an hour, the latter being used in some parts on account of the steepness of the inclined planes. The traffic is of much the same description as that on the Redruth and Deveron railway, and a large quantity of general merchandise is conveyed inland, which is brought by a steamer that plies between the ports of Hayle and Bristol. This railway (on which no passengers are conveyed) has been open about three years, but has not hitherto realised the expectations of its projectors.

REDSTART. [Sylviadæ.]

REDUCTIO AD ABSURDUM. [Absurdum, Reductio ad.]

REDUCTION. This term is used in arithmetic in the well-known sense of the operation of turning one denomination of weights or measures into another; thus shillings may be reduced to pounds, or pounds to shillings. It is also used in the same sense throughout analysis, namely, that of bringing one form into another, making one question depend upon another, &c.; in fact, for transformation generally. It were to be wished that the latter word transformation should take its place whenever the two forms are of equal difficulty or the two questions of the same character, &c., and that reduction should be employed only when there is really a reduction, that is, a bringing down either of dimension or difficulty, &c. Many writers do use the word thus, and thus only, but others do not.

REDUCTION INTO POSSESSION. [Possession.]

REEFS, or CORAL REEFS, are a peculiar kind of rock which occurs abundantly in some parts of the ocean. They differ from other rocks in extending over a considerable space of the sea in length, with a very narrow width. Generally they are also only a few feet below water; so that on the side where they are washed by the open sea, a heavy surf is continually running against them.

Reefs appear under various forms. In some places they are contiguous to the shores, as in the Red Sea; in others they fringe the shores, being separated from them by a narrow channel of moderate depth. Sometimes they surround islands at a considerable distance from the shores, and the islands so encircled are almost without exception of volcanic origin. Very frequently they surround a portion of the sea, within which there are some small islands, which are often contiguous to the reefs, and seem to be a part of them, as both are composed of the same material. There are also coral reefs at a great distance from the land, which run nearly parallel to it, like a barrier. Among the latter are those of the Coral Sea, along the eastern coast of Australia. [Pacific.]

The attention of navigators and naturalists was first attracted to those islands which go under the name of Lagoon Islands. A reef approaching in form to a circle surrounds a part of the sea and forms a lagoon, on the inner part of which there are usually several smaller islands, wooded and inhabited, which are contiguous to the reefs themselves, and frequently extend along them with little interruption. The water on the outside is always nearly unfathomable, but within the reefs good anchorage is generally found, and the reefs themselves have one or more openings of deep water, by which the largest vessels may enter the lagoon. Accurate observers soon discovered that the reefs were composed of coral, and were the production of an animal. On these circumstances the first theory of reefs was founded. This theory received some addition from Forster, who accompanied Captain Cook on his second voyage. According to him, they are raised by these small animals perpendicularly like a wall, from a great depth to a very small distance from the surface of the sea. The waves afterwards bring sand, muscles, tang, and pieces of coral, and deposit them on the reef, which, in this way, is gradually raised above the sea-level, and becomes fit for vegetation. Currents and sea-fowls bring the seeds of marine plants, which, being decomposed, form a mould on which the cocoa-nut palm, when carried thither by the waves, thrives luxuriantly. This theory of Forster was adopted and extended by Flinders, who in surveying the coasts of Australia had abundant opportunities of observing the formation of these islands; and still more by Peron and Chamisso. The last-mentioned naturalist accompanied Kotzebue on his first voyage of discovery (1815-1818).

But facts have since been observed by Quoy and Gaimard, who accompanied Freycinet on his voyage, and published their observations in the ‘Annales des Sciences Naturelles,’ which are inconsistent with this theory. They found that the reefs did not entirely consist of coral, and that the layer of coral hardly exceeded a few fathoms in depth. Besides this the polypiaria which are able to form such a layer do not inhabit the sea to any great depth, and are not found where the water is more than 30 feet deep. They therefore supposed that these animals executed their work only in those parts of the sea where the bottom had been raised by some natural cause nearly to the surface of the water. They supported their theory by adducing the fact that the continuity of every lagoon-reef was broken at one or more places, so as to constitute a strait of very deep water, which could not be the case if these works were carried on at a depth of from 100 to 200 fathoms. This theory coincides with the views adopted by Von Buch, in his description of the Canary Islands, and has been adopted by Ehrenberg, in his pamphlet ‘Ueber die Natur und Bildung der Coralleninseln und Corallenbanke im rothen Meere;’ and by Darwin, in the third volume of the ‘Surveying Voyages of the Adventure and Beagle.’ The last-mentioned writer however does not doubt that the reefs which form the lagoon islands are composed of coral to a great depth, much greater indeed than those polypiaria which form them can live in. He explains this in a very ingenious way, by supposing that they formerly had an elevated island in the middle, but that in those portions of the sea where they now occur, the bottom of the waters was gradually lowered by subsidence, by which the polypiaria were enabled to continue their work farther, and the mountainous islands in the middle disappeared. In other parts of the Pacific and Indian oceans the contrary is supposed to have taken place: the bottom of the sea was elevated, and in these tracts volcanic islands occur. He observes that in this respect these seas may be divided into broad bands, in which an elevation and submersion has alternately taken place; and he draws from it some important inferences (p. 562-569).

REFLECTION. [Optics.]

REFLECTING INSTRUMENTS, viz., reflecting circle and sextant. [Sextant.]

REFLECTING TELESCOPE. [Telescope.]

REFORMATION is the name generally given to the great schism which took place in the Western Church in the first half of the sixteenth century, and by which about one-fourth of the population of Europe has become separated from the Church of Rome. The countries in which the doctrines of the Reformation have become predominant, being the creed of the great majority of the people, are Sweden, Denmark, Norway, England, Scotland, the kingdom of Prussia, the kingdoms of the Netherlands, Hanover, Saxony, Würtemberg, the electorate of Hesse Cassel, the grand-duchies of Hesse Darmstadt and Mecklenburg; the land-graviat of Hesse Homburg, the duchies of Nassau and Brunswick; the principalities of Anhalt, Lippe, and some others; the free towns of Hamburg, Bremen, Frankfort, and Lübeck; the Russian Baltic provinces of Livonia, Esthonia, Courland, and Finnland; the Swiss cantons of Bern, Zürich, Basle, Schaffhausen, Aargau, Thurgau, Grisons, Vaud, Glarus, Appenzell, Neuchatel, and Geneva. The countries in which the reformed doctrines are followed by part, but not the majority of the population, are Hungary, Transylvania, the grand-duchy of Baden and some minor German states, France, the Swiss canton of St. Gall, and Ireland. Besides these, the great majority of the people of the United States of North America, as well as of the English and Dutch colonies, follow the same mode of faith.

In order to understand correctly the history of the Reformation, it is necessary to be acquainted with the social, political, and intellectual state of Europe in the fifteenth century; and for this purpose the histories of the Councils of Constance and of Basle, and the ‘Historia Bohemica,’ by Æneas Sylvius Piccolomini, are of great service. [Pius II.] Previous to the Reformation, the see of Rome claimed of divine right, and asserted, with the assistance of the lay power of the various states of Europe, an absolute authority over the whole Christian Church, and consequently over the population of all Europe, with the exception of the provinces of the Turkish empire, the dominions of the czar of Russia, and of part of Poland, where the Eastern or

Greek church was established. By virtue of this supreme authority, the Roman pontiff decided absolutely all doubts and disputes which might arise, whether in matters of doctrine, jurisdiction, or discipline: his decisions were considered as infallible; and whoever resisted or gainsayed them was considered a heretic, and as such liable to canonical censures, and also to the temporal penalties awarded by the canon law against heretics. The government of the church was therefore absolute; and the church, or rather, the bishop of Rome, as head of the church, assumed also a supremacy even in temporal matters, although the exercise of this last supremacy was resisted by various princes. [GREGORY VII.; INNOCENT III.; INNOCENT IV.; GREGORY IX.]

The great object of the reformers of the sixteenth century was to overthrow the principle of absolutism in the government of the church, by contesting the infallibility and supremacy of the bishop of Rome. This had been already contested, and indeed set aside by the Councils of Constance and of Basle; but the point of contention had never been finally and permanently settled. [POPE.] The reformers of the sixteenth century however went much farther; they denied the absolute authority even of the councils, and they leaned towards the popular or democratic principle in religious matters, by allowing the right of individual interpretation of the Scriptures, and discarding all tradition and human authority in matters of faith. And here it must be observed that previous to the sixteenth century several of the most strenuous opposers of Roman absolutism in matters of jurisdiction and discipline, such as Gerson, chancellor of the university of Paris, in his work, 'De Modis uniendi et reformandi Ecclesiam in Concilio Universali,' never questioned the right of the church in council assembled to decide upon matters of doctrine, and to enforce decision against all dissenters even by means of temporal penalties. In his letter to the archbishop of Prague, on the Hussite controversy, which is given by Cochlæus, 'Historia Hussitarum' (lib. i.), Gerson recommends the axe and the stake as the last effectual means of extirpating heresy: 'Superest igitur, velut in desperata peste, securis brachii secularis, excidens hæreses cum auctoribus suis, et in ignem mittens. Providens hac tanta severitate et misericordi, ut sic dicatur, crudelitate, ne sermo talium, veluti cancer, serpat in perniciem tam propriam quam alienam.' This spirit of intolerance is therefore not peculiar to the Roman see, but is a consequence of the absolute principle of the Latin or Roman Catholic church. In our own times, Llorente, the historian of the Inquisition, whilst censuring the practice of that tribunal, which he considers as illegal, thinks it proper that the respective bishops should prosecute heretics; and the Spanish Cortes of 1812, when they abolished the court of the Holy Office, stated, as one of their reasons, that the diocesan courts were the proper authority for prosecuting and repressing heresy. But the reformers of the sixteenth century denied this absolute authority of church, council, or bishop, and as in the course of their struggle they were met by several dogmas or doctrinal tenets derived either from passages of the Scriptures as interpreted by the Roman church, or from tradition, or from decisions of the councils or decretals of the popes, which were urged in opposition to them, they set about translating and commenting on the Scriptures, substituting a different interpretation of the disputed passages, and thus sapping the very foundations of the whole fabric of church authority. A sketch of the manner in which the Reformation began in Germany is given under LUTHER.

It has been maintained by several writers that the principles asserted by Luther and other reformers were those of the early ages of the church: but all that can be proved seems to be that in almost every age since the apostolic times there has been here and there a display of opposition to the absolute system in the church; that some peculiar doctrines of Luther and Calvin had been asserted by others long before them; and that the Valdenses especially and their neighbours of the valleys of Dauphiné had retained from time immemorial a system of church discipline similar to that established by the Reformation in the churches of Switzerland and Scotland. [VALDENSES.]

Principal Epochs in the History of the Reformation.—Luther began his course of opposition to Rome by his memorable theses against the sale of indulgences, which he affixed on the doors of the cathedral of Wittenberg in Saxony, 31st of October, 1517. [LUTHER.] In 1519, Luther, in his disputation with Eckius, questioned the supremacy of the pope over the church, as well as the doctrines of purgatory, auricular confession, and absolution; and he afterwards published several treatises, in which he expressed his dissent more openly.

In June, 1520, pope Leo X. issued a bull condemning as heretical forty-one propositions extracted from Luther's writings. Luther appealed from the pope to the General Council, and publicly burnt Leo's bull (December, 1520). On the 6th of January, 1521, Leo expelled Luther from the communion of the church. In April of the same year Luther appeared before the diet of the empire at Worms, defended the substance of his tenets, and maintained that both popes and councils were liable to err. He was ordered to leave Worms, which he did unmolested, as he had a safe conduct; but after his departure he and his adherents were put under the ban of the empire.

Contemporary with Luther, Zwingli was pursuing a like course in Switzerland. It was in 1518 that Zwingli, without knowing then anything of Luther's proceedings at Wittenberg, opposed the sale of indulgences in the church of Einsiedlen, and preached against the abuses of that practice. In 1519, Zwingli, being transferred to the Gross Münster, or collegiate church of Zürich, began to preach openly not only against indulgences, but against the numerous outward forms of church worship, which, he said, 'fatigued the body without enlightening the mind or purifying the heart.' About the same time Bullinger at Bremgarten, Œcolampadius at Basle, Glareanus at Glarus, Wyttenbach at Bienne, and Berthold Haller at Bern, preached similar principles; they insisted upon the Liturgy being translated into the oral language of the people, and gradually proceeded to question the right assumed by the Roman pontiff of deciding all questions of religion. The court of Rome, whose attention was engrossed by Luther's German schism, did not for some years notice what was going on in Switzerland; but the bishop of Constance forbade the preaching of the new doctrines, and ordered the Papal bulls against Luther to be duly registered and promulgated. It appears that the bishop considered the new opinions in Switzerland as derived from and identical with those preached by Luther in Saxony. This however was not exactly the case, for the Reformation of Switzerland was of native growth, and independent of the German Reformation; and it differed from it from the first in some of its doctrines.

At Zürich, in 1522, Zwingli published his 'Apologeticus Architeles,' in defence of his doctrine. Conferences were held between Zwingli and his friends (who now assumed the name of 'Evangelicals'), and Faber, vicar-general of the bishop of Constance, and other papal advocates, but no approximation was effected between the two parties. In 1523 the great council or legislature of Zürich forbade the preaching of any doctrine which was not clearly founded on the Scriptures, and removed the images from the churches. Shortly after they abolished the service of the mass, as well as processions and pilgrimages, promulgated a new Liturgy, and suppressed convents In 1526 conferences were held at Baden between the Evangelicals and several Roman Catholic doctors and monks. An account of the proceedings was published at Luzern: 'Caussa Helvetica Orthodoxæ Fidei contra Martinum Lutherum, Zwinglium, Œcolampadium, &c.'

In January, 1528, the Council of Bern appointed a new and final conference to be held in that city, and invited the four bishops of Switzerland, Basle, Lausanne, Constance, and Sion, as well as deputies from the clergy of all the cantons, to attend. The four bishops declined, and six cantons, namely, Luzern, Zug, the three Waldstätten, and Freyburg, did not send any deputations. Zwingli came from Zürich, accompanied by twenty-five deputies: Basle, Schaffhausen, Appenzell, Glarus, Soleure, as well as the Grisons, and the towns of St. Gall, Bienne, and Lausanne, sent each its deputation. It was altogether a solemn assembly, the most important that had ever met in Switzerland on this momentous controversy. Regulations for the maintenance of order and the mode of proceedings were enforced by the magistrates of Bern. It was at the same time proclaimed that 'no argument should be admitted in the conference which was not grounded on a text of Scripture, to the exclusion of other authorities. This exclusion militated strongly against the Roman Catholic disputants; the conference however lasted nineteen days, and the Evangelical doctors displayed more learning than their adversaries. A zealous Roman Catholic priest of Soleure observed bitterly, that had his brethren, and especially the higher clergy, devoted more time to study and less to their pleasures, the result of the conference would have been different.

The conference being closed, the Council of Bern, considering the result to be in favour of the Evangelicals, published the following theses, which had been discussed; and they approved and confirmed them. 1. The holy Christian Church, of which Christ is the only head, is born of the word of God, and continues to adhere to it, and does not listen to the voice of the stranger 2. The Church of Christ makes no laws and ordinances which are not grounded upon the word of God; therefore all the ordinances of men which are called by the name of commandments of the church are not obligatory unless it be proved that they are founded on the word of God. 3. Christ alone is our wisdom, our justice, our redemption, and satisfaction for the sins of the whole world: it follows therefore that to acknowledge other merits as means of salvation and satisfaction for sin is to renounce Jesus Christ. 4. It cannot be proved from holy Scriptures that the body and blood are contained materially and bodily in the eucharistic bread and wine. 5. The mass, such as it is now, in which the sacrifice of Jesus Christ is daily offered to God the Father for the sins of the living and the dead, is contrary to Scripture. 6. Jesus Christ, having alone died for us, must be alone invoked as our mediator and intercessor with God the Father. It is therefore without any foundation on Scripture that we are told to invoke other mediators and intercessors from among the dead. 7. There is no scriptural evidence for asserting that there is after this life any purgatory or place in which souls are purified by fire. Therefore all the services for the dead which have been introduced, as vigils, masses, funeral processions, oblations, anniversaries, lamps, wax tapers, and other such things, are useless and vain. 8. To make and set up images, in order to bestow upon them a religious honour or worship, is contrary to the word of God both in the Old and the New Testaments; they ought therefore to be abolished whenever there is danger that the people should bestow upon them a religious honour. 9. Marriage is not forbidden by Scripture to any class or order of men; it is, on the contrary, recommended to all, in order to avoid fornication and lewdness. 10. A public fornicator is excommunicated by the Scriptures; and there is no order of men in whom lewdness is more pernicious than it is in clergymen, on account of the influence of their bad example and of the disorders consequent upon it.

These ten propositions embody the substance of the Reformation, not only in Switzerland but in the rest of Europe; for with the exception of the fourth, concerning the eucharist, which differs from the Lutheran doctrine in the Augsburg Confession on that particular point, all the principles contained in them are acknowledged by all the reformed churches, however those churches may differ among themselves on some other abstruse points, such as predestination and grace, or on subjects of church discipline. The doctrines expounded in these ten propositions constitute their common ground of union in opposition to the doctrine and practice of the Roman Church, and they also exhibit at one view the fundamental points on which the Reformed Churches dissent from Rome; for the question of the supremacy and infallibility of the pope is evidently contained or implied in the second proposition. Those points of dissent are neither few nor unimportant, and are expressed perhaps more clearly, soberly, and concisely in the above Swiss declaration than in any of the more elaborate confessions of faith subsequently promulgated by the various Reformed Churches.

Conjointly with the publication of the above ten propositions, the great and little councils of Bern published, on the 7th of February, 1528, an edict of Reformation based upon them, consisting of thirteen articles, declaring, among other things, that the spiritual jurisdiction of the bishops of Constance, Basle, Lausanne, and Sion over the subjects of the state was abrogated; that the deans and other members of chapters should take an oath of allegiance to the little council or executive of Bern; that all rectors, curates, and other presbyters were not to teach or preach anything contrary to the ten theses already approved, under pain of being deprived of their benefices; that monks and nuns might remain in their convents if they liked, but without receiving any novices or boarders; that those who wished to leave their convents were at liberty to do so, and to take away what they brought with them at the time of admission. It also declared that the mass and images were finally abolished at Bern, but that as there were in the country districts various populations which were yet uninstructed, the council did not wish to act harshly towards them, but, praying to God that they might become enlightened, left them the power of abolishing or retaining the mass or images, according to the vote of the majority. In the meantime, it enjoined both parties not to insult or revile each other.

Although the ceremonies of the mass, the offices for the dead, &c. were abolished, yet the endowments and gifts for those objects, quit rents, fees, tithes, and other dues continued to be paid as formerly, 'in order,' said the edict, 'that those clergymen of the old communion who had benefices might enjoy their income during their lifetime, and live and die in peace.' After their death, the council of Bern reserved to itself the disposal of the property according to justice and for the benefit of the state. Those persons however who had given property to convents or had founded chaplainships and other minor benefices without cure of souls might resume their gifts if they chose. Those cures or benefices which were annexed to convents were to be disposed of by the council, but no lord, patron, or collator of any church was to appropriate to himself or dispose of any part of its revenues. The precious vases and other utensils and ornaments of the churches were to remain in their places for the present; but permission was given to those companies, corporations, and families that owned altars and chapels, to claim the ornaments and utensils attached to them. The clergy as well as nuns were allowed to marry. Every person was allowed to eat of all sorts of meat without distinction of days, but excess and drunkenness were forbidden. Taverns and other public places were to be shut up at nine o'clock in the evening. All clergymen having the care of souls were to preach four times a week, Sunday, Monday, Wednesday, and Friday, except during the seasons of sowing, reaping, and vintage, the peasants being then unable to attend church on week days. (Ruchat, *Histoire de la Réformation en Suisse.*)

These regulations of the government of Bern, which were similar to those adopted by Zürich, being conceived in a spirit of mildness, charity, and liberality, reflect great credit on the spirit that governed the Swiss Reformation, of which Bern and Zürich were the main pillars, and contrast advantageously with the harsh and rash fanaticism of many reformers in other countries. Even Roman Catholic states in our own times, when engaged in suppressing the monastic orders in their territories, might have learned from the equitable and humane conduct of the dissident government of Bern towards the convents of that state, a lesson of honourable forbearance, which however they have been far from following.

There are many persons at present in Protestant countries, and especially in England, who from reading the history of England, and more particularly the period of Henry VIII., have conceived a kind of prejudice against the English reformation, which they are apt to identify with the capricious and cruel acts of that tyrannical prince. Led by his own violent passions and intent on his selfish gratification, Henry VIII. effected a schism with Rome on matters of jurisdiction by asserting his own supremacy, but not on doctrinal points, in which he continued to adhere to the tenets of the Roman church. He did not produce or encourage the Reformation; on the contrary, he persecuted and put to death the real reformers. He seized the property of convents, but bestowed it chiefly upon laymen, his own courtiers. The Reformation in England sprung from among the people and the clergy. It had begun with Wicliff; it spread from England to Germany among the Lollards and the Hussites, and was carried back from the Continent to the shores of Britain with a fresh impulse from the preaching of Luther, Bucer, and the Swiss reformers. The schism of Henry VIII. paved the way, but it did not originate nor promote nor establish the doctrines of the Reformation; they made their way rather in spite of, than by the favour of that capricious king. It was only under his successor, Edward VI., that the Reformation found favour with the throne, and became established by authority. Still the origin of the church of England as a body independent of Rome dates from the wayward deeds of Henry VIII., and when that church afterwards adopted the reformed doctrines, there was a great admixture of political and state reasons in the final establishment of it, especially under Elizabeth, and consequently much severity and harshness were exhibited towards those who adhered to the old religion, which threw for a time a dubious light over the ascendency of the Reformation in England. But the case was very different with the Reformation in Germany and Switzerland. Those countries were the native soil and the battle-field of the Reformation; there the first reformers took up their ground at once on doctrinal points against Papal Rome; they were obscure individuals assailing the stupendous fabric of ages, and when they afterwards gained the favour of some princes of the empire, they had still against them the fearful odds of the Imperial authority backed by all the influence of the House of Austria and of a powerful hierarchy, and by the numerical majority of the population of Germany.

While Zwingli and his friends were propagating religious reform in Switzerland, Luther was proceeding in his career in Germany. In 1521-2 he wrote against auricular confession, clerical celibacy, monastic vows, and prayers for the dead. In 1523 he preached against the mass, which was about that time abolished by the Austin friars in their church of Wittenberg. A number of monks quitted their convents and married. Frederic, called 'the Wise,' elector of Saxony, without openly countenancing the schism, tolerated these proceedings. Pope Adrian VI. sent a Nuncio to the Diet at Nürnberg to rouse the States against the Lutherans, acknowledging at the same time that many abuses had crept among the clergy, which should be reformed. But the majority of the Diet besought the pope to convoke a general council, and drew up a list of no less than a hundred grievances, which are known by the name of 'Gravamina Centum.' The Diet separated, postponing the consideration of the new doctrines to the next session. In 1524 Luther divested himself of his monastic dress, and in the following year he married. Frederic, elector of Saxony, died in 1525. John, who succeeded him, openly embraced the Reformation and commissioned Luther to prepare a new church service for his dominions. Luther also published his two catechisms for the use of schools, as well as his German version of the New Testament. His friend Melanchthon co-operated zealously in establishing the Reformation in Saxony. Martin Bucer was pursuing a similar course at Strasburg. [BUCER; MELANCHTHON.] Between the years 1525 and 1529 Luther's doctrines spread rapidly through Germany. The elector palatine, the landgrave of Hesse, the duke of Deux Ponts, the margrave of Brandenburg and grand-master of Prussia, and numerous cities, adopted the Reformation. The descendants of the Hussites of Bohemia inclined to the same course. The doctrines of Luther spread also to Sweden, where the canon Olaus Petri, archdeacon Anderson, and others of the clergy adopted them; and at last king Gustavus Vasa, having assembled a synod at Orebro, the Reformation was solemnly proclaimed in 1528. It ought to be observed that the rapid diffusion of the Reformation through Germany, though proceeding in a great measure from the popular feeling, was also greatly favoured by the self-interest of the various princes, who eagerly seized upon the wealth of the suppressed convents, collegiate churches, and other ecclesiastical establishments—a selfish motive which no one deplored or censured more bitterly than Luther himself. In the case of Sweden the ascendency of the doctrines of the Reformation was promoted by the feeling of national independence against the Danes, who were favoured in their designs by the intrigues of the Catholic clergy. [GUSTAVUS ERICKSON.] In the history of the Reformation, as in that of other great human contests, we perceive an admixture of various causes and influences, of good and evil, of conviction and self-interest, of spirituality and sensualism.

In March, 1529, at the diet of the empire, assembled at Speyer, the Roman Catholic princes proposed that those who should continue to embrace or favour the new doctrines should be placed under the ban of the empire; but the opposition raised by the elector of Saxony, the landgrave of Hesse, the margrave of Brandenburg, and the deputies from the imperial cities, caused the motion to be rejected. The next object of the Roman Catholics was to divide the Lutherans from the followers of Zwingli, or Sacramentarians, as they were called, who denied the real presence, and whose doctrines had spread to Strasburg, Constance, Lindau, Memmingen, and other towns of Germany; for if the Lutherans could be made to join in the proscription of the Zwinglians, they might afterwards be assailed in their turn. Accordingly a decree was drawn up proscribing the Anabaptists, a fanatical sect which had committed great disorders in the Netherlands and other parts, and which may be considered as a wild offshoot of the Reformation. The decree also condemned the denial of the real presence in the eucharist, and prescribed that the mass should be preserved, and that ecclesiastics both Lutheran and Roman Catholic should not annoy each other for their respective belief, until a council or another Imperial Diet should finally decide upon the matters in dispute, and that the gospel should continue to be preached according to the sense of the most approved doctors of the church. The Lutheran princes and deputies however, perceiving the policy of the Roman Catholics, refused to sanction the decree, especially as it was so expressed as to condemn indirectly some of their own tenets The Roman Catholic princes, who formed the majority, insisted on the decree, and it was then that the reformed princes and deputies, making common cause without distinction of Lutherans or Sacramentarians, delivered in a formal 'protest,' dated from the Diet of Speyer, April 19, 1529, from whence the denomination of 'Protestants' has been derived. In that celebrated document they maintained that the decree of the preceding Diet, which connived at toleration until the meeting of the General Council, having passed unanimously, could only be abrogated by unanimous consent; that they could not accede to the sweeping condemnation of the Anabaptists and Sacramentarians without their being summoned and heard in their defence; that as the Romish mass was contrary to Scripture, they could not attend it themselves nor let their subjects attend its celebration; that the clause which stipulated that the gospel should be preached only according to the interpretation of the church, did not remove the main difficulty, as the question was, which of the churches was the true one. This protest was signed by John, elector of Saxony; George, margrave of Brandenburg and grand-master of Prussia; Ernest and Francis, dukes of Luxemburg; Philip, landgrave of Hesse; Wolfgang, prince of Anhalt; and by the deputies of fourteen cities, Strasburg, Nürnberg, Ulm, Constance, Reuttingen, Hildesheim, Melingen, Lindau, Kempten, Heilbrunn, Weissenburg, Isny, Nordlingen, and St. Gall. (Spalatinus, *Annales Reformationis;* and also *Vitæ aliquot Electorum Saxoniæ.*)

The landgrave of Hesse, feeling the necessity of unanimity among the reformers for their common preservation, endeavoured to effect an approximation between the Lutherans and the Zwinglians. After some hesitation on the part of Luther, a conference was agreed on at Marburg between Luther and Melanchthon on one side, and Zwingli and Œcolampadius on the other. Melanchthon has given an account of this conference. Zwingli and his friends were disposed to make concessions to Luther in regard to the questions of original sin, justification by faith, and absolution, on which they differed; but when they came to the eucharist, they could not agree. Luther adhered to the literal sense of the words 'This is my body,' which however he explained, by saying that the real body co-existed with the elements of the bread; and this he called consubstantiation, which was different from the Roman Catholic transubstantiation. Zwingli maintained that the words had a figurative meaning, and that the bread was only the type of Christ's body. Upon this Luther grew warm, and expressed his astonishment at Zwingli's presumption in opposing the interpretation of all the doctors and commentators from the earliest ages of the church. He seems however to have been ignorant of the controversy that had already been raised on the subject in the ninth century by Paschasius Radbert, a Benedictine monk and abbot of Corbie, who published a treatise 'Concerning the Sacrament of the Body and Blood of Christ,' which he presented to Charles the Bald, and in which he positively maintained that which had not been previously decided by any council or general authority, namely, that after the consecration of the bread and wine, nothing remains of those elements except the outward figure, under which the body and blood of Christ, such as when he suffered upon the cross, were really and locally present. Charles commissioned two of the ablest writers of his time, Ratramn, or Bertram, a monk of Corbie, and Joannes Scotus Erigena, to investigate the assertion of Radbert. The work of Scotus is lost, but it appears that he was opposed to the real presence. Ratramn's opinion was qualified: he asserted the real presence, but he denied the identity of the body with that which suffered on the cross, and especially the consequence deduced by Radbert, that Jesus Christ was sacrificed anew every day at the consecration. The treatise of Ratramn is still extant. Hincmar and other theologians engaged in the dispute, some for and others against Radbert; and the question was revived in the eleventh century by Berenger, who denied the bodily presence, professing to follow the opinion not only of Scotus, but of Augustin, Jerome, and Ambrose; until Gregory VII. obliged him to retract before a council, and to subscribe to the identical propositions maintained by Radbert. [BERENGER; CONSUBSTANTIATION.]

Luther and Zwingli separated without coming to an understanding, Zwingli observing that both parties were agreed in the fundamental principles of Christianity, and that in others they might have charity for each other, and might be united under the common denomination of reformers and brethren. Luther offered to part in Christian charity, but not in brotherhood: they shook hands in presence of the landgrave, and agreed to refrain from open controversy.

In the following year, 1530, Charles V. convoked a diet of the empire at Augsburg for the month of April, and directed the Evangelical members of the same to bring with them a written profession of their faith in German and Latin. The most eminent theologians, both Roman Catholic and Reformed, were summoned. Luther alone, in consequence of the former decree of the diet of Worms of 1521, was forbidden to appear in person; but the elector of Saxony directed him to remain at Coburg, in order to be consulted in case of need. The Reformed divines of the various states set about writing a summary of their doctrine; and the task of examining all these papers, and of extracting from them 'a good and explicit confession of faith,' which should be acceptable to all German reformers, was entrusted to Melanchthon. When the Confession was written, John, elector of Saxony, sent it to Luther at Coburg to be revised. Luther approved of it without any exceptions. On the 25th June, 1530, the elector, accompanied by his son John Frederic: by George, margrave of Brandenburg; by Ernest and his brother Francis, dukes of Brunswick and Lüneburg; Philip, landgrave of Hesse; Wolfgang, prince of Anhalt; and the deputies of the town of Nürnberg and some other free cities, came into the Diet, and presented that important document to the emperor, who directed the chancellor to read it aloud to the assembly. Melanchthon had softened some of the points of dispute, in order to conciliate, if possible, the good will of the Roman Catholic party. The Confession of Augsburg was published in 1531, 'Confessio Augustana,' and consisted of twenty-eight articles. The real presence in the sacrament without transubstantiation, justification by faith alone, the number of sacraments, communion of both kinds, and the invocation of the saints, were the chief points comprehended in it. The Roman Catholic theologians undertook to refute the positions of the reformers, who replied by an 'Apology for the Confession,' which was likewise written by Melanchthon. Seeing that there was no hope of an agreement, Charles V. and the Roman Catholic princes issued an edict in November, 1530, which, without denying the abuses and corruption which had crept into the church, promised that the emperor would insist on the pope calling a general council for their correction, and in the mean time enjoined all parties to conform to the regulations of the Roman church, and not to write or preach against any article of the antient faith, or to admit any novelties in doctrine or discipline: it further exhorted them to unite in suppressing the heresies of the Anabaptists and Sacramentarians. The latter had also presented their confession of faith to the Diet on the part of the four cities, Strasburg, Memmingen, Lindau, and Constance, which is generally known by the name of the Confession of Strasburg, or 'Confessio Tetrapolitana.' The German Protestant princes, alarmed by the edict of the emperor, assembled at Smalkald, in December, 1530, with the elector of Saxony at their head, and entered into a league, both religious and political, with the determination of defending their rights and the liberty of conscience, by force if necessary, against all attacks. Thus in the year 1530 the Reformation was finally established in Germany, first by the Confession of Augsburg, which was published as the acknowledged and common creed of a great body of Christians; and secondly by the league of Smalkald, which made that creed the bond of union of a powerful political confederacy.

The landgrave of Hesse invited the Reformed cantons of Switzerland to join the league of Smalkald; but as they refused to sign the Confession of Augsburg, the elector of Saxony declined to admit them into the Protestant league, and thus the Swiss Evangelicals continued distinct from the Lutherans, though they joined in a separate league with the city of Strasburg, and the landgrave of Hesse, who adopted their doctrines. In a great synod held at Bern in 1532 (Zwingli had died the year before), the Helvetic confession of faith was finally proclaimed; being mainly based upon the ten theses or propositions agreed upon at Bern in 1528, and which have been given above. In 1566 a new edition of the Helvetic Confession, signed by all the Reformed states of the Swiss Confederation, was published at Zürich: 'Confessio et Expositio simplex orthodoxæ fidei et dogmatum Catholicorum sinceræ religionis Christianæ, concorditer ab ecclesiæ Christi Ministris qui sunt in Helvetia, Tiguri, Bernæ, Glaronæ, Basiliæ, Scaphusii, Abbati-cellæ, Sangalli, Curiæ Rhætorum, et apud Confederatos Mylhusii, item ac Biennæ; quibus adjunxerunt se Genevensis et Neocomensis ecclesiæ ministri, una cum aliis evangelii Præconibus, in Polonia, Hungaria, et Scotia,' 8vo. Tiguri, 1566, republished in 1651. A French translation was lately published at Lausanne, 'La Confession de Foi Helvetique,' 1834. It is the same as that of the French Protestants, as they are commonly though improperly called: 'La Confession de Foi des Eglises Reformées de France.' Montpellier, 1825. The Helvetic Confession consists of thirty chapters, an abstract of which is given in the 'History of Switzerland,' published by the Society for the Diffusion of Useful Knowledge, Appendix iv. The same work contains a full account of the rise, progress, and final settlement of the Reformation in Switzerland. The Reformed doctrines had early spread to Geneva, through Bonnivard, and afterwards through Farel, a native of Dauphiné, who had come to Geneva about the year 1530. After several years of noisy and turbulent controversy, attended by violence and even bloodshed, the great council forbade the mass, images, &c. in 1534. It was only in 1536 that John Caulvin or Calvin made his appearance at Geneva on his return from Italy, from whence he had escaped through fear of the Inquisition. Farel induced him to settle at Genoa as professor of theology. Both he and Farel went further than the Swiss reformers. They abolished all festivals except Sunday, discarded all church ceremonies, used leavened bread for the sacrament, and maintained the doctrine of predestination in all its sternness. This drew upon them the disapprobation of the Evangelical synod, then assembled at Lausanne for the purpose of regulating the discipline of the Helvetic Church. As Calvin and Farel however would not submit to the decision of the synod, the council of Geneva ordered them to leave the town in 1538. Farel settled at Neuchatel, where he remained till his death. Calvin went to Strasburg, where he established a French Evangelical church; but in 1541 he was invited to return to Geneva, where he became the civil as well as religious leader of the republic. The rest of the career of this remarkable man is given in the article CALVIN. His peculiar tenets concerning religious doctrine and church government, as expounded by him in his 'Institutiones,' are noticed in the article CALVINISM. Calvinism became the creed not only of Geneva but of the French Huguenots, as they were styled, a word said to be derived from Eidgenossen, or Confederates, which was the name assumed by the popular party at Geneva which brought about the Reformation. Calvinism spread also into the Netherlands and parts of Germany, and afterwards into Poland, Hungary, and Transylvania, and it was brought by Knox into Scotland. Calvinism thus became the third great branch or division of the Reformation, Luther and Zwingli being the heads of the other two. The doctrines of predestination and grace are its distinguishing dogmas. The distinction however between the Zwinglians and the Calvinists is not material, and they are now considered as one, having the same confession of faith.

In France, as early as 1530, the doctrines of the Reformation had found their way from Germany and Switzerland. Some of those doctrines had lingered in the south for ages before, especially in the mountains of Dauphiné bordering on the Valdenses. Pierre Robert d'Olivet, Michel Cop, rector of the University of Paris, Beza, and others, adopted and spread them; and Margaret, sister of Francis I., and Renée, daughter of Louis XII., gave them their countenance. But Francis I., who through policy secretly encouraged the Protestant states of Germany against the emperor, persecuted his own subjects who had embraced the new doctrines. The stake and the faggot were employed at the same time in France and in England, by Francis and Henry VIII. against the reformers. In 1535, Francis, attended by his family, the clergy, the magistrates, and other officers of state, was present at the burning by a slow fire of six citizens of Paris, who had been condemned by the parliament as heretics. The execution lasted two hours. This was the forerunner of many scenes of a similar character which disgraced France for more than half a century. In 1545 the villages of Merindol and Cabrieres in Provence were burnt, and the inhabitants of both sexes were massacred on account of heresy, in consequence of an order of the parliament of Provence and of Francis I. The persecutions, the civil and religious wars, the truces and other vicissitudes of the French Calvinists, during the reigns of Francis I., Henri II., Francis II., Charles IX., and Henri III., are part of the history of France. [BARTHELEMY, ST.] De Thou, in his 'Historiæ sui Temporis,' Beza, 'History of the Reformed Churches of France,' and the recently published 'Mémoires et Correspondence de Duplessis Mornay pour servir à l'Histoire de la Reformation et des Guerres civiles et religieuses en France depuis l'an 1571 jusqu' en 1623,' Paris, 1824-34, are the best contemporary authorities for that period. At last Henri VI., by his 'Edit de Nantes,' 1598, acknowledged the Reformed communion as the lawful creed of a part of the French population.

In Germany, during the same period, the course of Protestantism did not run smooth, although there were no stakes lighted nor massacres perpetrated. The Protestant states were too powerful, and Charles V. had too much need of their support against the Turks and his other enemies, to quarrel with them on the score of religion, and push the dispute to extremities. By the treaty of Nürnberg, 1532, the obnoxious decree of Augsburg, of 1530, was revoked so far that the Lutherans were to retain their present power and privileges, but were not to make any further innovations in faith or discipline than were contained in the Confession of Augsburg, nor send missionaries into Roman Catholic states, nor encourage the subjects of Roman Catholic princes to take refuge in their territories, nor to support the Anabaptists or Zwinglians; and that all proceedings in the Imperial chamber on the score of religion should cease.

This pacification of Nürnberg, as it is called, lasted till 1546, the year of Luther's death. That great reformer was busy during this period in consolidating his church by his teaching and writing, and by his influence over the Protestant princes, who consulted him in all matters of religious polity, and in completing his great work, the German translation of the Bible. He also effected, in concert with Bucer, a union with the Sacramentarians of Germany, who came to a compromise on the subject of consubstantiation.

The Swiss however or Zwinglians, refused to sign the articles on which Luther and Bucer had agreed, and they continued separate. Still the union of all Protestant Germany under one banner was a great step, and the accession to the Protestant party of Maurice, duke of Saxony, the elector palatine, and Ulrick, duke of Würtemberg, greatly added to its strength. Their power was shown in the war which followed against the emperor; for although in the first instance (in 1546), through the defection of Maurice of Saxony, whom Charles had won over, the Protestant league was defeated, it afterwards recovered itself. The league took the field again with Maurice at its head in 1552, and obliged Charles to sign the treaty of Passau in August of that year, by which it was agreed that the Protestants should retain their liberties and possessions, until the meeting of a diet, which should establish a perpetual religious peace, and that during the interval there should be no more disputes about religion. In 1555 the promised diet assembled at Augsburg, and framed the articles of a religious peace for Germany, which, after some modifications, were subscribed by both parties. The terms were: that neither emperor nor Roman Catholic prince should attempt to force back Protestants into the bosom of the Roman Catholic church, nor Protestants force Roman Catholics to renounce their faith; that every prince should have the power of establishing, in his own state, which of the two communions he thought proper, and of granting toleration to the other if he pleased; that those subjects who professed a creed different from that established in their state, might retire unmolested with their property, and settle in another state where their faith was professed; that no Roman Catholic bishop should have jurisdiction over those who follow the Confession of Augsburg; that Protestant clergymen should retain possession of their benefices, and Protestant princes the right of administering the property of the church of which they were actually possessed; that if a Roman Catholic ecclesiastic abandoned his faith, he should lose his dignity, and his benefice should be conferred upon another, but that his reputation or civil rights should remain untouched; that the Imperial chamber should do justice to both parties, and the members of it without exception might be Protestant as well as Roman Catholic.

Such were the conditions of the peace of Augsburg, by which the Protestant religion was acknowledged in the German empire, and when we reflect that these conditions were agreed upon about three centuries ago, by Protestants and Roman Catholics, by clergy and laity of both communions, by bishops and princes of the empire, we cannot help being struck with the equity and reasonableness of those who framed it, as honourable alike to German feeling and German judgment. This peace was broken many years after by the war which is known by the name of the Thirty Years' war (1619-48), but the treaty of Westphalia, which terminated the war, confirmed the articles of the religious peace of Passau and Augsburg, and extended its benefits to the Calvinists as well as the Lutherans. The princes, states, and towns of the empire of the three communions were placed on a footing of equality by this treaty. In all matters of religion, and in other disputes between Roman Catholics and Protestants or Calvinists, the diet was to decide not by a majority of suffrages, but by amicable accommodation. In extraordinary commissions appointed by the diet, the commissioners were to be all Protestants, if the matter concerned Protestants only; all Roman Catholics, if it concerned Roman Catholics only; and an equal number of each, if it concerned both religions. Toleration and the exercise of private worship for every individual were also secured.

The consequence of this tolerant arrangement has been that since the peace of Westphalia religious persecution has been unknown in Germany, and German Roman Catholics, accustomed to live in peace and intercourse with their Protestant neighbours and fellow-subjects, exhibit none of that fanatical horror which the ignorant population of Spain and of many parts of Italy still evince at the very name of a heretic.

The doctrines of the Reformation had made many converts in the Netherlands in Luther's lifetime, and a fresh influx of Calvinists from France and Switzerland increased the number of dissidents from the Roman church. The wild outbreak of the Anabaptists at Leyden, Münster, and other places threw discredit for a time on the cause of the Reformation, but these disturbances were soon put down. During the reign of Charles V., the friends of the new doctrines in the Netherlands were persecuted as heretics, and many suffered death by sentence of the regular courts of the country; but after Charles abdicated, at Brussels in 1555, in favour of his son Philip, the latter, in order to extirpate heresy more effectually, sent inquisitors from Spain to establish the tribunal of the Holy Office in the Netherlands. This gave rise to a strong opposition both from the nobles and the people, which, being mixed up with political grievances, led to an open insurrection against Philip. During the long war which followed between the rebels and the Spanish forces, some of the provinces separated from the rest, and the seven northern provinces of Holland, Zealand, Guelderland, Friesland, Utrecht, Overyssel, and Groningen formed a confederacy by the name of the 'Seven United Provinces,' and proclaimed liberty of conscience. The great majority however of the population of the seven provinces followed the doctrines of Calvinism, and have remained attached to them ever since. The confession of faith for the provinces of the Netherlands was published in 1562, and was afterwards approved by the members of the synod of Emden in 1571. The disputes that broke out afterwards between the Arminians and Gomarists are related in the article ARMINIUS. The synod of Dort, in 1618, revised and republished the Netherlandish Confession.

About the year 1556 the Lutheran or Protestant creed was adopted as the state religion in the kingdoms of Denmark and Norway, under king Christian III. Denmark however, as well as Sweden, has retained episcopacy.

The Protestants or Lutherans, as well as the Calvinists, became very numerous in Poland under the reign of Sigismund

Augustus, and many of the high nobility had embraced the Reformed doctrines. An approximation was effected between the Lutherans and Calvinists, and a confession was drawn up, in concert, by the clergy of both communions, at Sandomir, in 1570, called 'Consensus Sandomiriensis.' The followers of the Reformation however never constituted the majority in Poland, and being afterwards persecuted under Sigismund III. and some of his successors, their number was greatly reduced, but they were never annihilated, and Lutheran and Calvinist congregations have continued to exist in most towns of Poland. The most complete account of the Reformation in Poland is in the recent work of Count Krasinski (*Historical Sketch of the Rise, Progress, and Decline of the Reformation in Poland*, London, 1838).

In Hungary and Transylvania both Lutherans and Calvinists have long been established, and they constitute at present about one-fourth of the population of those countries, enjoying equal rights with the members of the Roman Catholic and Greek churches.

The doctrines of the Reformation spread into Italy from Switzerland and Germany at an early period, and found proselytes in several towns, especially Ferrara, where Renée of France, duchess of Este, countenanced them; at Lucca, Faenza, Milan, and Naples. Several learned monks and priests, the Capuchin Ochino of Siena, Vermigli, a canon of Florence, Montalcino, a Franciscan friar, Lorenzo Romano, an Augustine monk, and others, adopted and preached the new tenets. Meetings and private places of worship were established in various towns. Paul III., alarmed at this change, established, in 1543, the Congregation of the Holy Office at Rome, with full powers to proceed against heretics independent of the ordinaries, and he also sent inquisitorial commissioners into the various provinces of Italy for the same purpose. [OFFICE, HOLY.] By these means he effectually checked the course of the Reformation, and his successors Paul IV. and Pius V. completed its extirpation by the most severe measures. Many of the followers of the Reformed doctrines suffered death either by fire or by the sword of the executioner. [PIUS V.] Numerous families emigrated to Switzerland on account of religion, especially from Tuscany and Lombardy. A considerable district of Calabria, near Cosenza, which is said to have been originally peopled by a colony from the valleys of Piedmont, having publicly adopted the tenets of the Reformation, and sent for some Calvinist preachers from Geneva to teach them and their neighbours, the duke of Alcala, Spanish viceroy of Naples, about 1560, sent several inquisitors with a body of armed men, who arrested and put to death many people in the village of San Sisto. Upon this the neighbouring villages broke out into open revolt. The town of La Guardia Lombarda sustained a regular siege. Being taken at last, a general massacre of the inhabitants took place, with circumstances of the greatest atrocity. (Botta, *Storia d'Italia*, b. x.)

At Locarno, an Italian district on the Lago Maggiore, subject to the Swiss Catholic cantons, the Reformation had made numerous proselytes, but in 1555 an order came from the ruling cantons for banishing all the Evangelical families from Locarno. The heads of those families being assembled in the town-hall, the sentence was read to them, and they were preparing to obey it, when a priest entered the hall, and suggested that the wives and children of the heretics should be detained in order that they might be converted. But the Swiss Roman Catholic deputies shuddered at the proposition: 'We will not alter the sentence which has been pronounced,' they replied; and the exiles, accompanied by their wives and children, set off across the Alps, and took refuge chiefly at Zürich, where the families of Orelli, Muralti, and others still retain their name and traditions.

In the district of Valtellina, which was subject to the Grisons, the Reformed doctrines were openly professed by many, and encouraged by their rulers. But the two parties, Roman Catholics and Protestants, having become identified with the political parties in the Grisons, one of which was favourable to an alliance with Austria and Spain, and the other opposed to it, feeling ran high, acts of violence were committed, and the Roman Catholics, being the more numerous in Valtellina, conspired against the Grison government, and in July, 1620, massacred all the Protestants in the valley, their own countrymen as well as Grisons, to the number of several hundreds. The Reformed religion was thus extirpated in the Valtellina also, and all Italy has ever since remained exclusively Roman Catholic, with the exception of the valleys of Pignerol, the inhabitants of which, after many persecutions, have been allowed to retain and profess their antient faith.

In Spain the doctrines of Luther and Calvin spread in the sixteenth century, and made numerous proselytes at Seville and other places; but the arm of the Inquisition effectually eradicated them. M'Crie has written the history of the rise, progress, and extinction of the Reformation both in Spain and in Italy.

For the progress and final settlement of the Reformation in England, we must refer to the history of this country, and the articles BUCER, CRANMER, CROMWELL (THOMAS), EDWARD VI., ELIZABETH of England, GARDINER, HENRY VIII., MARY I. of England, and POLE, REGINALD. For the Reformation of Scotland, see KNOX and MARY STUART.

Independently of the religious question of the truth or falsehood of the doctrinal points on which the Reformed churches dissent from that of Rome, a question upon which it is not our business here to express an opinion, it is unquestionable that the Reformation, as an historical fact, has exercised a most powerful influence upon the moral, political, and intellectual condition of mankind. The invention of printing, the discovery of America, and the Reformation are three events which, following each other in succession, may be said to have effected a complete change in the face of the civilised world. A writer who is by no means partial to Luther and the other reformers individually, thus speaks of the effects of the Reformation:—'Let the Roman Catholics argue as they please about the unity and universality of their religion, the records of the middle ages prove that, in the majority of men, it was a lifeless tissue of ceremonies, which, from their frequency, could not even strike the imagination; which made assuredly little impression on the heart, none whatever on the understanding. Since Luther's time, religion has been an object of the understanding rather than of the eye; of the heart rather than of the memory. The repetition of a prescribed number of prayers, almsgiving, a journey to some shrine, the veneration of a relic, might in former times satisfy for sin; but from the sixteenth century downwards, it has been admitted that, without true compunction, without reformation of life, such things are ineffectual and even puerile. In this respect the Roman Catholics have gained as much as the Protestants; they have learned spirituality; they have forsaken their cold, unmeaning, and useless observances, for a principle—that of divine love—which pervades the heart; for knowledge, which informs the understanding. In the second place, there has been no less improvement in the conduct than in the feelings and reasonings of men. The tenets of the Reformation produced vices enough, but they were vices less odious than those which previously disgraced society. As religion was in danger of being smothered under an accumulated heap of human observances and opinions, so were morals of perishing through the boundless licentiousness of the period. In this respect too the present Roman Catholic has need to bless the memory of Luther and his colleagues in the Reformation. Cast our eyes wherever we may, we find an amazing improvement in the general state of morals. . . . . In the third place, the Reformation has been exceedingly favourable to civil liberty. The same principle of curiosity which taught men to examine the grounds of their faith, urged them, in an equal degree, to weigh the nature and design of civil government. It was soon discovered that despotism was founded on ignorance; that it had no divine right to support it; that, on the contrary, it was repugnant alike to reason and the word of God. If that word inculcated obedience to the highest powers, it also taught that the poorest and lowest subjects had rights inalienable and sacred; that in the eye of heaven the highest and lowest are equal, all Christian brethren coheirs of another and a better kingdom, equally on earth the objects of the Divine solicitude. . . . . In the fourth place, and as a necessary consequence of this augmented knowledge alike of religious and political rights, was the increased stimulus given to individual exertion. Despotism, whether civil or ecclesiastical, is a sad enemy to social enterprise, to individual activity. When man perceives that he has rights which cannot be invaded with impunity, that the profits of his industry are secured to him by recognised law and custom, he will require no spur to labour; and in proportion as he enriches himself, so will

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the state be benefited. . . . . Fifthly, the same moral revolution has led to an amazing increase of knowledge. To understand the Scriptures, which Catholics and Protestants admitted to be the common fountain of faith, the early reformers assiduously studied the original tongues, the Hebrew and the Greek, and the attainment served as a key to other departments of knowledge—to history, laws, geography, and antiquities no less than to theology. Prior to the sixteenth century, these languages were almost entirely neglected; they were even condemned by doctors of the church and by universities. The doctors of Louvain and even of Paris stigmatised the study of the Scriptures in the original tongues—in any other than the Vulgate—as the inevitable path to heresy. But this pitiful hostility soon gave way; the Catholics, no less than the Protestants, applied with success to the study of the Hebrew and Greek Scriptures; manuscripts were discovered and carefully collated, and the Divine text was restored to something like purity. . . . . From these and other considerations, it is evident that on the whole the Reformation has been an incalculable good to Europe; it has purified religion and morals; it has improved the intellect, and has guaranteed civil liberty.' (Dunham, *History of the Germanic Empire*, b. iii., ch. 2.)

Among those authors who have written or commented upon the history of the Reformation, the following deserve notice, besides those mentioned in the course of this article: among the Protestants—Beausobre, *Histoire de la Reformation*; Burnet, *History of the Reformation*; Seckendorf, *Commentarius Historico Apologeticus de Lutheranismo*; Loscherus, *Acta et Documenta Reformationis*; and among the Catholics—Maimbourg, *Histoire du Lutheranisme*; Pallavicini, *Historia Concilii Tridentini*; Bossuet, *Histoire des Variations des Eglises Protestantes*; besides the general historians of the church. The following work, published at Paris about 1823, deserves special mention: *Musée des Protestans célèbres, ou Portraits et Notices Biographiques et Littéraires des Personnages les plus éminens dans l'Histoire de la Reformation, rédigé par une Société de Gens de Lettres, et publié par* G. T. Doin.

REFORMATION, HOUSES OF. [PUNISHMENT; TRANSPORTATION.]

REFRACTION, REFRANGIBILITY. Refraction is the turning of a ray of light, heat, or other imponderable substance from its direction, when it falls obliquely on the surface of a medium differing in density from that through which it had previously moved. The differently coloured rays of light have different degrees of refrangibility, as evidenced by the common prismatic spectrum; in other words, the refractive indices of different lights vary for a given medium. The fundamental law of refraction and the optical effects of this law are discussed under the heads LIGHT and OPTICS, and a table of refractive indices is given in the article OPTICS, PRACTICAL. For the different refrangibilities of the rays, the articles DISPERSION and ACHROMATIC may be consulted, and for one of the most striking phenomena thence arising see RAINBOW. On the subjects of Fraunhofer's lines and of double refraction see DISPERSION and POLARIZATION.

The doctrine of refraction, as distinguished from reflection, is called dioptrics, and the caustics formed by the continued intersections of refracted rays emanating from a luminous point, are termed diacaustics; properly speaking, these are surfaces, but by confining the investigation to the plane of refraction, they are generally treated as curves. A diacaustic curve, like a catacaustic, has the property of being rectifiable. They are noticed in the articles above quoted, but they are rather objects of analytical dexterity than of practical use.

So long as the medium into which the refracted ray enters remains of uniform density, the ray will pursue a straight course, but every alteration of density in the medium gives rise to a corresponding deviation in the path of the ray. Now the air is a medium of which the density continually increases as its altitude above the surface of the earth diminishes; its density is also altered in the same stratum by inequality of temperature, and frequently from the aqueous and other vapours which it holds. Hence arise the ordinary terrestrial refraction and the phenomena of MIRAGE, FATA MORGANA, &c., which are treated under their respective heads.

A ray of light proceeding from a star which is not vertical, on entering the atmosphere is bent towards the radius drawn from the earth's centre to its point of incidence, and upon its successive incidences on the lower strata it continues to bend towards the successive radii, thus describing a curvilinear trajectory through the air. The star is visible in the direction of the tangent to this curve, at the point at which it meets the eye of the spectator; hence the apparent altitude of the stars is increased by refraction, and thus the sun, moon, &c. are visible before the real time of rising and after that of setting.

From the causes above assigned for atmospheric refraction, it follows that the nearer the direction of the ray is to the plane of the horizon, the greater is its refraction, and the refraction is nothing when the ray is vertical. This is the cause of the apparently oval forms of the sun and moon in the horizon; for the sun's angular diameter being taken at 32 minutes, its lower limb is elevated through horizontal refraction more than its upper by 4 minutes 54 seconds.

Atmospheric refraction of the solar rays after sunset, combined with subsequent reflection, is the cause of twilight, and also of the light thrown on the moon's surface when eclipsed by the earth.

The amount of refraction of rays proceeding from a celestial body would be proportional to the tangent of its zenith distance, if the atmosphere were homogeneous: not only however is this not the case, but its state is continually altering, as shown by the barometer, thermometer, and hygrometer. An empiric formula, the result of numerous observations made by Bradley, gives a good correction relative to the first two of these instruments, viz.:—

Let $r = 57'' \times$ tang. zenith dist. (z);
$h =$ height of thermometer (Fahrenheit);
$a =$ altitude of barometer in inches;
$R =$ the required refraction; then shall

$$R = 57''. \frac{a}{29{,}6} \cdot \frac{400}{350 + h} \cdot \tan(z - 3r) \text{ nearly.}$$

Similar formulæ have been the objects of analytical research to Laplace and other modern mathematicians; their results are however not well adapted for insertion in this work.

REFRIGERANTS are remedial agents which directly diminish the force of the circulation, and reduce the heat of the body or a portion of it, without occasioning any diminution of the ordinary sensibility or nervous energy. This definition must not be considered as excluding *cold* from among the number of such agents, because it is capable, when carried to extremes, of rendering the sensibility null, and utterly extinguishing the nervous power; it is only its moderate and therapeutical employment which is here contemplated.

The manner in which refrigerants effect the ends which they accomplish is far from being understood: and a remarkable feature in their character is, that they display their peculiar effects chiefly when the action of the organs is above their natural standard, and more heat than natural is evolved. Till we have a perfect knowledge of the sources and mode of formation of animal heat, we are not likely to possess a correct theory of their mode of operating; and at present, whatever plausibility the mere chemical hypothesis of Dr. Murray exhibits, we cannot consider the evolution of animal heat to be other than a vital process. This function is mainly carried on in the capillaries or extreme vessels, and is much influenced by the amount of supply of nervous energy to these vessels. Hence when a limb is paralysed, it is colder than the opposite sound member: or when a single nerve is injured, the parts supplied by it have a lower temperature than the surrounding ones. Whatever therefore hinders the free communication of the nervous power to a part or to the whole system, will lessen its quantum of animal heat. By applying to the surface of the body any acid the calibre of the capillaries is lessened, and hence the paleness which is observed, owing to less blood entering them. As the blood furnishes the pabulum from which the nerves evolve the heat, the less fuel the vessels contain, the less potent will be the heat resulting. The introduction of any article of the class of refrigerants into the stomach appears to operate by sympathy on the whole vascular system, as may be seen in the case of dilute sulphuric acid checking hæmorrhage. The agents which are usually regarded as refrigerants are weak vegetable acids, or very greatly diluted mineral acids; some saline, neutral, or super salts; and cool air, ice-cold water, and externally evaporating lotions. An indirect refrigerant is found in diminishing the quantity of animal food. [ANTIPHLOGISTICS; BATHING; LOTIONS.]

REFRIGERATION OF THE GLOBE. Since the mathematical researches of Fourier regarding the diffusion and conduction of heat in a mass constituted as the earth appears to be in the parts near the surface, have become in some degree known, geologists have been much encouraged in attempting to connect with a gradual change and diminution of the internal temperature of the globe, such as would be consistent with Fourier's theoretical results, the higher order of geological inferences. The phenomena of a general if not universal base of once melted rocks below all the strata, the peculiar (often called metamorphic) condition of the lowest of these as compared with the upper, the absence or rarity of fossils in the lowest strata, the evidence of even general high surface temperatures on the antient land and in the antient sea as contrasted with the modern distribution of climates, are all consequences supposed to be derivable from the assumption of the earth having once been thoroughly very hot, and being now partially cooled by radiation of heat into the cold planetary and stellar spaces around us. But though such a deduction of phenomena from a primal condition of our planet is or appears to be correct enough to justify geologists in employing the hypothesis as a means of discovering truth, they must be careful neither to disregard inquiries into the certainty of the fundamental assumption, nor to neglect a scrupulous examination of its consequences.

On the first point Professor Whewell communicated to the Geological Section of the British Association at Dublin (1835) some observations which are likely to be influential on the second point, and which can neither be condensed nor amended.

'The heat of the interior parts of the earth has always been treated of by those who have established the theory of heat upon mathematical principles. They have hitherto considered it as proved upon such principles, that the increase of temperature of the substance of the earth as we descend proves the reality of an *original heat*. But M. Poisson, in his 'Theorie de la Chaleur,' just published, dissents from this opinion, and is disposed to assign another reason for the higher temperature below the surface. He observes that the cosmical regions in which the solar system moves have a proper temperature of their own; that this temperature may be different in different parts of the universe; and that, if this be so, the earth would be some time in acquiring the temperature of the part of space in which it has arrived. This temperature will be propagated generally from the surface to the interior parts. And hence, if the solar system moves out of a hotter into a colder region of space, the part of the earth below the surface will exhibit traces of that higher temperature which it had before acquired. And this would by no means imply that the increase of temperature goes on all the way to the centre.' (*Reports of the British Association for* 1835, p. 66.)

A speculation, perhaps in reality involving such views as those of M. Poisson, though founded on examinations and inferences among the Helvetic Alps, has been of late brought prominently before the geological world by M. Agassiz. According to this very distinguished naturalist, there is evidence from the peculiar effects left by glaciers in the valleys of Switzerland and on the surface of the Jura Mountains, that the icy mantle which now wraps the High Alps once filled the valleys for miles beyond its present limits, and rendered it a mere glacier movement across an ice-filled hollow, which carried the blocks of Mont Blanc and the Valorsine across the Lake of Geneva to the Jura. Recently Dr. Buckland and Mr. Lyell have endeavoured by similar evidence and reasoning, by the evidence of scratched, smoothed, and grooved surfaces of rock, and the appearance of moraine heaps both in the Highlands of Scotland, near Edinburgh, and in Cumberland and Westmoreland, to prove that glaciers antiently covered large tracts of the Caledonian and Cumbrian regions. (*Geol. Proceedings*, 1840, November and December.)

Moreover, it is understood to be the opinion of M. Agassiz that the icy covering thus attempted to be demonstrated by its remaining effects in the mountainous parts of Great Britain, 'once extended over all the north of Europe and the north of Asia and America,' and that in this 'mass of ice the elephants and other mammalia found in the frozen mud and gravel of the arctic regions were imbedded at the time of their destruction.' To the quick melting of this immense mass of ice and the currents of water which resulted, the author attributes the transport and deposition of the 'masses of irregularly rounded boulders and gravel which fill the bottom of the valleys, innumerable boulders having at the same time been transported, together with mud and gravel, upon the masses of the glaciers then set afloat.' (See the work of M. Agassiz entitled *Etudes sur les Glaciers de la Suisse*; and the accounts of his observations before the British Association at Glasgow in 1840.)

Now it is obvious that in examining this speculation, two ways are open: first, a careful comparison of the phenomena with the hypothesis which is proposed for their explanation; secondly, an inquiry into the probability of the conditions which might render such a general and extreme refrigeration of the globe as the hypothesis requires *possible*. Confining our remarks to the former process, we may observe: first, that to admit the antient existence of glaciers in some of the Highlands and Cumberland valleys which display *glacial effects*, is one thing; to admit *glacial action* as the physical cause of the dispersion of boulders and gravel, another. Glaciers are found at this day in corresponding latitudes and at corresponding elevations in the southern parts of America; a local effect of causes which may be conceived to have formerly produced an equal effect in the northern zone: but the distribution of the boulders and gravel is so peculiar and yet so various, the dispersion of them so wide in regions where, according to the present configuration of the land, they could not be pushed by glaciers, nor carried by floating ice; and the connection of these circumstances with a great change of organic life, so strict, that it is hardly conceivable such effects could be due to anything but a cause simultaneously general or successively repeated. Of the physical causes by which the explanation of this great phenomenon has been attempted, it will suffice to mention three:—

1. Great and extensive oceanic action consequent on mighty misplacements of the solid land, and corresponding changes of land and sea.

2. Repeated local displacements of land and sea, and consequent litoral action.

To each of these views has been attached a speculation of the auxiliary agency of floating ice.

3. The melting of great circumpolar glaciers, and the drifting of floating ice.

Our object being to call unprejudiced attention to this subject, we shall only append a few short remarks.

1. The researches of Mr. Smith of Jordan Hill, Captain Bayfield, Mr. Lyell, and others, have shown the probability that in much of the gravel which contains sea-shells, in Northern Europe and America, these shells are not indicative of a warmer but a colder climate than the present.

2. The circumstances under which the extinct mammalia occur in the caverns of tropical Brazil are entirely analogous to these which have been noticed in temperate Europe.

3. The simultaneous gathering of ice over all the northern zone could only happen as a consequence of a *general cooling of the surface of the globe*, and the laws of melting ice are such as to render it almost inconceivable that *even by a rapid change* of temperature such prodigious floods *could be occasioned* as the transport of blocks seems to require; moreover, would not such a rapid change of temperature be excluded by the condition of a previous general refrigeration?

4. The proper course to be now pursued by geologists is to refer to other branches of science the determination of the probability or admissibility of the fundamental assumption of this hypothesis (that the earth has undergone *vicissitudes of temperature* and suffered extensive circumpolar refrigeration); and in the spirit of inductive philosophy, which has hitherto guided their researches, to analyse, classify, and map the boulder formation, so as to arrive at correct inferences regarding the direction, nature, and origin of the forces concerned in producing it.

REGA'LIA, the ensigns of royalty. This term is more especially used for the several parts of the apparatus of a coronation. In England, the regalia properly so called are the crown, the sceptre royal, the virge, or rod with the dove, St. Edward's staff, the orb or mound, the sword of mercy, called Curtana, the two swords of spiritual and temporal justice, the ring of alliance with the kingdom, the armillæ or bracelets, the spurs of chivalry, and sundry royal vestments. The regalia here enumerated, all but the vestments, are preserved in the Jewel-Office in the Tower of London. Before the Reformation in the time of Henry

VIII., they were constantly kept by the religious of the abbey of Westminster; and are still presented before the king on the morning of the coronation by the dean and prebendaries of that church.

In 1649 a complete inventory was made out of the regalia in the Tower, a copy of which may be seen in the additional notes to Taylor's *Glory of Regality*, 8vo., Lond., 1820, p. 312; subsequent to which it is stated that the crowns, according to order of parliament, were 'totallie broken and defaced.' On the restoration of kingly government in the person of Charles II., new insignia were made for his coronation, and these, with the necessary alterations to accommodate them to their successive wearers, and to repair the injuries of time, have continued to the present day.

REGALS (*Regale*, It.), a small portable finger-organ, well known during the sixteenth and seventeenth centuries, and probably much earlier, but not now in use: though Snetzler, the celebrated organ-builder, informed the Hon. Daines Barrington, about the year 1770, that it was not then entirely lost in Germany (*Archæologia*, iii. 32); and till sixty years ago, if not later, there still existed an officer in the royal household called 'Tuner of the Regalls.' In Rees's Cyclopædia this instrument is described as having 'pipes of reeds for convenience of carriage,' an error arising from a mistaken application of the organ-builder's term 'reed stops,' or stops in imitation of hautboys and other instruments blown through a reed.

REGEN, THE CIRCLE OF THE, so called from the name of one of its rivers, is a province of the kingdom of Bavaria, composed of parts of the antient duchy of Bavaria, the Upper Palatinate, the principality of Sulzbach, the territory of Ratisbon, and some other parcels of territory. It lies between 48° 37′ and 49° 44′ N. lat., and between 11° 17′ and 12° 50′ E. long. It is bounded on the north by the circle of the Upper Main, on the north-east by Bohemia, on the south-east by the circle of the Lower Danube, on the south by that of the Isar, on the south-west by that of the Upper Danube, and on the west by that of the Rezat. The area, according to Hassel, is 4170 square miles. The Danube passes through the circle from Ingolstadt to Wirth, and divides it into two unequal parts. The southern portion, which is the smaller, is generally level and very fertile; the eastern and northern part is rugged and mountainous, being traversed by elevations which are partly a continuation of the Fichtelgebirge, and partly of the Bohemian Forest. The soil to the north of the Danube is generally poor, and extensive tracts are covered with sand or with bare uninterrupted rock. Accordingly, though agriculture is followed in the whole circle, it is only to the south that it is extremely productive, and that the finest wheat is grown. To the north, towards the Fichtelgebirge and the Bohemian forest, rye, oats, potatoes, flax, hemp, and hops are grown, and here and there tobacco; but the labour of the husbandman is very severe, and the harvest sometimes fails. The vine is not much grown, for the few vineyards on the Danube are of no importance; fruit too is not cultivated to any extent. The great forests constitute the wealth of the northern part, as they enable the inhabitants to keep up numerous iron-works and glass-houses. The breeding of cattle might be carried on more extensively than it is: that of oxen and swine is most attended to. Fish and game abound. The mineral kingdom is very rich, but no mines are worked except those of iron and coal: those of copper, lead, and sulphur are neglected. There are good quarries of freestone and marble. On the whole there is a more active spirit of industry in this circle than in Bavaria in general. Besides the iron and glass manufactories, there are potteries, paper-mills, and in some districts considerable linen manufactures. The breweries are very important, and the beer of this circle is among the best in Germany. The brandy-distilleries are numerous.

The population is 449,600, of whom a very great majority are Roman Catholics.

REGENSBURG. [RATISBON.]

REGENT, REGENCY. These words, like *rex*, contain the same element as *rego*, 'to rule,' *regens*, 'ruling;' and denote the person who exercises the power of a king without being king, and the office of such a person, or the period of time during which he possesses the power. Wherever there has been hereditary sovereignty, or an hereditary kingly office, it has been found necessary sometimes to have recourse to the expedient of appointing a regent. The cases are chiefly those of (1) the crown devolving on a minor too young to execute any of the duties belonging to it; (2) mental incapacity of the person in whom the sovereignty or kingly office is vested; (3) temporary illness, where there is a prospect of the long continuance of the disease, and of incapacity in consequence; (4) absence from the realm. But in the first case the regent has usually been called in England by the name of Protector: the latest instance being the minority of Edward VI., when his uncle the duke of Somerset was the Protector. By the act of parliament recently passed, Prince Albert is appointed regent during the minority of the princess royal in the event of the demise of the queen, but not with the title of protector. His functions are however the same as those of the protectors of former times, allowing for the changes which have taken place in the English constitution in the course of the last three centuries.

In the earlier periods of English history we have several instances of protectors during minorities, and some of regencies during the temporary absence of the king. The occasional absences of George I. and George II. on visits to their continental dominions rendered the appointment of regents a matter of convenience, if not of necessity. Sometimes the power was put, so to speak, in commission, being held by several persons jointly; but queen Caroline sometimes possessed the functions of regent during the absence of George II.

The nature of this part of the English constitution was however so little understood, and the practice was so imperfectly defined, that when George III. was incapacitated for discharging the duties of royalty on the first occasion when his malady became the subject of public notoriety, a question arose, on which the chief constitutional and political authorities of the time were divided in their judgment. The question was this—whether the heir apparent, being of full age, and the king's eldest son, did not become of right regent. The Whig party of the time, led by Mr. Fox, contended that he did. On the other side, it was maintained that it lay with parliament to nominate the person who should be regent. No regent was at that time appointed, the recovery of the king intervening. When the king was a second time incapacitated, all parties agreed in conferring the title, office, and privileges of regent on the Prince of Wales, then heir apparent. But it was done by parliament, who laid certain restrictions upon him during the first year; but in the event (which event did happen) of the continued incapacity of the king, he was to enter into the full possession of all rights and privileges of king, as if the king were dead, using however only the name of regent, not king: so that in reality the constitution of the country remained unaltered.

The time when the Prince of Wales held the office of regent is the period of English history which will be meant hereafter by the expression 'the regency,' just as 'the regency' in reference to French history denotes the time of the minority of Louis the Fifteenth, when the duke of Orleans was regent. It was during the English regency that the power of Napoleon was broken, and peace was restored to Europe.

REGGIO. [MODENA, DUCHY OF.]

REGGIO. [CALABRIA; RHEGIUM.]

REGIMENT, a body of troops, whether infantry or cavalry, forming the second subdivision of an army; the union of two or more regiments or battalions constituting a brigade, and two or more of the latter making up a grand division or corps d'armée. A regiment is commanded by a colonel, a lieutenant-colonel, and a major, whose several ranks are graduated so as to correspond to those of the general officers commanding the army or division; and when a regiment is divided into two or more battalions, each of these has, at least when complete, its own lieutenant-colonel and major. The word denotes, in general, any government, but it is now applied only to a body of men, indefinite in number, who are subject to military regulations, and immediately under the control of a colonel. The precise period when bodies of men were so designated, for the first time, is uncertain, yet no doubt exists that the common application of the term took place in France after the middle of the sixteenth century.

According to Père Daniel, the first formation of corps of troops corresponding in organization to the modern regiments occurred in the reign of Henry II. of France; and that writer states (*Histoire de la Milice Françoise*, tom. ii.

liv. xi.) that, very soon after the battle of St. Quintin (1557), in which the Constable de Montmorenci was defeated and nearly all the French infantry was dispersed, that king issued an ordonnance for the institution of seven legions of foot soldiers, each to consist of 6000 men, who were to be raised, or to do duty, in the frontier provinces of the kingdom. Each of these legions, which was commanded by a colonel, was divided into 15 companies, and to each of the latter were appointed a captain, a lieutenant, and an ensign. [Company.] In this respect the legions differed from those which Francis I. had attempted to raise; for though each of the latter was to have consisted of 6000 men, it was to be commanded by six captains, one of whom only had the title of colonel; and under each captain there were to be two lieutenants and ten centurions. The legions of Henry II. were never completed to the extent prescribed by the ordonnance, and the number of companies in each was, soon after its promulgation, reduced to six.

Though these legions had most of the characteristics of a modern regiment, it appears that they were quite distinct from the bodies of troops which, about the same time, bore this name; and P. Daniel conceives that the regiments were first formed from the companies, or bands, as they were called, of which, from the time of Francis I., or earlier, to that of Henry II., the infantry of France chiefly consisted. Each of these bands was commanded by a captain, who, according to Brantome, was *mestre de camp* over his soldiers; that is, he had no officer above him except the colonel-general of infantry; and the bands were distinguished by the designation of old and new, according to the dates of their formation.

The embodiment of the bands in regiments could not, it is supposed, have been later than 1562, which was in the beginning of the reign of Charles IX.; and Daniel gives, in support of this opinion, the words of the historians Davila and Daubigné, who, in stating the events of the years 1562 and 1563, mention by name the regiments of Picardy and of Brittany; the former writer also, in speaking of the renewal of the civil war in 1567, says that the queen sent in haste for the colonels De Brissac and Strozzi with the *old* regiments. These last are supposed by Daniel to have been the regiments formed of the old bands above mentioned, and to have been so called in contradistinction from others which may have been more recently raised. In proof that regiments then existed independently of the legions, he remarks that, in the registers of the French army for the year 1567, mention is made of an officer who was colonel of the legion of Picardy, and of another who is called colonel of the regiment of Picardy. The regiment of French guards was raised in 1563, by Charles IX., for the defence of his person; and the legions of Guienne and Dauphiné, which had been instituted by Henry II., and disbanded in 1562, were by the same prince restored under the name of regiments, the former in 1567 and the latter in 1568. Charles also organised other regiments, and it is probable that during his reign the denomination became general. The word *terzo*, which according to Sir James Turner (*Pallas Armata*, 1683) was in his time applied by the Spaniards to a regiment, seems to indicate that the numerical strength of the latter was considered as equal to the third part of that of some other body, as a legion.

The time when the name and institution of a regiment were adopted in England cannot be fixed with precision; but Sir James Turner, in the work above quoted, remarks that the word regiment was not then a hundred years old; and if it is meant that the word had been nearly a century in use in this country, it would follow that it was introduced about 1583, or about 20 years after it began to be used in France. In the account of the pay of the officers of the army which was raised by Queen Elizabeth in 1588, when the country was threatened with the Spanish invasion, mention is made of the colonel and lieutenant-colonel of the regiment (Grose, *Military Antiquities*, vol. i., p. 348); and both colonel and regiment occur in Morrison's account of the army in Ireland, in 1598. From the time of that queen's reign the British army has been invariably divided into regiments; and this practice has been followed by all the other nations of Europe.

The army which it was proposed to raise in 1620 for the protection of the Palatinate was to have been formed of 12 regiments of infantry, each consisting of 13 companies, of which the first, or the colonel's company, was to be composed of 200 men, and the others of 150 men; and there were to be 50 troops of horse, each consisting of 100 men. At this time, and perhaps earlier, the word battalion came into general use to denote either the whole or some division of a regiment: Sir Walter Raleigh, in his 'History,' calls the maniples of the Roman troops at the battle of Zama small battalions. Each of the four regiments of infantry which were raised by Charles I. to serve against the Scots consisted of 1850 men: and, in 1659, during the civil wars in this country, the parliamentary forces consisted of nine regiments of horse, each divided into six troops of 80 men, and 14 regiments of foot, 12 of which consisted of 1200 men, and two of 1100 men, all exclusive of officers. Each of the regiments was divided into ten companies; and there were, besides the regiments, five bodies, each containing 500 men, and three others, each containing 300 men: these eight bodies were called companies, and probably they corresponded to the companies or independent bands in the French army before the institution of regiments.

Soon after the Restoration all the regiments were disbanded; two of them however, one of which is designated the lord-general's regiment of foot and the other his life-guard of horse, were immediately (1661) re-engaged in the service of the crown; and in the same year the Scotch corps or band of 1700 men, which in the time of James I. had gone into the service of France, returned to England. (Daniel, tom. i., liv. x.) This body was then denominated the First or the Royal Regiment of Infantry; and it boasts of being the oldest regular corps in Europe.

In 1684, or near the end of the reign of Charles II., that part of the English army which was assembled near London was reviewed on Putney Heath; and a list of the officers commanding the several regiments is given by Grose (vol. ii., Appendix No. x.). The first named are three troops of horse-guards, which apparently were the lord-general's life-guards above mentioned. These were afterwards disbanded, and instead of them there were raised two troops of horse-grenadier guards; and in 1788, when the latter were reduced, the two regiments of life-guards at the head of the present list of the British regiments were raised. The second at the review was the Earl of Oxford's royal regiment of horse-guards, which was divided into eight troops; and these are the royal horse-guards which constitute the third regiment in the present list. The third was Lord Churchill's regiment of dragoons, which was divided into six troops; and which is at present denominated the First or the King's Dragoon-Guards.

The infantry consisted of the following corps, viz.:—Two battalions of the royal regiment of guards, now called the grenadier guards; one battalion of the Coldstream regiment of guards, which regiment still bears that name; one battalion of the Earl of Dumbarton's regiment, or the royal regiment of infantry above mentioned; and one battalion of the Duke of York's, or the admiral's, maritime regiment. This last, which was named in compliment to the king's brother (afterwards James II.), was subsequently disbanded or converted into a regiment of marines. No other regiments were at the review, but there then existed the queen's regiment of foot, since denominated the queen's royal regiment of infantry: the Holland regiment, which was raised in 1665, and was so designated because it had served in that country. This was then considered as the fourth regiment of infantry, after the two regiments of guards, but it was afterwards and is still designated the third, in consequence perhaps of the reduction of the admiral's regiment. The same regiment is also called the *Buffs*, from the colour of the facings on the dresses of the men. In the year 1684 a regiment of infantry was raised in Ireland; and this appears to have been the seventh, but not being considered as in the pay of England till some years afterwards, and other regiments having in the interval been raised, it became the eighteenth on the list. This is now designated the Royal Irish regiment; the epithet royal having been given to it for its gallant behaviour at the siege of Namur in 1695.

The augmentations which have since taken place in the British army consist of one additional regiment of guards (infantry), called the Scots Fusiliers; of fifteen additional regiments of cavalry, making, exclusive of the guards, sixteen regiments; and, of infantry, as many as make ninety-nine regiments, independently of the foot-guards, the royal regiment of artillery, and the royal corps of marines. Three of the regiments of cavalry, including the first above mentioned, are heavy dragoons, five are light dragoons, four are hussars, and the remaining four are lancers. Of the infantry regiments, eight are distinguished as light infantry, four are called fusilier regiments, and one, the 60th, is called the king's rifle corps: there is also a rifle brigade in England, and a rifle regiment (of native troops) in Ceylon; a regiment of fencibles at Malta, and three West India regiments (of coloured troops). To these should be added the Honourable East India Company's regiments, a corps of mounted riflemen at the Cape of Good Hope, and the African colonial corps.

As the legions of Henry II. of France bore the names of the several provinces where they were raised, so most of the regiments composing the line of the British army are distinguished by the names of the counties or districts in which the men were enlisted: thus the third is called the East Kent regiment; the fifth, the Northumberland; the sixth, the royal Warwickshire; and so on. The second of the guards also is called the Coldstream regiment.

For the divisions and evolutions of a regiment see BATTALION.

REGIOMONTA'NUS, or, as he styled himself in some of his works, Joannes Germanus de Regiomonte, is the adopted name of a celebrated German astronomer whose real name was Johann Müller. He was born June 6, 1436, but his biographers are not agreed as to the place of his birth. Some say Königsberg in Prussia (Starovolsci); others Königsberg in Franconia (Montucla); De Murr, in his 'Noticia trium Codicum,' afterwards referred to, says, Unfind near Königsberg, in the duchy of Saxe Hilburghausen; while Doppelmayer and Niceron, followed by Delambre, say Königshofen in Franconia. His adopted name favours the supposition of his birthplace having been Königsberg.

When twelve years old he was sent by his parents to prosecute his studies at Leipzig, but whether he entered the university of that city does not appear. His progress in arithmetic, geometry, and astronomy is said to have been such, that before completing his sixteenth year he could meet with no one sufficiently learned to instruct him in these sciences, which induced him, about 1452-3, to remove to Vienna, where he became the pupil and intimate friend of Purbach, who was at that time professor of astronomy in the university of Vienna. Under Purbach's direction he applied himself zealously to the Greek astronomy, through the medium of such Latin versions of the 'Almagest' as existed; and commenced a series of astronomical observations, including several eclipses and a conjunction of Mars, which last led to the detection of an error of two degrees in the Alphonsine Tables.

Purbach had undertaken a new Latin translation of the 'Almagest,' but dying suddenly, the completion of the work devolved upon Müller. [PURBACH.] Upon Purbach's death (1461), Müller accepted the vacant professorship of astronomy in the university of Vienna, on condition of being permitted to reside for some time in Italy, in order that he might there, in compliance with Bessarion's suggestion, acquire a knowledge of the Greek language.

In 1461-2 he accompanied the Cardinal to Rome, where he began the study of the Greek language, and occupied himself in collecting, collating, and copying Greek MSS., and making astronomical observations, chiefly of eclipses, and where also he made the acquaintance of George of Trebizond, who had anticipated him in a translation of the 'Almagest' from the original, though the work was very imperfectly executed. In 1463, Müller proceeded to Ferrara, where for about a year he continued his philological studies under Blanchini, Theodore Gaza, and Guarino, at the expiration of which time he accepted an invitation from the students of Padua to give in that city a course of instruction explanatory of the astronomical writings of the Arabian philosopher Alfragan. The introductory discourse, entitled 'Oratio in Prælectionem Alfragani Introductoria in Scientias Mathematicas,' &c., delivered by him on this occasion, was prefixed by Melanchthon to his edition of Alfragan, published in 1537. From Padua he proceeded, in 1464, to Venice, to meet Bessarion, with whom he returned to Rome, and shortly afterwards returned to Vienna, where he entered upon the duties of his professorship. While in Italy he composed his work entitled 'De Triangulis Planis et Sphæricis,' first published at Nürnberg, in 1533, fol., 57 years after the author's death, which is now the most interesting of his works. It contained two tables of natural sines, one to a radius 6,000,000, the other to a radius 10,000,000, and by their means all the cases of plain and spherical triangles were solved, without the aid of a similar table of tangents, the utility of which he did not perceive, and the consequence of which oversight was that the solutions, though occasionally very ingenious, are in most cases excessively prolix. The solution of that case of spherical triangles in which, the angles being known, it is thence required to determine the sides, was first given in this work. The trigonometry and the tables of sines appear to have been published separately. The title of the latter, according to Niceron, was 'Compositio Tabularum Sinuum, cum Tabulis Duplicibus Sinuum ejusdem,' Nürnb., 1541, fol. A detailed analysis of the trigonometry is given in the 'Astronomie du Moyen Age,' pp. 292-323 and 347. It affords, says Delambre, a very complete view of what was then known of plane and spherical trigonometry, though the discoveries in this branch of science which belonged exclusively to Müller were not of great importance. While in Italy he likewise detected many errors in Trebizond's version of the 'Almagest,' which he severely criticised. This excited so much animosity, that some have attributed Müller's early death to poison administered to him by one of the sons of Trebizond. (Vossius, *De Scientiis Mathematicis*, p. 184.)

The earliest edition of Purbach and Müller's translation of the 'Almagest' appears to be that of Venice, 1496, fol. It was reprinted at Basle, in 1543, and there are several subsequent editions. The title of the two editions mentioned is 'Joannis de Monte Regio et Georgii Peurbachii Epitome in Cl. Ptolemæi Magnam Compositionem, continens Propositiones et Annotationes quibus totum Almagestum declaratur.' The first six books were the work of Purbach, who makes the length of the sidereal year 365 days, 6 hours, 9 minutes, 12 seconds, which is much nearer the truth than that given by his predecessors. He also states that the obliquity of the ecliptic given by Ptolemy is 23° 51′ 20″, but that, in his own time, he is unable to make it more than 23° 28′, though he does not say whether he considers the obliquity to be decreasing or Ptolemy's result to be erroneous. In all the demonstrations sines are employed to the exclusion of chords. (Delambre.) Upon the whole, this epitome is supposed to have been chiefly extracted from the Latin version which Gerard of Cremona had made of the Arabic commentary of Geber on the 'Almagest.' It appears in effect that both Purbach and Müller rather divined the sense and seized the spirit of Ptolemy than understood the letter of their text. The work was a model of precision, but nevertheless it was an abridgement, and an abridgement of Geber much more than of Ptolemy. (Preface to the French translation of the 'Almagest,' by M. Halma, Paris, 4to., 1813.)

After some years' residence at Vienna, Müller was invited by the king of Hungary (Matthias Corvin) to take up his abode at Buda, where he amused himself with collating the Greek MSS. which had been brought from Athens and Constantinople, and in constructing 'tables of directions,' in which he shows himself no less attached to astrology than to astronomy. The work is entitled 'Tabulæ Directionum Profectionumque, non tam Astrologiæ Iudiciariæ quam Tabulis, instrumentisque innumeris fabricandis utiles ac necessariæ,' &c., Nürnb., 1475, 4to. It contained the first table of tangents published in Europe, extended however only to each degree of the quadrant. But although similar tables had been constructed by the Arabs, and applied by them to trigonometry full 500 years earlier, Müller, as has been stated, was quite ignorant of this their chief use. The work is reviewed in the 'Astr. du Moyen Age,' pp. 288-92. It may here be observed that the term 'tangents' was not introduced till after the time of Müller. Both by him and Purbach, as by the Arabs, they were called 'shadows,' the length of the shadow of every object cast by the sun being in fact the tangent of the sun's zenith distance, the radius being the vertical height of the object. The state of Hungary induced him, in 1471, to remove to Nürnberg, where he formed an intimacy with a wealthy citizen, Bernard Walter, at whose expense several astronomical instruments were constructed and a printing office established. With these instruments a series of observations were made which afforded abundant proof of the inexactitude of the Alphonsine Tables. They were published in 1544, under the title of 'Observationes 30 Annorum à J. Regiomontano et B. Walthero. Scripta de Torqueto, Astrolabio Armillari, Regula magna Ptolemaïca, Baculoque astronomico,' Nürnb., 4to. Müller's observations commence at Rome, 3rd January

1462, and at Nürnberg, 6th March, 1472, and terminate 28th July, 1475. Those of Walter begin 2nd August, 1475, and end 3rd June, 1504. Lacaille made use of these observations in the construction of his solar tables. (*Astr. du Moyen Age*, p. 337.) The appearance of a comet led him to compose a work entitled 'Problemata xvi. de Cometæ longitudine, magnitudine, et loco vero,' first published at Nürnberg in 1531, 4to., wherein he gives a method of determining the parallax of a comet, afterwards employed by Tycho Brahé, but which, observes Delambre, though true in theory, cannot be depended on in practice. (*Astron. du Moyen Age*, pp. 340-4.) Prior to 1475, he published his 'Kalendarium Novum,' for the three years 1475, 1494, and 1513 (the interval being an entire cycle of 19 years), which was probably the first almanac that appeared in Europe, though the idea was taken from a similar work composed by Theon of Alexandria. It gives the length of day at all places situated between the parallels of 36° and 55° N. lat.; and for every three degrees of the sun's longitude. On the appearance of this almanac, the king of Hungary presented Müller with 800 (some say 1200) crowns of gold; and such was the demand for it, that, notwithstanding the price of twelve gold crowns, the whole edition was speedily disposed of in Hungary, Italy, France, and England. Besides the above works of his own composition, he had printed an edition of Purbach's 'Theory of the Planets,' the 'Poems' of Manilius, &c., and was proceeding with others, when Pope Sixtus IV., who contemplated a reformation of the calendar, purchased his services by appointing him archbishop of Ratisbon. He immediately quitted his old patron Walter, and proceeded to Rome, in July, 1475, where he died on the 6th July of the following year, in the 41st year of his age. His body was interred in the Pantheon.

Müller, observes Delambre, was a man of remarkable sagacity, and of an ardent and enterprising disposition. He was without contradiction the most learned astronomer that Europe had then produced; though he was inferior to Albategnius as an observer, and to Aboul Wéfa as a calculator. It is matter of astonishment that having recognised the advantage of employing tangents in some few particular cases, he should not have seen the importance of introducing them into ordinary calculations. He had shown the inaccuracy of the Alphonsine Tables, had contemplated their improvement, and had instituted a systematic course of observations for that purpose; time and leisure were alone wanting to the realization of his views. His journey to Rome and premature death occasioned an injury to astronomy which it required a long interval to repair.

The following list of his works, not already mentioned, is taken from the list given by Delambre, in the 'Biog. Univers.,' compared with that given by Niceron With the exception of the first two, they were all published after his death:—1, 'Disputationes contra Cremonensia in planetarum theoricas deliramenta,' Nürnb., 1474, fol. 2, 'Tabula magna primi mobilis,' Nürnb., 1475. 3, 'Almanach, ab anno 1489 ad annum 1506.' 4, 'In Ephemerides Commentarium,' Venice, 1513, 4to. 5, 'Tabulæ Eclipsium Purbachii. Tabulæ primi mobilis à Monteregio,' Venice, 1515, fol. 6, 'Epistola de compositione et usu cujusdam meteoroscopii armillaris,' Ingolstadt, 1533, fol. (appended to an edition of Apian's 'Introduction to Geography'). 7, 'Problemata 29 Saphææ nobillissimi instrumenti à I. de Monteregio,' Nürnb., 1534. (The Saphee bore some resemblance to the Analemma.) 8, Mahometis Albategnii de Scientia Stellarum Liber, Latinè ex Arabico per Platonem Tiburtinum versus, et additionibus aliquot Joannis Regiomontani illustratus,' Nürnb., 1537, 4to. (Niceron). 9, 'De Ponderibus et aquæductibus, cum figurantibus Instrumentorum ad eas res necessariorum,' Marpurgi, 1537, 4to. 10, 'Tabulæ Revolutionum,' 4to. n. d. 11, 'De Influentiis Stellarum,' Argentorati, 1538. 12, 'Problemata Astronomica ad Almagestum spectantia,' Nürnb. 1541 (Niceron). 13, 'Fundamenta operationum quæ fiunt per tabulam generalem,' Idem., 1557, fol.

Three MSS., in Müller's handwriting, came into De Murr's possession. One consisted of notes on the Latin version of Ptolemy's Geography. The second was his defense of Theon against Trebizond. The third was entitled 'De Triangulis omnimodis Liber V. Extracts from these were published by De Murr, under the title of 'Noticia trium codicum autographorum Johannis Regiomontani,' Nürnb., 1801, 4to. Müller's Letters were also published by De Murr in 1786, in his 'Memorabilia Bibliothecarum publicarum Norimbergensium et Universitatis Altdorfianæ,' tome i, pp. 74-205 See also 'Astron. du Moyen Age,' pp. 344-65. Weidler, in his 'Historia Astronomiæ,' pp. 310-313, gives a list of the works which issued from Müller's press at Nürnberg, and also of those which he contemplated publishing.

(Montucla, *Histoire des Mathématiques*, and the works above quoted. The reader may further consult the *Life of Müller* by Gassendi, appended to his *Life of Tycho Brahé*, Paris 1654, 4to.; Fabricius, *Bibliotheca Latina Mediæ et Infimæ Latinitatis*, tom. iv., p. 353; *Pauli Jovii Elogia*, No. 144.)

REGISTER, REGISTRATION, REGISTRY. In feudal times, the owner of land, or at least the person immediately entitled to the profits arising from it, was usually the occupier, and his right was notorious among his neighbours; for in their presence possession or *seisin* of the land was delivered to him upon the spot by the lord; they signed the instrument, which was evidence of the grant, and they formed part of the lord's court, in which the grant was usually recorded. [CONVEYANCING.]

But this simple method of conveyance was in the course of time found insufficient for the more complicated circumstances of society. Land by improved cultivation became more productive, and the profits arising from it were devoted to more extensive purposes than when a large proportion of every great estate was waste. Leases of land then became more common, and as the lessee was of course in actual possession of the premises, possession ceased to be sufficient evidence of absolute property in land. Purchasers therefore now require not only proof of possession and production of the instrument by virtue of which the apparent proprietor holds the land, but also an investigation of the *title-deeds*, or documents which form the history of the land; lest any one should hereafter be produced which should be destructive of the claim of the supposed owner, and therefore of the title of those who derive their rights from him. Thus the evidence of a right to land, or to the profits arising from land, consists partly of possession, partly of the facts disclosed by the written documents or *title-deeds* relating to it, and hence partly again of the possession of the title-deeds themselves.

But there are many interests in land which exist without either of these protections. For instance, A, who is supposed by all his neighbours to be the owner of an estate which he derives from his ancestors, and has occupied since his father's death, mortgages the land to B for a sum far less than its value: he delivers the title-deeds to B, but (as is usual) retains the possession and entire enjoyment of the land by paying regularly the interest on the mortgage, and being supposed well able to pay the principal money when demanded. A then mortgages the estate a second time to C, to whom he gives notice of the prior incumbrance to B, and thus accounts for the absence of the title-deeds, which C investigates in B's hands. Here we observe that C has an interest in the land, without the security which either possession or the holding of the title-deeds gives A has the one, B the other. We will suppose the two sums for which the estate is mortgaged to be nearly equal to its value. A borrows a further sum upon it from D, whom he informs of B's mortgage, but not of C's; and in case of dispute the Court of Chancery has to decide between the mortgagees. This would be an easy task if the rule of equity were undeviating, that priority of time gives superior right (qui prior est tempore potior est jure); but the rule that where equities are equal, law shall prevail, destroys the simpler maxim. The two last mortgagees, C and D, have, we may suppose, only an equitable interest in the land, A having granted it at the time of the first mortgage to a trustee for many hundred years, in order that the stipulations of the mortgage-deed shall be fulfilled. [MORTGAGE.] This is called creating a term of years, and it has the effect of protecting the estate from any acts done subsequently to the creation of the term, and inconsistent with the objects for which it exists. Those terms which have not merged or otherwise ceased are called *outstanding terms*. Now if, in the case supposed D pays off B, and takes an assignment of his mortgage and of the outstanding term; if, to use the technical phrase, he 'tacks' B's security to his own, he unites in himself equal equity with C, and also the legal right which the term gives him; and then he takes precedence of C, who loses the sum which he had advanced, unless indeed he too can find and obtain the assignment of an outstanding term created by one of A's ancestors antecedently to B's. But the case may be more complicated, and the means of fraud still further extended. A dies; and then comes to light a settlement made by his father, to which A was himself a party, which shows that A was entitled to the estate only during his life, that the course in which it should go after his death had been clearly defined, and that it had been conveyed, by his father and himself, to trustees for this purpose. This discovery destroys the estates of B, C, and D alike. These cases, or cases partaking of the character of these, whether the result of ignorance, or accident, or fraud, are frequent sources of litigation: they arise from the facility afforded for the concealment of deeds by the present system of conveying land: and besides the direct injury which they do to the individuals involved in them, they produce a feeling of insecurity concerning the titles to land, which, joined to the difficulty, often the impossibility, of proving titles, especially by descent, renders the alienation of land or the raising of money upon it difficult and costly. Again the advantage derived from obtaining an assignment of outstanding terms causes a conveyancer to investigate the various transfers and transmissions of them with as much care as the title to the fee; and as it may be safest to obtain the assignment of as many outstanding terms as can be procured, and especially of the most antient, there are a variety of claims to an interest in an estate, all to be proved by the seller, and investigated by the purchaser. The deed too assigning the term is usually distinct from the conveyance of the fee, and is often of great length. Hence vast additional expense is incurred in the sale and mortgaging of land.

But supposing it to be certain that no concealed charge affects land, it may happen that the undoubted owner of it may be unable to prove his right from want of the title-deeds. N possesses an estate, which may be a small part of a much larger estate, of which the owner, M, retains the title-deeds, giving to N authenticated or *attested copies* of them, and a covenant that he, M, when required, will produce the originals. But M sells the estate, and the title-deeds pass into hands not bound by the *covenant to produce;* or he dies, and his representatives are unknown; or again, N himself sells his portion of the estate, and he cannot transfer the benefit of his covenant [Covenant]; or, by a multitude of accidents, the deeds or some of them are lost. In these cases the estate is unmarketable. Indeed instances have been known where the mere expense of giving attested copies of deeds, which a person who had contracted to sell an estate was bound to furnish, has exceeded the value of the estate.

The Real Property Commissioners have expressed their opinion that a large proportion of all the land in the country is unmarketable, either from the fear of latent incumbrances, or from the inability of the owner to produce his title deeds. Prior incumbrances are indeed somewhat assisted by the doctrine of courts of equity, that if a subsequent purchaser or mortgagee has notice of the previous charge before his own transaction with the estate, he shall not by any device obtain priority over that charge. But notice does not necessarily imply knowledge. [Notice.] Notice may be an actual direct intimation of a fact given to the party or his agents, which is called *actual notice;* or it may be only something leading a discreet person to an investigation, which would enable him to discover the fact: thus the existence of a suit (lis pendens) touching the land affects the purchaser or mortgagee with notice. This latter class of notice is called *constructive:* it is so vague as to be easy of proof, and difficult to avoid; and one consequence of the admission of it in a court of equity is, that solicitors often think it their duty to avoid investigations which might lead to constructive notice, and so endanger the priority of their client's security.

These remarks may assist the unprofessional reader in understanding the use of a general register of deeds, a subject which the Real Property Commissioners declare to exceed in importance all others submitted to their inquiry. To this subject they have devoted their Second Report, and they unanimously recommend the establishment of a General Public Register for England and Wales of all deeds or instruments affecting land, in order to secure titles against the loss or destruction, or the fraudulent suppression or accidental non-production of instruments; to simplify titles by rendering in most cases needless the assignment of outstanding terms; to protect them from the consequences of constructive notice; and to render conveyances shorter and more simple.

To a certain extent such registers have been already established in England. By the 27 Henry VIII., c. 16, it is enacted that all bargains and sales of land shall be inrolled. [Bargain and Sale.] The 2 & 3 Anne, c. 4 (amended by 5 Anne, c. 18) directs that a memorial of all deeds, conveyances, and wills concerning any lands in the West Riding of Yorkshire may, at the election of the parties, be registered; and that any conveyance or will affecting the same lands shall be deemed void against a subsequent conveyance unless a memorial shall be registered. The 6 Anne, c. 35, recites that 'lands in the East Riding of York, and in the town and county of the town of Kingston-upon-Hull, are generally freehold, which may be so secretly transferred or conveyed from one person to another, that such as are ill disposed have it in their power to commit frauds, and frequently do so, by means whereof several persons (who, through many years' industry in their trades and employments, and by great frugality, have been enabled to purchase lands, or to lend moneys on land security) have been undone in their purchases and mortgages by prior and secret conveyances and fraudulent incumbrances; and not only themselves, but their whole families thereby utterly ruined:' and then the act establishes a register of the memorials of deeds and wills in the East Riding of Yorkshire. The 7 Anne, c. 20, establishes such a register for Middlesex; and the 8 George II., c. 6, establishes one for the North Riding of Yorkshire, and provides that deeds, wills, and judgments affecting land may be registered at length, instead of the registration of mere memorials of them. In the Bedford Level too there is a registration of all deeds affecting land there. These registers, owing to the insufficiency of their indexes, and to some other defects, do not answer all the purposes which might be expected from them, and in many respects their arrangements are cumbrous and expensive: nevertheless (as the Commissioners remark) no one has proposed to abolish them. A registration of wills has long been established in the ecclesiastical courts [Prerogative Court], not certainly upon a good plan, since it is not always possible to say beforehand in what court a will has been proved, but nevertheless with great advantage. The recent act for Abolishing Fines and Recoveries (3 & 4 Wm. IV., c. 74) substitutes for them a deed which is inrolled in the Court of Chancery. In Ireland, in the Colonies, in most of the United States, in Sweden, France, and Italy, and in many of the German States, registers are established. Nor is it found that the disclosures which a register makes of the state of landholders' property produce inconvenience, even supposing such disclosures inseparable (which they are not) from all systems of registration. It is obviously for the public benefit that the apparent extent of a person's landed property should not induce men to give him a credit to which the actual amount of that property does not entitle him.

As the plan of register proposed by the commissioners has not yet been adopted, it will be only necessary briefly to indicate its main provisions. They propose to register every document transferring any estate in land or charge upon it, excepting such as relate to copyholds, and leases for not more than twenty-one years, accompanied by possession. Thus contracts concerning land (with certain limitations), liens upon it, judgments, crown debts, decrees in equity, pending suits and appeals, should all form matters of registration. They recommend that all deeds should be registered at length; indeed that the original deeds should be deposited at the Registry, and that (unless in special circumstances) office-copies of them shall be admitted as evidence. They propose that the register should not be classified according to the names of individuals, but that to the registered deed relating to an estate a symbol shall be attached indicative of that estate, under which symbol all subsequent documents affecting it will be entered. The system admits of opening a fresh series of entries, or, in other words, commencing a new title for any portion of the estate which may be separately conveyed, references being made from each to the other. And thus again many separate estates might be united under one symbol. Indexes should be prepared both of the symbols and of persons: and to facilitate reference, England and Wales should be divided into districts, usually corresponding in limits with the counties. Separate indexes should be made to wills, judgments, &c.

It is the opinion of the commissioners that if a register is established, it ought to be taken as sufficient notice of the documents registered; and that on the other hand default of registration ought not to be remedied by any proof even of actual notice. With this view they recommend that persons should have liberty to register contracts, to enter caveats during the interval between the execution of the deed and its registration, and inhibitions which shall prevent owners of estates who enter them from dealing with the estate pending such inhibition.

The act 1 and 2 Victoria, c. 110 (abolishing arrest on mesne process, except in certain cases) provides (§ 19) that no judgment of the superior courts or decree of the courts of equity shall affect lands unless a memorandum of such judgment, &c. shall be registered with the senior master of the Court of Common Pleas, who shall enter it under the name of the person whose estate is to be affected by it. The 2 and 3 Vic., c. 11, enacts that these registered judgments shall not be valid for a longer space than five years, but it provides that the entry of them may be renewed; it also enacts that no pending suit (lis pendens) shall affect the purchaser or mortgagee with notice, unless a similar memorandum is registered by the same officer, under the head of the person whose estate is affected by it, and the entry must be renewed every five years; and thirdly the act requires crown debtors to be registered in the same office, and provides means for obtaining and recording their discharge from their liabilities to the crown; but the act does not require the renewal every five years of the entry in this case.

(*Second Report of Real Property Commissioners; and the Works therein cited*; Tyrrell's *Suggestions for the Laws of Real Property*.)

REGISTER ACT. [SHIPPING.]

RE'GIUS MORBUS, as used by the classical Latin authors, must not be confounded with the *King's Evil*, or *Regius Morbus*, of the writers of the middle ages. In the former it means jaundice (Horat., *Art. Poet.*, 453), called also ἴκτερος, 'morbus arquatus,' and 'aurugo' (or 'aurigo'); in the latter it means scrofula. [SCROFULA.] The derivation of the term as applied to jaundice is both uncertain and unsatisfactory. According to Serenus Samonicus (*De Medic.*, cap. 58, v. 1033)—

> '*Regius est vero signatus nomine morbus,*
> Molliter hic quoniam celsa curatur in aula.

Varro (apud Plin., *Hist. Nat.*, lib. xxii., cap. 53, ed. Tauchn.), '*Regium* cognominatum morbum arquatum tradit. quoniam mulso curatur;' 'Scilicet,' (says Doering ad Horat., *loc. cit.*), '*mulsum* (vinum mello conditum) pertinet ad delicias, quas reges imprimis et beatiores appetunt et facile sibi comparare possunt.' The same derivation is given by Celsus (*De Medic.*, lib. iii., cap. 24), who says the cure is to be attempted by various kinds of exercises: 'Lecto etiam et conclavi cultiore, lusu, joco, ludis, lascivia, per quæ mens exhilaretur, ob quæ *regius* morbus dictus videtur.' Blancardus (*Blanckaert*, or *Blankaard*) in his 'Lexicon Medicum,' is rather inclined, 'ab *auro*, metallorum *rege*, denominationem statuere, sicut et *Aurigo*, ab *auri* colore.' Dr. Good (*Study of Medicine*) says, 'the meaning of *Regius*, as expounded by Celsus, will, I apprehend, content very few;' he then remarks that this and the two other Latin names of the disease (*Arquatus Morbus*, and *Aurugo*) 'are not indeed univocals, but very clearly equivalents, and equally import *gold*, *golden crown*, *golden bow*, or *circumfusion*; the colour of the disease, and its encompassing the body.' Each of these derivations appears somewhat far-fetched and unsatisfactory, and the term is probably one of those of which no plausible explanation can be given.

REGRATING. A regrator is defined (6 Ed. VI., c. 14) to be one who buys in a fair or market the various articles specified by the act; which are principally articles of provision, and sells them again in the same, or in any other fair or market within four miles. That statute and others providing certain penalties for such acts have all been repealed by 12 Geo. III., c. 7. Whether or not regrating is an offence at common law is doubtful; and at all events to make it so the act must be done with intent to raise the price of provisions. (Burn's *Justice*, tit. 'Forestalling.')

REGULAR CLERGY. [CLERGY.]

REGULAR FIGURES, POLYGONS, SOLIDS, POLYHEDRONS. We have here to add to what is said in POLYGON AND POLYHEDRON all that concerns the regular figures or solids, not as to their general properties, but as to the proportions of their parts and the mode of describing them. We shall take first the plane figures, and then the solids.

A regular polygon, meaning one of which all the sides are equal and all the angles are equal, may have any number of sides from three upwards. The Greek terms trigon, tetragon, pentagon, hexagon, heptagon, octagon, nonagon, decagon, undecagon, dodecagon, are in use (except the two first) to express polygons of three, four, &c., up to twelve sides. The term quindecagon is in use to express the polygon of fifteen sides.

Let the polygon be described, having n sides: let its side be a, its area V, and let r and R be the radii of the inscribed and circumscribed circles. The formulæ which connect these quantities are then as follows:—Let ν stand for the nth part of 180°, then

$$a=2\,\mathrm{R}\sin\nu=2r\tan\nu,$$

$$\mathrm{V}=\frac{na^2\cot\nu}{4}$$

which are enough to determine the remaining three of V, a, R, r, when one of them is given. To facilitate the determination and construction of any regular polygon not having more than twelve sides, we take the following table from James Dodson's 'Calculator' (1747), which is correct to every figure as far as we have thought it necessary to examine it. The author generally corrected errata with his own pen in every copy, and the one before us has his corrections:—

When the Length of Side = 1.

No. of Sides.	Radius of Circumscribed.	Radius of Inscribed.	Area.
3	0·5773503	0·2886751	0·4330127
4	0·7071068	0·5000000	1·0000000
5	0·8506508	0·6881910	1·7204774
6	1·0000000	0·8660254	2·5980762
7	1·1523825	1·0382617	3·6339124
8	1·3065630	1·2071068	4·8284271
9	1·4619022	1·3737387	6·1818242
10	1·6180340	1·5388418	7·6942088
11	1·7747329	1·7028437	9·3656404
12	1·9318516	1·8660254	11·1961524

When Radius of Circumscribed Circle = 1.

No. of Sides.	Length of Side.	Radius of Inscribed.	Area.
3	1·7320508	0·5000000	1·2990381
4	1·4142136	0·7071068	2·0000000
5	1·1755705	0·8090170	2·3776412
6	1·0000000	0·8660254	2·5980762
7	0·8677674	0·9009689	2·7364102
8	0·7653668	0·9238795	2·8284271
9	0·6840403	0·9396926	2·8925437
10	0·6180340	0·9510565	2·9389263
11	0·5634651	0·9594931	2·9735250
12	0·5176381	0·9659259	3·0000000

When Radius of Inscribed Circle = 1.

No. of Sides.	Length of Side.	Radius of Circumscribed.	Area.
3	3·4641016	2·0000000	5·1961524
4	2·0000000	1·4142136	4·0000000
5	1·4530851	1·2360680	3·6327128
6	1·1547005	1·1547005	3·4641016
7	0·9631491	1·1099160	3·3710222
8	0·8284271	1·0823919	3·3137084
9	0·7279405	1·0641776	3·2757315
10	0·6498394	1·0514622	3·2491970
11	0·5872521	1·0422172	3·2298913
12	0·5358984	1·0352760	3·2153904

When Area = 1

No. of Sides.	Length of Side.	Radius of Circumscribed.	Radius of Inscribed.
3	1·5196716	0·8773827	0·4386912
4	1·0000000	0·7071068	0·5000000
5	0·7623870	0·6485251	0·5246678
6	0·6204033	0·6204033	0·5372849
7	0·5245813	0·6045183	0·5446520
8	0·4550899	0·5946034	0·5493420
9	0·4201996	0·5879764	0·5525172
10	0·3605106	0·5833184	0·5547687
11	0·3267617	0·5799148	0·5564242
12	0·2988585	0·5773503	0·5576775

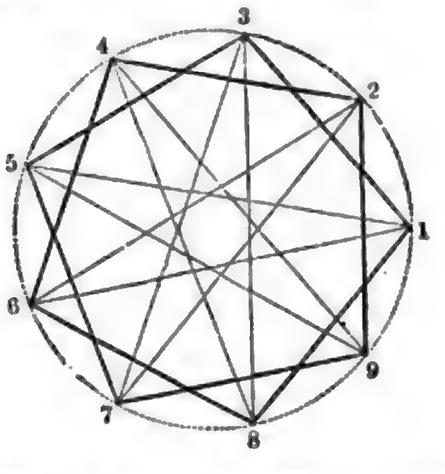
By means of these tables the construction of any figure is immediately reduced to a short calculation, the drawing of a circle, and setting off equal chords on that circle, the compasses and a scale of equal parts being all the instrumental aid necessary. It is required to construct, for example, a regular heptagon, or figure of seven sides, with an area of 225 times the square on one of the larger divisions of the scale. The side and radii must therefore be increased in the fourth table in the proportion of $\sqrt{225}$ to $\sqrt{1}$, or of 15 to 1. And

$\cdot5245813\times15=7\cdot8687$ side.
$\cdot6045183\times15=9\cdot0678$ rad. circum.
$\cdot5446520\times15=8\cdot1698$ rad. inscr.

If the two circles be carefully drawn from the same centre, and chords equal to the side taken off, the compasses will be found to be carried exactly seven times upon the larger circle, and the chords, being drawn, will be found to touch the inner circle. and any little error of construction will be better shown by failure of touching the inner circle correctly than by any other means.

The above presumes that it is desired to proceed as accurately as possible; but for rough work, and when the circumscribed circle is known, the proportional compasses, or even a common pair of compasses and trial, will succeed perfectly well. The proportional compasses have a scale for the adjustment of the pivot in such manner that when the opening at one end is the radius of a circle, that at the other end shall be the side of the inscribed polygon of a given number of sides.

The regular polygons hitherto treated have been those of Euclid, without any re-entering angles. The star-shaped polygons (which, though equilateral and equiangular, do not come within Euclid's definition) are described by drawing a regular polygon of the same number of sides, and drawing successive diagonals so as to cut off a number of sides which is prime to the number of sides of the polygon.



Thus if 12, 23, 34, &c. be the sides of a regular nonagon, or nine-sided polygon, it follows that there are two regular star-shaped nonagons, one made by diagonals which cut off 2 or 7 sides, and one made by diagonals cutting off 4 or 5 sides. Diagonals cutting off three sides would give three equilateral triangles, but no nonagon at all. These nonagons are 1357924681, and 1594837261. Star-shaped dodecagons are also only one in number, since 5 and 7 are (except 1 and 11, which would only give the dodecagon of Euclid) the only numbers less than 12 which are prime to 12. But a regular polygon of 13 sides has 5 star-shaped polygons, made by diagonals cutting off 2 and 11, or 3 and 10, or 4 and 9, or 5 and 8, or 6 and 7 sides.

We now come to the subject of regular polyhedrons, presuming the reader to know the contents of the article Polygon and Polyhedron. A great many properties of these solids have been investigated, but as they are of little use, it will be unnecessary to do more than show the relations of their parts, the radii of the inscribed and circumscribed spheres, and the solidities and surfaces: with tables for constructing them of given dimensions. Let a solid be contained by f faces, each of which is a regular polygon of n sides. Let c be the number of corners or solid angles, e the number of edges, and m the number of angles which meet at a corner. Then since there are c corners with m angles at each, the number of edges, counting each edge as often as it meets a corner, is mc; or, as each edge meets a corner twice, $\frac{1}{2}mc=e$, the number of distinct edges. Again, since there are f faces, of n sides each, and every edge is the union of two faces, we have $\frac{1}{2}nf=e$. But $f+c=e+2$, or

$$\frac{2e}{n}+\frac{2e}{m}=e+2,\text{ or }e=\frac{2mn}{2m+2n-mn}$$

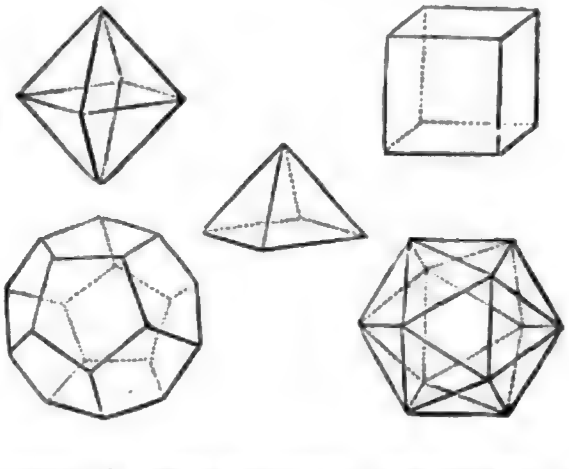
which must be a whole number. And neither m nor n can be less than 3, nor greater than 5, for there are no figures of fewer sides than 3, and [Polygon and Polyhedron] spaces cannot be inclosed entirely by figures of more than five sides. The rest follows from the properties of conjugate solids in the same article.

Let $n=3$, or $e=6m\div(6-m)$. This is a whole number (1) when $m=2$; this must be rejected: (2) when $m=3$, giving $n=3$, $m=3$, $e=6$, $f=4$, $c=4$, or four triangles; we have here the regular tetrahedron, or triangular pyramid: (3) when $m=4$, giving $n=3$, $m=4$, $e=12$, $f=8$, $c=6$, or eight triangles; we have here the regular octohedron: (4) when $m=5$, giving $n=3$, $m=5$, $e=30$, $f=20$, $c=12$, or 20 triangles; we have here the regular icosahedron.

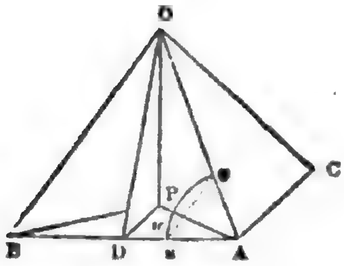
Let $n=4$, or $e=8m\div(8-2m)$. This is a whole number (1) when $m=2$; which reject: (2) when $m=3$, giving $n=4$, $m=3$, $e=12$, $f=6$, $c=8$, or six squares; we have here the regular hexahedron, or cube, the only one of its kind.

Let $n=5$, or $e=10m\div(10-3m)$. This is a whole number (1) when $m=2$; which reject: (2) when $m=3$, giving $n=5$, $m=3$, $e=30$, $f=12$, $c=20$, or 12 pentagons; we have here the regular dodecahedron, the only one of its kind.

We have thus the five regular solids, and have shown that there can be no others.



The centre of a regular polyhedron is obviously the point of intersection of lines drawn from the corners, each inclined at the same angle to all the edges which meet it. The radius of the circumscribed sphere (R) is the line drawn from any corner to the centre; that of the inscribed sphere (r) is the perpendicular let fall from the centre upon any of the faces. Let O be the centre, A any corner, AB and AC adjacent sides of one of the faces passing through A, and let OP be the perpendicular. Let a be the side of the polygon, $2x$ the angle BOA subtended by any edge BA, and y the angle made with OP by the line OD bisecting BOA



$$\text{Let } \frac{180^\circ}{n}=\nu,\ \frac{180^\circ}{m}=\mu.$$

$$\text{Now DPA}=\frac{1}{2}\,\frac{360^\circ}{n}=\nu.$$

The angle of the planes DAO, OAP, is half of an angle m of which meeting at A make four right angles, it is therefore $360^\circ\div 2m$, or μ. And drawing the right angled spherical triangle which represents the solid angle AD, AP, AO, we see that its angle at v is μ, the side wu is $90^\circ-\nu$, and the hypothenuse vu is $90^\circ-x$. Hence

$$\sin(90^\circ-\nu)=\sin(90^\circ-x)\ ;\ \sin\mu \text{ or } \cos x=\frac{\cos\nu}{\sin\mu}.$$

But the angle at u is $90^\circ-y$, whence

$$\cos\mu=\cos(90^\circ-\nu)\sin(90^\circ-y);\text{ or } \cos y=\frac{\cos\mu}{\sin\nu}.$$

The determination of x and y, angles depending only on the number of sides of the polygon and the number of angles which meet at each corner, settles every question. We have

$$a=2\text{R}\sin x \quad \ldots\ldots\ (1)$$

$$r=\text{OD}\cos y=\text{R}\cos x\cos y=\text{R}\cot\nu\cot\mu\ \ldots\ (2).$$

The superficies (S) of the solid is f times the superficies of one face, or

$$\text{S}=f.\frac{na^2\cot\nu}{4}=nf\text{R}^2\sin^2 x.\cot\nu\ \ldots\ (3).$$

The solidity or volume (V) is the superficies multiplied by the third part of r, or

$$\text{V}=\tfrac{1}{3}\,nf\text{R}^3\sin^2 x.\cot^2\nu.\cot\mu \quad \ldots\ldots\ (4).$$

The angle of two faces with a common edge is $180^\circ-2y$. We also see that in conjugate solids [POLYGON AND POLYHEDRON] the angles x and y are inverted, the value of x in one being that of y in the other, and *vice versâ*.

The following are the values of μ and ν in the several solids:—

Tetrahedron $\mu=60^\circ$, $\nu=60^\circ$ $\cos\mu=\cos\nu=\frac{1}{2}$.
Hexahedron $\mu=60^\circ$, $\nu=45^\circ$ $\cos\nu=\frac{1}{2}\sqrt{2}$.
Octohedron $\mu=45^\circ$, $\nu=60^\circ$.

Dodecahedron $\mu=60^\circ$, $\nu=36^\circ$ $\sin\nu=\frac{1}{2\sqrt{2}}\sqrt{(5-\sqrt{5})}$.

Icosahedron $\mu=36^\circ$, $\nu=60^\circ$.

These formulæ will enable any one to verify the various expressions with which old books of geometry abound. The following table answers to that for polygons, and is taken from the same source:—

When the Side = 1.

Solid.	Radius circumscribed.	Radius inscribed.	Superficies.	Volume.
Tetrahedron .	0·6123724	0·2041241	1·7320508	0·1178511
Hexahedron .	0·8660254	0·5000000	6·0000000	1·0000000
Octohedron .	0·7071068	0·4082483	3·4641016	0·4714045
Dodecahedron	1·4012585	1·1135164	20·6457280	7·6631188
Icosahedron .	0·9510565	0·7557613	8·6602540	2·1816951

When Radius of Circumscribed Sphere = 1.

Solid.	Side.	Radius inscribed.	Superficies.	Volume.
Tetrahedron .	1·6329932	0·3333333	4·6188023	0·5132002
Hexahedron .	1·1547005	0·5773503	8·0000000	1·5396006
Octohedron .	1·4142136	0·5773503	6·9282032	1·3333333
Dodecahedron	0·7136442	0·7946545	10·5146223	2·7851639
Icosahedron .	1·0514622	0·7946545	9·5745413	2·5361507

When Radius of Inscribed Sphere = 1.

Solid.	Side.	Radius circumscribed.	Superficies.	Volume.
Tetrahedron	4·8989795	3·0000000	41·5692192	13·8564064
Hexahedron	2·0000000	1·7320508	24·0000000	8·0000000
Octohedron	2·4494897	1·7320508	20·7846096	6·9282032
Dodecahedron	0·8980560	1·2584086	16·6508731	5·5502910
Icosahedron	1·3231691	1·2584086	15·1621684	5·0540561

When the Superficies = 1.

Solid.	Side.	Radius circumscribed.	Radius inscribed.	Volume.
Tetrahedron .	0·7598357	0·4653025	0·1551008	0·0517003
Hexahedron .	0·4082483	0·3535534	0·2041241	0·0680413
Octohedron .	0·5372850	0·3799178	0·2193457	0·0731152
Dodecahedron .	0·2200822	0·3083920	0·2450651	0·0816884
Icosahedron .	0·3398080	0·3231774	0·2568144	0·0856048

When the Volume = 1.

Solid.	Side.	Radius circumscribed.	Radius inscribed.	Superficies.
Tetrahedron .	2·0395489	1·1547006	0·4163417	7·2056240
Hexahedron .	1·0000000	0·8660254	0·5000000	6·0000000
Octohedron .	1·2848990	0·9080604	0·5245576	5·7191069
Dodecahedron .	0·5072221	0·7107492	0·5648000	5·3116140
Icosahedron .	0·7710254	0·7332887	0·5827111	5·1483486

REGULUS, M. ATILIUS. [PUNIC WARS.]

RE'GULUS. [SYLVIADÆ.]

RE'GULUS. A line drawn from the pole star, not through the two pointers, but between them and the five secondary stars of the Great Bear, which lie near them, will pass through the bright star called α Leonis, or Cor Leonis (the lion's heart). By Ptolemy and other Greeks it was called *βασιλίσκος*, whence comes the Latin name Regulus, a word which is the diminutive of *rex*.

REICHA, ANTOINE, a well-known composer, though more esteemed as a writer on music, was born at Prague in 1770, but educated at Bonn under his uncle, where he at first clandestinely studied the art passionately loved by him, and which soon became his profession; from which acknowledgment, made by himself, it is to be presumed that he was originally intended for a different pursuit. He early attempted musical composition, and when only seventeen years of age conducted the performance of his first symphony. In 1794 he went to Hamburg, and there remained five years, applying much to the abstruse theory of music, for which study his knowledge of algebra, a branch of mathematics wherein he was highly skilled, eminently qualified him. At the same time he also devoted great attention to the French language, in which he composed an opera in two acts. In 1799 he proceeded to Paris, and at the celebrated concert *de Cléry* produced with decided success a grand symphony. He afterwards took up his residence at Vienna, where he wrote many of his works, and among them thirty-six fugues for the piano-forte, the whole edition of which was sold in the first year. He returned to Paris in 1808, and there remained till his decease, which took place in 1836.

M. Reicha was a member of the Institute in both its forms, and a very leading professor of composition at the *Ecole Royale de Musique*. Among his numerous works, those on which his future fame will rest are, *Cours de Composition, ou Traité complet et raisonné d'Harmonie Pratique*, in 1 vol. folio; and *Traité de Mélodie, Abstraction faite de ses Rapports avec l'Harmonie*, in 2 vols. 4to., 1814, both of which ought to be carefully studied by every musician who wishes to understand his art otherwise than empirically.

REICHENBACH, now the chief town of a circle in the government of Breslau in Silesia, was the capital of a government of the same name, which was abolished and annexed to the government of Breslau by a cabinet order of the 3rd of February, 1820. It is surrounded by a double wall and moat, and has four gates and four suburbs. There are a Roman Catholic and a Protestant church, a Catholic and 2 Protestant schools, a synagogue, and a drawing-school for mechanics. The inhabitants, nearly 5000 in number, manufacture linen, woollen, cotton, canvas, muslin, &c. This town is remarkable for the action fought in its vicinity on the 16th of August, 1762, in which the duke of Brunswick-Bevern defeated the Austrians under Marshal Daun, who was coming to the relief of Schweidnitz; and for the convention concluded in 1790 by the ambassadors of England, Holland, Poland, Prussia, and Austria, by which the further existence of the Turkish empire was secured, which Austria and Russia wished to destroy.

REICHENBERG, the largest and most flourishing town in the kingdom of Bohemia next to Prague, is situated in the north part of that kingdom, in the circle of Bunzlau, on the river Neisse, 52 miles north-north-east of Prague. It is the capital of a lordship belonging to Count Claus-Gallas, which contains thirty-seven other places, some of which are considerable. The principal buildings are, three churches, two palaces, a theatre, and the handsomest and largest school-house in all Bohemia. There are four great manufactories of woollen cloth, with fulling-mills and dyeing-houses. There are besides manufactories of stockings, hats, linen, and calico. The annual value of the goods manufactured here is above half a million sterling. The trade of the town is very considerable, it being the staple place for all woollen, linen, and cotton manufactures of the circle. The population is nearly 15,000.

On the 21st of April, 1757, a victory was gained near this town by the Prussians under the duke of Brunswick-Bevern, over the Austrians.

REICHENHALL, a town in the circle of the Isar in Bavaria, is situated in a romantic country on the left bank of the Saale, at an elevation of 1323 feet above the level of the sea. Though it has not 3000 inhabitants, it is a place of great importance, as being the central point of the four great salt-works of Bavaria, which are connected by an immense system of pipes and conduits, by which Traunstein and Rosenheim are provided with brine from this place, and the brine of the salt-springs at Berchtesgaden is brought to Reichenhall, either to be boiled with the brine of the springs there, or conveyed to Traunstein or Rosenheim. Almost all the manufactures of machinery, which furnish everything requisite for the salt-works, are at Reichenhall. The most antient documents relative to the salt-springs at Reichenhall are of the eighth century. As the great consumption of wood for so many years made fuel too scarce to boil all the brine on the spot, a very ingenious system of pipes was contrived in 1618 from Reichenhall to Traunstein, over an elevation of 828 feet perpendicular height, and extending eight leagues in length. A similar conduit to Rosenheim on the Inn, where there is abundance of wood, was made in 1809, by M. Reichenbach. It is fourteen leagues in length; so that now all the springs which formerly ran to waste for want of wood are turned to account. In 1817, M. Reichenbach, with very great skill, connected the salt-springs of Reichenhall, Traunstein, and Rosenheim with the salt-mines of Berchtesgaden. Though the Ferdinandsberg at Berchtesgaden is only 160 feet higher than Reichenhall, yet, on account of the intervening mountain-chain between the two places, it was necessary to raise the brine by waterworks to the height of 1579 feet, and so let it have a fall of 1740 feet to Reichenhall. For this purpose a conduit, partly covered, partly open, of 102,000 feet in length, part iron, part wood, was required. The machine erected at Illsang on a new principle by M. Reichenbach, raises the saturated brine to an elevation of 1218 feet perpendicular. The quantity of salt produced annually is 16,000 tons.

(Hassel; Stein; *Conversations Lexicon.*)

REID, DR. THOMAS, was born April 26th, 1710, at Strachan in Kincardineshire, about twenty miles from Aberdeen, of which parish his father, the Rev. Lewis Reid, was minister for fifty years. He was first sent to the parish school of Kincardine, and after two years he was removed to Aberdeen to be placed under a course of preparation for the university. At the age of twelve or thirteen he entered the Marischal College of Aberdeen. The principles of the philosophy of which he afterwards became so able an advocate he imbibed here under Dr. George Turnbull, author of 'The Principles of Moral Philosophy.' He continued beyond the usual time at the university, of which he had been appointed librarian. This office he resigned in 1736, and he then visited England in company with Dr. John Stewart, afterwards professor of mathematics in the Marischal College. They proceeded to London, Oxford, and Cambridge, and were introduced to several distinguished men, among whom were Dr. Bentley and Mr. Saunderson, the blind mathematician. In 1737 Reid returned to Scotland, and was presented by King's College, Aberdeen, to the living of New Machar in Aberdeenshire. His entrance upon this living was by no means a pleasant one. The parishioners, having been accustomed to a minister of intemperate zeal, and being averse to the system of patronage which led to this appointment, were at first violently opposed to Reid; but his unwearied attention to his duties and the mildness of his temper soon overcame their opposition, and converted their dislike into the highest esteem. It appears however that he had been so little used to composition, and was naturally so diffident, that for some time he delivered very few of his own sermons, but used those of Archbishop Tillotson and Dr. Evans. In 1740 he married Elizabeth, daughter of his uncle Dr. George Reid, a physician in London.

While he was minister of New Machar, he pursued a course of intense study; and in 1748 he inserted in the 'Transactions of the Royal Society of London' 'An Essay on Quantity, occasioned by a treatise in which simple and compound ratios are applied to virtue and merit.' In other words, it was an essay on the application of mathematics to morals. Doctors Pitcairne and Cheyne had recently attempted to apply mathematics to medicine, and Hutcheson to morals. According to the latter, the good done by a man depends partly on his benevolence and partly on his dispositions; the relations between these moral notions might be expressed algebraically, after this manner:—the benevolence or moral desert of an agent was analogous to a fraction, which had the good performed for the numerator, and the dispositions of the agent for the denominator. Reid, after examining in his essay the nature of mathematical proof, and the subjects to which it had been applied by Hutcheson, clearly showed that mathematics could by no means have a necessary relation to morals, because the truths to which the two sciences respectively refer addressed themselves to different faculties of the mind. In 1752 the professors of King's College, Aberdeen, elected Reid to be their professor of moral philosophy, in testimony of the high opinion which they entertained of his talents. After this appointment he devised the plan of a private literary society, which was soon formed, and which existed a long time. This society met once a week, and its object was the discussion of philosophical subjects for the mutual improvement of the members, among whom were Doctors George Gregory, Campbell, Beattie, and Gerard, including of course the projector. Though Reid had as yet published nothing but the 'Essay' mentioned above, his character as a philosopher was established; and in 1763 the university of Glasgow invited him to the chair of moral philosophy there, which was then vacant by the resignation of Dr. Adam Smith. He accepted this invitation, and entered upon his duties in 1764, in the discharge of which he laboured indefatigably to carry out his principles. In the same year he published his 'Inquiry into the Human Mind,' the substance of which he had previously delivered to his pupils at Aberdeen, and also read to the society just named. The principal object of this work was to counteract the influence of that scepticism which Hume had founded on the spiritual and ideal system of Berkeley. About the time that the 'Inquiry' was published, the author received the degree of D.D. from the university of Aberdeen. In 1773 he published, in Lord Kames's 'Sketches of the History of Man,' 'An Analysis of Aristotle's Logic,' which he wrote at the particular request of Lord Kames, who thought that no man was better acquainted with Aristotle's writings than Dr. Reid. In 1781 Dr. Reid withdrew from public labours; but he did not cease to pursue his favourite occupations. In 1785 he published his 'Essays on the Intellectual Powers,' of which the substance had been delivered, as he tells us, annually for more than twenty years to a large body of the more advanced students at Glasgow, and for several years before at Aberdeen. In 1788 came out his 'Essays on the Active Powers of the Human Mind.' Dr. Reid does not appear to have published any more works than those already mentioned; but he gave his attention to various other subjects, both in his private studies and in relation to his college lectures. Upon commencing his duties at Glasgow, he divided his course into four parts, after the example of his predecessor, Adam Smith: the first part comprised metaphysics: the second moral philosophy; the third, natural law; and the fourth, political rights. He also gave lectures on rhetoric. He read several essays at different times before a philosophical society of which he was a member. Among these were 'An Examination of Dr. Priestley's opinion concerning Matter and Mind;' 'Observations on the Utopia of Sir Thomas More;' 'Physiological Reflections on Muscular Motion.' The last essay was read by Dr. Reid to his associates a few months only before his death, which took place October 7, 1796, in the eighty-seventh year of his age. After his death, his 'Essays on the Intellectual and Active Powers' were published by Mr. Dugald Stewart, as 'The Philosophy of Dr. Reid,' with a life of the author prefixed, from which this account of him it chiefly taken.

The moral and social qualities of Dr. Reid were such as naturally to inspire esteem, and in private life no man could be more highly esteemed than he was. As a writer, his language is simple and manly, and his style clear and forcible, without any pretence to ornament. Opinions vary as to the merits of his philosophy. His aim was to arrive at the general laws which regulate our mental operations by the inductive method, which, he thought, had never been applied to this subject. He has the merit of showing the unsatisfactory nature of certain moral systems proposed by his predecessors. Whether he has laid the foundation of a system that will prove satisfactory is very doubtful. Perhaps the laws which regulate the material world will never be found altogether applicable to the operations of mind. In all the attempts that have hitherto been made so to apply these laws, some conclusions have inevitably followed, which our sense of right and wrong refuses to admit, and this men will ever regard as a safer guide than any scheme of philosophy however ably propounded. As to Dr. Reid's view of Aristotle's logic, it appears only just to say that he did not clearly understand it. If candour and patient investigation could alone have unfolded the meaning of Aristotle, Dr. Reid would have been successful in this matter; but it is probable that he never received a good classical training, and never read Aristotle in the original with a mind free from the influence of the false interpretations of his writings which had so long prevailed. It is not to be expected that any man can understand Aristotle without thoroughly studying him in his own language.

(Stewart's *Life of Reid*; Chalmers's *Biographical Dictionary*; *Biographie Universelle*.)

REIGATE. [SURREY.]

REIMARUS, HERMANN SAMUEL, was born at Hamburg, December 22, 1694. Early in life he devoted himself to the study of languages, and he became distinguished for his knowledge of the Latin, Greek, and Hebrew. He pursued his studies at the university of Wittenberg, and upon the completion of his course, in 1717, he maintained some theses 'On the Differences of Hebrew Words,' which established his character for learning and acuteness. He then began to travel, and, having passed over several parts of Germany, he stayed a considerable time at Weimar, where he took the opportunity of publishing a collection of minor productions. After having satisfied his curiosity, he returned to Hamburg, and in 1727 he was made professor of philosophy in the university of that city, and he filled this office with much honour to himself during the space of 41 years. Reimarus married, in 1728, Johanna Frederica, the third daughter of the celebrated J. A. Fabricius. This connection with Fabricius proved to him the occasion of many and great advantages, and he also assisted Fabricius in some of his important literary labours. Towards the end of his life Reimarus devoted his hours of leisure to the study of natural history, of which he acquired an extensive knowledge. He had naturally a feeble constitution, and he was long a sufferer from ill health. He died March 1, 1768, in the 74th year of his age. Reimarus was a member of the Imperial Academy of St. Petersburg, and also of most of the literary societies in Germany. He was a man of varied and solid learning, of unwearied industry, and of great moral worth. His principal works are the following:—1, 'A Commentary on the Life and Writings of John Albert Fabricius,' Hamburg, 1737, 8vo.; 2, 'A Letter to Cardinal Quirini concerning the works of Dion Cassius,' Hamburg, 1746, 4to.; 3, 'The Roman History of Dion Cassius,' Hamburg, 1750, 2 vols. folio. In the publication of this work he availed himself of materials which had been prepared by his father-in-law, Fabricius, who had projected an edition of this author. Reimarus's edition of Dion Cassius is pronounced by Dr. Harwood 'one of the most correct and valuable Greek books ever published. 'The notes,' he adds, 'contain a treasure of erudition.' 4, 'A Dissertation on the Counsellors of the Great Sanhedrin,' Hamburg, 1751, 4to.; 5, 'A Discourse on the Principal Truths of Natural Religion,' Hamburg, 1754, 8vo.; 6, 'Observations, Physical and Moral, on the Instinct of Animals,' Hamburg, 1760, 2 vols. 12mo. He is said moreover to have written the essays which were published by Lessing, in 1774 and 1777, and known by the name of the 'Wolfenbüttel Fragments.' [RATIONALISM.]

(Weiss, in *Biographie Universelle*; Reimarus's *Life of J. A. Fabricius*.)

REIMS, or RHEIMS, a town in France, in the department of Marne, on the right or north bank of the Vêle, a feeder of the Aisne, 80 miles from Paris in a direct line east by north, or 96 miles by the road through Dammartin and Soissons, in 49° 14′ N. lat. and 4° 2′ E. long. In the Roman writers this town appears under the name of Durocortorum. It is mentioned by Cæsar, in whose time it was the capital of the Remi, one of the most considerable nations of Belgic Gaul, remarkable for their steady adherence to the alliance of Rome. Strabo writes the name *Δουρικόρτορα* (Duricortora). It was at the convergence of several military roads, according to the Antonine Itinerary and the Peutinger Table. At a later period it took the name of the people to whom it belonged, and is mentioned by this name (Remi) in Ammianus Marcellinus and in the Notitia. Under the Roman sway Durocortorum was the most important place in the province of Belgica Secunda; and was distinguished by its literary character. Cornelius Fronto, a rhetorician of the time of Hadrian, has compared it to Athens, an indication, making allowance for rhetorical exaggeration, of its reputation.

In 494 this city, then in the hands of the Franks, by whom it had been occupied after the defeat of Syagrius, was the scene of the baptism of Clovis and the chief lords of his court, after his victory at Tolbiac. In the civil troubles of the ninth and tenth centuries, Reims was repeatedly besieged, and twice at least taken and plundered. In 1179 it was signalized by the consecration of Philippe Auguste: all the succeeding kings of France down to Charles X. inclusive have also been consecrated here, with the exception of Henri IV. (who was consecrated at Chartres), Napoleon (who was consecrated at Paris), and Louis XVIII. (who was never consecrated at all). On the Revolution of 1830 the ceremony was abolished. Reims had become at an early period the seat of a bishop, who attained the rank of metropolitan of Belgic Gaul. In the middle ages several councils were held here. Reims was also the capital of a county, afterwards of a duchy. In 1359 it was blockaded for seven months by the English under Edward III., just previous to the treaty of Bretigny. In the campaign of 1814 it was taken (12th of March) by a corps of Russians, commanded by St. Priest, a French emigrant, and retaken next day by Napoleon, who killed 2000 of the enemy, with their commander.

The town is situated in a vast basin surrounded by chalk-hills, on which some good wines are produced. The site of the town is an oblong, extending from north-west to south-east. The antient walls which surround it are between two and three miles in extent; they are strengthened with towers, and, being planted with trees, form in summer a very agreeable public walk. They enclose within their circuit many large gardens and several spaces entirely unoccupied.

The entrance into the town is by six gates, called the gates of Mars, Ceres, Bacchus, Le Dieu Lumière or Dilimire, or Dieu Merite, Vêle or Paris, and the New Gate. There are suburbs to the gates of Ceres and Vêle. The gates of Ceres and Bacchus are supposed to indicate the sites of heathen temples which were without the walls of the Roman Durocortorum. The gate of Mars, a comparatively modern erection, has superseded a more antient one, disused since 1545, but still standing, and forming part of the circuit of the walls. It is a Roman triumphal arch of uncertain date. It has three arches; that in the centre about sixteen feet wide, those on the sides twelve or thirteen feet: all three covered with bas-reliefs, parts of which are too much defaced to be intelligible. This triumphal arch is also adorned with eight fluted Corinthian columns, of which only three are in good preservation. The gradual elevation of the soil has half buried this monument of antiquity

The streets are wide and tolerably well laid out; they are well paved and neat, but present a dull appearance from the absence of bustle, and the grass which grows plentifully in them. The houses are for the most part built of chalk, or of boards covered with slate; some of them still present their gables to the street; and in others the upper stories project, and, being supported on wooden columns, form on the ground-floor a covered walk or gallery. The houses consist for the most part only of one story above the ground-floor. The squares are generally small and of irregular shape, except La Place Royale, a regular square, surrounded by good houses or public buildings of mingled Doric and Italian architecture, and having in its centre a well-executed statue of Louis XV. The streets are adorned with fountains supplied with water from the Vêle by the waterworks erected at his own cost by the Abbé Godinot, one of the canons of the cathedral. There is a pleasant public walk planted with trees on the west side of the town.

The most striking public building is the cathedral of Nôtre Dame, considered to be one of the finest Gothic edifices in Europe. It was commenced in the thirteenth century on the site of a more antient church, which had been destroyed by fire. The length of the nave and choir is about 480 English feet, the breadth 99 English feet, interior dimension; the length of the transept (croisée) is 160 English feet, interior dimension; the height of the building is 117 English feet. The western or principal front is surmounted by two square towers rising to the height of 267 English feet, and adorned by three large doorways, loaded with a vast number of statues, bas-reliefs, and other ornaments, many of which are of exquisite workmanship. Over the principal doorway is a fine circular window or rose of stained glass. The shafts of the flying buttresses, surmounted with statues, the rose-windows over the side-doorways, and the Angel Tower, a remarkably light bell-tower rising 59 English feet above the roof of the church at the eastern end, surmounted by a ball, and by the statue of an angel from seven to eight feet high, are all worthy of attention. The interior of the church is also very striking from the vast extent of the nave, the splendid stained-glass windows, the pavement of the choir, inlaid with marble of various colours, the antient baptismal fonts, the organ, reputed to be one of the best in France, the painting of Christ washing his disciples' feet, one of the finest works of Poussin, and the antient Roman tomb of Jovinus (a citizen of Reims, who, A.D. 366, attained to the honour of the consulship, and died in 406), formed of a single block of white marble, adorned with sculptures in relief, of tolerably good workmanship.

The church of St. Remy, the most antient in the town, is almost as large as the cathedral, but not so lofty; the principal front is of simple architecture, surmounted by two lofty spires. The interior is remarkable chiefly for the tomb of St. Remy, bishop of Reims in the fifth century, an elaborate piece of workmanship, erected in 1803, partly from the remains of the more antient one destroyed in 1793. The sacred Ampulla (Ampoule), or vessel containing the oil with which the kings of France were anointed, and reputed to contain a portion of the very oil with which St. Remy had anointed Clovis, was deposited in this church until it was destroyed in the revolutionary troubles.

The church of St. Nicaise, demolished during the revolutionary period, was by many considered the finest church in the town; it was superior in elegance to the cathedral, though inferior to it in the richness of its ornaments. There are three other churches, a town-hall, and other buildings. The town-hall, begun in 1627, but not finished till 1825, is made up of three compartments, a centre and two wings, adorned with Doric, Ionic, and Corinthian columns. Over the central building, the architecture of which is superior to that of the wings, rises a tower, having a clock, an equestrian statue of Louis XIII., and four pedestrian statues. The public library is deposited in the town-hall.

The population of Reims was estimated by Expilly to have been, at the close of the seventeenth century, 30,000; and in the middle of the eighteenth, about 27,000. At the commencement of the present century it had risen again to 30,000; in 1826 it was 34,862; in 1831, 35,971; and in 1836, 38,359. The manufactures are extensive, chiefly of woollens, or fabrics of wool combined with other materials, in which branch of industry, in and round the town, 15,000 persons are employed by about 180 master-manufacturers. It is estimated that 1,200,000 kilogrammes (about 24,000 cwt.) of wool are consumed; the yearly value of the productions of the town is estimated at above a million sterling; they include woollen cloths, kerseymeres, light stuffs for summer coats and trowsers, swanskins, camlets, merinos, Cashmere shawls, flannels, blankets, carpets, hosiery, &c. The yarn is spun partly by steam-power, partly by water, and partly by horse-power. There are also manufactures of bolting-cloth, cordage, candles, soft soap, and leather. Wax and woollen bleaching, dyeing, wool-combing, brewing, and the making of machinery, are carried on. The spiced bread and biscuits of the town are in great repute. The chief trade is in the above-named articles of manufacture, corn, flour, Champagne wines, brandy, spices, colonial produce, wool, cotton-yarn, flax, hemp, raw hides. There are four yearly fairs. The trade of the place is restricted by the want of water-carriage; there are however good roads to Paris, Châlons-sur-Marne, Mézières, St. Quentin, and other places.

The woollen manufacture of Reims owes its origin to the great minister Colbert, who was a native of the town.

Reims is the seat of an archbishopric; it has an assize court, a subordinate court of justice, a commercial tribunal, and a chamber of manufactures, arts, and trades; several fiscal government offices, a public library of 25,000 volumes and 1000 manuscripts, a high school, a secondary school of medicine, schools on the principle of mutual instruction (*i. e.* Lancasterian schools), a botanic garden, at which courses of instruction are given, a savings' bank (*caisse d'épargne*), a loan-office (*mont de piété*), and other institutions. There are two seminaries for the priesthood, and some nunneries; before the Revolution the town was remarkable for the number of its monastic establishments. There are four hospitals or asylums, including one for orphans. The principal hospital, the Hôtel Dieu, occupies the buildings formerly belonging to the abbey of St. Remy, in which is some carved wood-work of great delicacy. There are two establishments of baths, and a large and convenient theatre.

Among the eminent natives of Reims are Colbert, the Abbé Pluche, and Linguet, a man of letters, who perished during the Revolution.

The diocese of Reims was of early foundation; it was at first a simple bishopric, and comprehended the territory subsequently assigned to the dioceses of Laon and Châlons. St. Remy occupied the see in the time of Clovis, whom he baptised. In the eighth century the bishopric was elevated to the rank of an archbishopric: its occupiers possessed great influence, and Hincmar, who held it in the middle of the ninth century, was one of the leading personages of his time.

The archbishops claimed, and in most cases exercised, the right of officiating at the consecration of the kings of France; they had the dignity of dukes, and ranked first among the peers of France. The suffragans of the see were antiently the twelve bishops of Amiens, Arras, Beauvais, Boulogne, Cambray, Châlons, Laon, Noyon, Senlis, Soissons, Therouenne, and Tournay; but four of these were withdrawn on the elevation of Cambray (in A.D. 1559 and 1560) into an archbishopric, with Arras, Therouenne, and Tournay as its suffragans; and others were suppressed at the Revolution. At present the suffragans are the bishops of Amiens, Beauvais, Châlons, and Soissons. The diocese of Reims comprehends the town and its arrondissement.

The arrondissement of Reims has an area of 685 square miles; it comprehends 181 communes, and is divided into ten cantons. The population, in 1826, was 118,340; in 1831, 120,680; and in 1836, 123,919.

REINEKE or REINEKE FUCHS, Reynard the Fox (Reineke is probably only a corrupt diminutive of Reynard, or the French *Renard*), is a poem which, during the latter part of the middle ages and the early centuries of modern times, had an almost European reputation, for in some form or other it was known and read all over Europe.

The first complete version of the story in German verse was printed in 1498 at Lübeck, and bears the title 'Reynke de Voss.' It is written in the Frisian dialect, which is only a modification of that spoken in Lower Saxony, and it consists of four books, each of which is subdivided into chapters. The verses consist of iambics mixed with numerous spondees and anapæsts. The poem contains a lively picture of a court, in which the prince allows himself to be guided by the flattery of a deceitful and cunning favourite, who, notwithstanding all the wrongs that he inflicts upon others, is still successful to the last. The moral conveyed is this, that in the affairs of this world cunning has the advantage over justice. The king and his vassals and officers, as well as all other classes of persons, are represented, as in the fables of Æsop, under the names of such animals as are most suited to their individual characters. The king is accordingly represented under the name of Lion; his friend and favourite is the fox (Reineke), who, after having silenced, by his cunning, his hypocrisy, and lies, the charges which are brought against him by other animals, is loaded with favours and marks of honour by the king and his queen, and, accompanied by a numerous train of friends, returns to his castle Malepartus, where he relates to his family the happy issue of his dealings at court. The whole poem is a satire, but written in a truly epic style. The great number of editions which appeared in Germany after the first publication of it, and still more the numerous bad paraphrases in prose, which were sold by thousands at every fair, show the immense popularity which the story had in Germany.

The first edition is preceded by a prose introduction, in which the author of the German version calls himself Hinrek von Alkmer, and states that he translated the story from the Welsh (French) into German verse. But as no trace of this Alkmer can be found, the statement of Rollenhagen, who, in the preface to his 'Froschmaüsler,' calls Nicolas Baumann the author of 'Reynke de Vos,' has generally been adopted, though nothing certain is known of the matter. (Flögel, *Gesch. d. Komisch. Lit.*, iii., p. 28, &c.) The last and best edition of the poem was edited by Hoffmann von Fallersleben (Breslau, 1834), with an introduction, glossary, and commentary. The text is a correct reprint of the first edition. Göthe has made a most beautiful translation of 'Reineke Fuchs' into modern High-German, in hexameters (Berlin, 1794); D. W. Soltau has made another, in doggrel-verse (Berlin, 1803), a new and much improved edition of which appeared at Braunschweig, 1823. It has also been translated into Latin by Hartmann Schopper, under the title 'Opus poeticum de admirabili fallacia et astutia vulpeculæ Reinikes,' &c., Frankfort, 1574; this translation has often been reprinted. In 1706 there appeared in London a metrical English translation from the Latin of Schopper.

The German version of Reineke was, notwithstanding the statement of its author, formerly thought to be an original composition, but the subject was known for many centuries and in several countries before the German poem was printed. A Dutch edition of the story of Reineke, in prose, interspersed with occasional verses, was printed, in 1485, at Delft; it was reprinted in 1783, at Lübeck and Leipzig, under the title 'Die Historie va Reinaert de Vos.' The author of this Dutch version, which is in many respects superior to the German, and has probably served as the source from which the German poet drew his materials, calls himself Willam Matok, and also refers to a French work which had served him as his model. But even this Dutch version cannot have been the first, for Caxton (1481), in his English translation, states that he kept closely to a Dutch original. It may be inferred, from the various subsequent corrected and enlarged editions of this poem, as well as from the allusions of our early dramatists, that it gained considerable popularity in England also. The Flemish likewise possess an excellent metrical version, which was published in 1836, at Ghent, by Willems, with a very valuable introduction. The early French literature however is the richest in poems founded on the story of Reynard. Méon, in his 'Roman du Renard' (Paris, 1826), has shown that most of these poems belong to the thirteenth century, and more modern researches have proved that the story was known as early as the ninth century. The subject is one which so readily presents itself to the imagination, that it would be impossible with any probability to assign its invention to any particular time or nation. Whenever a work of fiction of commanding interest appears, unpoetical minds are always ready to seek some real history disguised under it, and this has been the case with this poem ever since its publication, until Jacob Grimm, in his 'Reinhart Fuchs' (Berlin, 1834), showed that there is no ground whatever for such a supposition. (Compare Carlyle's *Miscellanies*, vol. iii., p. 197, &c.)

REINE'SIUS, THOMAS, one of the most learned of modern physicians, was born at Gotha in Saxony, on the 13th of December, 1587. He was tolerably versed in the Greek and Latin languages at the age of twelve; and being afterwards sent to Wittemberg, the professors wished him to apply to theology. His inclination however led him to medicine: he continued his studies at Jena, and then travelled through various parts of Germany and Italy, remaining some time at Padua, for the sake of the medical lectures delivered there. On his return through Basle, he took his degree of doctor of medicine in that university, and then passed some time at Altdorf, in the hope of procuring a professorship by the interest of his relation Caspar Hoffman. He married, and, in 1617, settled in the practice of his profession at Hof in Franconia. Thence, on the invitation of the margrave of Bareith, he removed to that town, having the posts of the margrave's physician and inspector of the public schools. In 1627 he accepted the place of public physician of the town of Altenburg, in which he resided several years, and obtained the dignity of burgomaster. The elector of Saxony conferring upon him the rank of counsellor, he finally removed to Leipzig, where he died in 1667, at the age of eighty. Reinesius was a man of vast erudition, and may be reckoned almost at the head of learned physicians. 'There is scarcely anything (says Saxius) in the Greek and Latin authors, especially the antient medical writers, or in the monuments of antiquity, which he has left untouched in his epistles, observations, various readings, scholia, or disputations, either published or in manuscript.'

Bayle says of his writings in general, that 'good judges of literature have no sooner read some pages, but they place him above those philologers who have only a good memory, and rank him with critics who go beyond their reading, and know more than books have taught them. The penetration of their understanding enables them to draw consequences, and suggests conjectures which lead them to the discovery of hidden treasures. They by this means dart a light into the gloomy places of literature, and extend the limits of antient knowledge. Reinesius was one of this class of critics, and made it his chief business to find out what others had not said.' By his printed letters it would appear that he was consulted as an oracle; that he answered very learnedly whatever questions were brought to him; and that he was extremely skilled in the families of antient Rome, and in the study of inscriptions. A great eulogium is given of his merit, as well as of his learned and classical works, by Grævius, in the dedication of the second edition of Casaubon's Epistles, dated Amsterdam, August 31, 1655; and by Haller, who calls him (*Biblioth. Medic. Pract.*) 'a miracle of learning' (*ad miraculum doctus*); and says that 'in the accurate study and comparison of antient writers, and in sagacity in discovering the true reading of corrupt passages, he was unrivalled.' He partook of the liberality which Louis XIV. showed to the most celebrated scholars of Europe, and received at the same time a very obliging letter from Colbert, which favour he returned by dedicating to him one of his works. With respect to the character of Reinesius, his religion was suspected to be of the philosophical kind, and he seems to have no small share of the pride and irritability that too often accompany the possession of great talents and learning. This involved him in several angry controversies, and is said to have been the cause of his leaving Altenburg. He had a quarrel upon a ludicrous occasion with his friend Caspar Barthius, who, upon paying a visit to him when burgomaster, was taken by his beadle for the common hangman, and refused admission to his master. In spite of his numerous occupations and the duties of his office, he kept up a correspondence with several of the most eminent literary characters of his age, and several valuable collections of his letters have been published, viz. those to Caspar Hoffmann and Christ. Ad. Rupert, Leipzig, 1660, 4to.; to John Vorstius, Cologne, 1667, 4to.; to the elder and younger Nester, Leipzig, 1670, 4to.; to Christopher Daum, Jena, 1670, 4to.; and to John Andrew Bose, Jena, 1700, 12mo. Besides some notes on Manilius, inserted in the Strasburg edition, 1655, 4to., and some observations on Petronius, Leipzig, 1666, 8vo., one may mention the following works of Reinesius:—1, 'De Diis Syris, sive de Numinibus Commentitiis in Veteri Testamento Memoratis Syntagma,' Lips., 1623, 4to. This work, though learned, is less complete than that which Selden published afterwards on the same subject. 2, 'De Deo Endovellico ex Inscriptionibus in Villa Vizosa Lusitaniæ repertis Commentatio Parergica,' Altenb., 1637, 4to. This is a divinity of the antient Lusitanians, the same as Mars, or, according to others, Love 3. ''Ιστορούμενα Linguæ

Punicæ Errori populari, Arabicam et Punicam esse eandem, opposita,' ibid., 1637, 4to. This curious dissertation has been inserted, as well as the preceding one, by Grævius, in the 'Syntagma Variar. Dissertat. Rariorum,' Ultraj., 1702, 4to. 4, 'Variarum Lectionum Libri Tres Priores, in quibus de Scriptoribus sacris et profanis, classicis plerisque, disseritur,' ibid., 1640, 4to. These three first books were to have been followed by three others, which never appeared. It is a thick volume of about seven hundred pages, of multifarious and (as Haller says) incredible learning, chiefly, but not exclusively, classical. It also contains a good deal of matter relating to medicine, and explains several obscure and difficult passages in the antient physicians and those of the middle ages. Some of the explanations of Reinesius were attacked with much bitterness by André Rivinus, who was not ashamed of making use afterwards of all sorts of means to prevent his adversary from answering him, and even wished the magistrates to take part in a discussion entirely literary. Reinesius however succeeded in thwarting these intrigues, and published his reply under the title of 'Defensio Variarum Lectionum contra Censuram Poëtae L. (*Laureati*),' Rostoch., 1653, 4to. 5, 'Inscriptio vetus Augustæ Vindelicor. eruta et Commentario illustrata,' Lips., 1655, 4to. 6, 'Ænigmati Patavino Œdipus è Germaniâ, hoc est Marmoris Patavini Interpretatio,' ibid., 1662, 4to. This is a new explanation of the famous epitaph of Ælia Lælia Crispis, which has so much and so uselessly occupied some learned men. 7, 'De Palatio Lateranensi ejusque Comitivâ Commentatio Parergica, accedit Georg. Schubarti, de Comitibus Palatinis Cæsareis Exercitatio historica,' Jenæ, 1679, 4to. 8, 'Syntagma Inscriptionum Antiquarum,' Lips., 1682, fol. This collection only contains the inscriptions omitted, or badly explained, by Gruter. It was regretted by the learned that the editor should not have published at the same time another work of Reinesius (*Eponymologium Criticum*), which could not fail to explain a number of obscure passages in the Latin and Greek authors. The original manuscript was, in 1717, in the hands of Th. Fritsch, a bookseller at Leipzig; and it was thought that he would comply with the wishes of all philologers by having it printed (Klofeker, *Biblioth. Eruditor. Præcocium*, p. 313); but these hopes have not been realised. 9, 'Dissertatio critica de Sibyllinis Oraculis,' Jena, 1702, 4to., at the end of a work by George Schubart, 'Enarratio Parergica Metamorphoseos Ovidianæ de Diluvio Deucalionis.' 10, 'Judicium de Collectione MSS. Chemicorum Græcorum quæ extant in Biblioth. Gothanâ,' inserted in the 'Catal. Cod. MSS. Biblioth. Gothanæ,' Lips., 1714, 4to., p. 88; and in the 'Biblioth. Græca' of Fabricius, vol. xii., p. 748. To these works, which are mentioned in the 'Biographie Universelle,' and Klefeker (loco cit.), may be added, from Bayle.—11, 'De Vasis Umbilicalibus, eorumque Ruptura Observatio Singularis,' Lips., 1624, 4to. 12, 'Chymiatria, hoc est Medicina Nobili et Necessaria sui Parte, Chymia, instructa et exornata,' Geræ-Ruth., 1624, 4to. C. G. Müller lately edited his 'Observationes in Suidam,' 8vo., Lips., 1819. Another work appeared under his name, which was in fact the production of Fortunatus Fidelis, entitled 'Schola Jurisconsultorum Medica, Relationum aliquot Libris comprehensa, quibus Principia Medicinæ in Jus transumpta ex professo examinantur,' Lips., 1676, 8vo. Several other works have also been wrongly attributed to him. Some letters of Reinesius are to be found at the end of his eulogium, in the 'Elogia Clarorum Altenburgensium,' by Fred. Gotth. Gotter, Jena, 1713, 8vo. Bayle, in his 'Dictionnaire,' and Niceron, in vol. xxx. of his 'Memoirs,' have given an interesting account of him. His Life, written by himself in German, and found among his manuscripts, has been made use of in the account given by Witten, 'Memor. Philosoph.,' dec. viii., p. 461, &c. J. Brucker has inserted a more detailed life, in German, in his 'Ehrentempel der deutscher Gelehrsamkeit,' dec. iii., p. 110, Augsburg, 1747, 4to.

REINDEER. [DEER, vol. viii., p. 354.]

REINHOLD, ERASMUS, was born October 21, 1511, at Saalfeld, about sixty miles south-west from Leipzig. He taught astronomy and mathematics in the university of Wittenberg till the year 1552, when, being obliged to quit that city on account of the plague, he returned to his native province of Thüringen, where he died February 19, 1553. His published works are:—1, 'Commentary on the Theoricæ novæ Planetarum G. Purbachii,' 1542 and 1558, 8vo. This work, observes Delambre, supplied in some respect the omissions of Purbach, and must have facilitated the understanding of several passages of the Syntaxis of Ptolemy. In the dedication Reinhold shows himself so infatuated with judicial astrology as to be at the trouble of collecting all the instances which appeared confirmatory of the notion that solar eclipses were the harbingers of great calamities. 2, The first book of the Almagest, in Greek, with a Latin version and scholia, 1549, 8vo. 3, 'Prutenicæ Tabulæ Cœlestium Motuum,' 1551, 1571, and 1585, 4to. These tables were formed from the observations of Copernicus, compared with those of Hipparchus and Ptolemy. Reinhold had made some observations himself, but his best instrument was a wooden quadrant, and Tycho, on visiting Wittenberg in 1575, expressed his surprise that so celebrated an astronomer should have been provided with no better tools. In this work the author gives a very clear explanation of the equation of time. He assigns three reasons to account for astronomical tables, constructed at one period, not according with more recent observations, namely, the motion of the apogee, the variation of the excentricity, and the inequality of the precession. The last was sensible only in the systems of Thébith and Copernicus. The excentricity of the sun he makes from 0·0417 to 0·03219, and the mean precession $50'' \, 12''' \, 5'''' \, 8'''''$. From a comparison of the observations of Ptolemy and Copernicus, he makes the length of the year 365d. 5h. 55m. 58s., and this determination was employed in the Gregorian reformation of the calendar. He computes the motion of the planets both after the manner of Ptolemy and that of Copernicus, whence Bailly concludes that he had no decided preference for either system. 'This conclusion,' observes Delambre, 'appears to me hazarded. The most that can be inferred is that the partisans of the antient system were yet the more numerous, and that Reinhold sought to conciliate all parties. He says nothing which can lead the reader to suspect the existence of two different systems. He neither speaks of the motion of the earth nor of that of the sun. His tables resemble our own, which still give the motions of the sun, notwithstanding that we are all Copernicans. It cannot be supposed that he who wrote a commentary on the work "De Revolutionibus," &c., who repeated all the calculations and reconstructed the tables of Copernicus, had not a sentiment of preference for a system which he had studied more than any one of his day.' The Prutenic tables were the result of seven years' labour, and where so called in compliment to the author's benefactor, Albert, marquis of Brandenburg and duke of Prussia. The 'privilege,' printed at the head of the work, which bears the date July 24, 1549, refers to several other compositions which the author contemplated publishing, such as ephemerides, tables of the rising and setting of the stars for various epochs and latitudes, &c. 4, 'Primus Liber Tabularum Directionum, discentibus prima elementa Astronomiæ, necessarius et utilissimus. His insertus est Canon Fœcundus ad singula scrupula quadrantis propagatus. Item nova Tabula Climatum et Parallelorum, item Umbrarum. Appendix Canonum secundi libri Directionum qui in Regiomontani Opere desiderantur,' Tübingen, 1554, 4to. In this work the table of tangents was first extended to each minute of the quadrant from 0° to 89°, and to every 10″ from 89° to 90°. The last figure of the tangents here given can nowhere be depended on, and above 70° the error is much greater. Like Müller, he showed himself very little acquainted with the use to which such a table is applicable, notwithstanding the epithet 'fœcundus' which they applied to it. Reinhold supposed, with Copernicus, that the obliquity of the ecliptic varied from 23° 28′ to 23° 52′. 5, 'Tabulæ Ascensionum Obliquarum à 60° Gradu Elevationis Poli usque ad Finem Quadrantis, per Erasmum Reinholdum supputatæ,' appended to the edition of Müller's 'Tables of Directions,' printed in 1584. 6, There is also an anonymous work, printed in 1568, 8vo., entitled 'Hypotyposes Orbium Cœlestium quas vulgo vocant Theoricas Planetarum Congruentes cum Tabulis Astronomicis,' which is supposed to be the composition of Reinhold. See *Astron. Moderne*, i., pp. 142 and 146.

(*Astronomie du Moyen Age*, pp. 272-4; *Astron. Moderne*, i., p. 164; Zedler, *Grosses Universal Lexicon*, Leip., 1742, fol., band 31, p. 206; Vossius, *De Scientiis Mathematicis*, c. 36, p. 14; Dappelmayer, *De Mathem.*, &c.)

REINHOLD, ERASMUS, son of the preceding. He possessed some knowledge of astronomy, and submitted to Tycho a copy of the Prutenic Tables calculated to each 10″,

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but the want of fortune obliged him to adopt the medical profession.

REISKE, JOHANN JACOB, a physician, and celebrated scholar, whose fame rests chiefly on his knowledge of Arabic, was born on the 25th of December, 1716, at Zorbig, a small town near Leipzig. His grandfather was an innkeeper, and his father a tanner. At the age of twelve he was sent to the orphan-school at Halle, and was entered at the university of Leipzig in 1733, where, being destined by his relations to the theological profession, he spent five years chiefly in the study of the rabbinical writings and Arabic. He was soon induced to renounce the first of these pursuits, but he became extremely devoted to the second; and his passion for Arabic books was so strong that he almost deprived himself of the common necessaries of life in order to purchase them. The learned Wolf of Hamburg having, in 1736, sent him the 'Narrations' of Hariri, he copied it with great eagerness, and in the following year printed at Leipzig the twenty-sixth 'Consessus' with Arabic scholia and a Latin version. The success of this essay caused him to take the resolution, contrary to the advice of his friends, of going to Holland for improvement in the Arabic language. He ransacked all the Oriental treasures of the library at Leyden, whilst for his subsistence he was obliged to become a corrector of the press. He passed his time in a state of indigence and discountenance that brought upon him hypochondriac affections, the effects of which never left him. During his stay at Leyden, he made use of the advantages the place afforded for the study of medicine, and on his return to Leipzig he was presented with a gratuitous degree of doctor of physic; but his manners and habits were altogether unsuited for the obtaining of professional practice. Poverty was his perpetual companion, and his scanty resources were derived from correcting the press, translating, and performing other tasks for booksellers. His condition soured his temper, and he made many enemies by the severity of his censures. In the mean time, many valuable works in Oriental and Greek literature were occasionally proceeding from his pen, which made him well known to the learned world, and he was at length nominated rector of the college of St. Nicholas in Leipzig. Thus placed in happier circumstances as to fortune, he pursued his literary labours more according to his inclination, and fulfilled the duties of his office with exemplary diligence. At the age of forty-eight he married Ernestine Christine Müller, a young woman of twenty-nine, who was afterwards of great use to him in his editorial employments. He died on the 14th of August, 1774, at the age of 58.

The following is a list of some of the most valuable of his works, beginning with those on Oriental subjects:—1, 'Miscellaneæ aliquot Observationes Medicæ ex Arabum Monimentis,' 4to., Lugd. Bat., 1746, a little work of much importance to all who take an interest in the Arabic physicians, which was republished after Reiske's death by Christ. God. Grüner, 8vo., Halæ, 1776; 2, 'Abilfedæ Opus Geographicum.' This translation of the Geography of Abulfeda is to be found in Büsching's 'Magazin für die neue Historie und Geographie,' vols. iv. and v., Lips. 1770. 8vo. Unfortunately Reiske did not possess sufficient mathematical knowledge to understand the systematic part of such a work. The whole of it has lately been published at Paris in Arabic, 4to., 1840, by MM. Reinaud and le Baron MacGuckin de Slane, and a French translation with notes and illustrations by M. Reinaud will shortly appear. 3, 'Proben der Arabischen Dichtkunst in verliebten und traurigen Gedichten, aus dem Motanabbi, Arabisch und Deutsch, nebst Anmerkungen,' Leipzig, 1765, 4to. This contains only a part of the poems of Motanabbi, the whole of which he had copied out during his residence at Leyden, and wished to publish. A German translation of the whole of his poems is among his unpublished manuscripts. 4, 'Abilfedæ Annales Moslemici,' Leipzig, 1754. 4to. This volume contains the translation of the Annals of Abulfeda [ABULFEDA], from the birth of Mohammed to A.H. 406 (A.D. 1015-6): it is scarcely two-fifths of that part of Abulfeda's work which treats of the history of the Mohammedans. Reiske did not translate the first part of this work, which has for its object the history of the time anterior to Mohammed. In his preface Reiske has mentioned all he has written upon Abulfeda, and the motives which induced him to publish successively and in parts his translation, notes, historical commentary, and the different indexes which were to facilitate the use of the work. He justly experienced great regret at not being able to publish the text, as he had hoped to do; and the sale of this volume was so much below what he had hoped, that he gave up all idea of printing the rest of the translation. Happily the public in the present day, through the generosity of M. de Suhm, are in possession of the Arabic text of this important work, which alone would have sufficed to assure to Reiske the gratitude of the learned world. It has been printed under the direction of M. Adler, under the title, 'Abulfedæ Annales Muslemici,' Arab et Lat., Hafniæ (*Copenhagen*), 5 vols. 4to., 1789-1794. The translation of Reiske often degenerates into a paraphrase, which does not prevent persons who are ignorant of the language of the original from making use of it with confidence; the historical notes which are joined to it add greatly to its value, and it is only to be regretted that M. Adler has not given a table of all the proper names that these annals contain. His other works consist of editions of various classical authors, as 'Constantinus Porphyrogennetus,' Gr. et Lat., fol., Lips., 1751, 1754; 'Ciceronis Tusculanæ Quæstiones,' 12mo., Lips., 1759; 'Theocritus,' Gr. et Lat., 4to., 2 vols., Lips., 1766; 'Oratores Græci,' Gr. et Lat., 8vo., 12 vols., Lips., 1770-75; 'Plutarchi Opera Omnia,' Gr. et Lat., 8vo., Lips., 1774-82, 12 vols., of which only the first appeared during his life; 'Maximus Tyrius,' Gr. et Lat., 8vo., 2 vols., Lips., 1774; 'Dionysius Halicarnassensis,' Gr. et Lat., 8vo., Lips., 1774-77, 6 vols., of which the four last were published after his death. Some of these latter works, as well as several translations, were hastily executed in order to gain a livelihood, and most of them have been superseded by more recent and accurate editions. A complete list both of his published works and his manuscripts is given by Reiske's wife, in her continuation of his memoirs, which were published at Leipzig, 1783, 8vo., under the title, 'J. J. Reiskens von ihm selbst aufgesetzte Lebensbeschreibung,' pp. 816. His knowledge of Greek was considerable, and he is universally allowed to have been one of the best Arabic scholars that ever lived; in both these languages however he is much too bold and hasty a critic to be implicitly trusted, and his alterations and conjectures are frequently unnecessary and absurd.

REISKE, ERNESTINE CHRISTINE, whose maiden name was Müller, the wife of the preceding, and a woman of great literary accomplishments: she was born on the 2nd of April, 1735, at Kumberg, a small town near Wittemberg in Prussian Saxony. In 1755 she became acquainted with Reiske at Leipzig, where she was paying a visit. Her beauty, modesty, goodness of heart, and fondness for literature, immediately attracted his notice; and notwithstanding that he was twenty years her senior, they conceived a mutual love and esteem for each other; owing however to the war which raged all over Saxony, they were not married till 1764. This union, which contributed so much to Reiske's happiness during the rest of his life, was also of service to the cause of literature, and Christine Reiske deservedly occupies a distinguished place in the list of learned women. In order to help her husband by dividing with him his literary labours, she acquired under his instructions such a knowledge of Latin and Greek that she was soon able to understand the writers in those languages. From this time she was of the greatest assistance to him: she copied and collated manuscripts for him, arranged the various readings that he had collected, and read and corrected the proof sheets of his works. Her attachment for him and her respect for his memory are strongly shown in the supplement to his Autobiography, which she completed, from the first of January, 1770, to the time of his death in 1774. The gratitude of Reiske, and the ardour of his affection for one who lived only for him, are not less strongly expressed both in the autobiography just mentioned and in the prefaces to some of his works. On the occasion of his publishing his Demosthenes, we have the following interesting note by his wife in his Memoirs:—'When the work went to press, only twenty thalers of the subscription money had come in. The good man was quite struck down with this, and seemed to have thrown away all hope. His grief went to my soul, and I comforted him as well as I could, and persuaded him to sell my jewels, which he at length came into, after I had convinced him that a few shining stones were not necessary to my happiness.' After her husband's death she published several works that he had left unfinished; viz., the three last volumes of the 'Oratores Græci,' 8vo., Lips., 1775; 'Libanii Sophistæ Orationes et Declamationes,' Altemb., 1783-87, 8vo., 4 vols., Græce; 'Dionis Chrysostomi Orationes,' Græce, 8vo., 2 vols., Lips., 1784. She also published two works herself, one at Mitau, 2 vols. 8vo., 1778, 1779, with the title of 'Hellas;' and another entitled 'Zur Moral: aus dem Griechischen ubersetzt von E. C. Reiske,' pp. 364, 8vo., 1782, Dessau and Leipzig, containing several moral works, translated by her from the Greek into German. Concerning this last work see the 'Bibliotheca Critica,' by Wyttenbach, part viii., page 142, Amstel. 1783. She also gave to M. Boden, for his edition of the Greek romance of Achilles Tatius (Leipzig, 1776, 8vo.), the various readings of a manuscript collated by herself. After her husband's death she lived successively at Leipzig, Dresden, and Brunswick, and died at her native town, Kumberg, of apoplexy, at the age of sixty-three, on the 27th of July, 1798.

REJOINDER. [Pleading.]

RELAND, ADRIAN, an eminent Orientalist and scholar, was born at Ryp, a village in North Holland, July 17, 1676. His father was a minister of that village, but afterwards removed to Amsterdam, where Reland was educated. He made such progress in learning, that at eleven years of age he had passed through the usual classical course. The next three years he spent in making himself acquainted with the Hebrew, Syriac, Chaldee, and Arabic languages, under the tuition of Surenhusius. At fourteen he was sent to Utrecht, where he studied under Grævius and Leusden; and, three years after, was admitted to the degree of doctor in philosophy, on which occasion he sustained a thesis, 'De Libertate Philosophandi.' At seventeen he entered upon a course of divinity, under the direction of Herman Witsius and others; but he did not abandon the Oriental languages, which were always his favourite studies. After a residence of six years at Utrecht, he removed to Leyden, and soon after the earl of Portland chose him as preceptor to his son. In 1699 he was elected professor of philosophy at Harderwick, but did not continue long in that situation; for the university of Utrecht, on the recommendation of King William, offered him the professorship of Oriental languages and ecclesiastical history, which he readily accepted, and filled with high reputation during the remainder of his life. In 1713 a Society for the Advancement of Christian Knowledge being established in England, Reland became a member of it, as well as of that for the Propagation of the Gospel in Foreign Parts, instituted the year after. He died of the small-pox at Utrecht, Feb. 5, 1718, in the forty-second year of his age. He wrote and published a great number of works on sacred and Oriental learning, the chief of which are the following:—'De Religione Mohammedica Libri Duo,' Utrecht, 1705, 12mo., a second edition of which, with many additions, was published at the same place, 1717, 12mo.; 'Dissertationum Miscellanearum Partes Tres,' 1706, 1707, 1708, 12mo. These three parts, which are not always found together, comprise thirteen dissertations upon various subjects, more or less connected with Eastern history and antiquities, with the exception only of one, treating of the languages of America. 'Analecta Rabbinica,' ib. 1702, 8vo.; 'Antiquitates Sacræ Veterum Hebræorum,' 1708, 12mo.; 'Dissertationes quinque de Nummis Veterum Hebræorum,' &c.; 'De Spoliis Templi Hyerosolymitani in arcu Titiano Romæ conspicuis,' 1716, 12mo.; 'Oratio pro Lingua Persica,' ib., 1701, 4to.; and a dissertation on the Marbles of Puteoli, ib., 1709, 12mo. But his greatest work, and that in which his learning of the Eastern languages shines most conspicuous, is 'Palæstina ex Monumentis Veteribus illustrata et Chartis Geographicis accuratioribus illustrata,' which appeared first at Utrecht, 1714, 2 vols. 4to., and was reprinted at Nürnberg, 1716, 4to. Besides the above works, Reland wrote many others, as the 'Dissertatio de Philippi Imperatoris Patris et Filii credito temere Christianismo,' a funeral oration to the memory of Mary, wife of William III. of England, a dissertation on the progress of philosophy at the beginning of the eighteenth century, &c.

RELATION (Mathematics). What we here mean by this word would have been explained in the article Equation, if we had confined ourselves to the explanation of arithmetical algebra; but having in the articles Negative, &c. Quantities, and Operation, endeavoured to give higher views, we are induced to insert the present article by remembering that the difficulties of such a subject are of very different kinds to different persons, insomuch that any point of view may be usefully taken with reference to some minds, and any detail upon a fundamental notion may remove misapprehension in one quarter or another. There are some who ought to find great part of the present article an unnecessary appendage to the former two, and others who may perhaps find in it nothing but necessary explanation.

All reasoning is the discovery of relations which are not evident from those which are; or rather, since the proposed result is sometimes evident in itself, reasoning is the establishment of one relation as a necessary consequence of others. The term relation would be difficult to define in a manner satisfactory to all; it is enough for our present purpose to say a relation exists between any two objects, whether of sense or intellect, whenever they have anything in common; that is to say, the common point, whatever it may be, may be made the means of referring one to the other, or bringing our thoughts from one to the other, so as to think of both at the same time, and to compare the two. All the manifold senses of the word may be derived from this one the relationship of blood implies a common ancestry; the relationship of office, common duties. In mathematics the relation of greater, equal, or less, implies that one of the magnitudes is the same as to quantity with part or all of the other, and so on. Sameness in every respect would constitute identity; sameness in one or more respects, relation. The triangles in Euclid, i. 4, are by hypothesis related in a given manner in three particulars: a change of place shows that they can be made identical; that is, their difference before the change of place was difference of position only, not at all of form; in all that can distinguish one triangle from another, except its position in space, they are identical. We do not quarrel with the phrase that they are the same triangles differently placed, because sameness is understood with a reservation, and the preceding means that they are the same except in difference of place.

Words of identity are sometimes incautiously used to signify relations only, or words of more relation to signify less of relation: thus Euclid, who defines equality to consist in capability of coincidence, that is, in perfect sameness of form with difference of place, uses the word equal freely to signify nothing but equality of area, here meaning by equal equiareal. But we hold it to be exactly the same error to make a correction by introducing another general term in a limited sense; those for instance who have proposed *equivalent* instead of equiareal, have attempted to make a word which might stand for any relation of equality be confined to one of its particular meanings. In algebra there is a great want of terms, as well as of signs, significative of relation; we have in fact only one sign, =, and one phrase for it, *is equal to*. Hence proceeds either want of distinction between different relations, or the want of distinctness which arises out of such a generalization of the sign as will bring all its meanings under one.

In an algebraical expression we may have to consider its meaning, form, magnitude, source, mode of derivation, and properties. The meaning depends upon the fundamental definitions which are employed and the form; the form, upon the arrangement of the symbols; the magnitude, when magnitude is signified, upon the form and the particular values given to the symbols; so that these various sources of relation are closely connected with one another. The fundamental meaning of the sign = implies equality of quantity or magnitude, and some insist that it shall always retain this meaning. There can be no objection to any one insisting on this point for himself; but the learner, who, if he be wise, will learn all languages with the majority, even though he should afterwards teach with the minority, must make himself accustomed to various uses of this sign, as follows:—

1. The sign = means that on one side we have an operation to be performed, and on the other side the result of performing that operation by general rules, as in

$$(x+a)(x-a)=x^2-a^2 \qquad a^7 \div a^7 = a^0.$$

Whenever the resulting form is intelligible both in form and magnitude, the resulting relation is equality of magnitude under difference of form, independently of the particular values of the symbols; but when the result is unintelligible, as is the second of the preceding results when first obtained, this relation no longer exists: the process described in Interpretation makes it exist. In all such cases the relation is that of sameness of value and properties, sameness in fact of everything but form; and the relation is independent of the magnitude of the algebraical symbols.

But did no relation exist in $a^7 \div a^7 = a^0$, until we had interpreted the then unknown symbol a^0 to mean unity? We answer, that a relation did exist, namely, sameness of properties. The value of the first side is unity: the unknown symbol of the second side would be found on trial to have all the properties of the unit, when common algebraical rules are applied. If we were to refuse the interpretation, and consider a^0 as a self-contradictory symbol, we could not deprive it of the properties of a unit, or rather, we could not deprive ourselves of the knowledge that the algebraical use of it would produce the same results as the algebraical use of a unit.

To the same head may be referred the meaning of =, as connecting an infinite series with its finite source of development (or its involopment). Arithmetical equality may not exist, for the series may be divergent; but between the development and its involopment exists the relation of sameness of properties, and the relation of sameness of source. The infinite series $1-1+1-1+$, &c. is equated to half a unit; that is, the sign = is put between $\frac{1}{2}$ and $1-1+1-1+$, &c. *ad inf.* The relation of sameness of magnitude has no existence, for $1-1+1-$, &c., *ad infinitum*, furnishes no definite idea of magnitude; but in properties, the two are the same. This subject will be considered more in detail in SERIES.

2. The sign = means the relation of sameness of magnitude, without reference to form, and in this sense its use generally imposes conditions on one or more of the symbols employed, and always does so unless when the sign might also truly have the meaning described under the first head. Thus $2x+3=x+4+x-1$ imposes no condition on the value of x, because the first side is only a more simple performance of the operations indicated on the second side; but $2x+3=21-x$ is the assertion of a relation existing which is not true of the forms, and is not generally true as to the magnitudes. The condition $x=6$ is necessary to the truth of the relation asserted to exist. Relations of this sort, under the name of equations, are the first which meet the student at his entrance into algebra, and he frequently has a subsequent difficulty in extending the use of the symbol =. Being accustomed to see it impose conditions of magnitude, he cannot easily cease to imagine that it always does so; and he looks upon the two equations

$$\varepsilon^x = 1 + x + \frac{x^2}{2} + \text{\&c.}, \qquad \text{and} \quad x+1=2,$$

as things of the same kind, differing only in complexity. To prevent this, the distinction between *identical* equations (so called), namely, assertions of the relation described under the first head, and equations *of condition*, should be strongly marked at the outset of his course. It would even be wise to use somewhat different symbols for the two relations; thus ═══ might denote the first described relation, and = the second. The learner might drop the slight distinction which exists between the two symbols when he finds himself able to do without it; but we are satisfied that those who had once learned to use it would never think the time was come when they might safely drop it.

3. The sign = means the relation of algebraical identity between the results of different operations, when the symbols are not symbols of magnitude, but of OPERATION: that is, it asserts the relation of sameness of effect between the two operations which are written on one side and the other of it. And here it is in truth used in the first sense described, the difference being in the meaning of the symbols, not in that of the relation. And here again there is the distinction between the case in which the relation is explicable from definitions, and that in which it requires interpretation. Thus in the relation $(1+\Delta)^2=1+2\Delta+\Delta^2$, we can prove and verify that the operation $1+\Delta$ is of that sort which if performed twice following, will yield the same result as the sum of the results of the operations 1, 2Δ, and Δ^2. But when, having established, as in the article cited, a right to the use of all the ordinary transformations of algebra, we come to $1+\Delta=E^D$ and $D=\log(1+\Delta)$, we have results of which the first side only is explicable, and the second requires interpretation. It might be satisfactory to consider such symbols as $\log(1+\Delta)$, &c. in no other light than as abbreviations of the series into which they might be developed in common algebra; but as such a use of interpretation seems to a beginner to be more arbitrary than it really is, we may point out how to make the passage in a somewhat more guarded manner, presuming the reader to be perfectly well acquainted with the results of the article OPERATION.

If A, B, &c. stand for symbols of operation, then $A \pm B$, AB, $A \div B$, are compound results of operation, which are capable of and actually receive a distinct definition. Similarly A^n is also deducible in meaning from the definition when n is any number, whole or fractional, positive or negative; but A^B, where B is also a symbol of operation, cannot be immediately explained from definition. But it is to be remembered that an algebraic quantity may be susceptible of different definitions, though really amounting to the same definition. Sometimes nothing more than a mere change of the form of words will render a notion capable of being rationally extended further than it could have been before the change was made. For instance, in FRACTIONS, we understand the division of 7 into 3 equal parts, and into 4 equal parts; but a division into $3\frac{1}{2}$ equal parts is a set of words without meaning. But if we only speak of taking parts of which three make 7, and other parts of which four make 7, it is perfectly easy to imagine parts such that three parts and half a part make 7. Can we not then take such a method of defining A^B as, without in any way altering its common meaning, shall present that common meaning in a form which will be intelligible when A and B are symbols of operation.

In BINOMIAL THEOREM it is proved that the equation $\phi x \times \phi z = \phi(x+z)$ can only be satisfied for all values of x and z, by $\phi x = C^x$ where C is independent of x.

If then we propose the equation—

$$\phi x \times \phi z = \phi(x+z) \quad , \quad \ldots\ldots (1)$$

the only solution of both must be C^x. It is easy enough to show that—

$$C^x . C^z = C^{x+z},$$

the proof referred to shows that C^x is the *only* solution of this equation. If z and x be symbols of operation, and if by ϕx we mean a combination of operations performed with x, and by $\phi x . \phi z$ the result of successively performing the operations ϕz and ϕx, we may denote by y^x an operation which is such, that calling it ϕx, the successive performance of ϕx and ϕz is equivalent to that of $\phi(x+z)$; and that, calling it ψy, the successive performance of ψy and ψz is equivalent to that of $\psi(yz)$. If we want to define the particular operation A^x, we must add to the equation (1) the following—

$$\phi(1) = A.$$

Thus, let it be the definition of ε^D, D being a symbol of operation, that we have here an operation such that if it and $\varepsilon^{D_,}$ were successively performed, the result would be the same as if $\varepsilon^{D+D_,}$ were performed at once; this last symbol implying that the operation $D+D_,$ is used in the same way as D in the first. Moreover, let it be understood that if D were 1, that is, if the operation D produced no alteration in the function operated on, the result of ε^D would be simple multiplication by ε. There is nothing in this definition which is unintelligible, though there is something unknown. An operation is defined by means of itself; the definition must then be developed before its object can be understood, but it is not the less a definition, that is, a description or some one operation, and a distinction between it and every other. Thus, in common algebra, the magnitude of x may be defined by an equation, say $x = 12 - x$. Here x is only given in terms of its unknown self, but it is not the less defined to be 6, and nothing but 6. When the step above described has been made, it is (owing to the demonstrated connection of the rules of common algebra with those of the calculus of operations), the same process to prove that

$$\varepsilon^D = 1 + D + \frac{D^2}{1.2} + \cdots$$

when D signifies an operation, as when it signifies a quantity.

The definition of log D is that this operation is the inverse of ε^D with respect to D; so that $\log \varepsilon^D$ means D. Those functions which in common algebra are trigonometrical [SINE] cannot be defined in the subject of which we are speaking, otherwise than by reference to the well-known exponential forms. Thus, D denoting an operation—

$$\text{Cos D means } \frac{1}{2}\left\{ \varepsilon^{D\sqrt{(-1)}} + \varepsilon^{-D\sqrt{(-1)}} \right\}$$

$$\text{Sin D means } \frac{1}{2\sqrt{(-1)}}\left\{ \varepsilon^{D\sqrt{(-1)}} - \varepsilon^{-D\sqrt{(-1)}} \right\}$$

It might perhaps be said that though we have constantly used the word relation, yet we have considered nothing but identity, that is, either identity of magnitude, form, process, or properties; but that the term in common life refers to something short of complete identity, frequently meaning mere connection, and sometimes only analogy, or even nothing more than resemblance. We answer, that relation always refers to identity of some sort. For example, there is a relation between the position of the sun and moon and the state of the ocean. Here the word means merely a connection; but this connection involves an absolute identity: having given the position of those heavenly bodies with respect to any place, together with the direction and quantity of their motions, the height of the water at that place is connected with the quantities which express those positions and motions by an equation or a mathematical identity. Resemblance again means identity in some respect, or near approach to identity: analogy, a term generally applied to relations of similarity, will be found to admit of the word sameness being used instead of similarity. Thus, when we say that substance is formed from *substare* in a manner similar to that in which distance is formed from *distare*, the analogy asserted is one of absolute identity (of mode of derivation).

Reasoning by analogy is either the same thing as common reasoning; or else analogy is but another word for induction. If A give B, and C have something in common with A, it may be a necessary consequence that C gives D; D being connected with C in the same manner as B with A. But this happens only when the following of B from A is a necessary consequence of that which A and C have in common, and of that only: in which case the deduction of D from C by analogy with the deduction of B from A, is only an assertion of the possibility of applying the same mode of proof to that part or property of C which was previously applied to the same part or property of A. But when we conclude by analogy of a horned animal that it is not carnivorous, as it is said; that is, when we conclude that the horned animal of which we speak will resemble all other horned animals which we know, in every point in which they resemble each other, we apply no other process than the establishment of a highly probable result by induction.

Reasoning by pure analogy is then not absolutely demonstrative reasoning, except in the case above described, in which we want no new name for the process. But attention to analogy in the structure of definitions, and in the route of investigation, is necessary to the success of many inquiries, and gives clearness and saves time in all. Indeed it may be taken as a maxim that whenever there is any species of resemblance pervading the results of two branches of inquiry, there ought to be a reason for that resemblance in the nature of the two subjects, expressed by a resemblance of the notations used; and this reason ought to be made prominent and insisted on.

For instance, we have two distinct *algebras* [NEGATIVE, &c. QUANTITIES], which, for temporary distinction, we may call arithmetical and geometrical, using the same symbols in the same manner, but proceeding upon meanings given to those symbols which appear altogether different. The only reason given to the student in the article cited, to justify the definitions of the latter, or geometrical algebra, was that they would be found to answer a certain purpose, namely, to make all theorems in the earlier algebra true, when no other alteration was made than that of the meanings of the symbols. It is now to be asked, why have the new definitions that property? what relation have they to the old ones which gives the results of the two a perfect community of form? The answer to this question is not very difficult; but it will require us first to consider what are the operations of common arithmetic, and how they are to be described in terms of the simplest notions of the science.

The fundamental operations of arithmetic are addition, subtraction, multiplication, and division. Of these we may make the definitions of subtraction and division follow from those of addition and multiplication: thus subtraction is the process which destroys the effect of addition, and division that which destroys the effect of multiplication. It may be said however that we can resolve all operations into one only, and its inverse: the direct operation being the simple repetition of a unit; and its inverse, the ascertainment of the quantity which will by simple repetitions make a unit. Since however the analogies with which we have here to do are not in any way connected with the distinction of whole numbers and fractions, we will confine ourselves to whole numbers, and, choosing a unit, make repetitions of that unit the sole objects of consideration.

The fundamental ideas of arithmetic are, first, that absence of all magnitude which must precede the consideration of any particular number; secondly, the particular magnitude which we choose for repetition, and to which we refer other magnitudes. Nothing and unity are the names of these ideas; and 0 and 1 are their well known symbols. The first, 0, reminds him who uses it, of the state in which he is antecedently to thinking of any number; the second, 1, of the successive accessions by which he passes from one object of consideration to another. If 0 do not present itself before we can think of any number, it is that we avoid it by an act of memory; but if, for instance, a person had forgotten what seven was, as a young child might do in learning arithmetic, he would be obliged, beginning from 0, to construct 7 by repeated accessions of a unit each time.

Now addition of one number to another is a process which merely puts a number in the place of *nothing*, and proceeds to count from that number in the same manner as when we form the number to be added from 0. Thus, to add b to a we do with a what we should have done with 0 to form b: to add 4 to 3, we do with 3 what we should have done with 0 to form 4. If this last operation were performed on the fingers, we should first complete three, and then count the fingers which make four from and after the completion of the three; thus—

$$4=0+1+1+1+1$$
$$3+4=3+1+1+1+1$$

This definition of addition, namely, that '$a+b$ is a direction to do that with a, which would give b if a were nothing,' will now be put by for a moment, until we are ready to apply it in the construction of the new algebra.

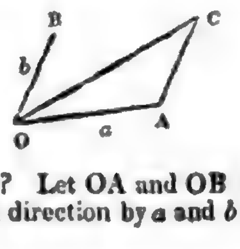
Multiplication of one number by another is a process which puts a number in the place of *unity*, and proceeds to use that number in the same manner as we use unity when we make another number. Thus, to multiply a by b, we do with a what we should have done with unity to make b; to multiply 3 by 4, we do with 3 what we should have done with unity to make 4. Thus,

$$4=1+1+1+1,$$
$$3\times 4=3+3+3+3.$$

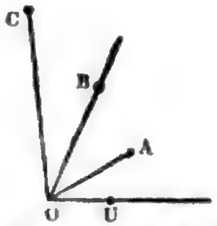
The definitions of subtraction and division are then obtained, as before described, by the supposition of inverse operations, or operations destructive of the effects of addition and multiplication.

In consequence of the preceding considerations, we shall pass from the limited to the more extended algebra without anything of any arbitrary character, except only the choice of a meaning for the fundamental symbols. In arithmetic, the symbols a, b, c, &c. mean simply numbers; let their meaning in the geometrical algebra be not numbers but lengths, or if numbers, let them be numbers of lengths, a given length being taken as the unit. And let each symbol be expressive not only of a length, but of a length in some particular direction; by which we mean, that two lines are not to be denoted by the same symbol, unless they have not only the same lengths but the same directions. Imagine all lines to be drawn from a given point; then $a=b$ denotes coincidence of the lines a and b; that is, sameness of length and sameness of direction.

This one fundamental change in the meaning of the things signified by letters is now all that need be made; for all the rest is absolutely the same as in arithmetic. For example, what is $a+b$? Let OA and OB be the lines represented in length and direction by a and b; having completed



OA, that is, having passed from O to A through the proper length and in the proper direction, do that which would have given OB if OA had been nothing, or if A had been at O; that is, draw AC equal and parallel to OB, and in the same direction. The point C thus attained terminates a line OC, the length and direction of which is therefore to be denoted by $a+b$, since every process is to resemble that of arithmetic in everything but the meaning of the objects of calculation.



Again, required the meaning of *ba*? We must now choose a length and direction which is to be represented by 1; let this be OU. We are now to do with OA or *a* what we should have done with OU to make OB. Suppose for simplicity that OB is double of OU. To turn OU into OB, we must double its length, and let it revolve through a certain angle UOB. Do this with OA; that is, double its length, and make it, thus doubled, revolve to the position OC, so that the angles UOB and AOC are equal. Then OC must be that which is represented by *ba*; and the angle UOC is the sum of the angles UOB and UOA.

If we examine the fundamental definitions of the geometrically defined system of algebra [Negative, &c. Quantities, p. 133], we shall find that we have here described enough to deduce them all, and that we have done it by pure analogy. But also remark that analogy here means nothing but an identity of process; we have described the processes of addition and multiplication in terms which connect them so closely with the objects to which they are applied, and at the same time made the process so distinct from the subject-matters of the process, that when we change the subject-matter, we can still preserve the process. If then any other subject-matter could be found, such that, with reference to meanings of *a* and *b* derived from it, $a+b$ and ab could be consistently defined, or rather deduced, from 0 and 1, a new application of the rules of algebra would follow.

In the calculus of operations, the same steps might be made; and when this branch of algebra consisted of nothing but the separation of the symbols of operation and quantity in an arbitrary manner [Operation, pp. 442, 443], analogy was the species of relation by which the deduction of results from this separation was connected with the results of common algebra. But this analogy was only the guide to the results, and not the proof of them: it became a proof when it was shown that the validity of the common algebra itself depended, not upon the whole meaning of the symbols, but upon that part of it which was preserved in the meanings of the symbols of operation.

RELATION, RELATIONAL. [Notion, Notional.]

RELATIVE MAGNITUDE. [Ratio.]

RELATIVE MOTION. [Motion.]

RELATIVE PRONOUN. The relative pronoun is so called because it relates to some object mentioned just before, which object is usually termed the antecedent. The English language possesses two words for the relative pronoun, *who* or *which*, and *that*. The word *what* must also be regarded as a relative, for it evidently contains the same root as *who* and *which*; it is generally used in the sense of *that which*, as 'Let them say *what* they will.' The terms *who*, *which*, and *what* are also used as interrogatives, and contain the same root as the Sanskrit *ka-s*, the Greek ὅ-ς, the Latin *qui*, the Gothic *hver*, &c. The term *that* is evidently the same word as the demonstrative pronoun. In the same way we find that the Greek article, which was originally a demonstrative pronoun, is also used as a relative; and the German language likewise possesses two forms for the relative, *welcher* and *der*, the latter of which is also a demonstrative, and is the same word as the English *that*. According to Bopp (*Vergleichende Grammatik*, p. 553), the relative in Zend is also used as a demonstrative.

In English the relative is not unfrequently omitted. Thus most persons would say, 'The first school I was at,' and not 'The first school which I was at.' This omission is condemned by some grammarians, but is authorised by the usage of our best writers. The omission however seems only admissible in familiar speaking and writing, and is a great defect in any composition of a serious or elevated character.

RELATOR. [Information.]

RELEASE. 'Releases are in divers manners, viz.: releases of all the right which a man hath in lands or tenements; and releases of actions personals and reals, and other things.' (Litt. § 444.)

The former kind of release may be considered as a species of conveyance, and the instrument of release must be a deed. The operative words of release are *remise*, *release*, *renounce*, and for ever *quit claim* (an abbreviation or corruption of *quietum clamasse*). According to Littleton (§ 508) a release to a man of all demands is the best release that can be made, 'and shall enure most to his advantage;' but Coke remarks that 'claims' is a word of still more extensive import. The parties to a release are the releasor and releasee: the releasor is he who quits or renounces that which he has; the releasee is he who acquires what the other gives up, but he cannot acquire anything by the release, unless he has some estate in or right to the thing which is the object of the release.

Releases are either of an estate in land or of a right to land; or they are releases of things personal. Releases of estates in or rights to land require to be considered separately.

In order that a Release of an estate in land may have its intended effect, there must be privity of estate between the releasor and releasee; that is, the estates of the releasor and releasee must have been acquired by the same conveyance or title, or the one estate must have been derived immediately out of the other. There must be this privity whenever the Release of an estate operates either by way of enlarging the estate of the releasee, or by way of passing to him the estate of the releasor.

It is not in all cases necessary that the person to whom the release is made should be in the actual possession of the land or that he should have the estate immediately preceding that of the releasor. If land be given by C, who is tenant in fee-simple, to A for years, remainder to B for life, C may release his reversion either to A or to B: in the former case A will acquire the reversion expectant on B's life estate; and in the latter case B's remainder will merge in the reversion, which will become an estate in possession on the determination of A's estate. This is commonly called a release which enlarges an estate; but in the case supposed, if the release is made to A, his estate is not thereby enlarged, and the effect is just the same as if C made him a grant of the reversion. The rule of law is undoubtedly true that 'whenever a release doth enure by way of enlarging an estate, there must be privitie of estate, as between lessor and lessee, donor and donee' (Co. Litt., 273, a); but there must also be privity, as in the case supposed, when no enlargement of the estate is made by the release. If C, tenant in fee simple, had originally granted the estate to B for life, and B had made a lease for years to A, a release of the reversion in fee from C to A would have no effect as a release, because there is no privity of estate, as above defined, between A and C. Such a release may however operate as a grant of the reversion, if there are sufficient words for that purpose. When lands are in possession of a lessee at will, for years, or for life, or of an assignee of such lessee, the lessor may release either to the lessee himself, or to his assignee. But a release by the original lessor to an under-lessee, as above stated, will not operate as a release. A copyhold tenant is, strictly, tenant at will to the lord who is the owner of the freehold, and therefore the lord may enfranchise the copyhold by release; but it is more usual to do it by lease and release, by way of greater caution.

In order that the release may operate to the enlargement of the estate of the releasee, it must contain proper words. Therefore if he who has the fee in reversion or remainder intends to release his estate to a tenant for years or for life, he must release to such tenant and his heirs. If he simply release to the tenant for life, the releasee will have no greater estate than he had before; and if he simply release to the tenant for years, the tenant acquires the estate only for life. (Litt., 468.)

If a lease is made, at common law, of lands in possession, the lessee has no estate till he enters, and therefore can accept no release from the lessor; but a release from the lessor to the lessee before entry of all his right in the land, extinguishes the rent. In the common conveyance by lease and release, it is usual to give the intended releasee an estate in the land for a year by bargain and sale, which by the statute of uses becomes a vested estate, and the bargainee is therefore qualified to take a release without actual entry, which would be necessary in the case of lands in possession, if the lease were made at common law, though not requisite in the case of a lease of lands in reversion.

A release may operate by passing the releasor's estate to the releasee, without enlarging the estate which the releasee already has; and this takes place in the case of joint tenants and coparceners. Joint tenants of an estate have one undivided title, and they can only convey their estates to one another by release. Coparceners have only one title, for they all make one heir, but they also transmit to their heirs separate estates. Accordingly coparceners can either release to each other or convey their estates by feoffment. In these cases it is not necessary to use any words of limitation in the release, for as the joint tenants and coparceners have all one title to their estate, whatever it may be, a release from one to another passes all the estate of the former to the latter, without any words of inheritance.

If there are three joint-tenants, and one of them releases his estate to another of them, such other becomes joint-tenant of two-thirds of the land with the remaining tenant, and he holds the released one-third as tenant in common with his remaining companion. If a lease be made to two persons, one may release to the other before entry; for there is privity of estate between them, and the release does not operate by enlargement, but by extinguishment of a right.

A man may release all his right in or to lands, and such release will comprehend all his rights at the time, but not future rights. An expectant heir cannot release the right which he may have to his ancestor's estate. A right, in order to be capable of being released, must therefore be an existing right and not a possibility. Sometimes however a release, though it cannot operate as such, may operate as an estoppel. In a particular case (Bensley *v.* Burdon, 2 S. and S., 519) a son was estopped under a release made by him in his father's lifetime, by the allegation of a particular fact, which was held to conclude the son who made it.

A right may be released to any person who has an estate in the land, either in possession, reversion, or remainder; but if the right be to an estate of freehold, it can only be released to a person who has an estate of freehold. Such a release will be for the benefit of all persons who are entitled to the land by the same means as the releasee.

There is also Release by act or operation of law, as it is termed; that is, from certain acts or events, which are not a direct release, the legal conclusion of a release follows. Instances of this kind of release often occurred in former times when disseisins were common, and the following is given as an example: If a disseisee disseise the heir of the disseisor, and make a feoffment, this amounts to a release of the right. (Co. Litt., 264, b.)

A Release, not considered as an instrument of conveyance, is the giving up or discharging of a right of action or suit which one man has against another. This release may be either by act of law or by deed.

If a creditor makes his debtor his executor or one of his executors, the debt is legally extinguished as soon as the creditor dies, though there can be no legal evidence of this extinguishment until the executor has obtained probate of the will. The ground of this legal conclusion is, the union of creditor and debtor in the person of the executor, who would be a necessary party to an action at law against himself. But in equity so far is the debtor from being released, that the debtor executor is considered to have received the debt, and to have it as assets in his hands. Accordingly in a suit in equity against him, he may be ordered to pay the amount of the debt into court, upon admitting it in his answer. If a debtor appoint his creditor his executor, the creditor executor, both at law and in equity, may retain his debt out of the assets which come to his hands, provided he does not thereby prejudice creditors of a superior degree. If a woman marries her debtor or creditor, the extinguishment of the debt is a necessary consequence.

In a Release of this kind also the proper words are *remise*, *release*, and *quit-claim*, but any words are sufficient for the purpose which clearly express the intention of the parties to the deed. If a man covenants with another that he will never sue him, this is legally construed to be equivalent to a release, because the same end would be ultimately effected by virtue of this covenant, as if there were an absolute release. But there are cases in which a perpetual covenant not to sue one debtor will not discharge a co-debtor. (Hutton *v.* Eyre, 6 Taunt., 289.) A covenant not to sue for a limited time cannot of course have the effect of a release.

All persons may release, who are not under some legal disability, such as infancy. A husband may release a debt due to his wife, because he is the person entitled to receive it; but his release of a debt due to the wife extends only to such debts as are demands at the time of the release. A partner, or other co-dettee, may also release a debt due to him and his co-partners. An executor may, at law, release a debt due to him and his co-executors as such; and one of several administrators has the same power: but such releases are ineffectual in equity, unless they are made in the due discharge of the executor's duty. Though one of several co-plaintiffs may release a cause of action, a court of law will set aside the release, if it is a fraudulent transaction.

A release may be set aside in equity on the ground of fraud, a term which will include every act of commission or omission that renders the transaction unfair, such as misrepresentation or suppression of facts important to be known to the releasor. A plea of a release is no answer to a bill in equity which seeks to set aside the release on the ground of fraud, or which, anticipating a plea of the release, charges that it was fraudulently obtained, unless the fraud which is charged is put in issue in the plea, and sufficiently denied by answer. The principle of this is fully and clearly stated by Lord Redesdale. (Roche *v.* Morgell, 2 Scho. and Lef., 730.)

It is a general rule that a stranger to a deed cannot maintain an action upon it; for covenants in a deed expressed to be made between parties do not give a right of action to a person not a party to the deed, though he is mentioned in it. This principle is applicable to the case of a release; for a release expressed to be made between certain parties cannot be pleaded as an answer to the claims of the releasor against a third party, even if such release should profess to discharge such third party from all such claims. A release made to one of several joint debtors who are also severally bound, discharges them all, and the reason given is, that 'in such a case the joint-remedy being gone, the several is so likewise;' the rule applies to releases by operation of law, and is true in equity also.

The releasor may have demands against another, both in his own right and in another right, such as that of executor for instance: and accordingly a question sometimes arises whether the release extends to demands in both rights, when the release contains no clear declaration of the demands to which it extends. If this ambiguity exists, it seems to be settled that the release will only extend to such claims as the releasor has in his own right, if he has any demands in both rights; but if he has only demands in right of another, the release will operate upon them. If a man who has a rent-charge issuing out of a certain number of acres of land, releases his right in any part of the land, he releases all the rent, for it is charged on all the land, and not on any part. A release of all demands means all demands which exist at the time of the release, and it does not extend to anything which, at the time of the release, is not a demand, but afterwards becomes a demand. It is generally considered that a release of all demands would extend to a rent-charge, or a rent-service, parcel of a seignory in gross (but not to a rent-service incident to a reversion), but a release of all actions could not extend further than to a release of arrears of rent then due. Though a release of all actions is not a release of a sum of money not then due, it is said that such a release made before the day of payment appointed by the condition of a bond would be effectual; a bond being an acknowledgment of a present debt, defeasible by a condition subsequent, which does not prevent the right of action from vesting in the mean time.

A release is generally so expressed as to include all demands up to the day of the date of it; but in this case the day of the date is excluded from the computation. If the release extends to all demands up to the making of the release, this will comprehend all demands up to the delivery of it.

It is usual for releases to contain very general words, which, in their literal signification, may comprehend things that the releasor does not intend to release. But whenever it can be clearly shown, as for instance by a particular recital in a deed, that the general words of release were intended to be limited, such construction must be put on them. Parol evidence is not admissible for the purpose of limiting or enlarging the words of a release; but, as in the case of wills, it may be admitted where a difficulty arises in applying the words of the instrument to the facts of the case, for which purpose the state of the facts at the time of the release must be ascertained by extrinsic evidence.

RELICS (in Latin, 'reliquiæ') is a term used to signify the remains, bones, or garments of departed holy men, which are honoured by the followers of the Church of Rome. During the first ages of the Christian Church, martyrs were held in veneration; and their relics were treasured up as something sacred. The anniversary of their martyrdom was celebrated by assemblies of the faithful, held round their tomb or on the places where they had perished, and chapels and sanctuaries were raised on the spot. The blood of the martyrs was eagerly collected with sponges, and other demonstrations of religious enthusiasm were exhibited; but the church had not sanctioned any worship of those mortal remains. In the fourth and fifth centuries the previous veneration for the saints became a kind of worship with many people; astonishing miracles were said to be performed by fragments of their bones or garments, and pilgrimages were undertaken to obtain these relics. Helena, the mother of Constantine, went to Palestine, and is said to have found the identical cross on which Christ suffered. [Pilgrim.] The use of images and that of relics as accessories to church worship seem to have grown up together during that period. Towards the end of the sixth century, Pope Gregory I. displayed a great veneration for relics. There is a letter of his to the empress Constantina, who had asked him for a part of the body of St. Paul, in which he excuses himself by saying that it was not the custom of the Romans, and, in general, of the Christians of the West, to touch, much less to remove the bodies of saints; but that they put a piece of linen called 'brandeum' near the holy bodies, which is afterwards withdrawn, and treasured up with due veneration in some new church, and as many miracles are wrought by it as if the bodies themselves were there: he adds that they were much surprised at the Greeks removing the bones of saints from place to place; but that in order not to disappoint the piety of the empress, he would send her some filings of the chains which St. Paul wore on his neck and hands. This letter is quoted by Baronius, Fleury, and other church historians. From that time the veneration for relics increased, till it became, during the middle ages, a vulgar superstition and disgraceful traffic; and the abuse has been censured by many sincere Roman Catholics. It was ordered by several synods that no relics should be exposed to view without the sanction of the local bishop. Pope Innocent III. forbade the sale of relics. The Roman Catholic Church however admits that the relics of saints have performed and may still perform miracles; and that they are a proper object of veneration.

(*Bibliothèque Sacrée, par les Pères Richard et Giraud*, articles 'Reliques' and 'Saints,' 3rd section, 'Reliques des Saints;' and also Father Honoré de Sainte Marie, *Dissertation sur les Reliques;* and the Abbé de Cordemoi, *Traité des Saintes Reliques.*)

RELIEF, RELE'VIUM, a burthen incident to feudal tenures, being a sum of money paid to the lord on the admittance of a fresh tenant. It is a relic of that state of things in which the succession was not strictly speaking of right, but at the will of the lord, who required the payment of such an acknowledgement for the concession. It became however so much the custom for the lords to admit the sons or near kindred (heirs, as we now say) to the inheritance of the ancestor, that a custom became established of doing so, and out of the custom grew the right of inheritance. The money however which had been paid for admission in the former state of things, continued to be paid when the succession of the next heir had become what is called matter of right.

Bracton gives what is probably the true etymology of the word. 'Relevia,' says he, are so called, 'quia hereditas quæ jacens fuit per antecessoris decessum, *relevatur* in manus heredum, et propter factam relevationem.'

RELIEF. [Basso Rilievo.]

RELIGION is a Latin word which, according to the common derivation of it (from *religare*), means a principle which acts as a *restraint* on the conduct of man. In its more general sense it is used as an abstract term to denote our ideas of the existence and character of a Divine Being, to whose power men are more or less subject. Thus we speak of *a sense of religion* and *the duties of religion*, and we call a man who regards such subjects as matters of great importance *a religious person*. But as different views have prevailed of the nature of the deity and the relation in which man stands to him, various systems of religious belief have sprung up, and each of these systems is called *a religion*. Thus we speak of the Greek, Hindu, Jewish, Christian, and Mohammedan religions. The word is also popularly used to express the attention of individuals to the doctrines and duties of the particular religion which they may have embraced. In this sense it is synonymous with *piety*.

The subjects with which religion has to do are God and man considered in the relation in which they stand to each other. It consequently includes all the philosophical questions which can throw light upon that relation; for example, those which respect the nature of the deity, the notions of infinite space and infinite duration, the existence and offices of spiritual beings, the origin and destiny of the human race and of the world they inhabit, the immateriality and immortality of the human soul; and also all the practical questions which arise out of that relation, such as the duties which men owe to God and to each other, and the consequences which God may have appointed to follow different courses of action. All impressions, notions, and belief upon these subjects, whether formed into a system or not, constitute what we call *religion*, as distinguished from *theology*, which is the science by which these ideas are reduced to a systematic form, their laws investigated, and their origin and results traced out. [Theology.]

The sources from which our notions of religion are derived are either the so-called laws of nature and the constitution of the human mind, or direct information given to us upon the subject by the deity himself, whether such information be embodied in any lasting form, or handed down from one generation to another by oral tradition. Religion derived from the two former sources is called *natural religion;* from the last, *revealed religion.* [Revelation.]

The fundamental principle upon which all religion rests is the notion of the existence of a Being whose power over us is absolute, whose nature is either perfect in excellence, or at least far superior to ours, to whom we owe certain duties, and from whom we have much to hope and fear. The existence of such a Being is proved by the evidences which the objects of nature present of perfect design, of fixed order, of power sufficient to accomplish everything which we can conceive that does not involve a contradiction, and which we therefore conclude to be infinite, and of benevolent provision for the wants of living creatures. Apart from all such evidence, the belief in the divine existence seems to be strongly impressed on the human mind, so strongly indeed, that it is a matter of great doubt whether even professed atheists have been really such. Lastly, this truth may be the subject of revelation; for revelation does not, as may at first sight seem, imply as a fact *previously* known the existence of the Being from whom it comes. To the first recipients of the revelation the very fact of their finding themselves possessed of the knowledge of truths beyond the range of human experience would be a sufficient proof of the existence of a superior Being, from whom they had, in whatever way, obtained such knowledge; and if, in making known the revelation to the world, these persons should display a command over the laws of nature beyond the compass of human power, or an acquaintance with future events beyond the reach of human knowledge, these miracles and prophecies would prove the existence of a superior Being, from whom they had received the power to perform the one and the foreknowledge implied in the other. Thus the revelation itself furnishes a proof of the existence of the before unknown revealer. We do not inquire whether the divine existence is really proved in either or all of these different ways, because the object of this article is to explain the nature of religion, not to establish its truths.

The belief in a God leads at once to the practice of worshipping him, on the very same principle on which all dependents honour and look up to those in whose power they are placed.

The existence of a God once proved, the next question is, In what relation do we stand to him? Are any laws laid down for our conduct? Are we responsible to him for keeping or breaking those laws? Are any rewards and punishments appointed for obedience and disobedience?

To these questions it does not appear that natural religion can give a perfectly satisfactory answer, though no one can read Bishop Butler's admirable work, 'The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature,' without being astonished at the amount of information on these subjects which it is there shown that the contemplation of natural phenomena reveals. It seems also that a general undefined notion of responsibility is associated in nearly all human minds with the idea of divine existence, at least a sense of responsibility sufficient to excite pleasure when we do what we believe to be good, and remorse when we do what we believe to be evil. Again, the connection which we find generally existing between vice and misery on the one hand, and virtue and happiness on the other, impresses upon us the idea that there does exist such a thing as retributive justice. But at this point we encounter the great difficulty of natural religion. Though the general law according to which the affairs of the world appear to be governed is, that virtue is followed by happiness, and vice by misery; and though a full knowledge of the circumstances of every case which appears an exception to that law might show us that more real happiness is enjoyed by a virtuous sufferer than by a prosperous sinner, yet it cannot be denied that daily experience furnishes us with exceptions to this law, numerous enough to throw great doubt upon its reality, if the period of human existence ends with the present life. Accordingly we find the doctrine of a future state forming a part of all religious systems, and generally connected with some notion of rewards and punishments. And this again is a branch of religion which, though it may be made to appear probable by arguments drawn from nature (we must again refer the reader to Bishop Butler's work), does not appear to be susceptible of satisfactory proof without a divine revelation. In the opening of the Epistle to the Romans there is an admirable though concise argument on the force and extent of natural religion (*Rom.*, i. 19): 'Because that which may be known of God is manifest in them; for God hath showed it unto them. For the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead; so that they are without excuse: Because that, when they knew God, they glorified him not as God, neither were thankful; but became vain in their imaginations, and their foolish heart was darkened.' And again (*Rom.*, ii. 14): 'For when the Gentiles, which have not the law, do by nature the things contained in the law, these, having not the law, are a law unto themselves: Which show the work of the law written in their hearts, their conscience also bearing witness, and their thoughts the meanwhile accusing or else excusing one another.'

Now if there be a supreme moral governor who rules the world by fixed laws, who has appointed rewards and punishments as the recompense for obedience and disobedience, and who has constituted man so that he shall exist in a future state to receive that recompense, the question is naturally suggested whether there be any means by which the consequences of disobedience may be averted. The experience of human governments proves that it would be unsafe to pardon a criminal merely upon his repentance; and analogy would therefore lead us to conclude that so loose a principle of forgiveness cannot be admitted into the divine government. Or even if this principle might be safely acted upon in some few cases, we should gain nothing more than a vague hope of mercy, being still left without any reasonable ground for expecting it. Justice must be an attribute of the ruler of the universe, and natural religion affords us sufficient proofs of his goodness to justify us in believing that he is also willing to show mercy. The question that remains to be answered is, how his mercy can be shown without injury to his justice; and the importance of this question is enhanced by the consideration that the great majority of mankind (experience would justify us, apart from the Christian doctrine of universal depravity, in saying all mankind) need the divine forgiveness for at least some actions of their lives. It is the highest province of religion to furnish an answer to this question; and here natural religion entirely fails us, for if left to it, the utmost we could do would be to rest in the exercise of an humble faith that some provision has been made by God for the just forgiveness of our sins, though the nature of that provision be unknown to us. The matter belongs to revealed religion, and accordingly we find in nearly every religion professing to have a divine origin, and in many others, the doctrine of an atonement; that is, of a satisfaction for sin, in virtue of which the actual transgressor may be released from the consequences of his guilt.

On whatever grounds systems of morality may be based by ethical writers, it is beyond a doubt that in the minds of men in general there is an inseparable connection between religion and morality, the former furnishing alike the rule and sanction of the latter. The positive morality of any people will always depend on the nature of their religion. The attributes which they attach to the divine character will be a standard for their own conduct, and their opinions respecting the recompense appointed for virtue and vice will determine the strength of the motives on which they act; while their moral system will be greatly affected by their views upon the subject of satisfaction for guilt. When, as is generally the case, the same religious principles are found to pervade a whole community, the positive morality which is formed upon those principles has a direct influence on legislation, and the sanctions and rites of religion are brought by the legislator to aid in working out his institutions, and thus religion becomes interwoven with the social and political system.

These then are the elements which seem to be contained in any religion suited to the wants of man: that there exists a supreme Being who possesses absolute power over man and the material universe, and all creatures therein, and who is to be worshipped by all his rational creatures; that he has laid down laws for our conduct, by our obedience or disobedience to which we subject ourselves to a recompense of reward or punishment, which recompense is awarded partially in the present life, but more completely in a future state, in which we are so constituted as to exist after death; that a provision has been made on behalf of those who feel that their conduct has subjected them to the divine displeasure, by availing themselves of which they may escape the consequences of their guilt without detriment to the equity of the divine government: and lastly, that there are certain practical rules of conduct by which the intercourse of men with each other ought to be governed, and by an attention to which the stability of the social system may to a great extent be ensured. And all these elements of religion are susceptible of proof, either from nature, or from human experience, or from revelation.

When we look at the different religious systems which have prevailed among the various divisions of the human family, we find the fundamental idea of the divine existence contained in them all; for the testimonies of modern travellers and of antient history concur to show that, as far as our knowledge extends, there is not nor ever has been a people utterly ignorant of the divine existence, however debased in other respects. Even where polytheism and idolatry have existed in their grossest forms, we can generally trace some notion of a supreme divinity, who is regarded as the origin of all other existences. The character of the worship which is paid to the divine Being is always found to be materially affected by the difficulty of conceiving spiritual objects. Hence the almost universal prevalence of idolatry; of which the earliest form appears to have been the worship of the heavenly bodies, which, as being the sources of light and heat and all vivifying power, were regarded as the fittest representatives of the deity. Then came the worship of the powers and objects of nature in general. The heaven, earth, and seas, the mountains, woods, and rivers, were peopled with divinities, and these were multiplied by assigning to many of them fixed abodes in particular places. Virtues and vices, passions and emotions, and even ordinary occupations, were all personified as deities, so that scarcely a feeling or action was left without some divinity who was supposed to regulate it. It would seem too that the general doctrine of the divine government and protection has not been sufficient to satisfy mankind: they seem to want to have the deity brought nearer to them, and therefore nearly every religion presents us with a class of beings intermediate between God and man, under whose immediate care the latter are placed, and thus we get guardian deities of countries, cities, families, individuals, and classes. The next step is the bringing these divinities into closer connection with the senses by adopting some material object to represent them, either a symbolical image, a statue, or picture in the form of man, or even a living animal. This is the general character of the religious systems which existed from the first beginning of idolatry to the period when Christianity became widely diffused (excepting of course the Jewish religion), and which still exists among most of the nations which have not received either the Christian or Mohammedan faith. In nearly all such systems we find especial honours paid to the reproductive powers of nature, which are often worshipped under the grossest forms, as, for example, in the Hindu religion, and in the worship of Baal and Ashteroth among the Phœnicians, and of Dionysus among the Greeks. In religions which teach a plurality of gods, the deities are generally represented as being more or less in a state of opposition to each other. This feature has probably arisen from the apparent mutual opposition of some of the forces which are found at work in nature, and from the poetical representations of early mythologers. The ultimate effect of such views of the divine nature has been to invest the character of the deities with those attributes of virtue and vice which belong to man, leaving the former only superior to the latter in their greater power and more lengthened existence. As a general principle, we find that the views which all nations take of the divine character bear a close analogy to the light in which they regard the phenomena of nature.

In most religions the existence of evil in the world is traced to the malignant efforts of a bad Being, who is viewed either as permitted to do evil for a time, with a view to the ultimate accomplishment of greater good, or as being independent in his origin and power of the good divinity, or even as so powerful that some nations have sought to appease him by divine honours.

Those religions which are based upon the doctrine of the unity of the deity, are chiefly distinguished from the polytheistic systems by their regarding the divine nature as utterly distinct from all material existences, and as incapable of being represented in any way by means of sensible objects. Hence the Jewish and Christian and Mohammedan religions are irreconcileably opposed to all forms of idolatry.

The different views which are taken of human duty and responsibility, and of the future state of existence, are generally found to depend upon the light in which the deity is regarded. It is not to be expected that men should measure their conduct by the standard of a purer morality than is furnished by the characters of their gods. Accordingly we find in all nations whose religion is polytheistic, that their positive morality has been low, and that their belief in an equitable divine government and in a future state of retribution has been most confused and vague. It is in Christianity alone that we find a code of morals based on the principle of universal love, and a clear announcement of a future state of rewards and punishments.

With regard to the doctrine of satisfaction for sin, we find in most nations some traces of the belief that 'without shedding of blood there is no remission:' and, as a consequence of this belief, the practice of propitiating the deity by sacrifice. In no religion however, except Christianity, do we find any clear or consistent doctrine of the means by which an atonement is provided, and of the course through which individuals must pass to secure the benefits of that atonement. [ATONEMENT.]

In their influence upon the social system, all religions, except Christianity, appear to have failed in producing that spirit of self-restraint and benevolence which is the best security for the peace and prosperity of any community. But in instituting a comparison on this point, we must not judge by the state of things existing in any community which *professes* a certain religion, but we must inquire whether in that community the religion in question exists in a genuine form, as determined by the documents in which its principles are embodied, or by any other test of acknowledged authority. If, for example, there exist any sacred books to which all the professors of any religion appeal as containing the tenets of their religion, we must first refer to them to test the purity of the religious system of a community, before we judge of the influence of that system on society. Tried by this test, we believe it will be found that Christianity, in proportion to the purity in which it has existed in any nation, has tended to produce peace and contentment, benevolence and industry, submission to the authority of the law, and regard for the rights of every class and individual, to an extent never approached by any nation professing a different religion. But, whatever views may be entertained of the respective powers of different religions in keeping a social system together, this fact at least seems established by evidence, that this object cannot be effected without some religion. All great legislators have used religion as the great bond of their institutions, and instances are frequent in history in which religious considerations have been the means of accomplishing or frustrating great political objects. Of the converse experiment we are almost without an example. But it is very probable that the anarchy of the French 'Reign of Terror,' in which the social system was for a time dissolved, had its chief cause in the general prevalence of infidel sentiments among the people.

The limits of this article will not allow of a detailed examination and comparison of the tenets of different religions. An account of the religions of the principal nations of the world will be found under their respective articles. To those articles the reader is referred for the facts by which he may judge of the opinions which are here expressed.

REMAINDER. An estate in remainder is defined by Coke to be 'a remnant of an estate in lands or tenements, expectant on a particular estate, created together with the same at one time.' According to this definition, it must be an estate in lands or tenements, including incorporeal hereditaments, as rents and tithes; and it is an estate which at the time of its creation is not an estate in possession, but an estate the enjoyment of which is deferred. The estate in remainder may exist in lands or hereditaments held for an estate of inheritance or for life. It must be created at the same time with the preceding estate, and by the same instrument; but a will and a codicil are for this purpose the same instrument. A remainder may be limited by appointment, which is an execution of a power created by the instrument that creates the particular estate; for the instrument of appointment is legally considered as a part of the original instrument. A remainder may also be created either by deed or by will; and either according to the rules of the common law, or by the operation of the Statute of Uses, which is now the more usual means.

If a man seised in fee simple grants lands to A for years or for life, and then to B and his heirs, B has the remainder in fee, which is a present interest or estate, and he has consequently a present right to the enjoyment of the lands upon the determination of A's estate; or, in other words, he has a vested estate, which is called a vested remainder. A reversion differs from a remainder in several respects. He who grants an estate or estates out of his own estate, retains as his reversion whatever he does not grant; and upon the determination of the estate or estates which he has granted, the land reverts to him. There may be several remainders and a reversion expectant on them. If A, tenant in fee simple, limits his estate to B for years, with remainder to C for life, with remainder to D in tail, this limitation does not exhaust the estate in fee simple. By the limitation B becomes tenant in possession for years, C has a vested remainder for life, D a vested remainder in tail, and A has the reversion in fee. If the limitation by A exhaust the whole estate, as it would have done in the preceding instance if the limitation had been to C and his heirs, A has no estate left. It is a necessary consequence that if a man grants all his estate, he can grant nothing more; and therefore the grant of any estate after an estate in fee simple is void as a remainder. Indeed the word remainder implies that what is granted as such is either a part or the whole of something which still remains of the original estate.

The estate which precedes the estate in remainder or in reversion is called the *particular* estate, being a particula or portion of all the estate which is limited; and the particular estate may be any estate except an estate at will, and an estate in fee simple. It must therefore be either an estate for years, or for life, or in tail.

Estates for years may be granted to commence at a future time; but by the rules of the common law, no estate of freehold can be created to commence at a future time. If therefore such an estate of freehold is granted, there must be created at the same time an estate for years, which shall continue till the time fixed for the enjoyment of the estate of freehold. If a freehold remainder expectant on an estate for years is created at common law, there must be livery of seisin to the tenant for years, for it is necessary that the freehold should pass to the grantee at the time of the grant, and the livery to the tenant for years enures to give a seisin to him to whom the estate of freehold is granted.

A remainder cannot be granted so as not to take effect immediately on the determination of the particular estate. If there is any interval left between the particular estate and the remainder in their creation, the remainder is absolutely void. A grant of an estate to A, and one day after the determination thereof to B, is a void remainder.

Estates in remainder are either vested or contingent. The remainder may vest, at the time of the limitation, or it may vest afterwards: in either case the remainder-man acquires an estate in the land, to the enjoyment of which he is entitled upon the determination of the preceding estate. But it may happen that a vested remainder may never become an estate in possession.

A vested remainder is an estate which, by the terms of the original limitation or conveyance, is limited or conveyed unconditionally. If a remainder is not vested, it is contingent.

A contingent remainder is defined by Fearne to be 'a remainder limited so as to depend on an event or condition which may never happen or be performed, or which may not happen or be performed till after the determination of the preceding estate.' Accordingly it is the limitation of the remainder which is conditional, and there is no remainder limited or given until the condition happens or is performed. The uncertainty of the remainder becoming an estate in possession is no part of the notion of a contingent remainder; for this kind of uncertainty may exist, as already observed, in the case of vested remainders.

Fearne has made four classes of contingent remainders, to some one of which he considers that all kinds of contingent remainders may be reduced, but he adds that 'several cases which fall literally under one or other of the two last of those four descriptions, are nevertheless ranked among vested estates.'

The first class is, 'where the remainder depends entirely on a contingent determination of the preceding estate itself;' or, as it may be explained, where a remainder is limited to take effect only on the happening of a specified contingent event which is to determine the preceding estate, and is not to take effect if the preceding estate determines in any other way. An example usually given is the following A makes a feoffment to the use of B till C returns from Rome, and after C's return, then to D in fee. In this case B has an estate which will determine either upon C's return from Rome or by his own death; but the remainder is limited to D only upon the happening of a specified event which may never happen; and if B's estate determine by his death, or by forfeiture, which is possible, no estate is limited to D. There is then no limitation to D, except conditionally, and his estate is therefore contingent.

The second class is, 'where some uncertain event, unconnected with and collateral to the determination of the preceding estate, is by the nature of the limitation to precede the remainder.' This class is easily distinguished from the first, by the circumstance that the uncertain event upon which the remainder is limited, is entirely independent of the manner in which the preceding estate may or must determine. The following is an example: If a grant is made to A for life, remainder to B for life, and if B die before A, remainder to C for life, the uncertain event of B's dying before A is quite independent of the determination of A's estate, but the limitation of C's estate depends on this uncertain event happening.

In both these classes of remainders, the event on which the remainder is to take effect is absolutely uncertain; in the two following classes, the events on which the remainders are limited are events which certainly must happen, and the contingency arises from the uncertainty of the time when they will happen.

The third class is, 'where a remainder is limited to take effect upon an event, which, though it certainly must happen some time or other, yet may not happen till after the determination of the particular estate.' The following is an example:—a grant is made to J. S. for life, and after the death of J. D. the lands to remain to another in fee. Though it is certain that J. D. must die, this event, upon which the limitation in fee is to take effect, may not happen till after the determination of the life estate of J. S.

The fourth class is, 'where a remainder is limited to a person not ascertained, or not in being at the time when such limitation is made.' The following is an example:—a grant is made to A for life, remainder to the right heirs of J. S. Now as J. S. can have no heir till he is dead, and as he may not die till after the determination of the particular estate, such remainder is contingent. If an estate is limited to two persons for life, with remainder in fee to the survivor, the remainder is contingent, because it is uncertain which will be the survivor.

The first class of remainders mentioned by Fearne has sometimes been confounded with cases of conditional or contingent limitations, which, though not valid in conveyances at common law, are valid within certain limits in wills and in conveyances under the Statute of Uses. The distinction between the two things may be somewhat difficult to apprehend, but still there is a substantial distinction.

In the first class of remainders, the estate in remainder is limited to take effect as a remainder upon a determination of the preceding estate according to the original limitation. it does not defeat or abridge the preceding estate, but it is limited to commence when the preceding estate determines by the happening of that contingency which is originally declared to be a limit of its duration. In the case of conditional limitations, the event on which the conditional limitation is to take effect is an event independent of the measure of the previous estate, which measure is precisely ascertained by the terms of the original limitation. In the case of a contingent remainder, the second limitation takes effect as being a remnant which exists, and is capable of being limited over upon the contingent event taking place. If the first estate be limited in fee, as a limitation to the use of A and his heirs till C returns from Rome, and after the return of C, to the use of B in fee, this limitation to B cannot be a remainder, because the whole estate has been already limited, and there is nothing left to limit over. If the limitation is to A for life, and if C return from Rome, then to B in fee, the life estate of A may be defeated by the return of C, in which event B's estate commences, and is not merely a remnant limited on the expiration of A's life estate, but it comprises part of the estate limited to A: it is therefore not a remainder according to the definition. Both these are cases of conditional limitation, by which an estate of a definite measure is limited, and upon the happening of some event which in no way affects the original measure of the preceding estate, that estate is to determine before its regular determination according to the original limitation, and the estate so conditionally limited is to take effect in possession. It follows from what has been said, that a remainder cannot take effect at common law so as to defeat or abridge the particular estate: a limitation having that effect would not be a remainder, but if limited at common law would be void; and if limited by a will or by a conveyance to uses, it would take effect in another way.

The exception to the third class of contingent remainders is of this kind. The event on which the remainder is limited over, is an event which must happen some time, and may happen after the determination of the particular estate the remainder is therefore strictly contingent. But if the probability of the event happening after the determination of the particular estate is very small, the remainder is held to be vested. The following is an example:—a limitation to A for eighty years, if B shall so long live; and after the death of B, to C in fee. In this case B, a person in being, may outlive the utmost limit of A's estate (eighty years); but the probability of this event is very small, and accordingly C's estate is held to be vested.

The numerous exceptions to the fourth class of contingent remainders are comprehended in what is called the Rule in Shelley's case, of which a complete exposition is given in Fearne's 'Essay on Contingent Remainders;' and in Preston's 'Treatise on Estates' (vol. i.). The nature of this rule may be generally stated as follows:—If lands are limited, either by deed or will, to a man for life, and after his death to his heirs or the heirs of his body, the limitation to the heirs would appear to be a contingent remainder according to the definition of the fourth class of contingent remainders, for the heirs are persons who cannot be ascertained till the death of the person to whom the estate for life is given. But it is an old rule of law that the estate so limited to the heirs or the heirs of the body takes immediate effect as an estate in the ancestor, and therefore, in the former case, A takes an estate of freehold with a vested remainder in fee. His life estate is consequently merged in his remainder in fee, and he becomes tenant in fee simple in possession. If an estate for life, or an estate tail, is interposed between the estate for life to the ancestor and the remainder to his heirs or the heirs of his body, still this remainder is vested in the ancestor, just in the same way as if it were limited to him and his heirs, or to him and the heirs of his body. Thus when A takes an estate for life, remainder to B for life, remainder to C in tail, remainder to the right heirs of A, this ultimate remainder is a vested remainder in fee in A, and, after his death and the determination of the intermediate estates, his heir will take by descent. But cases within this rule are not so properly exceptions, as cases which by the operation of the rule are excluded from the fourth class of contingent remainders.

There is another exception to the fourth class, which is allowed in devises, where it can be clearly inferred from the particular expressions in the will, that a limitation to the heir special of a person then living is intended as a designation of a particular person. In such case the remainder will vest; for the conclusion is, not that the testator intended to limit the estate by way of contingent remainder to such person as should be ascertained to be heir by the death of his ancestor, but that he intended by the word 'heir,' accompanied with the other expressions in the will, to designate a particular person.

The following is an apparent exception to the first class of contingent remainders. In settlements lands are often limited to the use of A for life, and after the determination of that estate by forfeiture or otherwise in his lifetime, to the use of B and his heirs during the life of A, in trust for A, and to preserve the contingent remainders; and after the death of A, to the use of the first and other sons of A successively in tail male, &c. This estate to the use of B and his heirs during the life of A is the estate given to trustees to support the subsequent contingent limitations; and in order that such estate to B and his heirs may be sufficient for the purpose, it must be vested. Accordingly it has long been held that this limitation gives the trustees a vested freehold estate, which will therefore support the contingent remainders. The reason given by Fearne for this estate being vested is, that the trustees have a present capacity to take the estate whenever it becomes vacant. He observes, 'The present capacity of taking effect in possession if the possession were to become vacant, and not the certainty that the possession will become vacant before the estate limited in remainder determines, universally distinguishes a vested remainder from one that is contingent.' (p. 216.)

If we adopt this test, it is clear that the limitation to trustees to preserve contingent remainders is not a limitation of that kind which is included in the first class of contingent remainders, for the limitations in remainder of that class are to take effect as limitations only on the happening of a specified contingent event which determines the preceding estate, and not on the happening of other events which may or must determine the preceding estate. If then a limitation over is to take effect on the happening of an uncertain event, and not on the happening of any other event, there is nothing limited as a remainder till the uncertain event has happened. But the estate to the trustees is so given as to take effect as a limitation upon any event happening which shall determine the estate of A in his lifetime. There is therefore a clear distinction between the two cases as to the capacity of taking effect in possession. But this capacity of taking effect in possession whenever the preceding estate becomes vacant, can hardly be used as a means of ascertaining whether the trustees have a vested estate. An estate is vested when there is either a present right of present enjoyment or a present right to a future enjoyment. A vested remainder is not the former, but it is the latter: the right is ascertained and the enjoyment is merely deferred. But the present right to a future enjoyment is a present capacity to enjoy whenever the time for enjoyment comes. Therefore a present capacity to enjoy if the possession becomes vacant is a vested remainder, and a vested remainder is a present capacity to enjoy if the possession becomes vacant; but whether in a given case such present capacity or such vested remainder (which is the same thing) actually exists, is the matter to be determined. The rule then which is to be the test whether a remainder is vested or contingent, is merely a description of a vested remainder in other and equivalent words; and the conclusion is that a remainder is vested and not contingent when it is vested. Now, as the very notion of a contingent as distinguished from a vested remainder depends upon the limitation of the remainder being conditional or unconditional, it follows that there is no test of a contingent as distinguished from a vested remainder, except by means of the words in which the limitation of the remainder is expressed.

An estate to A for life, with remainder to B during the life of A, would be a void remainder, but for the legal possibility of A's estate being forfeited or surrendered in his lifetime. This legal possibility is also considered as one of the regular modes in which A's estate may determine, that is, as one of the modes by which it is liable to determine according to the nature of the original limitation. For if it is not so considered, the estate to B is in the nature of a conditional limitation. Now, an estate might be limited upon the determination of A's life estate by forfeiture or otherwise in his lifetime, either for the period of A's life, or for a longer period than A's life, as for instance to B and his heirs. But such a limitation to B and his heirs is in the form of a contingent remainder, for by the terms of the limitation it is made upon a condition which may never be fulfilled; and there is a mode by which A's estate must determine, namely, his death, in which event nothing is limited to B and his heirs. If the estate to B and his heirs were limited upon any determination of A's estate in his lifetime, or upon the death of A, it would be a vested remainder, for it would be limited in all events, and therefore not conditionally limited. Now, the estate to the trustees to preserve contingent remainders during the life of A, only differs from such last-mentioned limitation in not containing any limitation upon the event of A's death. But a limitation to the trustees upon the event of A's death is unnecessary for the purpose of giving a vested remainder, because the estate limited to the trustees determines with A's life. There is therefore no contingent event upon which the estate to the trustees during the life of A is limited, but it is limited in all events, that is, unconditionally, and therefore it is not a contingent remainder.

A difficulty arises from the form of the words in which the limitation is made, for the estate is limited upon the determination, &c. of A's estate, and these words apparently express a condition. But these words in themselves are not words of condition, any more than a limitation to A for life, and upon his death to B and his heirs. They merely denote the events on the happening of which the estate is to take effect in possession. The events which are to determine the life estate of A, and upon which the limitation over is made, are not extrinsic events, such as the return of B from Rome. A limitation over on the event of B's returning from Rome would be a conditional limitation to defeat A's life estate. But the events on which A's life estate may determine before his death, are events to which such an estate is incident; and these events may fix its measure, as well as the death of A. The estate to the trustees for the life of A is therefore clearly an estate analogous in its limitation to an estate limited over on the death of A; the only difference being that A's death is an event that must happen, and the forfeiture, &c. are events which may happen. An estate limited over by way of remainder upon the happening of any of all the events by which the previous estate may determine, is clearly not a contingent remainder within any of the four classes defined by Fearne. But the estate to the trustees and their heirs generally, upon the determination of A's estate in his lifetime by forfeiture or otherwise, without adding 'during the life of A,' is clearly conditional; for by the terms of the limitation nothing is limited to the trustees except in the event of A's estate determining in certain ways in which it may determine, and nothing is limited in the event of its determining by his death, an event that must happen. It is not the words, 'upon the determination of A's estate by forfeiture or otherwise in his lifetime,' which make the estate to the trustees and their heirs generally a limitation of a remainder upon a condition; but it is the circumstance of their estate being for a longer period than the life of A, and nothing being limited to them on the event of A's estate determining by his death, which renders the limitation conditional. This kind of contingent remainder is however hardly included in Fearne's first class; and it seems to form a fifth class of contingent remainders.

An estate similar to the estate to trustees to preserve contingent remainder occurs in the ordinary limitations to uses to bar dower in purchase-deeds, where, after the limitation to the purchaser for his life, and before the limitation of the fee, an estate is interposed to a trustee and his heirs during the life of the purchaser: the object being, by the interposition of a vested freehold remainder, to prevent the purchaser from taking such estate as will entitle his wife to dower. The like observations apply to this estate of the trustee to bar dower as to the estate of the trustees to preserve contingent remainders. This further observation applies to both estates: they fail to become estates in possession not from any contingency attached to their limitation either in words or substance, but because the estates themselves expire before or at the same moment with the particular estate, a circumstance which never prevents a remainder from vesting. Thus, a limitation to A for life with remainder to B for life, gives B a vested remainder; and even if the limitation to B were expressly made 'in case he shall survive A,' still the remainder to B would be vested. The reason of this appears to be, that notwithstanding the words of contingency, there is no real contingency attached to the remainder except that of its possible determination before the particular estate. The force of this observation will appear when it is considered that a limitation to A for life with remainder to B and his heirs in case he shall survive A, gives a contingent remainder to B, while, as already observed, a limitation to A for life with remainder to B for life in case he shall survive A, gives a vested remainder to B.

The importance of this subject must be an apology for these remarks. The limitation to the trustees to preserve contingent remainders may, owing to carelessness or other causes, be expressed in terms different from what it ought to be. Thus the limitation might be to the trustees and their heirs upon the determination of A's life estate by forfeiture or otherwise *in his lifetime*, without the words 'during the life of A;' or it might be to the trustees and their heirs upon the determination of A's life estate by forfeiture or otherwise, without the words 'during the life of A.' In the former case the limitation would be contingent; in the latter a vested remainder in fee would pass to the trustees and their heirs: in both cases the object of the settlement might fail to be secured.*

A contingent remainder may intervene between the particular estate and other limitations over, and yet the subsequent limitations may be vested, if made to a person *in esse*, provided the contingent limitation is not in fee simple. The contingent remainder itself may also vest, and then become an estate interposed between the particular estate and the subsequent vested limitations, if the contingency happens during the existence of the particular estate. If in the same conveyance an estate is limited to A for life, followed by a contingent remainder and a subsequent limitation to A and his heirs, or A and the heirs of his body, this last limitation, though executed under the rule in Shelley's case, is still so executed as to allow the contingent remainder to interpose as a vested estate when the contingency happens. A subsequent contingent limitation may vest before a preceding one, but it follows from what has been said that the preceding one is still capable of vesting.

Lands may be so limited as to be subject to a general power of appointment. In such cases, the general power of appointment will not prevent the estates limited in default of appointment from vesting; though the due exercise of the power will divest them.

Certain cases in which a remainder is limited upon a contingency which affects the preceding estate, but does not affect the ulterior limitations, are discussed by Fearne (p. 233). The same section (x.) contains remarks on limitation which seem to import a contingency, but in fact only denote the time when the remainder is to vest in possession. These remarks seem to be applicable to the case of the trustees to preserve contingent remainders to whom an estate is limited during the life of the tenant for life, though this application of them is not made by Fearne.

A contingent remainder may be limited generally upon any event, except in such cases as the following:—the contingent event being illegal; the remote possibility of the contingent event; and the condition enuring to defeat the preceding estate. These subjects are fully discussed by Fearne (c. 2).

It will be collected from what has been said that a contingent remainder of freehold must be preceded by a vested estate of freehold; for if there is no precedent vested estate of freehold, and the freehold remainder is contingent, the freehold either remains in the grantor, and therefore is not transferred to any one else, or it is transferred in some remainder which is limited after the contingent remainder, and which, being therefore vested in possession, precludes all possibility of the vesting of the contingent estate, which by the terms of the limitation must precede it. This rule as to the necessity of a vested freehold estate to support a contingent remainder, applies both to limitations of uses and of estates limited at common law. If the contingent remainder be for years, there is no necessity for a preceding freehold estate to support it: and when the legal estate is vested in trustees in trust, such legal estate in the trustees renders it unnecessary that a contingent remainder should vest during the continuance or at the expiration of the preceding limitation in trust.

It will also appear from the definitions of contingent remainders that they must vest, that is, the conditions on which they are limited must be fulfilled, during the continuance of the particular estate or immediately on its determination. One of the cases in which such remainders were formerly liable to fail under the fourth class of contingent remainders, was in the case of such limitations as to A for life, and to his first and other sons in tail. Originally a posthumous son could not take, but such child is now for this and several other purposes considered as a person *in esse* during the period of pregnancy. When a contingent remainder is limited to several in a conveyance to uses or by a devise, such remainder will vest in the first person in whom it can vest, but it will divest in due proportions in favour of other persons who are included in the limitations, and who become capable of taking before the determination of the particular estate; and such persons may take as joint tenants, though their estates vest at different times.

Any determination of the particular estate before a legal remainder vests, must, consistently with what has been said, destroy the contingent remainder. The contingent remainder may fail not only through the contingency not happening till after the expiration of the particular estate, but through its destruction by the surrender of the tenant for life, or by the forfeiture of his estate during the existence of the contingency. The intermediate contingent remainder will also be destroyed if the particular estate and the next vested estate of freehold become united by the conveyance or act of the parties, so that the particular estate be merged. This however is not the case when the particular estate with a contingent remainder over and the inheritance are limited by the same instrument, for though the estate in the inheritance is executed, this does not prevent the contingent remainder from vesting upon the happening of the condition on which it depends.

A contingent remainder of an estate of inheritance is descendible to the heirs of an ascertained person to whom it is limited, if such person should die before the contingency happens, and it will vest if the same should happen during the continuance of the particular estate. Contingent remainders were once not considered devisable, but it was afterwards determined that they were devisable whenever they were descendible to the heirs of the persons to whom they were limited; and under the recent statute (1 Vic., c. 26), they are devisable in common with all contingent, executory, or other future interests in any real or personal estate.

Contingent remainders are not assignable at law, though capable of being bound by a contract in equity. They were also capable of being bound by a fine by way of estoppel. By the Irish Act for the abolition of fines and recoveries there is a provision for the assignment at law of contingent estates. There is no corresponding provision in the English act; and as fines are abolished, and a contingent estate is confessedly incapable of being dealt with at law, and a married woman is incapable of contracting, a doubt (perhaps not well founded) exists whether a deed acknowledged by a married woman will bind her contingent remainder even in equity.

Though a fee cannot be limited after a fee as a remainder, two or more contingent fees may be limited in the alternative so that one only shall take effect.

Interests in chattels real and personal are susceptible of limitations over after the limitation of some partial interest in them; but from the nature of those interests they are incapable of such extensive modifications as freehold interests in land, and they cannot be operated upon by the Statute of Uses. Originally a bequest of a term of years to a man for his life was an absolute gift of the whole term, and the donee might dispose of the whole interest as he pleased; but at present a bequest of such term to A for life, and after his death to B, is a bequest of the whole term to A, subject to an executory bequest to B, to take effect if A dies before the expiration of the term. It is not a particular estate to A for life and a remainder to B. Any disposition of a chattel, which in the case of lands would make an estate tail, gives the whole interest. Thus if the second bequest of the term of years were to B and the heirs of his body, B would take the whole interest.

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* For this suggestion as to the nature of the estate limited to the trustees and their heirs without the words 'during the life of A,' and for other valuable remarks, the writer is indebted to a learned friend.

An executory devise is such a limitation of a future estate in lands, and an executory bequest is such a limitation of a future interest in chattels, as are allowed in the case of a will, though not in conveyances at common law. Accordingly a fee may be limited after a fee in a will or by way of use upon contingencies which may happen within certain limits of time; and such limitations take effect as executory devises or springing or shifting uses. But when future estates are so limited by devise as to be comprehended within the rules which apply to contingent remainders, they will be considered as such, and not as executory devises.

The subject of contingent remainders is fully discussed in the elaborate Essay of Fearne on *Contingent Remainders and Executory Devises*; see also Hayes, *On Conveyancing*, Appendix.)

REMAINS, ORGANIC. [ORGANIC REMAINS.]

REMBRANDT, PAUL GERRETZ, commonly called Rembrandt van Ryn, or Rhyn, was the son of Hermann Gerretz, a miller. He was born in 1606, in his father's mill on the banks of the Rhine near Leyden, whence the agnomen van Ryn. When very young he was sent to a Latin school at Leyden, but he showed such a distaste for learning, that his father gave up the idea of making a scholar of him, and consented to his becoming a painter, as he had manifested a decided talent for it. Young Rembrandt was accordingly placed first with Jacob van Zwaanenburg, or, according to another account, George Schooten. He remained with his first master about three years. He then studied for a short time under Peter Lastmann at Amsterdam, and lastly, for a short time, under Jacob Pinas. From these masters Rembrandt could have learnt nothing more than the mere mechanical part of his art, for both his taste and his style were peculiarly his own. After leaving Pinas, he returned to his father's mill, where he commenced painting, taking the immediate vicinity and the peasants of the neighbourhood as his standard of nature, and applying himself enthusiastically to his work. He had not finished many pieces before he was considered as a prodigy by his friends, and he was persuaded by them to take one of these early productions to a dealer in the Hague, who, to his no greater joy than astonishment, gave him 100 florins (about eight guineas) for his performance. Rembrandt was so elated with this unexpected good fortune, that he posted home to his father in a chariot to convey the joyful intelligence. From this time he rapidly acquired both fame and fortune. In 1630 he settled in Amsterdam, where he resided the remainder of his life, and shortly afterwards married a handsome peasant-girl of Ramsdorf, whose portrait he has often painted. His reputation now became so great that he had many scholars, each of whom paid him annually 100 florins, and he so arranged their studies as to make them as profitable as possible to himself; he retouched the copies which they made from his own works, and sold them as originals.

This rapid and unexpected good fortune appears to have engendered in Rembrandt a love of money, and avarice became his ruling passion: he resorted to various mean expedients for acquiring wealth; he sold impressions of his etchings, which were the principal source of his income, before they were finished, when finished, and afterwards with slight alterations; and such was the rage after his works, that collectors thought it incumbent upon them to possess impressions of his various etchings in all their different stages, and he is said to have thrown off from some plates even as many as seven proofs, all varying but very slightly. He also circulated reports that he was going to leave the country, and thus created large demands for his etchings. Various other much more absurd and not less mean practices are reported of him; they were worthy of the low taste of Rembrandt, for he could endure no restraint upon his manners or his conversation; polite society was to him intolerable, and he always avoided it.

The burgomaster Six was the only man of rank with whom Rembrandt associated, and with him he occasionally passed a few days in his house in the vicinity of Amsterdam, in which the burgomaster had fitted up a painting-room for him. The history of the celebrated print, the landscape De la Moutarde, which was etched in this house, is curious. Rembrandt could not relish his boiled beef without mustard, but it happened upon one occasion that there was none in the house; and the burgomaster, desirous of pleasing his guest, immediately sent off one of his servants in haste to the city to procure some. Rembrandt, observing that he was rather a phlegmatic-looking person, offered to bet that he would make an etching before the man returned. The wager was immediately accepted, and Rembrandt forthwith, having taken a prepared plate, commenced to etch the landscape from the burgomaster's window, comprising a view of Amsterdam, which he finished in his happiest style with that vigour and lightness of touch peculiar to him, just before the servant arrived with the mustard; hence it was called the landscape De la Moutarde. Although it is little more than a mere foreground, an original impression from this plate is worth from thirty to forty guineas.

According to Sandrart, Rembrandt realised an annual income of nearly 2500 florins (about 200*l.*) from the sale of the copies made from his works by his pupils, and the traffic in his etchings alone, independent of the labours of his own pencil and his pupils' fees; a large amount of itself, but which added to the rest must have made a princely income for those times. He considered that he conferred a favour which he disposed of impressions of some of his plates. The celebrated print of Christ healing the Sick, commonly called the Hundred Guilders, received its denomination from the fact that he refused to sell it for less than that amount—about eight guineas. This plate was bought by Alderman Boydell, who destroyed it after he had taken a few impressions from it, which enhanced the value of the prints accordingly. A good impression is worth from fifty to sixty guineas.

Rembrandt's best etchings realise enormous prices, both the portraits and the historical pieces varying from thirty to a hundred guineas. The most remarkable portraits are those of the burgomaster Six; Van Coppenol, the writing-master; Van Thol, the advocate; Uytenbogaert, the minister, and Uytenbogaert, the gold-weigher.

Rembrandt's great power was portrait; his pictures of that class are in the mass incomparably superior to his historical pieces. The evident cause of this was his utter want of taste in design, which, with rare exceptions, is decidedly the most vulgar of any artist's who has ever earned himself a name. Instead of acquiring fame in the ordinary way by any merits or beauties of form, Rembrandt commanded it, in spite of drawing the most gross and incorrect, through a rich and brilliant colouring, a consummate mastery of chiaroscuro, and not unfrequently a power of composition that has seldom been surpassed. He was, as Fuseli has remarked, 'a genius of the first class in whatever relates not to form. In spite of the most portentous deformity, and without considering the spell of his chiaroscuro, such were his powers of nature, such the grandeur, pathos, or simplicity of his composition, from the most elevated or extensive arrangement to the meanest and most homely, that the best cultivated eye, the purest sensibility, and the most refined taste dwell on them, equally enthralled. He possessed the full empire of light and shade, and of all the tints that float between them. None ever like Rembrandt knew how to improve an accident into a beauty, or give importance to a trifle.' (*Lecture II.*)

Rembrandt is supposed to have acquired his peculiar taste for a brilliant concentration of light from an appearance that he had been familiar with from his infancy in his father's mill, where a strong beam of light coming from a small and lofty aperture cast on the surrounding objects that peculiar tone which we see so happily illustrated in his pictures. He arranged the light in his own painting-room upon similar principles, and generally fixed a drapery behind his sitter of such colour as he intended to paint the ground.

Rembrandt had a contempt for the antique; and the ordinary cant of connoisseurs about grace, sublimity, and grandeur only excited his ridicule. His antiques, as he used to call them, were some old pieces of armour, unique weapons, curious turbans, and various antiquated articles of dress, which he procured from Polish Jews, and with which he indiscriminately clothed individuals of all nations, antient and modern. He once showed one of his performances to Vandyck, who praised the picture considerably; upon which Rembrandt, with a certain degree of satisfaction and consequence, said, 'Yet I have never been in Italy;' 'That's very evident,' returned Vandyck.

Rembrandt's taste led him to imitate certain effects of nature, and in the truth and power with which he gave these effects, both in his paintings and his etchings, he has seldom been equalled, and never surpassed. The prevailing light of his portraits is that of a brilliant sunset, and a rich golden tone of colouring pervades all his works. His originality is perhaps still more conspicuous in his etchings than in his paintings; he exhibited powers of the etching-needle before unknown; many of his plates are prodigies of chiaroscuro; and there is a softness and reality about them which we look for in vain in the works of other masters. It is said that he made a great secret of his mode of etching, and never allowed any one to see him at work. Most of his more important plates have evident traces of the dry point.

Rembrandt, at the beginning of his career, bestowed great labour on his pictures, and, in the manner of the generality of the Dutch painters, wrought them up to a very high finish. The Woman taken in Adultery, in the National Gallery, is probably his best picture in this style. At a later period of life his whole attention was given to the effect, and his pictures, although still greatly laboured, had the appearance of having been executed with a remarkable freedom and boldness of touch: this is particularly the case with his portraits, some of which have an astonishing body of colour in the lights. When this roughness was objected to by any one, he was in the habit of saying that he was a painter, not a dyer; and when visitors ventured to examine his pictures too closely, he used to tell them that the smell of paint was unwholesome.

Rembrandt died in Amsterdam, 1674. He had one son, Titus, who inherited his property, which, according to Descamps, was considerable. Titus was the pupil of his father, but being Rembrandt's son was the only distinction he ever enjoyed. Original Rembrandts are very valuable; some are estimated at several thousand pounds. They are scattered all over Europe, and this country possesses many; those in the National Gallery are all particularly fine specimens: the Gallery of Dresden also possesses several of his master-pieces.

A complete descriptive catalogue of his works was published by D. Daulby, in Liverpool, 1796; another, by A. Bartsch, in 1797, of Vienna; and a list of the principal of them is given in Bryan's *Dictionary of Painters*. The best notices of Rembrandt are those in the work by Descamps, entitled 'La Vie des Peintres Flamands,' &c., and Fiorillo's 'Geschichte der Zeichnenden Künste in Deutschland und den vereinigten Niederlanden.'

There is a fine collection of Rembrandt's etchings in the British Museum.

REMEMBRANCERS (*rememoratores*), formerly called clerks of the remembrance (37 Edw. III., c. 4), are officers of whom, until recently, there were three in the exchequer, called respectively the king's remembrancer, the lord treasurer's remembrancer, and the remembrancer of first fruits; their duty being to put the lord-treasurer and the barons of the exchequer, who are the judges of that court, in remembrance of such things as are to be called on and done for the king's benefit.

I. The office of the queen's remembrancer has relation to the proceedings of the court of exchequer in the exercise of its original jurisdiction as a court of revenue, and of its incidental jurisdiction as a court of equity, founded upon the fiction that the party seeking for relief upon matters of equity is a debtor and an accountant to the king, who by reason of the withholding of that to which he is equitably entitled, is the less able (quo minus sufficiens existit) to pay his debts to the crown. On the revenue side, the queen's remembrancer enters all the recognizances taken before the barons for any of the queen's debts, for appearances, &c., and he takes all bonds for such debts, and for the due execution of offices, and makes out process for breach of them; he also writes process against the collectors of customs, excise, and other public payments, for their accounts. Informations for intrusion into the queen's lands, and information for debts due to the crown, and on penal statutes, are entered and sued in his office; and he makes the bills of composition on penal laws. Indentures and other evidences which relate to the passing of any lands to or from the king are delivered into his office. At the beginning of Michaelmas term he reads in the court the oath taken by all the officers of the court upon admission. Writs of prerogative and writs of privilege for officers and ministers of the court are made out by him; and commissions of Nisi prius, by her majesty's warrant, on trial of any matters within his office, commissions to find debts due to the crown, and writs of extent awarded in pursuance of 33 Hen. VIII., c. 39, are issued and prosecuted in this office: also general process for the recovery of arrears of taxes and other debts due to the crown, which issue twice a year. All differences as to irregularities in proceedings are determined by the queen's remembrancer, with power to give costs against the party in fault, but subject to an appeal to the court. (5 Rich. II., st. 1, c. 15, 16; 13 and 14 Car. II., c. 21.)

On the equity side of the court the deputy-remembrancer performed till lately the same duties which in the court of chancery are performed by the accountant-general and the masters in chancery, but now the court of exchequer has the assistance of an accountant-general and masters in the exercise of its equitable jurisdiction. Under 57 Geo. III., c. 60, for regulating certain offices in the Court of Exchequer in England, the duties of the office of king's remembrancer, &c. are now discharged in person, and not, as formerly, by deputy. He is bound by a rule of court, 3 Jac. II., to attend the court during its sittings, to answer inquiries respecting the course of proceedings, and to enter the rules and orders of the Court of Exchequer relating to its fiscal or its equitable jurisdiction, and he now executes the duties formerly performed by the lord-treasurer's remembrancer, now abolished by 3 and 4 Wm. IV., c. 99.

II. The lord-treasurer's remembrancer's office was the office principally concerned in matters relating to the landed and casual revenue of the crown. When the king's title was found by an inquest of office, it became the duty of the officer with whom the writ and inquisition remained, to send a transcript into the office, in order to being put in charge for the service of the crown; he issued process for debts to the king, and against sheriffs, escheators, &c. and others who did not account. He took the accounts of all sheriffs, and made the record, whereby it appeared whether sheriffs and other accountants paid their proffers, that is, the balance appearing upon their accounts, due at Easter and Michaelmas, and he made another record showing whether sheriffs and other accountants kept their days prefixed. There were also brought into his office all the accounts of customers, comptrollers, and accountants, which were to be entered on record.

All estreats of fines, issues, and amerciaments, set or imposed in any of the courts at Westminster, or at the assizes or sessions, were certified into his office, and by him delivered to the clerk of the estreats, to make out process on them; and he might issue process for discovery of tenures and all revenue due to the crown by reason thereof, &c. As soon as the estreats came into this office, the parties interested might appear and deny the king's right, upon which the pleadings between the crown and the claimant were carried on in this office according to the course of the common law; and the right was either determined by the court upon demurrer or by verdict of a jury. The pleadings and judgments were entered on rolls called the 'Memoranda' of each year. Those of the reign of Edw. I. were published by Serjeant Maynard, in the first volume of his edition of the Year-Books, amongst which appears a letter from the lieutenant-treasurer and barons to the king, setting out the singular proceeding of the Earl Marshal and the Earl of Hereford, who, on Thursday next before the feast of St. Bartholomew, 25 Edw. III., came into the Exchequer with many others, knights-bannerets and bachelors: 'And the Earl of Hereford said that he was charged to say, on behalf of the Earl Marshal and the others who were there, and by all the commonalty (or community) of the kingdom, as well clerks as lay, that of two things they felt themselves grieved: first, by some grievances, the articles of which they had shown to you, their liege lord; and the other, which they understood was done by us of the Exchequer, without your knowledge, in respect of the levying of the eighth (utigme) and the taking of wools. And they said that in the writs which are issued for the levying of the eighth, it is contained, that earls, barons, knights, and the commonalty of the kingdom have granted the eighth, as they and their ancestors have heretofore done; whereas the said eighth by them and the commonalty never was granted. And he said that *nothing reduces a man to bondage more than being taxed at will*, and that if the eighth were so levied, it would turn to the disherison of them and their heirs. And he said openly, *and all the others afterwards*, that such tallage and such taking of wool *were not sufferable, nor would they in any manner suffer them*. And they prayed us that we should redress these things: whereupon they departed without waiting for any answer. Therefore, sire, be pleased to send us your will upon this matter.' The king answered, from Winchelsey, 'As to this, that they would in no wise suffer the levying of the eighth, we will that you do not omit to proceed in taxing, but in as much as they said that the levying would turn to their disherison, &c., make known to the said earls that, in the taxation of the eighth, if there be any who doubt of such prejudice or disherison, the king shall acquit him by his closed letters, that neither the taxation nor the levy be turned to the bondage of any one, or be drawn in use in times to come; but that the king may aid himself now for his great need, which is so urgent for the salvation of himself and themselves and of all the realm, and to lighten the mischief wherewith they have been long time charged. And that the chancellor shall make letters, &c. for those who doubt, &c. And as to the taking of the wools, that the ordinance made thereof be held, and that it be said everywhere by you and by those who intermeddle therewith, that the king will take nothing but by purchase making satisfaction, and that our intention never was otherwise, nor was the thing otherwise put in use.'

Pleadings in the lord treasurer's remembrancer's office have fallen very much into disuse since the alienation of crown lands and the abolition of military tenures by 12 Car. II., c. 24.

Parties may apply in a summary manner for the indulgence of the Court of Exchequer, which is empowered by privy seal, at the commencement of every reign, to compound or discharge any fines, issues, amerciaments, or recognizances, according to the circumstances of each case; and until the recent statute of 3 & 4 Will. IV., c. 99, such applications passed through this office. By that statute, the office of the lord treasurer's remembrancer was, with the offices connected therewith, abolished. Part of the duties of this office had been previously transferred to other offices, part ceased by the act, and the remainder are performed by the queen's remembrancer.

III. The remembrancer of the First Fruits' office receives the bishop's returns of institutions, takes all compositions and bonds for payment of first fruits and tenths, and makes process against all such persons as do not pay the same. (Cowell, *Report of Select Committee on Finance*, 1798.)

IV. Remembrancer of the City of London. The duties of this officer are those of agent for the corporation in parliament, and at the council and treasury boards. He gives a daily attendance at the houses of parliament during every session, to examine all bills and proceedings of the houses of lords and commons, and to report on such as may be likely to affect the interest or privileges of the city. For this purpose, the officers of both houses of parliament give him facilities of admission and attendance; and, for the purpose of identification by them, he sometimes wears a medal with the arms of the city. In this capacity he has to watch from 100 to 200 bills every year; and there are few years in which the corporation have not at least one bill of their own in progress. His duty is further to take the necessary steps to procure the presentation of all addresses and resolutions of the corporation to the king and queen and all the branches of the royal family: to make copies of the addresses and deliver the same, and to attend the sheriffs, when the appointment is made to receive the address or resolution, and the corporation, when the same is presented: to engross all petitions of the corporation to be presented to either house of parliament: to make and deliver copies, and to attend when the petitions are presented. If the petition be to the House of Lords, the remembrancer, with the sheriffs, waits on some peer of parliament, and requests him to present it. He has to give the city members and the sheriffs notice when petitions are to be presented to the House of Commons; to make applications for obtaining, and, when received, to distribute, the city imposts for duties on wine, an allowance made by the lords of the treasury, the origin of which is not known The earliest entry of its being made is about the year 1680. The sum allowed is 100*l.* 16*s.*, which is distributed in different proportions amongst the lord mayor, aldermen, recorder, sheriffs, common-serjeant, chamberlain, town-clerk, remembrancer, and sword-bearer. (*Second Report on Municipal Corporations of England and Wales*, 1837.)

REMIREMONT. [Vosges.]

RE'MIPES. [Hippa.]

REMO, SAN. [San Remo.]

REMONSTRANTS. [Pelagians.]

REMY, ST., a town in France, in the department of Bouches du Rhône, 10 miles east of Tarascon. This town appears to occupy the site of the Roman town of Glanum, or, more fully, Glanum Livii, mentioned by Pliny, and in the 'Antonine Itinerary' and the Peutinger Table. It derives its modern name from St. Remy, bishop of Reims. [Reims.] The town is situated in a marshy valley, and consists of some narrow streets, with irregularly-built houses. The public square is surrounded by buildings of a better class, and is adorned with a fountain: the town-hall, a good building, lately rebuilt, occupies one side of the square. The parish church has also been lately rebuilt. There are two remarkable Roman remains, a triumphal arch and a mausoleum. The triumphal arch has only one small archway, supported at the corners by square Doric pilasters, the capitals of which are the imposts of the arch. On each front of the structure, on each side of the arch, are two fluted Corinthian columns, which have lost their capitals and a portion of their shafts. In the four intercolumnar spaces are groups, each of two figures, touching the wall; but of the whole eight figures, only two retain their heads. The vault of the arch and the archivault are richly ornamented with foliage and similar ornaments in relief. The date of this monument, and the person to whose honour it was erected, are unknown. The upper part is very much dilapidated, and has been covered in with a stone roof to prevent further decay. The mausoleum is in better preservation: it consists of three compartments, resting one upon the other, the whole supported by a square base of masonry, and rising to the height of more than fifty feet. The first compartment is a square of rather smaller dimensions than the base on which it rests: its four faces are adorned with sculptures in relief of human figures as large as life, engaged in combat, of tolerably good design: at the corners of this compartment are square pilasters, with capitals of a very grotesque character. The second compartment is also square, with an open arch on each side: the arches, adorned with ornamental sculpture, rest on pilasters without bases. The angles of this part of the building are supported by fluted pillars, with Corinthian capitals and an ornamented frieze. The third part is circular, and is composed of ten Corinthian columns fluted, with an ornamented frieze, supporting a small dome, so as to present the appearance of a small round temple. In it are two statues, now headless, which may be seen between the columns.

There are some other remains, the ruins of walls and a Roman road. A subterraneous aqueduct extends from near the town in the direction of Arles: it is vaulted, five feet high by two feet wide. Urns; medals of gold, silver, and copper; and inscriptions, have been found in considerable numbers.

The population of the commune of St. Remy was, in 1826, 5367; in 1831, 5464, of whom 3213 were in the town. Some silk is thrown, and trade is carried on in corn and wine. There are two yearly fairs. Marble is quarried in the neighbourhood. The town has a lunatic asylum.

RENAIX (in Flemish, *Ronse*) is a considerable town in the province of West Flanders, in the kingdom of Belgium, 20 miles south by west of Ghent, and 7 miles south of Oudenarde. It is a flourishing place, and (according to Cannabich, 1836) has above 12,000 inhabitants, who carry on extensive manufactures of woollens and hats, and have a great trade in those articles and in linen. The only public buildings of any importance are a magnificent château, three churches, and an hospital.

RENAUDOT, EUSE'BIUS, a learned writer on the ecclesiastical history and antiquities of the Eastern church, was born at Paris in 1646. His father was first physician to the dauphin of France (afterwards Louis XIV.). Renaudot was educated at the Jesuits' college, and entered the congregation of the Oratoire, though he did not remain long in it. From his early youth he was particularly inclined to the study of the Oriental languages, but chiefly of the Arabic, Syriac, and Coptic tongues, by means of which he was afterwards enabled to enter so deeply into the origin and history of the Eastern church. He became well known at court, where his vast learning made him much esteemed and admired. In this way he was brought to the notice of Colbert, who, being then desirous of establishing printing-presses for the Oriental languages at Paris, consulted him upon the subject, engaged his services and offered him the reversion of a place in the Royal Library; but that minister having died before his views could be realised, Renaudot was not appointed to the vacant office. He seems however to have been employed by the king in various important negotiations with the governments of England and Spain, his time being so much taken up by these occupations, that, while they lasted, he almost entirely discontinued his favourite studies. In the year 1689 he was made a member of the French Academy, and, three years after, of that of the 'Inscriptions et Belles-Lettres.' In 1700 he accompanied to Rome Cardinal de Noailles, archbishop of Paris, who had become his patron, and he acted as his *conclavista* in the conclave which elected Clement XI. to the papal dignity. While at Rome, Renaudot resumed his favourite studies, and the library of the Vatican furnished him with ample materials for the history of the Eastern church—a subject which he had long in mind, and to which he now devoted his whole attention. In this design he was assisted by the new pope, who persuaded him to remain in Rome several months after the departure of Cardinal de Noailles, and gave him the priory of Frossey in Bretagne. From Rome Renaudot went to Florence, where he was equally well received and entertained by the grand-duke, who caused him to be made a member of the Academy della Crusca. On his return to France, Renaudot devoted himself entirely to letters, and composed a great number of learned dissertations, which are printed in the Memoirs of the Academy. He died in 1720, at the age of 74, greatly regretted by the learned men of his time. His fine and extensive collection of Oriental manuscripts he bequeathed to the abbey of St. Germain des Prés. They remained there until the Revolution, when they were incorporated with the Oriental collection in the Royal Library. Renaudot wrote the following works:—1, A collection of controversial pieces on the celebrated work by Nicole, entitled 'Défense de la Perpetuité de la Foi contre les Monuments authentiques de la Religion des Grecs,' Paris, 1708, 8vo.; 2, 'Historia Patriarcharum Alexandrinorum Jacobitarum,' &c., Paris, 1713, 4to.; 3, 'Liturgiarum Orientalium Collectio,' Paris, 1716, 2 vols. 4to.; 4, 'Antient Account of India and China,' written by two Mohammedan travellers of the ninth century, translated from the Arabic, Paris, 1718, 8vo. This has subsequently been found to be only a translation of part of a geographical and historical work, entitled *Murúju-dh-dhahab wa mádanu-jauhar* (meadows of gold and mines of gems), by the celebrated Masudí, an Arabian writer of the tenth century. 5, 'Gennadii Patriarchæ Constantinopolitani Homiliæ de Eucharistia,' together with other Latin treatises on the same subject, Paris, 1703, 4to.

RENDSBURG is a fortified town of Denmark, in the duchy of Holstein, and the capital of a bailiwick of the same name, the area of which is 290 square miles, and includes five parishes. It is situated in 54° 18′ N. lat. and 9° 40′ E. long., partly on a heath, partly on an island at the mouth of the Eyder, at its junction with the Holstein canal. It consists of three parts, the Old Town built on the above-mentioned island, the New Town on the Holstein bank of the river, and the Crown-work, with the last sluice of the canal, and some warehouses, all on the Schleswig side. It has 4800 inhabitants without the military, who amount to 3500 men. There are two churches, an hospital, a house of correction, a gymnasium, a military academy, a board of trade, and a custom-house. It is the residence of the superintendent-general (a high dignity in the Lutheran church); and the military chest of the duchies of Schleswig, Holstein, and Lüneburg is in the town. The place has manufactures of stockings, pottery, tobacco, and vinegar.

RE'NE' OF ANJOU, born in 1409, was the son of Louis II., duke of Anjou and count of Provence. In 1434 he succeeded his brother Louis III., who died in Calabria while waiting for the succession of Queen Joanna II. of Naples, who had named him her heir. Before this time, Réné had married Isabella of Lorraine. After the death of Queen Joanna II., in 1435, Réné laid claim to the kingdom of Sicily and Naples, but he had a powerful rival in Alfonso of Aragon. [ALFONSO V; JOAN II.] Réné was then a prisoner of the duke of Burgundy, who opposed his succeeding to the inheritance of Lorraine, which he also claimed after the death of the duke, his father-in-law. He sent however his wife Isabella to Naples with her younger son Louis. She was received with acclamations by the old and numerous partisans of the house of Anjou. Alfonso of Aragon was then a prisoner in the hands of Filippo Maria Visconti, duke of Milan; but soon after having recovered his freedom, he repaired to South Italy to dispute the crown of Naples with his rival. In 1438 Réné came to Naples, and a desultory warfare was carried on for three years in the Abruzzo and other provinces of the kingdom. The death of the Condottiere Caldora, Réné's best officer, decided the struggle in favour of Alfonso, who laid siege to Naples, and took it in 1442. Réné escaped on board a Genoese vessel to Provence. He was the last of the dynasty of Anjou who sat on the throne of Naples. In 1445 Réné gave his daughter Margaret in marriage to Henry VI. of England, on which occasion he obtained the restoration of his territories of Anjou and Maine, which were in the possession of the English. Réné now resided sometimes at Angers and occasionally at Aix in Provence, occupying himself with the administration of his territories, and also with the arts of painting, poetry, and agriculture. He wrote several works both in prose and verse, among others one on tournaments, the MS. of which, enriched with drawings, is preserved in the National Library at Paris. In 1449-50 Réné attended King Charles VII. of France in his successful war against the English, after which he returned to his dominions to pursue his favourite occupations. His eldest son John attempted to take Naples from Ferdinand of Aragon, who had succeeded Alfonso, but his enterprise failed. In 1473 Louis XI. of France seized Anjou under some pretence, and Réné retired to Aix in Provence, where he died in 1480 regretted by his subjects, among whom he has retained the enviable appellation of 'le bon Roi Réné,' for he continued to style himself king of Sicily and Jerusalem. He introduced several useful trees and plants into Provence, among others the muscadel grape, and encouraged manufactures of woollens and glass. A 'Précis historique' of his life was published by Boisson de la Salle, Aix, 1820, and a marble statue was raised to his memory in one of the squares of Aix, in 1823. Réné's sons having died before him, he was the last representative of the house of Anjou, and after his death Provence was united to France. Bargemont, Vicomte de Villeneuve, has published 'Histoire de Réné d'Anjou, Roi de Naples, Duc de Lorraine, et Comte de Provence,' Paris, 1825.

RENFREW. [RENFREWSHIRE.]

RENFREWSHIRE, a county in the west of Scotland, bounded on the north by the River Clyde, by which it is separated from Dumbartonshire, on the north-east and east by the county of Lanark, on the south and south-west by the county of Ayr, and on the west by the Frith of Clyde. It includes a small portion on the right or north bank of the Clyde, by which this portion is separated from the rest of the county. Its form is that of an irregular oblong, having its greatest length from the junction of the three shires of Ayr, Lanark, and Renfrew, on the south-east, to the banks of the Frith of Clyde, at the point or headland north of Innerkip, in the north-west, 32 miles; and its greatest breadth at right angles to the length, from the shore of Kilbirnie Loch to Erskine House on the Clyde, 13 miles. It is included between 55° 40′ and 55° 58′ N. lat., and between 4° 14′ and 4° 54′ W. long. (*Map of Scotland* pub. by Soc. for the Diff. of Useful Knowledge.) Its area is given by Playfair (*Description of Scotland*) at 225 square miles, or 144,000 English acres; and by MacCulloch (*Statist. Account of British Empire*) at 227 square miles (2 of them water), or 145,280 acres, of which 1280 are water. In Chambers's 'Gazetteer of Scotland' the area is given at 241 square miles, or 154,240 acres. The population in 1801 was 78,056; in 1811, 92,596; in 1821, 112,175; and in 1831, 133,443; showing an increase, steadily maintained, in 30 years, of 55,387, or above 70 per cent.; and giving (by Playfair's estimation of the area) 593 inhabitants to a square mile, a density of population unequalled by any county in Scotland except Edinburghshire, and in England by any except the metropolitan counties of Middlesex and Surrey, and the great manufacturing county of Lancashire. The greater part of the population is gathered round Paisley, Greenock, and Port Glasgow. Renfrew, the capital, is on the Clyde, in 55° 53′ N. lat. and 4° 22′ W. long.

Surface, Geology, Hydrography, and Communications.—The western part of the county, and the southern border which joins Ayrshire, are hilly; the eastern part, especially along the Clyde, is comparatively flat. The hills on the border of Ayrshire are the loftiest. Dunrod hill, Garvock hill, and Creuch hill are near the western extremity of this border; Queenside, Mistylaw (1240 feet high), the hill of

Staik (higher than Mistylaw), the Fernie Neeze hills, the Lochliboside hills and Neilston Pad (the last two rising from 820 to 900 feet), are near the middle of it; and Balagich (1000 feet high) is near the eastern extremity. Stanley or Stanely Brae (620 feet high) is the extremity of the Fernie Neeze hills, which extend toward the centre of the county. The principal eminence of the Lochliboside hills is called Corkindale Law.

The south eastern part of the county is included in the great coal-district of the west of Scotland. The chief coal-works are at Quarrelton near Johnstone; and at Hurlet and Househill near Paisley: the mines here are very productive. In the coal-works at Hurlet, a bed of shale over the coal has, by combination with sulphuric acid, been converted into alum-slate; and a considerable alum-work, perhaps the largest in Great Britain, has for some time been carried on. Limestone, sandstone, ironstone, granite, and secondary trap-rocks are found in considerable abundance. The hills about Mistylaw and Staik are mostly porphyry, capped with greenstone, which intersects the porphyry in innumerable dykes. Alluvial and diluvial beds are observed along the banks of the Clyde. Good freestone for building is quarried; limestone is also wrought for burning; and the coal and ironstone mines give employment to many persons.

The whole county is included in the basin of the Clyde, the æstuary of which washes a large portion of the border; but the tributaries which drain it are all small, and, with one exception, useless for the purpose of navigation. A stream which bears, in different parts of its course, the names of Rotten Burn, Shaws Burn, and Kipp Water, drains the western part, and joins the æstuary of the Clyde at Innerkip on the west side of the county. In one part of its course it expands into two ponds or lochs, one of them above a mile in length, used as reservoirs for a cut made to supply Greenock with a stream of water for turning the mills on the heights above that town. The central and eastern parts of the county are drained by three streams: the Gryfe, which flows from the westward; the Black Cart, which rises in Ayrshire, expands, at or near its source, into Kilbirnie Loch and Castle Semple Loch, and unites with the Gryfe about 2 miles north-west of Paisley; and the White Cart, or, by way of eminence, 'the Cart,' which rises on or near the eastern boundary, and drains the eastern side of the county, then, passing through Paisley, joins the united stream of the Black Cart and the Gryfe, just above its entrance into the Clyde near Renfrew. The White Cart is made navigable partly by an artificial cut to the Clyde. Although the other streams are not large enough for navigation, they supply moving-power to the mills or other machinery. Fish are not abundant in the White Cart; but in Castle Semple Loch pike and eels are found in great number; this loch is also much frequented by waterfowl. Beside the lochs already noticed, there are some others, but all small. The banks of Castle Semple Loch and Loch Libo are well wooded and picturesque.

The only canal is the Ardrossan, which was designed to open a communication between Glasgow and Ardrossan on the Ayrshire coast. It has never been carried farther than from Glasgow to Johnstone in Renfrewshire, about 11 miles west from Glasgow: it passes Paisley. The breadth of the canal at the surface is 28 feet; the depth 4½ feet: it passes through two tunnels, both at Paisley, and is carried over the White Cart by an aqueduct bridge. The traffic on this canal, which is very great, is carried on by luggage boats for goods, and 'gig boats' for passengers. The traffic may be estimated by the following statement:—

	Passengers.	Tons of Goods.
1831 . .	79,455 .	48,191
1832 . .	148,516 .	51,198
1833 . .	240,069 .	53,194
1834 . .	307,273 .	57,853
1835 . .	373,290 .	60,510
1836 . .	423,186 .	67,305

There is a railway from Paisley to the Clyde at Renfrew three miles and a quarter long. A railway from Glasgow to Paisley and Greenock, almost the whole of which is in this county, and one from Glasgow to Paisley, Johnstone, Irving, and Ayr, partly in this county, are nearly if not quite completed. They have a joint line to Paisley. The main-line of the Glasgow and Ayr railway is open. Some interesting details of these railways are given in the 'Companion to the Almanac' for 1841. Coach and other roads from Glasgow to Port Glasgow and Greenock run, one near the banks of the Clyde through Renfrew, another more inland through Paisley. Roads from Glasgow by Paisley run through the valley of Castle Semple Loch, one to Kilbirnie, Ardrossan, and Saltcoats, the other to Beith, Irving, and Ayr. A more direct road from Glasgow to Irving, and a road from Glasgow to Kilmarnock and Ayr, cross the eastern side of the county. Besides these principal lines of communication, there are less frequented roads crossing the county in every direction.

Climate, Soil, Agriculture.—The hilly parts of the county on the west and south are chiefly devoted to pasture. Scarcely more than half the whole surface of the county is under cultivation. The cultivated part is on the north and north-east, and in the centre; where the soil is most fertile. The uncultivated districts comprehend bleak moors or hills, with comparatively extensive bogs in some parts. Owing to the demand for meat, vegetables, milk, butter, &c., by the large and crowded population of Greenock, Port Glasgow, and Paisley, a large part of the cultivated land is meadow-land or garden-ground. Potatoes usually form part of every rotation of crops: a common rotation is as follows:—1, oats from grass; 2, potatoes or barley; 3, oats sown with red clover or rye-grass seeds; 4, hay; and 5 and 6, pasture: another common rotation consists of—1 and 2, oats; 3, barley; 4 and 5, hay; and 6 to 10, pasture. Dry stone dykes are in use in some parts of the county for fences; but where the soil is better and more under cultivation, hedges are used. Tile-draining and the use of bone-manure are rapidly extending. Dairy farming is very extensively practised. There are some large estates, and more than half the valued rent is of entailed or corporate property, but property in the rest of the county is a good deal subdivided. Farms are middle-sized, and farm houses and buildings of middling character.

Divisions, Towns, &c.—There are fifteen parishes in the county, reckoning Paisley and Greenock each as one; and portions of four others, Beith, Cathcart, Dunlop, and Govan, which are partly in Lanarkshire or Ayrshire. There are four burghs: Renfrew, population in 1831, 2833; Greenock, population 27,571 [GREENOCK]; Paisley, population 57,466 [PAISLEY]; and Port Glasgow, population 5192 [GLASGOW]. The principal villages are Johnstone, Gourock, Eaglesham, Kilbarchan, Lochwinnoch, Pollockshaws, and Neilston.

Renfrew, the shire town, is about 6 miles north-west of Glasgow on the road to Greenock. The Stuart family had their earliest known patrimonial inheritance in this parish. Renfrew was a royal burgh, and with its territory and other possessions was granted by David I. (who reigned A.D. 1124-1153) to Walter, son of Alan, whom he at the same time created steward of his household, or, as it was afterwards called, steward of Scotland, a dignity which became hereditary in the family, whence the name of Stewart or Stuart. By virtue of this grant Renfrew ceased to be a royal burgh, and became a burgh of barony; but when the Stuarts came to the throne, it regained its rank as a royal burgh by grant from Robert III., A.D. 1396. The parish of Renfrew comprehends 3776 acres; mostly under cultivation: the population in 1831 was 2833; of whom 2002 were in the burgh. About one-sixth of the population was agricultural. The number of inhabited houses in 1831 was 268 for the town, or 365 for the whole parish. The town is on the east side of the parish, near the Clyde, and consists of one main street along the Glasgow and Greenock road, and some smaller streets. From the burgh to the Clyde is a short canal, about half a mile long, partly formed in the Paddough Burn, once an arm of the Clyde; along the canal is a commodious quay, and across it is a timber drawbridge. Two bridges, one below the junction of the Black Cart and the Gryfe, the other (Inchinnan bridge) below the junction of the White Cart with the united stream, are on the border of the parish, remote from the town. The church is a cruciform structure, insufficient for the accommodation of the parishioners. There are a town-house, jail, and school-house. The number of prisoners in the gaol does not amount to half a dozen in the year, chiefly debtors; and the period of confinement is commonly short. The manufactures are various: muslin-weaving is by far the most important, and employs about 500 to 600 persons, half weavers, the rest (either women or children) in winding or drawing. Many females are employed in clipping, tambouring, and flowering. There is a considerable bleach-field, employing about

100 persons, chiefly women and children. Starch and draining-tiles are made, malt spirit distilled, and coal-works wrought. The coal-works employ 30 to 40 men or boys in the pits, and many others above ground. A few small vessels carrying coal, manure, &c. on the Clyde, belong to the burgh; but a considerable number of vessels, chiefly laden with grain from Ireland or with dye-stuffs for Paisley, discharge their cargoes here. Potatoes and fish are brought here from the Highlands. There is no regular market: there are three fairs in the year, chiefly for cattle.

The corporation consists of a provost, two bailies, and sixteen councillors; the burgh revenues are estimated at about 1400*l.* or 1500*l.* per annum. A weekly court for the administration of justice is held by the magistrates, and the quarter-sessions for the county are held here, but the sheriff-court is held at Paisley. Renfrew was formerly united with Rutherglen, Glasgow, and Dumbarton in returning a member to Parliament; by the Reform Act it has been connected with Kilmarnock, Rutherglen, Dumbarton, and Port Glasgow. The number of voters in the borough is about 80. The parliamentary boundary is more restricted than the antient burgh limits. The election for the county is held here.

There were in 1836 an endowed burgh grammar-school, and five other weekly schools, attended by about 327 day and 90 evening scholars. About 390 children attended Sabbath-schools, and a youth's class of about 60 was taught by the minister. There were a parish library, a subscription library, and a news-room in the burgh; and an association was being formed for the cultivation of natural history and the useful arts. Most of the Sabbath-schools had juvenile libraries. There were several benefit societies, a Bible society, and one or two other charitable institutions. (*New Statistical Account of Scotland.*)

Johnstone is in the parish of Paisley, about three miles west of Paisley town, and is partly noticed elsewhere. [Paisley.] The village has risen by the introduction of manufactures: it had in 1831 a population of 5617. In the centre is a large square entirely surrounded with houses, and a new square and market-place to the south of this are probably by this time completed. There are several streets lined with substantial houses of two stories, roofed with slate. There are a chapel-of-ease, several dissenting meeting-houses, a subscription library, two news-rooms, and a mechanics' institution and library. There are eleven cotton-mills in the town, and several more in the neighbourhood, beside brass-foundries, iron-foundries, machine-manufactories, and gas-works.

Gourock is a small burgh of barony on the Frith of Clyde, about three miles below Greenock, in the parish of Innerkip. Its regular inhabitants are chiefly fishermen; and it is said that this was the first place in Great Britain in which red herrings were cured. There is a ropewalk. Gourock is resorted to in the season as a bathing-place. It has a neat chapel-of-ease. The population of Innerkip parish in 1831 was 2088, about one-fourth agricultural. Innerskip is also resorted to by bathers.

Eaglesham is near the south-eastern extremity of the county, nine miles south of Glasgow. It is a neat village, rebuilt in 1769 by the Earl of Eglintoun, and consists of two rows of houses, 200 yards apart; the intermediate space, through which a rivulet flows, is chiefly used as a bleach-green. There is a cotton-mill in the village, which employs many hands: there are others in the parish. Lawn is woven here. There is a market, and there are four yearly fairs. The church of Eaglesham was built A.D. 1790, by the Earl of Eglintoun; and there is a Secession meeting-house. The population of the parish in 1831 was 2372.

Kilbarchan is a mile and a half west of Johnstone. The houses are mostly of freestone quarried in the neighbourhood. The inhabitants are chiefly engaged in cotton and silk weaving; and the young women are expert in tambouring, embroidering, and flowering muslin. Kilbarchan has a parish church, several meeting-houses, two public libraries, and an agricultural society. There are two other thriving villages in the parish, called the Brig o' Weir (or Bridge of Weir) and Linwood. The population of Kilbarchan parish in 1831 was 4806.

Lochwinnoch is near the western bank of Castle Semple Loch. It is a large village; the houses are generally of two stories, and slated; cotton-spinning is the chief branch of manufacture; but muslin-weaving, wool carding and spinning, and the manufacture of Angola shawls, Canton crapes, and other fabrics are carried on. There are a large parish church and a Secession meeting-house. There are three libraries, two parochial and one other, besides a library for the children attending the Sunday-schools, and several book-clubs. There are three yearly fairs at Lochwinnoch. Population of the parish, in 1831, 4515.

Pollockshaws is in Eastwood parish, about three miles from Glasgow. It is a tolerably large place, consisting of several streets, in a pleasant situation. It has a town-house with a tower and clock, a church rebuilt in 1781, and two places of worship for Seceders, and a small prison or lock-up house. The place depends almost entirely on the cotton-manufacture; spinning, weaving, bleaching, and printing are actively carried on. This place was made a burgh of barony by a grant from the crown. There were five schools in the parish in 1836, attended by about 600 day or evening scholars. There are several benefit societies. Coal and stone are procured in various parts of the parish. The population of Pollockshaws in 1831 was 4627; of the whole of Eastwood parish, 6854.

Neilston is nine miles from Glasgow, on the road to Irvine. The population of the village is nearly 2000; that of the whole parish, in which there are some other large villages, was, in 1831, 8046. Cotton-mills, print-fields, and bleach-fields are numerous; freestone and whinstone are quarried, and coal is dug in the parish. The church of Neilston contains some remains of antient Gothic architecture. There is a Secession meeting-house. Five fairs are held in the parish yearly.

The cotton-manufacture is also carried on to some extent in the parishes of Houston, Killellan, and Mearns.

Ecclesiastical and Legal Arrangements.—Of the nineteen parishes which are wholly or partly in Renfrewshire, two, viz. Beith and Dunlop, are in the presbytery of Irvine; three others, Cathcart, Govan, and Eaglesham, in the presbytery of Glasgow; and the rest in the presbytery of Paisley. These presbyteries are all under the synod of Glasgow and Ayr.

The quarter-sessions for the county are held at Renfrew, also the meetings of the commissioners of supply, and the court of election for the member of parliament for the county; but in case of an adjournment of any of these courts, they are generally transferred to Paisley. The sheriff-court for the county was held at Paisley before the appointment of a second sheriff-substitute, since which time two sheriffs' courts have been held for the two divisions of the county, one at Paisley, the other at Greenock. There are a gaol and a house of correction or bridewell for the county and the burgh of Paisley, in one building, at Paisley. It is a substantial edifice, containing in all 77 cells or rooms, viz. 43 in the bridewell, and 34 in the gaol; the discipline of the bridewell was reported by the Inspectors of Prisons, in their Second Report (in Dec., 1836), to be very good, that of the gaol to be very bad; but a later Report, the fourth (Nov., 1838), speaks of considerable improvement. There are small burgh prisons for debtors and criminals at Renfrew, Greenock, and Port Glasgow, and a lock-up-house at Pollockshaws. Several new prisons are required. 'There appears to be much crime in this county: the offences consisting chiefly of thefts and assaults. Housebreaking also is common, though seldom or never accompanied by personal violence. It is stated that there has been a great decrease of murders and highway robberies within the last thirty years; but it is said that the number of petty thefts has increased, and that beyond the increase of population. The places most distinguished for crime in Renfrewshire are reported to be Paisley, Greenock, Neilston, and Pollockshaws. Most of the offenders are said to be from ten to twenty years old. Drunkenness is looked upon as being the chief cause of crime in this county. The procurator fiscal at Greenock having taken twenty cases indiscriminately, and examined into their origin, found that nineteen of them arose from whiskey. Many of the offenders have no knowledge of a trade, and many of their parents are known to be of bad character. The offenders are generally found to be ill educated—more so than others in the same rank of life. Indeed in this respect they appear to be inferior to their predecessors thirty years ago; for the sheriff-substitute of Paisley states that at that period more came before him who could write than now. This want of education is particularly noticed among the Irish, who constitute a considerable portion of the offenders, and whose number in the county has greatly increased of late years, a fact which probably explains the apparent falling off in education among the poorest class. (*Third Report of the Inspectors of Prisons*, Dec., 1837.) 'There is great want of a good police in the county.' (*Ibid.*)

The county returns one member, who is elected at Renfrew. Paisley and Greenock return one member each; and Renfrew and Port Glasgow unite with Dumbarton, Rutherglen, and Kilmarnock to return another.

The county included, in 1833-34, 19 parochial schools, with 22 instructors, attended by a number of children varying from 656 (viz. 419 boys and 237 girls) to 925 (viz. 577 boys and 348 girls); and 169 schools not parochial, with 193 instructors, and a number of children varying from 5129 (viz. 2965 boys and 2164 girls) to 9747 (viz. 5676 boys and 4071 girls); no other children than those receiving daily instruction are included in the foregoing summary.

History, Antiquities, &c.—In the earliest historical period this county seems to have formed part of the territory of the Damnii, who occupied portions of the adjacent counties of Ayr, Lanark, Stirling, and Dumbarton. Under the Romans it was comprehended in the province of Valentia; and a Roman town or post (Vanduaria) is fixed by some at Renfrew, but more commonly at or near Paisley. It appears to have been subsequently included in the British kingdom of Strathclyde, and afterwards in the kingdom of Scotland. A large part of it came into the hands of the Stewards of Scotland, progenitors of the Stuart family, by grant from the Scottish kings or by other means, especially Strath-Gryfe, or the valley of the Gryfe. A body of the Renfrew men, called, from the Lavern or Levern, a feeder of the White Cart, *Laverani*, were present at the battle of the Standard, in the reign of David I., A.D. 1138. In a later period Renfrewshire made part of the principality formed out of the Stuart domains as an apanage for the eldest sons of the kings of Scotland; in consequence of which arrangement, the district, which was previously under the sheriff of Lanark, was formed into a separate county. Renfrew still gives the title of baron to the eldest son of the reigning king.

Of those antient times Renfrewshire contains a few memorials. Paisley abbey is noticed elsewhere. [PAISLEY.] There are some antient camps. Some antiquities, supposed to be druidical, exist in the parishes of Kilbarchan and Lochwinnoch; but they are of little moment. Barr Castle and Elliston Castle, both in Lochwinnoch parish, Peel Castle on Castle Semple Loch, and Newark Castle near Port Glasgow, belong to the middle ages. Elliston is said to have belonged to the progenitors of Wallace, and popular tradition connects some of the exploits of that hero with localities in Renfrewshire.

The battle of Langside, in which the Regent Murray [MURRAY, JAMES STUART, EARL OF] defeated the last attempt of Mary Queen of Scots to regain her throne, was fought just within the eastern border of the county. The battle of Muirdykes, in which those who supported the attempt of the Duke of Argyle in 1785 (contemporaneous with that of the Duke of Monmouth in the west of England) were defeated, was fought in Lochwinnoch parish in this county.

(*New Statistical Account of Scotland;* Playfair's *Description of Scotland;* Forsyth's *Beauties of Scotland;* Chambers's *Gazetteer of Scotland;* MacCulloch's *Statistical Account of the British Empire; Parliamentary Papers.*)

RENI, GUIDO. [GUIDO RENI.]

RENNELL, JAMES, born near Chudleigh in Devonshire, in 1742, entered the navy at an early age as a midshipman. His father was a captain in the artillery. Young Rennell went with Admiral Parker to India, and rendered some effectual service at the siege of Pondicherry. At the age of twenty-four he quitted the navy, and entered the corps of engineers in the service of the East India Company. He distinguished himself in the campaigns of Lord Clive, received some severe wounds, and was promoted to a majority. It was during this period that he produced his first work, 'A Chart of the Bank and Currents of Cape Agulhas,' the most southern point of Africa. While he was stationed in Southern India, he surveyed Adam's Bridge and the Paumbeen Passage between the island of Ramisseram and the continent, and he expressed his conviction of the practicability of widening the passage for ships. This suggestion has been lately acted upon, after a lapse of seventy years. While he held the appointment of surveyor-general of Bengal, he published his 'Bengal Atlas,' with an account of the Ganges and the Brahmapootra, in which he conjectured that the Sampoo of Tibet was the main feeder of the latter river. [BRAHMAPOOTRA.] On his return to England, in 1782, Major Rennell published a map of Hindustan, accompanied by a Memoir, 4to., 1788. He was also elected member of the Royal Society, and became intimate with Dr. Vincent, Sir Wm. Jones, Dr. Horsley, bishop of St. Asaph, and other learned men of his time. In 1793 he published 'Marches of the British Army in the Peninsula of India during the Campaigns of 1791.' He also published 'Memoir of a Map of the Peninsula of India, exhibiting its Natural and Political Divisions, the latter conformably to the Treaty of Seringapatam, of March, 1792; and also 'Elucidations of African Geography, from the Communications of Major Houghton and Mr. Magra, in 1791, with a Map.' In 1794, Major Rennell published a political pamphlet, entitled 'War with France the only Security of Great Britain at the present momentous crisis, by an Old Englishman.' The French Convention had already placed themselves out of the pale of international law by their resolutions of the 19th of November, 1792, in which they offered their aid to any people in any country of Europe who wished to overthrow the existing government. In 1798 he assisted Mungo Park in the arrangement of his African travels, and illustrated his work by a map and a memoir in the appendix. His next work, and that by which he is most generally known, was 'The Geographical System of Herodotus examined and explained,' 4to., 1800. He also wrote:—1, 'Observations on the Topography of the Plain of Troy;' 2, 'A Treatise on the Comparative Geography of Western Asia,' with an Atlas, a work of great labour and research; 3, 'Illustrations, chiefly Geographical, of the History of the Expedition of the younger Cyrus from Sardis to Babylon, and the Retreat of the Ten Thousand;' 4, 'An Investigation of the Currents of the Atlantic Ocean, and of those which prevail between the Indian Ocean and the Atlantic.' For this important work he examined and collated the log-books of all the ships of war and Indiamen which had traversed those seas during the last thirty or forty years, re-computing their observations and reducing them to one general system. The results of all this prodigious labour were ready for the press at the time of his death, and were shortly afterwards published by his daughter, Lady Rodd, in several large charts, showing by an infinite number of arrows the direction and force of the currents throughout the Atlantic ocean, and accompanied by a thin volume which ought to be studied by every seafaring person. Major Rennell also wrote some papers in the Transactions of the Royal and Antiquarian Societies, such as a Disquisition on the Melita Island of St. Paul's voyage; the place of Julius Cæsar's landing in Britain, in which he proves that the principal mouth of the Thames was then to the southward of the Isle of Thanet, &c. Major Rennell died on the 29th of March, 1830; and on the 6th of the following April his remains were interred in Westminster Abbey, where a tablet with an appropriate inscription is placed over his tomb. Biographical notices of him were inserted in the periodicals of the time, in which both his public and his private character were spoken of in those terms of praise which he justly deserved.

The merits of Major Rennell as a laborious investigator and an acute critic are universally acknowledged. Love of truth, patient and persevering research, and sound judgment are eminently displayed in all that he did. It is a matter of surprise, with the limited means at his command, that he accomplished so much in the department of comparative geography; and though we are now enabled, by new discoveries, to rectify many of his conclusions, the results to which he did attain will always remain as evidence of his unrivalled sagacity. His 'Geographical System of Herodotus' is a monument worthy of the writer whom he illustrated. Though unacquainted with the Greek language, and obliged to trust to the very inaccurate version of Beloe, he succeeded in producing a commentary on a classical author which is not surpassed by the labour of any scholar The blundering of Beloe, and his occasional complete perversion of the original, did not mislead the geographer, who could detect the author's meaning, even under the disguise of the translation. (*Journal of Education*, vol. i., p. 330, &c.) As a geographer, Major Rennell was one of the first Englishmen who has earned any permanent reputation; and in illustrating Herodotus and the Retreat of the Ten Thousand, he occupies a place by the side of D'Anville.

RENNES, a town in France, capital of the department of Ille et Vilaine, 186 miles in a direct line west by south of Paris, or 215 miles by the road through Versailles, Dreux, Alençon, Mayenne, and Laval; in 48° 6′ N. lat. and 1° 42′ W. long.

This town, at the time of the Roman conquest, bore the name of Condate. It is mentioned by Ptolemy as the chief town of the Redones, a Celtic nation, and is also mentioned in the Itinerary of Antoninus and the Table of Peutinger. At a later period it took the name of the people to whom it belonged, Redones, from which is derived the modern name of Rennes. In the ninth century, when the kingdom of Bretagne was restored by Nomenoé [BRETAGNE], Rennes was taken by that prince, and either then or some time afterwards became capital of Bretagne. In the anarchy which prevailed in Bretagne towards the close of the ninth century, Rennes was the capital of a county till A.D. 992, when Count Geoffroi of Rennes assumed the title of duke of Bretagne; after which event it became again the capital of all Bretagne. In the struggle between De Montfort and De Blois for the ducal coronet, Rennes, then held by the partisans of De Blois, was besieged for six months by John of Gaunt, duke of Lancaster, but he was obliged to raise the siege. Before the Revolution the states of Bretagne met at Rennes, and it was the seat of a parliament instituted A.D. 1555, by Henri II.

In 1720 the town of Rennes was laid waste by a fire, which lasted from the 22nd to the 29th of December, and consumed twenty-seven streets, five squares, and eight hundred and fifty houses in the very heart of the place. The new part, rebuilt after this catastrophe, forms one-third of the town, or, including the faubourgs or suburbs, one-fifth. It is distinguished by wide and straight streets intersecting at right angles. The town stands in a plain watered by the Vilaine and its tributary the Ille, which unite a little below the town. It is surrounded by an antient wall and towers, and, though of little strength, still ranks as a fortress. The Vilaine divides Rennes into two parts, the upper town on the north bank, and the lower town on the opposite bank, which are united by three bridges. The lower town, which is the smaller, is built on a low flat site, frequently inundated, and has narrow and crooked streets, with houses mostly built of wood, curiously carved and highly picturesque. The faubourgs or suburbs, which are large, resemble the lower town in character. The upper town is between the Vilaine and the Ille, on a site little more raised than the lower town; it comprehends the new quarter, and has well-paved streets, large squares or 'places,' and generally lofty well-built houses. Vaysse de Villiers however speaks of the place as dull and gloomy, characteristics which may be partly ascribed to the sombre tint of the granite or sandstone of which the houses are built, and partly to the dulness of the climate, the flatness of the surrounding country, and the sluggish and muddy current of the Vilaine. The principal 'places' or squares are La Place du Palais, so called from the Palais de Justice, which forms the north side of it, and La Place d'Armes, or Parade, larger than La Place du Palais, but not so handsome. There are several public walks: that of La Motte, which separates the Faubourg de Paris from the town; the promenade on the quay of the Vilaine, nearly a mile in length; the Champ de Mars; and Le Mail · the last just at the junction of the Ille and the Vilaine.

The cathedral is a heavy and ugly Gothic structure; a new cathedral, dedicated to St. Pierre (Peter), was commenced after the great fire of 1720, but, according to our latest authorities, is not yet finished. The two towers of the principal front form a conspicuous object in a distant view of the town, but on a closer view by no means answer the expectations excited. Of the other churches, that of St. Sauveur is the handsomest. Le Palais de Justice, or court-house, is a building having a front of the Tuscan order, heavy and ill-proportioned; the other three sides are adorned with Corinthian pilasters. It is appropriated to the administration of justice and to the study of the law, and is decorated with paintings and arabesque ornaments. The Hôtel de Ville (town-hall) is a building of less architectural pretension but more pleasing appearance than the Palais de Justice. Over the central part rises a clock-tower: it contains the rooms for the tribunal of commerce and the public library. Among the other public buildings are the office of the prefect, the episcopal palace, the ex-abbey of St. Georges, now occupied as a barrack, the Hôtel Kergus, antiently a school or college, now a barrack, and the Hôtel Blossac.

The population of the commune of Rennes, in 1826, was 29,377; and in 1831, 29,680, of whom 27,340 were in the town and the immediate suburbs; and, in 1836, 35,552. The manufactures of the place are not extensive, but comprehend a variety of articles—linen and cotton yarn, sail-cloth and stout linens, common flannels, hosiery, lace, cordage, nets, hats, gloves, starch, glue, earthenware, porcelain, candles, and liqueurs. There are tan-yards, curriers' shops, and wax-bleaching houses. A pretty considerable trade is carried on in these articles, and in the honey, wax, poultry, and butter of the surrounding district. The Vilaine is rendered navigable by locks up to the town, and communicates with the little port of Rédon. The canal of the Ille and the Rance communicates with the port of St. Malo, and roads converging at the town communicate with St. Malo, St. Brieuc, Brest, Lorient, Vannes, Rédon, Nantes, and other places on or near the coast of Bretagne. There is a fair on the 1st of each month.

Rennes is the seat of a bishopric, comprehending the department in its diocese; the bishop is a suffragan of the archbishop of Tours. It has a Cour Royale, or court of justice, and an Académie Universitaire, the jurisdiction of which extends over the five departments of Ille et Vilaine, Côtes du Nord, Finistère, Morbihan, and Loire Inférieure; and it is the head quarters of the thirteenth military division, which includes the same departments except Loire Inférieure. There are a number of fiscal or administrative government offices; a prison or house of correction for the department, subject to the jurisdiction of the Cour Royale; an arsenal, an artillery forge, royal schools for artillery and riding, and several other military establishments. The educational establishments are important. There are a law school, a secondary school of medicine, a high school or college, two seminaries for the priesthood, some schools of mutual instruction, a society of arts and sciences, and a school of painting. The public library was formed a century ago by a body of advocates, and augmented by the spoils of the monasteries plundered at the Revolution: it now contains 30,000 well-chosen volumes, including some of the rarest and earliest editions of the antient classics, and some valuable MSS. There is a small well-chosen cabinet of paintings: and there are cabinets of physics, natural history, antiquities, and medals; a botanic garden, and a theatre. There are several churches, four hospitals, a maternity society, and several public baths.

Among the eminent natives of Rennes are the Benedictine Lobineau, who died A.D. 1721, author of a well-known history of Bretagne, and, in conjunction with Felibien, of a history of Paris; Tournemine, the Jesuit, who died A.D. 1739, author of a history of the Jews; L'Abbé de la Bletterie, who died A.D. 1772, author of a history of the Roman emperor Julian, and translator of Tacitus; several eminent lawyers, the engineer Vauban, and the count Lanjuinais.

The arrondissement of Rennes has an area of 528 square miles, and comprehends 78 communes. The population, in 1831, was 126,375; in 1836, 130,838. It is divided into ten cantons or districts, each under a justice of the peace.

RENNIE, JOHN, was a native of Scotland, and born on the 7th of June, 1761, at Phantassie in Haddingtonshire, where his father was a respectable farmer. He acquired the rudiments of education at the school of the place, and afterwards received instruction in the elementary part of mathematics at Dunbar, where, on the promotion of the master, he for a short time conducted the school.

It does not appear that Rennie pursued his studies far in pure mathematics, but his taste leading him to contemplate the nature and properties of machines, he probably applied himself chiefly to those parts of science which relate to elementary mechanics, and it is certain that he made himself a proficient in the useful art of drawing machinery and the different objects which belong to practical architecture. He also took advantage of such opportunities as his avocations afforded to attend the courses of lectures on mechanical philosophy and chemistry which were then given at Edinburgh by Drs. Robison and Black. Prepared thus with what books and professors could teach, he entered the world; and it may be said that, during all the course of his useful life, he was adding to his stock of knowledge, or seeking the means of improving his practice by observing the operations and effects of his own works, as well as of those which were executed by other men.

Mr. Rennie was employed for a time as a workman by Mr. Andrew Meikle, a mechanist of his native parish, under whose superintendence he assisted in the erection of some mills in the neighbourhood; and he is said to have rebuilt, on his own account, one near Dundee. It is probable that soon after this work was finished, or about 1780, Mr. Rennie, feeling himself qualified to practise the profession of civil engineering on a greater scale than his own country at that time afforded, set out for London. On his way he visited the docks at Liverpool, and spent some months at Soho near Birmingham, in examining the works of Messrs. Boulton and Watt, to whom he had brought letters of introduction from the professors at Edinburgh.

Soon after he was established in the metropolis, Mr. Rennie was employed by those gentlemen in the construction of two steam-engines and the machinery connected with them, at the Albion Flour-Mills near Blackfriars Bridge. These steam-engines were of the kind called double, for which Mr. Watt had taken out a patent in 1782; each of them was of 50-horse power, and the two could turn twenty millstones. All the wheel-work was made of cast-iron, instead of wood, which had before been used in such machinery; and the talents of Mr. Rennie were particularly manifested in the methods which he adopted to render the movements steady. The works were finished in 1789; but they continued in operation only during two years, the whole of that great establishment having been unfortunately destroyed by fire in 1791.

Mr. Rennie continued to the last to be employed in the construction of steam-engines, or of the different kinds of machinery to which, as a first mover, steam is applied; and at the same time he was almost constantly engaged in designing or superintending those public works which have given him so just a claim to celebrity. Between 1799 and 1803 he constructed the stone bridge at Kelso, below the junction of the Tweed and Teviot. This work, as elegant in its design as valuable for its utility, consists of five elliptical arches carrying a level roadway, and over each pier are two small columns, which support the entablature. Mr. Rennie also built stone bridges at Musselburgh and other places in Scotland; but his master-piece of this kind is the Waterloo Bridge over the Thames. This bridge, so much distinguished by its grandeur and simplicity, was begun in 1811, and finished in six years. It consists of nine equal elliptical arches, 125 feet in span, and the faces of the piers are ornamented with coupled Doric columns. Besides the elegantly designed iron bridge over the Witham in Lincolnshire, he also built that which is called the Trafalgar or Southwark Bridge, over the Thames. The latter consists of three cast-iron arches resting on stone piers [Bridge], and the span of the centre arch is 240 feet.

Mr. Rennie superintended the formation of the Grand Western Canal, which extends from the mouth of the Ex to Taunton; and, in conjunction with Mr. Murray, that of the Polbrook Canal between Wade-bridge and Bodmin, in Cornwall. He also superintended the execution of the Aberdeen canal uniting the Don and the Dee, and of that between Arundel and Portsmouth. But his chief work in connection with inland navigation is the Kennet and Avon canal, which extends from Bath to Newbury, and which required all the skill of the engineer to conduct it through the rugged country between those places. He also gave a plan for draining the fens at Witham in Lincolnshire, which was executed in 1812.

The London Docks, and the East and the West India Docks at Blackwall, are among the great works which were executed from the plans and under the direction of Mr. Rennie; and at the last-mentioned docks he constructed the sheds which cover timber and other merchandise; the roofs of these are formed of iron frames covered with slate and supported on iron pillars. He formed the new docks at Hull (where also he constructed the first dredging-machine which was used in this country), the Prince's Dock at Liverpool, and those of Dublin, Greenock, and Leith, of which the last is remarkable for the particularly strong construction of its sea-wall. [Dock.] To these must be joined the insular pier or breakwater protecting Plymouth Sound from the waves which during high winds used to roll in with tremendous force. [Plymouth.] Mr. Rennie also gave plans for improving the harbours of Berwick, Newhaven, and other places, and the dockyards of Portsmouth, Plymouth, Pembroke, and Chatham: he also built the pier at Holyhead.

Before his death he had given plans for improving the docks at Sheerness; which have since been executed by his first and second sons Messrs. George and John (now Sir John) Rennie: the gates are formed of cast-iron ribs, covered, on the side next to the stream, with cast-iron plates, and on the other side with planks of wood. It should be observed also that Mr. Rennie, sen. gave the designs for the present London Bridge; and that the charge of its construction was confided to Sir John Rennie, who, in 1831, finished that magnificent structure. [Bridge.] The span of its centre arch is 150 feet. The same gentleman executed also the light and elegant stone bridge which has replaced the old bridge of timber at Staines.

Mr. Rennie married in 1789, and had six children; four sons and two daughters. He survived his wife, and, till within a few years of his death, he enjoyed excellent health. He died of an inflammation of the liver, October 16, 1821, and was buried in St. Paul's Cathedral.

The sums expended in the construction of Mr. Rennie's bridges have appeared so great as to give rise to an opinion that the measures adopted for the stability of those structures exceeded those which a due regard to economy should warrant. Of this however it is scarcely possible to form a right judgment. It is true that the Waterloo Bridge cost more than a million sterling, but several circumstances contributed to make the expense of that bridge greatly exceed that of the bridges before built over the Thames; it is, in the first place, longer, the material is granite, and the piers were built in cofferdams. Now, granite is more costly than any other species of building-stone, both at the quarry and in the charges for working it into form; and a cofferdam, with the engines necessary to keep out the water, is much more so than a caisson. But in a great public work durability is a primary consideration; and this is ensured by the employment of the best materials and by taking the most effectual means of securing the foundations. The expensive repairs which the bridges at Westminster and Blackfriars have required, and will continue to require, will probably, in the end, afford a full justification of the measures which have been followed in the construction of the Waterloo and the new London bridges. In the execution of machinery, Mr. Rennie may be said to have been the first who made that skilful distribution of the pressures, and gave those just proportions to the several parts, which have rendered the work of Englishmen superior to that of any other people.

We may here observe that the refined theories of the mathematician are too general to admit of being brought down to all the circumstances which depend on the constitution of material substances; and, from the minute division of labour among us, the artisan passing his life in the execution of one particular kind of work is seldom capable of making alterations by which a complex system of machinery might, as a whole, be improved. Therefore neither the profound philosopher nor the industrious operative can, alone, be expected to constitute a complete engineer; and if this character is to be attained, it will probably be found in a man in whom, as in the subject of this article, are united the thinking mind, and, to a certain degree, the labouring hand, and whose duties leave him sufficient leisure to investigate the mutual actions of bodies on one another by appropriate experiments.

RENT, in Political Economy, is defined by Mr. Ricardo to be 'that portion of the produce of the earth which is paid to the landlord for the use of the indestructible powers of the soil. It is often however (he remarks) confounded with the interest and profit of capital, and in popular language the term is applied to whatever is annually paid by a farmer to his landlord.' Mr. Malthus (*Prin. of Pol. Econ.*) defines rent to be 'that portion of the value of the whole produce which remains to the owner of the land, after all the outgoings belonging to its cultivation, of whatever kind, have been paid, including the profits of the capital employed, estimated according to the usual and ordinary rate of the profits of agricultural capital at the time being.' The origin and progress of rent will be subsequently considered.

The chapter on rent, in the 'Wealth of Nations,' though abounding in important facts, is, in respect to the author's conclusions, generally regarded as the most erroneous and defective in that work: it contains no distinct enunciation of the nature and causes of rent, although, it is remarked, he appears in some instances to have contemplated the subject in its true light. Other writers have treated the question in the same way, without more clearly elucidating it. The economists of the school of Quesnay have taken many just views of the nature of rent, but have equally failed in deducing from them the inferences to which they obviously led. Dr. James Anderson [Anderson], in the 'Recreations in Agriculture' (vol. v., p. 401), published in

1801, is acknowledged to have propounded the theory of the origin and progressive increase of rent as now generally recognised; but his theory excited little attention at the time; and it was not until 1815 that it was more fully and elaborately treated in two works published simultaneously: one of them was an 'Essay on the Application of Capital to Land,' by a Fellow of University College, Oxford (Mr. West, a barrister, afterwards chief-justice of Bombay); the other work was by the late Mr. Malthus, and was entitled 'An Inquiry into the Nature and Progress of Rent.' The late Mr. Ricardo had adopted the principles of these two works several years before they were published, but it was not until 1817 that a pamphlet by him appeared in which their truth was forcibly and clearly demonstrated. The publication of his 'Principles of Political Economy and Taxation,' in the same year, may be considered as having established all the main points included in the theory of rent. This theory, and that of Mr. Malthus on population, are undoubtedly the most important additions which have been made to the science of political economy since the publication of the 'Wealth of Nations' in 1775. But although the fundamental principles of the theory of rent are now generally considered as settled, there are several subordinate parts of the question on which political economists are at variance. Mr. Mill and Mr. MacCulloch have more fully adopted the Ricardo theory than any other writers; but Mr. Malthus has dissented from some of its principles, although his views in the main coincide with that theory; and Professor Tucker, of the university of Virginia, dissents from it still more widely than Mr. Malthus. Mr. Senior, while condemning some of Mr. Ricardo's reasonings, appears to have again propounded them under a different form.

The causes of the ordinary excess of the price of raw produce above the cost of production, as enumerated by Mr. Malthus, are:—1, That quality of the soil, by which it can be made to yield a greater quantity of the necessaries of life than is required for the maintenance of the persons employed on the land. This is the foundation of rent, and the limit to its possible increase. 2, The second quality consists in that property peculiar to the necessaries of life, by which, if properly distributed, they create demanders in proportion to the quantity of necessaries produced. Thus, the effect is to give a value to the surplus of necessaries, and also to create a demand for more food than can be raised on the richest lands. 3, The comparative scarcity of fertile land; a circumstance which is necessary to separate a portion of the general surplus into the specific form of rent to a landlord. As most modern economists have adopted the main principles of the Ricardo theory, we here give an outline of it, in the words of Mr. Ricardo.

Mr. Ricardo says:—'If all land had the same properties, if it were boundless in quantity and uniform in quality, no charge could be made for its use, unless where it possessed peculiar advantages of situation. It is then because land is of different qualities with respect to its productive powers, and because, in the progress of population, land of an inferior quality, or less advantageously situated, is called into cultivation, that rent is ever paid for the use of it. When, in the progress of society, land of the second degree of fertility is taken into cultivation, rent immediately commences on that of the first quality, and the amount of that rent will depend on the difference in the quality of these two portions of land. . . . With every step in the progress of population which shall oblige a country to have recourse to land of a worse quality to enable it to raise its supply of food, rent on all the more fertile land will rise. . . . If good land existed in a quantity much more abundant than the production of food for an increasing population required, or if capital could be indefinitely employed without a diminished return on the old land, there could be no rise of rent; for rent invariably proceeds from the employment of an additional quantity of labour with a proportionally less return.'

Rent, according to the definition which has been given, consists of a surplus which remains after the capital expended in production has been replaced with ordinary profits. This surplus, which constitutes rent, arises, as Mr. Ricardo asserts, from, and is in proportion to, the necessity for resorting to inferior soils or employing capital on the old soil with smaller returns. To use the words of Mr. Mill, his friend and disciple—'Rent is the difference between the return made to the more productive portions and that which is made to the least productive portion of capital employed upon the land.' In a country containing, as every country does contain, land of various degrees of fertility, rent therefore will not be paid until the demands of an increasing population have rendered it necessary to have recourse to the inferior soils. 'Thus (continues Ricardo), suppose land, Nos. 1, 2, 3, to yield, with an equal employment of capital and labour, a net produce of 100, 90, and 80 quarters of corn. In a new country, where there is an abundance of fertile land compared with the population, and where therefore it is only necessary to cultivate No. 1, the whole net produce will belong to the cultivator, and will be the profits of the stock which he advances. As soon as population had so far increased as to make it necessary to cultivate No. 2, from which 90 quarters only can be obtained after supporting the labourers, rent would commence on No. 1; for either there must be two rates of profit on agriculture, or ten quarters or the value of ten quarters must be withdrawn from the produce of No. 1 for some other purpose. Whether the proprietor of the land or any other person cultivated No. 1, these ten quarters would equally constitute rent; for the cultivator of No. 2 would get the same result with his capital, whether he cultivated No. 1, paying ten quarters for rent, or continued to cultivate No. 2, paying no rent. In the same manner it might be shown, that when No. 3 is brought into cultivation, the rent of No. 2 must be ten quarters, or the value of ten quarters, whilst the rent of No. 1 would rise to twenty quarters. . . It often and indeed commonly happens that before Nos. 2 and 3, or the inferior lands, are cultivated, capital can be employed more productively on those lands which are already in cultivation. . . In such case, capital will be preferably employed on the old land, and will equally create a rent; for rent is always the difference between the produce obtained by the employment of two equal quantities of capital and labour. If with a capital of 1000*l.* a tenant obtain 100 quarters of wheat from his land, and by the employment of a second capital of 1000*l.* he obtain a further return of 85, his landlord would have the power, at the expiration of his lease, of obliging him to pay 15 quarters, or an equivalent value for additional rent; for there cannot be two rates of profit. If he is satisfied with a diminution of 15 quarters in the return for his second 1000*l.*, it is because no employment more profitable can be found for it. . . In this case, as well as in the other, the capital last employed pays no rent. For the greater productive powers of the first 1000*l.*, 15 quarters is paid for rent; for the employment of the second 1000*l.*, no rent whatever is paid. If a third 1000*l.* be employed on the same land, with a return of 75 quarters, rent will then be paid for the second 1000*l.*, and will be equal to the difference between the produce of these two, or 10 quarters; and at the same time the rent of the first 1000*l.* will rise from 15 to 25 quarters, whilst the last 1000*l.* will pay no rent whatever.' (Ricardo's *Prin. of Pol. Econ.*, 3rd ed.) Perhaps however the clearest definition of this theory of rent is that given by Mr. Mill, in his 'Elements of Pol. Econ.,' 3rd ed.

There remains to be noticed another incident of rent, namely, that it does not form a part of the cost of production. Mr. MacCulloch has given the shortest explanation of this law in Note iii. of his edition of the 'Wealth of Nations.' 'The price of raw produce,' he remarks, 'does not exceed the cost of production,' including in that expression the ordinary profits of the producer's capital. 'The aggregate price exceeds the aggregate cost of production; but this is because the cost of production is unequal. The price exceeds the lowest, but not the highest cost of production: and this highest cost, since it regulates the price of the whole, may be considered, without impropriety, as the cost of the whole, and the rent to be a peculiar privilege of favoured individuals.'

The circumstances which precede or accompany the cultivation of inferior lands or the employment of additional capital on the old lands are—1, an increase of population; 2, the accumulation of capital; 3, a rise in the exchangeable value of raw produce. The two first cause a fall in profits and wages, and a rising market-price of raw produce is a consequence of more labour or more capital being required to produce it, or of a deficient supply previous to its being produced. In a new country, the whole produce is divided between the capitalists and labourers, and so long as fertile land is in abundance and may be had for an almost nominal price, nobody will pay a rent to a landlord, and profits and wages are maintained at a high rate. But capital accumulates and wages decrease; and whenever agriculture has reached a state in which the returns of additional capital on the old lands are less than could be obtained from the inferior land, such inferior land will be cultivated, and if the profits of the capital employed on such inferior land were 20 per cent., while the old lands yielded 30 per cent., a rent would arise equivalent to the difference, or 10 per cent. This, as well as any subsequent rise of rents, is caused by more capital being ready to be laid out on the old lands, but which cannot be so employed without diminished returns, and this circumstance renders it more profitable to take fresh lands into cultivation, though of an inferior degree of fertility.

One of Professor Tucker's objections to the Ricardo theory of rent is directed against the assumption that 'the means of subsistence are a fixed quantity, or near it, instead of its admitting of such gradations that a labourer may be supported by one-fifth of the soil once required for subsistence;' and he points to the western states of the American Union, where a labourer can earn in less than ten days as much grain as he can consume in a year, and where consequently a very high scale of diet is maintained, and he contrasts it with other countries in which the whole of the year's labour is necessary to earn subsistence for the year, although the scale of diet is comparatively low. In the Atlantic states of the Union, as compared with the Western states, the contrast is also very striking. This varying character of human subsistence, Professor Tucker contends, may be a cause of rent, without either an increase or decrease in the returns to capital. The very high rents paid in Ireland may be partly attributed to this cause. In the course of his objections to Mr. Ricardo's theory, Professor Tucker remarks:—'Land is a productive machine, which but a few possess, but whose produce none can dispense with, and for which there being more and more demanders, they must and will give more and more of their labour to obtain it. . . . Rents, having once begun, continue to increase with the increase of population and the more frugal consumption to which it impels individuals.' Mr. MacCulloch simply regards the adoption of a less costly food by the labourers as similar in its effects upon prices and rents to an improvement in agriculture. Professor Tucker's further objections against the Ricardo theory consist in its ascribing 'the progressive rise of raw produce and of rents to the greater amount of labour expended on the soil last cultivated, and not to the greater cheapness of all labour from the increase of population:' and in its maintaining that when raw produce rises, labour also rises' (p. 156). He concludes, 'that neither is a resort to soils of inferior quality, to lands more distant from market, nor different outlays of capital on the same lands, necessary either to the existence of rent, or to its progressive increase, but that it is caused solely by the increase of population, together with the capacity which the same soil possesses of supporting a greater number by reason of their resorting to a more frugal mode of subsistence' (p. 121). It should be observed, that Professor Tucker admits that 'successive resorts to inferior soils, or outlays of fresh capital on old lands, keep pace with the rise of raw produce, and ordinarily afford a *measure of the progress of rent*, and of its different degrees, according to diversities of fertility, culture, or distance from market, but they are not the cause of its rise' (p. 113). Indeed, whatever may be the true theory of the causes and amount of rent in any given community, it may be very easily shown that the existence of soils varying in fertility is not a necessary element to the existence of rent, while the limited amount of productive soil is a necessary element.

Advantages of position, such as a proximity to markets, may counterbalance the disadvantage of barrenness, and land of this description, which, if it were further removed, would yield no rent, will, under these circumstances, produce a higher rent than more fertile lands situated at a distance from the same market. Land in the neighbourhood of towns yields a high rent, and a still higher rent is paid for land in towns. The rent in each of these cases is regulated either by the common principle that there cannot be two rates of profit, of which the case first mentioned is an instance; or, as in the latter examples, it is determined by the limited extent of such land.

Restrictions on the importation of grain, by forcing the inferior soils into cultivation, undoubtedly tend directly to raise rents; but no possible quantity of imported produce could have any material effect in diminishing the total rents of the country. Importation necessarily implies the existence of high prices in the importing country: it has a tendency to equalise rather than to lower prices, as, by facilitating the exchange of manufactured goods for common food, population is increased, and an increased demand arises for other products of the soil besides bread corn. This has been the case in the territory of Genoa, where the soil, though of a sterile nature and unfit for the production of corn, yields a higher rent than the fertile corn-lands in the plains not far distant; for the cost of production being low by means of the low price of imported food, land may be cultivated for various agricultural objects, and yield a rent which, if employed in the production of grain, would scarcely repay the cost of production. In a country which possesses superior manufacturing resources and capabilities, the exchange of manufactures for common food may therefore be a cause of rent without resorting to inferior soils.

Mr. Ricardo regarded the owners of land in the same light as the possessors of a monopoly, advantageous to themselves and proportionably injurious to the mass of consumers. Mr. Malthus proposed to modify this view of their advantages, and to consider them as originating only in a 'partial monopoly.' The former is accused of underrating the national importance of rents, and Mr. Malthus of overrating them. Under a system of free importation of the produce of the soil, it may be correct to consider the owners of land as possessed only of a 'partial monopoly,' but it is scarcely so when laws are passed which, except in seasons of high prices, prohibit the supply of provisions from foreign countries; and in this case the interests of the community do not coincide with that of the owners of land.

When the rights of property are fully established, rents will exist, whether they accrue to the farmer-proprietor or are paid by the farmer-tenant to a landlord. That quality of land which terminates in rent, Mr. Malthus regards as a boon most important to the happiness of mankind, and the main security against the time of the whole society being employed in procuring mere necessaries. 'This,' he observes, 'is the source of all power and enjoyment; and without which, in fact, there would be no cities, no naval and military force, no arts, no learning, none of the finer manufactures, none of the conveniences and luxuries of foreign countries, and none of that cultivated and polished society which not only elevates and dignifies individuals, but which extends its beneficial influences through the whole mass of the people.'

In Mr. Malthus's 'Principles of Pol. Econ.' the subject of section 7, chap. iii., is 'On the causes which may mislead the landlord in letting his lands, to the injury both of himself and the country.' Most of the considerations which he urges are of a practical nature, and relate to rent in agriculture. On this part of the subject the reader may refer to Grainger and Kennedy, 'On the Tenancy of Land in Great Britain.'

(Ricardo, Malthus, Mill, and MacCulloch's *Treatises on the Elements and Principles of Political Economy*; Professor Tucker's *Laws of Wages, Profits, and Rent investigated*, Philadelphia, 1837; Professor Jones's *Essay on the Distribution of Wealth and on the Sources of Taxation*.)

RENT (in Law Latin, *redditus*, 'a return') is a right to the periodical receipt of money or something valuable in respect of lands or tenements held by him from whom the rent is due. There are three kinds of rent—rent-service rent-charge, and rent-seck.

There is rent-service when a tenant holds lands of his lord by fealty and certain rent, or by homage, fealty, and certain rent, or by other services and certain rent. Rent-service therefore implies tenure, and it may be due to the lord of the manor of which the lands are held, or to some other chief (that is, immediate) lord of the fee, or to the reversioner. The right of distress is an incident to rent-service in arrear, so long as it is due to the same person to whom fealty is due. Before the statute of Quia Emptores (18 Edw. I.), a person might make 'a feoffment in fee simple either by deed or without deed, yielding to him and his heirs a certain rent, which was a rent-service, and for this he might have distrained of common right; and if there were no reservation of any rent, nor of any service, yet the feoffee held of the feoffor by the same service as the feoffor did hold over of his lord next paramount.' (Litt., 216.) The statute of Quia Emptores enacted that the feoffee shall hold of the chief lord by the same services by which the feoffor held, and consequently no rent can now be reserved when a man transfers to another all his estate in land In order that rent-service may now be created, the person to whom the rent is reserved must have a reversion in the lands and tenements out of which the rent is to issue; but any reversion is sufficient. Thus a person who has a term of twenty years may grant it to another, all but one day, and this will leave him a reversion, so that a rent-service may be reserved, with its incidents of fealty and the right of distress. If he assign all his term, reserving a rent, but without a clause of distress in the assignment, he cannot distrain for the rent.

Rent-service therefore which has been created since the statute of Quia Emptores can only be reserved to the lessor who retains a reversion, and it will belong to the person who is entitled to the reversion. If a man seised in fee simple makes a lease of lands for years, reserving rent, the rent-service is descendible to his heir with the reversion; though all rents which accrue due to the lessor before his death will belong to his personal representatives. A rent-service reserved out of chattels real will of course belong to the personal representatives of the lessor. A rent is now most commonly reserved in leases for years, but it may be reserved on any conveyance which passes or enlarges an estate; and it may be reserved in the grant of an estate in remainder or reversion, or in a grant of a lease for years to commence at a future time.

A rent-service may be separated from the reversion or seignory, by the reversioner granting the rent and retaining the fealty: in this case the lands are still held of the grantor, but the rent is due to the grantee; not however as rent-service, but as rent-seck (redditus siccus), so called, 'for that no distress is incident to it.' (Litt., 218.) If the seignory or reversion is granted, the rent-service will pass by the grant, and the grantee is entitled to receive the rent from the tenant from the time that he gives him notice of the grant, together with all rent that had accrued due since the grant, and is unpaid at the time of such notice.

Rent-service can only be reserved to the feoffor, donor, or lessor, or to their heirs, upon any feoffment, gift, or lease; and if rent is reserved generally, without specifying the persons, it will belong to the lessor, and after his death to those who are entitled to the reversion. Rent is payable at the times mentioned in the reservation, but not till the last minute of the day on which it is payable.

When rent-service is in arrear, the common-law remedy for the recovery of it is by distress. [DISTRESS.] By 4 Geo. II., c. 28, s. 2, every landlord who by the terms of his lease has a right of re-entry in case of non-payment of rent, may, when half a year's rent is due, and there is no sufficient distress on the premises, serve a declaration in ejectment on his tenant, without any formal re-entry or previous demand of rent, and a recovery in such ejectment is final and conclusive, unless the rent and all costs are paid within six calendar months after the judgment in the action of ejectment has been executed. The action may also be stayed before trial, if the tenant will pay or tender to the lessor, or pay into court, all the rent then in arrear, together with the costs. By the common law the lessor has also an action of debt for rent against a lessee for years or at will; and by the statute of Anne (8, c. 14, s. 4) there is also the same action against a lessee for life during the continuance of his estate, which had previously been given for arrears of rent after the determination of the estate (32 Hen. VIII., c. 37). A lessor may also have an action of covenant for rent, either by force of the implication contained in such words as 'yielding and paying' rent, or by force of an express covenant to pay, which is seldom omitted in any lease. If the lessee assign his interest in the term, he, and his executors so far as they have assets, are still liable under the covenants to the person entitled to the reversion. The assignee also becomes bound by such of the covenants as run with the land, and is consequently liable to an action upon them. There is also the remedy by action of assumpsit or debt for the use and occupation of land, which action lies without any express agreement for rent.*

Rent-service may be discharged in various ways. If the tenant be evicted from the lands demised to him, he is discharged from payment of the rent; and if the lessor purchase the lessee's interest, the rent is also discharged. The lessor may release a part of the rent-service, without releasing the whole.

If the person entitled to the rent-service purchases part of the interest in the land in respect of which rent is due, the rent-service is apportioned according to the value of all the land, and accordingly the tenant is discharged from payment of rent in respect of the part purchased. The person entitled to the reversion may also grant his interest in part of it, and the rent will be apportioned between him and his grantee; for the interest in the reversion is of a divisible nature, and the rent follows the reversion. If the lessee should be evicted out of part of the lands, there will also be an apportionment. Before the late alterations of the law, when the moiety of a reversion was extended on an elegit, the rent was apportioned, and the lessor consequently retained half of it. If a widow is entitled to dower of a reversion, she is also entitled to one-third of the rent reserved upon a lease for years made by her husband.

At common law, if a tenant for life died before the rent became due, which was reserved on a lease that determined by the death of the tenant for life, his personal representatives could not claim an apportionment of the rent, nor could the reversioner or remainder-man claim such portion as accrued due during the life of the tenant for life. But such an apportionment was given to the personal representatives by stat. 11 Geo. II., c. 19, s. 15. The act 4 and 5 Wm. IV., c. 22, extends the provisions of this act to rents reserved on leases that determine on the death of the persons who make them, though they are not strictly tenants for life, and on leases of lands held *pur auter vie;* and by the same act all rents-service reserved on any lease by a tenant in fee or for any life interest or under any power, and granted after the passing of this act, and all rents-charge and other rents, annuities, &c. made payable under instruments executed, or (being a will) coming into operation after the passing of the act, shall be apportioned, and a proportionable part thereof, from the last time of payment to the day of the death of the party interested therein, paid to the personal representatives of such party.

A rent-charge is a rent granted out of land either at common law or by the Statute of Uses, with a power of distress for the recovery of the rent. Such rents may be created by the owner of the land who retains the property of it; and they may also be reserved on the alienation of the land. These rents differ from rent-service in not being connected with tenure, and the remedy by distress is therefore not an incident to rent-charges, but is created by the same instrument which creates the rent-charge. If no power of distress is given, the rent is a rent-seck. Rent-charge may be created either by deed or by will. Sometimes, by the terms of the grant, the grantee of a rent-charge is empowered to enter on the land and satisfy himself for all arrears out of the profits of the land. When a rent-charge is created under the Statute of Uses (s. 4, 5) with a power of distress and entry upon the land in case of arrear, the person to whom the rent-charge is given obtains the legal estate in the rent-charge, with all the remedies for its recovery, as he would by a direct grant of the rent-charge; and the same instrument (lease and release) which creates the rent-charge may also make a settlement of the lands charged with the rent. In this way in a marriage settlement a rent-charge may be provided for the wife's jointure.

An estate in a rent-charge may be either in fee simple, in fee tail, for lives, or for years, according to the terms of the original limitation. A rent-charge of inheritance is real estate, and descendible to the heir; but a payment that is due belongs to the person representative. There may also be an estate in fee simple in a rent-service created before the statute of Quia Emptores. A rent-charge in fee simple is subject to curtesy and dower; and also a rent-charge in tail. But if a rent-charge be created and granted to a man and the heirs of his body, his surviving wife will not be entitled to dower if the husband dies without issue. Until the act 3 and 4 Wm. IV., c. 106, a woman was not entitled to dower out of a rent-charge, unless her husband had the legal estate in it. A rent-charge may be limited by way of remainder; and a new rent-charge may be created to commence at a future time.

A rent-charge may be discharged in various ways. If a man who has a rent-charge out of certain lands buys any part of them, the whole rent is discharged, for it issues out of the whole of the lands; and the consequence is the same if he releases all his right in any part of the land. But a man may release part of the rent-charge without affecting the remainder; and a division or apportionment of a rent by conveying part of it to a stranger is a valid conveyance. If part of the lands which are subject to the rent-charge descend to the grantee, the rent will be apportioned according to the respective value of the two parts of the land.

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* See a remark on this action, 6 A. and E., p. 830

A rent-seck, as already mentioned, is not, like rent-service, accompanied with a right to distrain at common law; but by the stat. 4 Geo. II., c. 28, s. 5, this distinction in respect of remedy between rent-service and rent-seck, created since that statute, is abolished; and the act also applies to rent-seck created prior to the statute which had been duly paid for three years out of the last twenty years. Other rents, though they belong to one of the three divisions above mentioned, are often distinguished by particular names: thus the rent due from a freeholder is called a chief rent (redditus capitalis); the rents of freeholders and antient copyholders of manors are sometimes called rents of assise, being *assisi*, or ascertained, and also quit-rents (quieti redditus), because they are a quittance and discharge of all services.

A fee-farm rent is properly a perpetual rent-service reserved by the crown, or, before the statute of Quia Emptores, by a subject, upon a grant in fee simple. The purchaser of fee-farm rents originally reserved to the crown, but sold under 22 Car. II., c. 6, has the same power of distress that the king had, and so may distrain on other land of the tenant not subject to the rent.

By the stat. 42 Geo. III., c. 116, in cases where the land-tax has not been redeemed in due time by the owner of the land, it may be purchased by any other person, to whom it will belong as a perpetual rent-charge (though it is called a fee-farm rent in the Act), and the purchaser will have all the remedies for rent reserved on a lease.

By the 3 & 4 Wm. IV., c. 27, s. 42, no arrears of rent or of interest in respect of any sum of money charged upon or payable out of land or rent, or any damages in respect of such arrears of rent or interest, shall be recovered by any distress, suit, or action, but within six years next after the same respectively shall have become due, or some acknowledgment in writing given to the person entitled thereto by the person by whom the same was payable; except where there has been a prior mortgagee or other incumbrancer in possession of any land or receipt of the profits thereof within one year next before an action or suit shall be brought by a subsequent mortgagee, &c.; and then the arrears of interest may be recovered for the whole time such prior mortgagee, &c. was in such possession or receipt.

RENULI'NA. [FORAMINIFERA, vol. x., p. 348.]

RE'OLE, or RE'OLLE, LA. [GIRONDE.]

RE'OPHAX. [FORAMINIFERA, vol. x., p. 347.]

REPEATING CIRCLE. The principle of repetition from which this circle has its name was first explained by Tobias Mayer, professor of the university of Gottingen, in *Commentarii Societatis Regiæ Scientiarum Gottingensis*, tom. ii., p. 325, for the year 1752. Mayer found that the common surveying instruments were often inaccurate to 5′, while the quadrant, then used in all great scientific surveys, was, from its weight and price, and the trouble required for verifying and adjusting it, scarcely to be considered a portable instrument, but only fit for the observatory. The substitute which he proposed for geodesical purposes may be described briefly as follows:—Suppose a hollow tube fitting upon an axis, to which it can be clamped, when required, by a screw; the axis itself is fixed on the top of a staff. This part of the instrument is exactly similar to a common mounting for surveying compasses, &c., where greater stability is wanted than a ball and socket will give. On the top of the tube a flat bar is screwed, the plane of which is horizontal when the tube and axis are vertical; the bar and tube thus form one piece, which has the shape of a T. A second bar of the same length is placed exactly above the former. This latter bar moves easily, and without shake, on a pin concentric with the tube and axis, and thus can be placed at any angle with the fixed rule, and, as it is supposed, without at all disturbing it. Two fine dots are pricked towards the ends of each bar; the lines joining the dots in each should pass exactly through the axis of motion of the upper bar, and the dots must be equidistant from the centre. When this is so, the four dots will, in every position of the bars, be the angular points of a rectangle, and the equality of the opposite sides can be ascertained by measuring the distance with compasses. Finally, on the top of the upper bar a telescope with cross wires is fixed, the telescope being a little shorter than the bar, that it may not interfere with measurements between the dots.

The mode of measuring an angle with this instrument is as follows:—Let the two objects be R (that to the right) and L (that to the left). Set the fixed bar to some angle from ten to twenty degrees to the right of R by the motion of the tube on the axis, and clamp the axis-screw firmly; then, by the motion of the upper bar alone, bisect R with the telescope. Take, with a pair of compasses, the distance between the dots, apply the distance to a scale of chords, and you have the angle between the fixed bar and the object R. Call this angle θ. Now, by the motion of the upper bar alone, bisect the object L. It is clear that if the distance between the dots were again measured, and the angle deduced, as before, from the scale, we should have a measure of the angle required $+\,\theta$. But instead of measuring at present, let the telescope be brought back on R, *by unclamping the axis-screw and moving the whole instrument on its axis;* when this is satisfactorily performed, clamp the axis, and bisect L exactly as before, by moving the upper bar and telescope alone. The angle between the bars as deduced from measuring the chord between the dots will now clearly be twice the angle required $+\,\theta$. Let the operation be performed so many times, eight for instance, that the bars are nearly in their original position with regard to each other, and let the distance between the dots be measured and the corresponding angle be deduced from the scale of chords, which suppose to be ϕ, ϕ being larger than θ. If this last-mentioned angle had been θ exactly, it is clear that the bar would have come round exactly to its original position after having moved through 360°, but as it has besides moved over an angle $=\phi-\theta$, the whole angle moved through is $360°+\phi-\theta$, which is also eight times the angle to be measured: hence the angle subtended at the spectator by R and L is $\frac{1}{8}(360°+\phi-\theta)$. By continuing this process of stepping several times round, there seems to be no limit to the accuracy with which an angle can be measured, except that which depends on the imperfection of the telescope, the indistinctness of the objects, or the uncertain lateral effect of terrestrial refraction. Mayer used a scale of chords, probably because he was thus able to construct the instrument himself, and could dispense with any circular arc or divisions. We do not see that he has noticed one slight inaccuracy, viz. that as the dots lie in different planes, the distance between them is not the actual chord of the angle required, but is the hypothenuse of a right-angled triangle, the altitude of which is the thickness of the upper bar, while the base is the chord required; but this error is easily allowed for, and, when the angle to be measured by the compasses is of a tolerable size, is scarcely worth considering. If we conceive the plane of the lower bar extended and changed into a divided circle, while the upper bar becomes a vernier at each end, we should probably have the instrument Mayer would have proposed, had it been in his power to employ a tolerable mathematical-instrument maker. Mayer says that he invented this instrument eight years before the publication of his memoir.

The reward proposed by the English parliament for any means by which the longitude at sea could be determined, stimulated Mayer to perfect the method of lunar distances. For the successful solution of this problem two things are required—tables correct enough to predict the true place of the moon at any future time, and an instrument for measuring the distance between the moon and star with sufficient accuracy. Mayer fulfilled the first condition by his celebrated Lunar Tables, one copy of which was sent to the lords of the admiralty in 1755, and a later, improved up to his death (1762), forwarded by his widow in 1763.* For measuring the distance between the moon and star he proposed an instrument similar to Hadley's sextant, but in which the angle can be repeated or multiplied without intermediate readings off, similar in principle to the instrument just described.

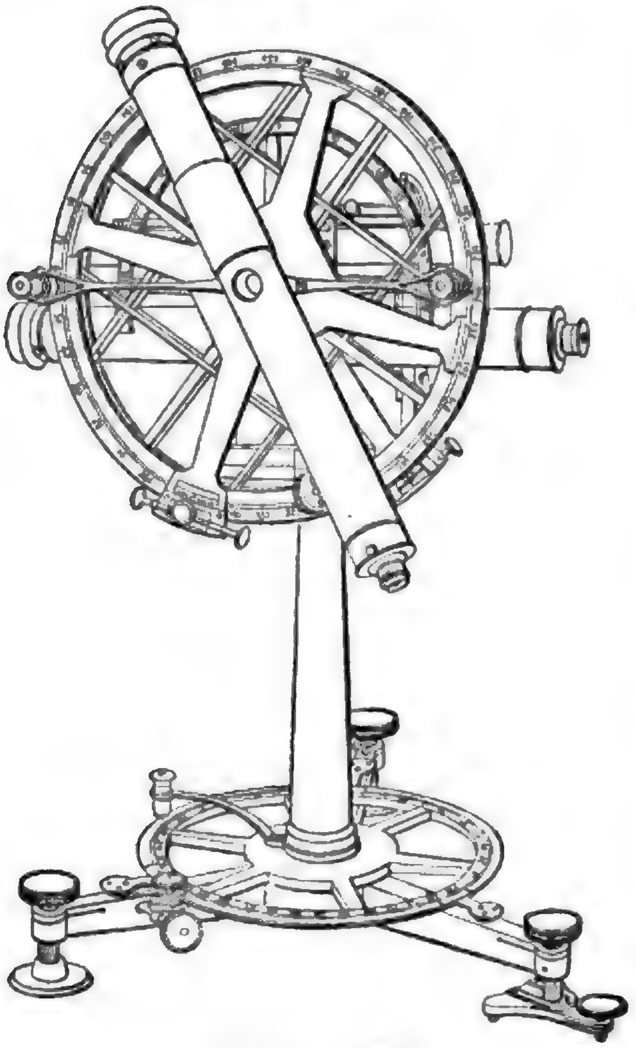
Mr. Troughton says (article 'Circle,' Brewster's *Cyclopædia*) that Bird was employed to make reflecting circles after Mayer's idea, but his dividing was so excellent, that the entire circle was thought useless, and the sextant preferred, as having a larger radius, and being lighter and handier.

In 1787 the Chevalier de Borda published his '*Description et Usage du Circle de Réflexion*,' in which he proposed a modification of Mayer's circle, so slight that at first sight it would almost seem trivial, but which gives an unquestionable superiority to this above every other form of reflecting instrument when well made and skilfully and *perseveringly* used. We shall return to Mayer and Borda's construction of the repeating reflecting circle in article Sex-

TANT, as they cannot be understood until the principle of reflecting instruments has been explained.

The date of the invention of the repeating circle which is the proper subject of this article, is somewhat uncertain: it is later than that of the reflecting circle. One was constructed in 1787, and employed in connecting the meridians of Paris and Greenwich. (See *Mém. de l'Académ.*; a Memoir by Le Gendre, 1797; and a Memoir by Cassini, 1798.) The *Connoissance des Tems*, An VI. (1797-8), contains the plate and description of a repeating circle, which was made by Lenoir for the astronomer La Lande. When the French government undertook the measurement of an arc of the meridian from Dunkirk to Barcelona, the commission to whom this operation was entrusted resolved to employ the repeating circle

Fig. 1.



Borda's Repeating Circle.

This is one of the most complicated as well as ingenious of existing instruments, and obtained an immense reputation, from being the only instrument employed in the geodesical and astronomical observations of the great measurement of an arc of the meridian, on which the French have founded their modern system of measures, weights, and money. Since that time the construction has been altered by different artists, and generally with disadvantage. Partly owing to this cause and to the tendency to undervalue everything which has been once overrated, the repeating circle is now lower in reputation than we think it merits, though it must also be admitted that the great improvements which have been made in recent years, especially on the Continent, in the graduation of small circles, has rendered one principal merit of this construction, viz. the annihilation of errors of division, comparatively of small importance. From the superior execution of English instruments at the time when Borda's circle was in its highest fame, and the dislike of our countrymen to calculation, the repeating circle was never much or successfully used in England, though several have been made.

In this figure the general form of the instrument is shown tolerably well, but some of the essential motions are at the back of the circle, and these are drawn on a larger scale in a second diagram. The whole circle turns round on the vertical column, which has an inner axis of steel with good fittings at the top and bottom. It is usual and proper to make these fittings with great care, but it is not an essential condition to accuracy in the performance of the instrument.[*]

The top of the column finishes in a square bar, to which the upper works and circle are firmly screwed. We shall first describe the motions which are required for astronomical purposes, and point out the rest when the geodesical properties of this instrument are considered. The azimuthal circle is scarcely to be considered a part of the instrument.

The front telescope, its verniers, and clamp, are seen distinctly in front. (*Fig.* 1.) This moves very freely on a spindle within the axis of the circle. There is a level behind, a projecting end of which is seen in the figure. This and its accompanying back telescope are—one a little above and the other a little below the axis of the circle, and revolve on a collar which works on the outside of that axis. These can be fixed in any position by a clamp (also seen in the figure) which embraces the back edge of the circle: the back telescope is for measuring terrestrial angles. Finally, the axis of the circle itself passes through a fitting, on which it also turns freely, carrying telescopes, level, &c. without altering their position in respect to itself. There is a clamp to restrain this motion and fix the circle, the head of which is seen at A, *fig.* 2, and a tangent screw for slow motion at B. This is the weakest and most inconvenient part of the instrument, for the clamp holding so near the axis of motion has little power, and there is scarcely room for getting at the screw-head, while the slow-motion clamp is out of the way of the observer when he requires it for bisection. The large weight behind is a counterpoise, and the small level above is for setting the circle vertical. There is a clamp at C, which bites on the semicircle to make this adjustment and prevent its being deranged. We will describe the process of observing with the instrument when the object is a star at or near its meridian altitude.

Supposing everything to be adjusted, *i.e.* the axis and circle both vertical, the observer bisects the star with the telescope, he or an assistant having previously brought the level nearly to the corresponding points of its scale. The level is now read off, giving it time to settle if wanted. We suppose its graduation to be in seconds, and reckoned outwards from the centre of the scale. The verniers are read off, the instrument turned half-round on the vertical axis, the telescope clamp released, and the star again bisected by the telescope, using its peculiar clamp and tangent screw; and finally, the level is again read off. This operation is precisely the same in all circles having an azimuthal motion, and it is clear that if the verniers were again read off, the difference between the first and second readings would be (after it is corrected for the indication of the level) twice the zenith distance of the star. Let the circle be now reversed, the level clamp and circle-axis clamp be released, and the whole circle moved in its plane till the telescope points to the star, and let the star be bisected again by using the axis clamp and its tangent screw only. The level must be brought back to be horizontal while this is doing, and be actually *clamped* before the final bisection of the star is made. We conceive that this must be done at twice, even by two observers; and it may be done at twice by one, though in a longer time. If the reader has fully understood the process, he will see that the instrument is precisely as at the commencement, except that the telescope and its verniers have travelled over the circle, an arc equal to twice the zenith distance of the star. A repetition of the operation will carry the telescope verniers over four times the distance, and by continuing the process the final arc read off may be made any number of times twice the zenith distance of the star. If the series stops after ten such processes, the arc travelled over is twenty times the simple zenith distance. Let the verniers be now read off, then subtracting the first reading from the last, and

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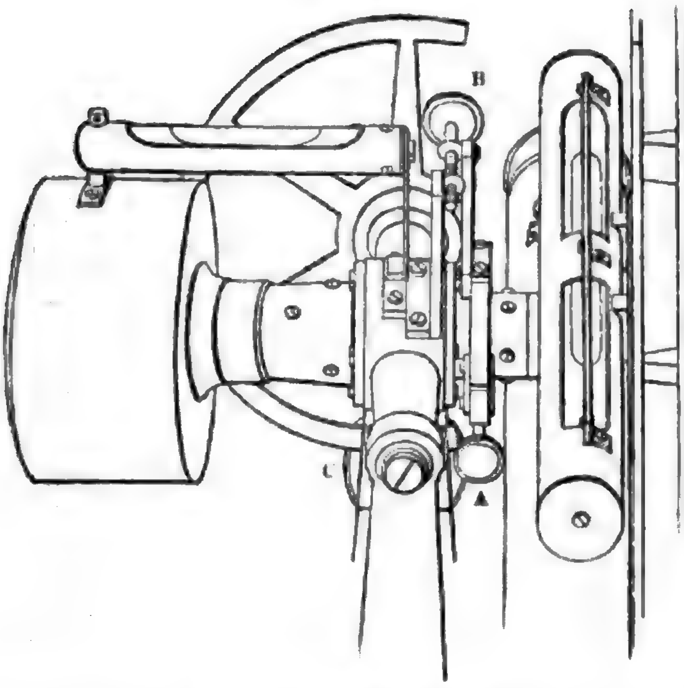
[*] Three thousand pounds were paid Mayer's widow for these Tables in 1765: they were printed by order of the Board of Longitude, under Maskelyne's superintendence; *Tabulæ Motuum Solis et Lunæ, autore Tobia Mayer*, Londini, 1770.

[*] In one of the expeditions sent to explore the North-West Passage, the repeating circle was found unmanageable because the superior contraction of the brass tube over the steel axis changed the close-fitting into a tight grasp which no force could overcome. This must always have given trouble, but ought not to have thrown the instrument out of use. If the whole instrument had been lifted up and turned half round, bodily, and the level brought to its former reading, the double, quadruple, &c. zenith distances might have been observed just in the ordinary way. If the level forms one body with the circle during reversal, and keeps its zero unchanged, everything besides is unessential.

Fig. 2.



Back of Borda's Repeating Circle.

dividing by twenty, the result will be the zenith distance of the star, and the errors of division or of reading off will also be divided by twenty. If the number of repetitions which can be taken at one culmination are not thought sufficient to destroy these errors, the series may be prolonged on the following and subsequent nights, starting from the preceding reading without disturbing the verniers, until any number whatever are taken, the only essential condition being that in reversing, the level is undisturbed both in its attachment to the circle and in its own zero; and that in bringing the telescope on the star by turning the whole on its horizontal axis, the connection between the telescope and circle is permanent. The hour, minute, and second at which each bisection is made are to be noted.

We have said that it is better to read off the level than to attempt to bring the ends of the bubble exactly to the same division, which is really an impossible condition with one observer, and scarcely practicable even with two. The differences should be as small as they can be made with moderate care and in a moderate time; but a well ground level will measure small arcs better than any graduated limb or even than any small telescope can do, and it is therefore as safe to correct for an error of level as to adjust. The level readings should be registered as towards the object end and eye end, or − and +, along with the times, and the correction may be made to the final arc. It is clear that if the level were always brought to the same divisions, there would be no level error. The effect of a derangement of the vertical axis, which is shown by the level, is calculated as follows:—Let the reading of the level end towards the object be 10″ larger than the reading towards the eye. To correct this, the footscrew towards the observer should be raised 5″, when the two readings will agree; but now the telescope points 5″ *below* its former position, in which it bisected the star correctly. The telescope therefore must be raised, *i.e. the zenith distance must be diminished* 5″; hence if 5″ be subtracted from the multiplied zenith distance on account of that observation, the error will be corrected, and so on with every other instance. The rule is, add together all the level readings towards the object end, and prefix −; do the same with those towards the eye end, and prefix +; take their algebraic sum, and divide by twice the number of observations, and the result is the correction to be applied with its sign to the mean zenith distance. This will generally be a very small quantity. As the great difficulty in observing out of a regular observatory is in the reading off, the division of the level might be to every 2″, but numbered as single seconds. These would be better seen, and the divisor of the difference would be the number of observations. When the instrument is very small, and the probable circumstances under which the observer may be placed promise few facilities, the scale may be cut to 10″ only, with bold lines. A mistake of one or two tenths in guessing the subdivisions would be very rare, and scarcely cause a sensible error in the final result.

The circle has been supposed to be adjusted before observing; this is a very simple operation. First place the instrument with the footscrews in their cups, and let that footscrew be towards the observer which rests on the slow-motion piece. This is seen at *fig.* 1, on the right. Place the axis nearly vertical by guess, or, if there is an azimuthal circle, set the plane of that nearly horizontal by a box level. Then place the plane of the vertical circle upright by the cross level, and bring its plane to be parallel with the two footscrews which are *from* the observer; *i.e.* if the object is in or near the meridian, set the circle east and west. Bring the bubble of the main level to the same division at each end by its clamp and tangent screws, and then reverse the instrument (turn it 180° in azimuth). The level is to be brought again to the same divisions, half by its tangent screw, half by screwing the two footscrews an equal quantity in opposite directions. Now turn the circle a quarter round (place it in the meridian according to the supposition), and bring the bubble of the level to its proper position by the third footscrew only. This first attempt at adjustment need only be approximate, but it must be performed over again with considerable nicety. The slow-motion piece is, we believe, due to Borda, and is a very ingenious and useful contrivance for making a coarse screw do the work of a fine one. By placing the footscrew nearer to or farther from the line of the two studs, the elevating power of the screw can be reduced in any proportion, and the finest and slowest motion possible given to the instrument. We have used the slow motion for finally bisecting a star in observing with great comfort. It is more ready to the hand than any other part of the instrument, and the disturbance of the axis is of no importance, as the level must be read off at all events. The approximate bisection is performed by the other screws, and if the observer recollects which way the star is moving, the space through which the instrument is thus moved need only be a very few seconds. The cross level must be originally fixed and adjusted, after the plane of the circle is known to be vertical, either by hanging a plumb-line before the limb, or when the telescope bisects at the same time an object and its image reflected from a fluid. When the cross level is adjusted, the horizontal wire of the telescope may be set right by making a star in the meridian run along it, or else by bisecting a fixed object with it and afterwards moving the circle in azimuth. The object should run along the wire, and by twisting the wire-plate round may be made to do so.

In the astronomical use of the instrument the azimuthal circle is scarcely required, except to see that you have turned the circle 180° at each reversal. It is convenient to have a coarse division to show this; it is a relief to the eye, and prevents the possibility of catching a wrong star. Any stop which is adjustable and gives notice when the rotation has reached 180° will do. In many of Troughton's repeating circles there is a pin which is pressed by a slight spring against two holes in the azimuth circle, which are 180° apart. This is convenient enough if the observations are confined to Polaris or a very slow moving star, but wholly insufficient for stars near the equinoctial. It supposes besides that the feet of the instrument are almost exactly placed with respect to the meridian, which is not to be done at once. A bar moving rather stiffly on the vertical axis, and coming against a stop, seems a better contrivance.

For setting to the approximate zenith distance, there is a graduated semicircle attached to the level, which may be seen in the general view. This has its diameter parallel to the level. A slender bar is attached to the object end of the telescope, and passes at the back of the circle; this points out on the semicircle the approximate zenith distance of the star. In many circles which we have seen there are two slips of brass which slide with a little force on the semicircle, and the slight bar above mentioned is brought to *touch* each of these stops alternately. Nothing can be more convenient, but unfortunately, however well the clamps may be made, the contact between the bar and a stop forces the clamp somewhat, and the essential condition of the instrument, that these should be undisturbed, is destroyed. The bar should not be allowed to touch the semicircle at all, but stand freely from it. In this way, by alternately bringing the bar to the equal and opposite divisions, when either the telescope or the level is moved, the telescope will always be at the proper altitude when the level is horizontal. If any one should wish to use the repeating circle as an altitude and azimuth circle, or as a surveying instrument, the wires of the telescope must be set at right angles to the circle axis, by bisecting a distant and distinct object, reading the azimuthal verniers, turning the instrument half round, again bisecting the object and reading the verniers a second time. If the object be very distant, the azimuth circle may be set to the mean of the readings, and the object bisected by the horizontal screws which draw the wire-plate; but if very great accuracy is required, either two marks must be set up having the same distance from each other as lies between the two positions of the axis of the telescope, or the angle which this last space subtends at the distant mark must be allowed for. The instrument is not fitted for nice observation with the azimuth circle.

We have now explained the chief astronomical use of Borda's circle, which is that of determining the altitudes of stars upon the meridian by several observations near the meridian. There is a correction to be applied to the mean result, which is easily computed when the approximate latitude and exact time are known. The formulæ and tables required may be found in several works on astronomy, in Schumacher's *Hülfstafeln*, p. 38, and Baily's *Tables*, p. 154. The length of time during which the observations may be carried on depends on the altitude of the star and its proximity to the pole. Polaris might be observed safely beyond 36^{m} on each side the meridian, which is the extent of the present tables, and, in these latitudes, stars in or below the equinoctial for fully half an hour on each side. It is supposed that the error of the clock is well known, but even this may be wrong to a small amount without causing much error, if the number of observations on each side the meridian and the hour angles are nearly equal.

The repeating circle may be very well used for getting the time either by equal altitudes, or by absolute altitudes with one or two repetitions. For this purpose there should be three or five horizontal wires, and the instrument should be previously carefully adjusted. The instrument must be moved in azimuth, so that the star passes each wire near the centre, and nothing should be touched which affects the level. For illumination by night, there is an opening with a reflector in the centre of the telescope. This is objected to as weakening the telescope, but the other mode of illuminating by a small central reflector, or outer ring in front of the object glass, is inconvenient. Perhaps by taking a longer hold of the telescope and strengthening the intervening portion of the tube, the former convenient arrangement may be preserved without sensible loss of strength. The repeating circle, on Borda's construction at least, cannot be well employed in observing the sun without very careful screening. The level is so perpetually changing its zero, when exposed to the sun, that there is no possibility of saying what the instrumental zenith is.

One of the first operations which the observer must engage in, is to determine the scale of his level at different temperatures, and then he may, for small deviations, use the indications of the level, instead of worrying himself and losing his time in attempting to produce a perfect adjustment. The value of the scale is thus measured:—Bring the bubble towards one end, bisect a very well defined object with the telescope, and read off both scale and verniers. Then, by the slow-motion foot-screw, bring the bubble towards the other end, bisect the object again by the telescope, and read off the level scale. Now bring the bubble to its original position by the circle-axis clamp, and the telescope on the object by its own clamp, when everything is as at starting, except that the telescope has moved over the circle the sum of the angular motions pointed out by the level. This may be repeated till a sufficiently accurate value is got for the *whole* scale. To try the equality of the divisions of the level, place the foot-screw near the line passing through the studs of the slow-motion piece, and note the motion of the level for every *whole* revolution of the screw. Opticians of character are generally very careful about their levels and scales, but the practical astronomer should never trust where he can have proof.

We shall speak as briefly as possible on Borda's circle as a geodesical instrument, although it is an excellent surveying instrument, as the great French survey proves, but the same advantages can be obtained by a different application of the repeating principle. On looking at *fig.* 2, it will be seen that the whole of the upper circle, with its counterpoise, &c., revolves on a horizontal axis, and, by the two motions round the vertical and the horizontal axis, it is evident that the plane of the circle can be made to pass through any two points on the earth's surface. There is a little address and practice required to do this quickly and correctly, but it is easily learned. When it is effected, the adjustment will remain undisturbed to the end of the series of observations. The middle wire of the front telescope is supposed to have been adjusted perpendicular to its axis, and the middle wire of the back telescope may be adjusted similarly, or, what will do as well, may be made to bisect a very distant mark at the same time with the front telescope. The circle, being placed in the plane of the two objects, is clamped, and one observer bisects R, the right hand object, with the front telescope, while the assistant bisects L with the back telescope. Now release the circle-axis clamp, and move the circle round in its own place until R is bisected by the back telescope, clamp the circle again, and bisect L with the front telescope. It is clear that the front as well as the back telescope has been carried on to the right through the angle to be measured by the motion of the circle, and, therefore, when the front telescope is brought back to R, and over to L, that it has travelled over the face of the instrument twice the angle to be measured, which is therefore equal to the difference of the readings before and after the operation. Release the circle again, bring the front telescope to R by the general motion of the circle, and the back telescope on L by its own proper motion; the instrument is now in its original position, except that the divided circle has revolved as it were from right to left in its own plane (which also passes through the two objects L and R) twice the angle to be measured. By repeating the above process the motion given to the circle is four times the angle to be measured, and so on, the number of repetitions being only limited by the patience of the observers and the time they can bestow on their work. The repeating circle used thus is a very powerful instrument. As the angles in an accurate survey are never very small or very large, a little defect in the plane of the instrument or a slight non-parallelism between the planes of the two telescopes is of little injury, though, from the poor centring of the back telescope, defects of this nature are unavoidable. As both telescopes may be, and the back telescope always is, eccentric, there is a reduction to be applied to the angle on this account. Whoever wishes for a full account of these and similar reductions will find it in Delambre's *Méthodes Analytiques pour la Determination d'une Arc du Méridien*, &c., Paris, An VII.; in the *Discours Préliminaire*, by the same author, contained in the *Base du Système Mètrique Décimal*, vol. i., Paris, 1806; and in almost any modern French geodesical work. There is a very full account of the repeating circle, with all its verifications, &c., in the second volume of the last-mentioned work, pp. 160 *et seq.*, and the four volumes will supply examples of every kind of observation and reduction. As a geodesical instrument however the repeating circle of Borda has gone completely out of use, and probably for ever.

Borda's repeating circle possesses two most valuable properties: mere errors of division may be diminished by sufficient patience; and the fatigue of reading off the divisions, the most ungrateful part of an observer's task, is greatly reduced. Hence, it may be asked, why is not the repeating circle in general use as a portable astronomical instrument? We should answer that, in the first place, the construction of Borda is by no means satisfactory for an *astronomical* instrument; it is weak, and heavy, and rickety. But if a *portable* astronomical circle is wanted, and to this class of instruments we should confine the repeating circle, we think the following alteration should be adopted. The telescope hangs loosely from its centre,[*] and whatever care may be taken by the artist, the flexure of each end must be considerable, probably different, and possibly varying from time to time with variations in the temperature. It should be grasped by two strong collars near the ends of a diameter of a vernier circle, and the telescope might then be safely extended three or four inches each way beyond the divided circle. Again, the axis clamp which holds the vertical circle should be fixed on the pillar and embrace the rim of the inner circle, the clamp of the level (for no second telescope is wanted) might be at the back, above, and quite out of the way. The whole circle should be brought as close to the upright pillar as possible, and perhaps its axis had better be fixed by the maker permanently at right angles to the pillar. This would take away much weight and give great firmness to the whole instrument.

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[*] If the object and eye end bend equally, there is no alteration in the direction of the line of sight; the only evil is that the oblique incidence of the rays on the object glass deforms the image when the obliquity is considerable. The German artists of Reichenbach's school apply levers to telescopes hung by the middle, in order to counteract flexure. We prefer, on the whole, obtaining a maximum of stiffness, and then determining the effect of flexure which must be allowed for. There is no possibility of avoiding the investigation in any case where accuracy is demanded. Gambey takes a longer hold of the telescope, but in providing a motion for surveying when the circle is horizontal, we think he has lost something in stability when the circle is vertical.

It must however be admitted that unless there are two intelligent observers, or unless the base on which the instrument stands is so steady as to prevent the possibility of any derangement when the observer moves from the telescope to read the level, that errors may creep in, though not, as it seems to us, greater than in all other instruments *not* reflecting. We have previously cautioned circle observers, and the warning cannot be too strongly pressed upon our countrymen at least, that the *level* must *always* be noted contemporaneously with the *bisection* of the star. If the foundation of the instrument is immoveable, this will be the same as the level a minute after bisection, and so only one observer be required. But if the position of the instrument is affected by the weight or motion of the observer, the *level* after bisection is no test of the position *at* bisection, and two observers are absolutely necessary. In Borda's repeating circle, where the clamp is necessarily imperfect from the shortness of its bearing, it is impossible to move the front telescope without shifting the circle a little at the same time; but this is of no importance, for the level shows the change, and the reading off of the level, when properly applied, corrects this error.

It is precisely from not thoroughly considering this fundamental principle in the repeating circle, that the French, and, we believe, German artists, made an alteration in its construction, which introduced larger errors than previously existed. They applied the level not to the circle itself, but to the vertical column, which is, in truth, a much more convenient situation. Now if the clamp which holds the circle while the telescope is moved, were absolutely perfect, the result would be the same as if the level were attached to the circle; but suppose the clamp to yield a little, and it is clear that the angular motion of the circle causes an error in the observation, which is not pointed out by the level. In some instruments of this construction (*à niveau fixe*) the polish of the surface to be clamped was so fine that the clamp allowed the circle to slip very readily. Indeed it is easy to see, on theoretical grounds, that if there is any tendency to yield, no clamp is to be relied upon against a very small degree of force acting perpendicularly to its grasp. It is evident on consideration that Borda's repeating circle depends almost entirely on the truth and delicacy of the level, and on its forming one body with the circle during each pair of observations so completely, that no motion can take place in the circle which is not instantly pointed out and measured by the level. In constructing an astronomical repeating circle, we should recommend the motion of the telescope and verniers to be made as light and delicate as possible, or what Troughton called a *flying* motion, while the motion of the circle in its collar should be rather heavy, so as scarcely to be disturbed, when unclamped, by moving the telescope. This is however in the original repeating circle not necessary, but only convenient.

In judging of the repeating principle as applied to any instrument, attention should be paid to the perfect independence of the telescope and level with respect to each other, and of their perfect connection with the circle when they are clamped to it. In some instruments a sort of repetition has been attempted by having the circle turn freely on the telescope axis, and clamping it alternately to the telescope and to a vernier circle which carries the level. It seems difficult in any such construction to secure the immoveability of the circle while clamping and unclamping is going on, and the construction has, we believe, gone out of use. There are some precautions which should be observed in every repeating circle, which we shall describe in reference to Borda's construction. Besides the perfect independence of the level, the telescope with its verniers and clamps should be perfectly self-balanced, so as not to apply any force to the clamp in any position; the telescope should be moved on the circle by two fingers pressing in oppposite directions towards the extremities; the circle should be turned in its own plane by laying hold of the circle itself, and so gently that no jar can take place, or any springing back or forward of the telescope or its verniers from the moment of inertia: finally, the level must have time to settle before it is read off. When these precautions are duly observed, great accuracy may be obtained; in two instances, to our knowledge, where the latitude has been determined by unexperienced but intelligent observers, the results even of a single night have come within 1″ of the truth.

It may be worth mentioning that with the circle of Borda the measurements may be made by moving the telescope *contrary* to the order of divisions, *i.e.* if the first observation is made with the face to the right hand instead of the left. There is no advantage in this modification, except perhaps that as the screws are handled a little differently, any discrepancy between an angle measured in the two ways would show an error in one or both the methods. It would be advisable, where several series are taken, to vary the direction in which the telescope is brought to its new position, and that in which the circle is turned upon the star. The tangent screw might be worked either constantly one way or the other, or alternately, but we should not expect any sensible difference in the results if the instrument is well made and the observers careful. If two steady observers can be found, the double altitude of any star may be repeated, with the genuine Borda and its two telescopes, exactly as a terrestrial angle, *i.e.* by measuring the angle between the star seen directly and by reflexion from mercury. This would in theory appear to be the most perfect application of the instrument, as flexure has no effect upon the angle measured, being equal and in the same direction in both positions of the telescopes. The level is not wanted for this observation at all, but the circle must be set truly vertical. A single observer might indeed make the same observation with one telescope, as the level would show and measure any shifting of the circle. And here again the effect of flexure is eliminated from the observed double altitudes. Finally, double nadir distances may be observed of a star reflected from a mercurial horizon, exactly as double zenith distances are observed in the ordinary method. This last species of observation may have the advantage of being sometimes more convenient, but the chief reason why it is pointed out is, that the effect of flexure upon double nadir distances is equal, but in a contrary direction, to its effect on double zenith distances; the observer has thus an easy mode of ascertaining whether flexure exists and of measuring its amount and law.[*] We are not aware that any of the methods described in this paragraph have been put into practice.

What precedes refers almost entirely to the repeating principle when applied to measurements in altitude. Instead of the circle of Borda and its two telescopes, later artists have given a motion in azimuth to their theodolets, in addition to the motion of the telescopes and verniers, by which the angle can be measured precisely as in Mayer's original instrument. But in several instruments which we have seen there is a considerable probability of disturbing the circle clamp while moving the telescope or using its tangent screws. It is to secure the detection of any similar motion that a watch telescope, as it is called, is frequently added to English theodolets, and is indeed required for many, spoiled as they are by an unnecessary adjustment to zero, to save indolent or ignorant surveyors a simple subtraction. A watch telescope can scarcely be applied to a repeating theodolet, and we think that the repeating tripod may be so made as to be free from any objection. This was first constructed by Mr. Dollond on the suggestion of the late Astronomer Royal, and has been found very useful in the trigonometrical survey of Ireland.

The three foot-screws of an ordinary theodolet are placed in the three notches which are seen on the table of the tripod. This upper part turns heavily on a stout short centre, it is fixed by a clamp at A, and there is a tangent screw at B for giving slow motion. The steady action of the tangent screw is secured by a spring at C. It is

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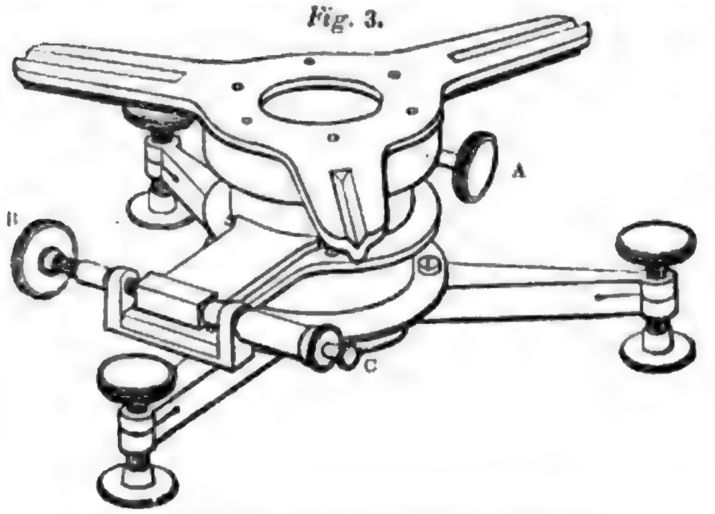
[*] We suppose that the apparent nadir distance of a reflected star is the same as the zenith distance of the star seen directly. The horizontal points of all the large circles which we know, vary to some extent with the altitude of the star observed, which seems contrary to what is here supposed. This last-mentioned discrepancy is one of the most perplexing points in modern practical astronomy. The amount is however so small as scarcely to vitiate sensibly any conclusion drawn from reflected observations with so small an instrument as a repeating circle.

Fig. 3.



Repeating Stand by Messrs. Troughton and Simms.

evident that if, in using an ordinary theodolet, R (the right hand object) is first bisected, the circle read off, and then L (the left hand object) is bisected, the circle being again read off, that the difference between the two readings is the angle to be measured, *if the instrument has not been shifted*, and if the bisection reading off, &c. are perfect. Now suppose the whole instrument to be taken up and set down exactly concentric with its first position, without any other alteration, but with the telescope on R; if L be a second time bisected, the difference between this latter and the preceding reading will be also the angle to be measured, and therefore the vernier will have passed over twice the angle, reckoning from the beginning. If instead of this impracticable taking up and setting down again, the stand on which the theodolet rests can be turned round concentrically with the theodolet, so that R is bisected by the telescope, the theodolet itself being untouched, it is clear that the operation is equivalent to that just described, and consequently that the telescope being brought on L by its own motion, the measure is obtained of twice the angle required, and the process may be continued *ad libitum*, until the errors of reading off and of division are eliminated. The only precaution to be observed is, that the stand must receive no angular motion from the motion of the telescope, and this is easily effected by giving a certain massiveness to the stand and a considerable heaviness to its motion while the telescope and its verniers revolve as lightly as possible. The observer should satisfy himself as to this perfect independence of the two motions and the stability of his repeating tripod by taking a set of twenty repetitions of an angle, always moving the telescope forward in the order of the divisions, and a second set of twenty of the same angle, carrying the telescope round the contrary way. The two results should agree if the stand has no motion; and if they do not, the upper motion must be lightened or the lower be loaded till they do agree. We should not feel satisfied to use the repeating stand if a motion of the telescope a little ruder than necessary affected its position although unclamped; and the stand which is here figured fulfilled this condition very well with a 12-inch theodolet. As the absolute coincidence of the axes of the tripod and theodolet cannot be obtained, the angle should be repeated at least once round the circle, and, if the case requires it, until the multiple angle is very nearly equal to one, two, or more circumferences. The original repeating tripod as designed by Mr. Pond was considerably higher than that figured here. (See Pearson's *Practical Astronomy*, plate xxix., fig. 7, and vol. ii., p. 513.) A little greater nicety is thus given to the adjustment of the vertical axis of the tripod, which is not necessary, and the snugness of the present stand is, we think, more than an equivalent. The axis of the tripod must first be set vertical, either by a level of its own or the theodolet level, exactly as is described in the adjustment of the vertical column of Borda's circle. For the subsequent adjustments, &c. of the theodolet, see Theodolet.

The best account of the repeating circle in English will be found in Troughton's article 'Circle,' Brewster's *Cyclopædia*, and in a paper by the same author, *Memoirs Astron. Soc.*, vol. i., p. 33, which is unfavourable to the repeating principle. (See too Pearson's *Practical Astronomy*, vol. ii., p. 488 et seq.) We do not agree with all Mr. Troughton's objections: some apply only to the defective construction of Borda; and others may be either got over by skilful handling, or belong to all small instruments. It must be remembered in reading his papers, that too much was then expected from this instrument, and that its proper sphere of action was absurdly extended. We doubt whether as good latitudes have been got with any small circles as with repeating circles, and it is to this purpose, we think, that they should be confined.

REPETEND, the part of a Circulating Decimal which is perpetually repeated. The word however means simply *to be repeated*, and is so little used in the above sense, that it might be advantageously employed with more generality.

REPLEVIN (*delivrance de namps, replegiatio*). In the middle ages the performance of legal duties was enforced by taking the person, the lands, or the goods of the defaulter into the custody of the party authorised to enforce the performance of such duties. When such a taking was effected, the party was said to be distrained (*districtus*, put under compulsion), by his body, his lands, or his goods, to do the act in respect of which he was supposed to have made default. [Distress.]

Upon a distress being effected, the body, land, or goods, as the case might be, of the distrainee remained in the custody of the distrainor until the act for which the enforcing of the distress had been made was performed: unless the distrainee brought the question of the legality of the taking before a competent tribunal, in which case he might either await the result of his legal proceedings, or, if he was desirous of obtaining a more speedy liberation of the thing distrained, he might replevy it by giving a pledge or security for a replacing it in the custody of the distrainor in the event of the legal decision being in favour of the latter.

The alleged defaulter might contest the legality of the taking in an action of trespass. [Trespass.] But in this form of action he could recover damages only. He would not be entitled to the liberation of his body, lands, or goods, as the case might be, pending the suit; nor indeed when the suit had terminated in his favour, could he by any proceeding which could be resorted to in the action of trespass be relieved from the distress. The remedy by which a party was to recover his liberty or the property distrained, and also damages for the temporary detention, was an action of replevin. Where the person of the plaintiff was taken, his remedy was by an action of replevin in a peculiar form, which, taking its denomination from the writ by which it was commenced, was called de homine replegiando. This proceeding was however surrounded by so many difficulties, rendered perhaps indispensable by the necessity of preventing criminals from using it as a means of evading justice, that it has now become obsolete in England, parties entitled to redress by the writ of homine replegiando preferring to obtain their discharge by the more speedy and summary process of habeas corpus, or, as it was formerly called, a writ of corpus cum causâ. [Habeas Corpus.] The great mass of the cases of homine replegiando in the old law books arose upon the seizure and detention of persons whom the parties seizing claimed as their fugitive villeins [Villein], and this process was frequently resorted to in Jamaica and other slave colonies. The seizing of the lands of a defaulter by way of distress has long ceased to be practised.

Formerly not only lands but incorporeal hereditaments were the subjects of replevin, of which a remarkable instance occurred in the reign of Edward III. (*Parliament Rolls*, vol. i., 45.)

The third form of replevin, and the only one now in use, is replevin of goods, called in the old statutes replegiari de averiis, cattle (in law Latin, averia) being the species of goods which usually formed the subject of a distress.

If the goods of a party were taken out of his possession against his will, he was entitled at common law to sue out a writ of replegiari facias, by which the sheriff of the county in which the goods were taken, or of the county in which they were detained, was required to cause the goods to be replevied, *i.e.* restored to the owner upon his giving pledges for the prosecution of his action, and also by statute pledges for the return of the goods to the distrainor in case a return should be adjudged. As the right of the party from whom the goods are taken to have the possession restored to him by replevin, depends upon the property belonging to him—if the taker of the goods claim them as his own property, the power of the sheriff is suspended, until the party has sued out a writ de proprietate probandâ, by which the sheriff is directed to summon a jury for the purpose of trying whether the goods are the property of the plaintiff or of the defendant; and if they are found to be the property of the plaintiff, then to replevy them; if of the defendant, the plaintiff's claim to be restored to the possession of the goods remains in suspense until the termination of the action. A special action lies at the suit of the crown and the party aggrieved, for falsely claiming property in the goods distrained, and thereby preventing a replevin.

A replevin does not lie for goods taken in execution, or for goods seized for a debt to the crown. In a very intemperate speech, addressed by Hyde, afterwards Lord Clarendon, to the House of Lords, upon a charge against the barons of the exchequer, for enjoining the sheriffs of London not to execute a writ of replevin for goods seized by the officers of the custom-house for refusing to pay the subsidies of tonnage and poundage, he is stated to have said, in the course of his argument, 'We all know a replevin lies against the king, if the goods be (be not?) in his own hands.' (Rushworth, part 2, vol. ii., 1361.) Though this strange assertion has been regularly transcribed by succeeding writers, it appears to be altogether unfounded. The replevins sued out for goods seized in respect of tonnage and poundage would issue against the officers as for goods seized by them in respect of debts claimed to be due to the crown. But goods seized for the king's debts cannot be replevied without the special mandate of the king or of the barons of the Exchequer. Still less could replevin be brought in respect of goods in the actual possession of the king, and upon an allegation of their having been wrongfully taken by him.

Replevin does not lie for goods taken in a foreign country, though afterwards imported here.

If upon a distress taken by the superior landlord upon premises in the possession of an under-tenant, the mesne or intermediate tenant puts his cattle in the place of those distrained, as by law he was allowed to do, he might replevy the goods so substituted, though the latter were never distrained.

Replevin lies notwithstanding an express agreement that the landlord shall be at liberty to distrain and hold the goods against pledges (that is, notwithstanding a tender of pledges) until the rent be paid; for goods cannot be made irreplevisable by the mere agreement of the parties.

Executors may maintain replevin for the goods of the testator taken in his lifetime, and a husband may bring replevin alone without naming his wife, for the goods of the wife taken before the marriage; as the property in the goods passes to the executors, and to the husband respectively, notwithstanding the seizure and detention.

A person may in some cases support a replevin without being the owner of the goods, as where the plaintiff is the bailee of the goods taken. [BAILMENT; PLEDGE.]

The writ of replegiari facias did not, as in the case of most other writs, confer upon the sheriff a bare ministerial authority: it operated as a commission clothing the sheriff with authority to determine the legality of the distress in the county court, in which he presides judicially. Notwithstanding the facility thus afforded, the remedy by writ of replegiari facias, which must be sued out of the Court of Chancery, was attended with great inconvenience and delay at a period when the chancery followed the person of the king, and many weeks might elapse before the party could obtain the restoration of his property. There existed also other difficulties connected with the execution of this writ. The inconvenience was felt as early as the time of Henry III., in whose reign it was provided by the statute of Marlbridge, passed in 1267, that if the cattle of any person be unjustly taken and detained, the sheriff, after complaint made to him thereof, may deliver them without hindrance or refusal of him who took the cattle. In 1554, with a view of making the delivery of distresses more expeditious, it was enacted by 1 and 2 Philip and Mary, c. 12, s. 3, 'that every sheriff of shires, being no cities nor towns made shires, shall at his first county-day, or within two months next after he hath received his patent of his office of sheriffwick, depute, appoint, and proclaim in the shire-town within his bailiwick, four deputies at the least, dwelling not above twelve miles distant from one another; which deputies so appointed and proclaimed shall have authority in the sheriff's name to make replevies and deliverance of such distresses, in such manner and form as the sheriff may and ought to do.' The proceeding by writ of replevin does not seem to be affected by the Uniformity of Process Act (2 Will. IV., c. 39, s. 21), which directs that the writs mentioned in that Act shall be the only writs for the commencement of personal actions in the cases to which such writs are applicable, inasmuch as none of these writs are capable of being applied to the objects to be accomplished by the writ of replevin.

The proceeding by plaint under the statute of Marlbridge, 52 Henry III., c. 21, has practically long superseded the proceedings by writ of replegiari facias. In numerous inferior courts jurisdiction is possessed, under charters from the crown, to hold pleas of replevin by plaint. By an act passed in 1284 (Westm. 2, c. 2), the sheriff is required, before he make deliverance of the distress, to take from the plaintiff pledges not only for the prosecution of the suit, but also for returning the cattle in the event of a return being adjudged. This statute is silent as to the amount in which security should be taken. For the purpose of fixing the extent of the responsibility of the pledges and of preventing vexatious replevins in cases of distress for rent, it was enacted in 1737 (by 11 Geo. II., c. 19, s. 23), that sheriffs and other officers having authority to grant replevin shall in every replevin of a distress for rent, take, in their own names, and before any deliverance is made of the distress, from the plaintiff and two responsible persons as sureties, a bond in double the value of the goods distrained (such value to be ascertained by the oath of one or more credible witness or witnesses not interested in the goods or distress, such oath to be administered by the person granting such replevin), with a condition for prosecuting the suit with effect and without delay, and for duly returning the goods and chattels distrained in case of a return being awarded.

By this latter statute the sheriff or other officer granting the replevin is authorised to assign the replevin bond to the avowant (the party who took the distress in his own right), or to the person making cognizance (the party acknowledging the taking of the distress on behalf of some other person, and as his bailiff, for the term applied to any person undertaking this species of agency, the duty of taking distresses having been formerly part of the ordinary duties of the bailiffs of manors); and the assignee of the bond is thereby empowered to sue upon it in the superior courts, in the event of the condition of the bond not being performed.

Although the county court has jurisdiction over the matters in dispute in actions of replevin, whether the proceeding be by writ or by plaint, the usual course, after security has been taken and the property returned, is to remove the proceedings into the Court of Common Pleas. This is commonly effected by a writ of recordari facias loquelam, called familiarly by practitioners a re. fa. lo., whereby the sheriff is commanded that he cause the plaint to be recorded which is in his county court between A and B, of the cattle, goods, and chattles of A, said to be taken and unjustly detained, and that he have that record before the justices at Westminster under his seal and the seal of four knights of the county of such as shall be present at the said recording, and that he give a day to the parties to be in court. This proceeding is evidently borrowed from the Norman practice of requiring the presence of four knights to constitute a record in certain cases, though in other cases other persons might be recordeurs [RECORDER], the supreme recordeur being the duke of Normandy himself (Grand Coustumier), all whose courts therefore, whether in Normandy or in England, in which he was supposed to be present, were courts of record. If the plaint which was required to be removed was not in the county court, but in the court of the lord of a franchise, the writ directed the sheriff to go to the lord's court, taking with him four knights, and there to cause the plaint to be recorded. This particular form of re. fa. lo. is called an accedas ad curiam. In some cases, proceedings in replevin may be removed from the county court into the Common Pleas by writ of pone loquelam; and where such proceedings are depending in an inferior court of record, they may be removed into any of the three superior courts by writ of certiorari.

Upon the appearance of the parties in the Court of Common Pleas (or the removal may be into the Queen's Bench, and, if from an inferior court of record, into the Exchequer also), the plaintiff declares against the defendant for the taking of the goods and chattels of the plaintiff, at such a time and in such a place, and unjustly detaining them against sureties and pledges (that is, notwithstanding the plaintiff had offered security to perform the act required, in case it should be found that he was liable so to do), until they were replevied. This is the ordinary form, and it is called declaring in the detinuit. But if the goods have not been restored to the plaintiff, the declaration charges that he still detains them. This is called declaring in the detinet, in which the plaintiff claims damages large enough to cover the whole value of the goods taken from him; whereas in replevin in the detinuit, the damages recoverable are for the taking and for the short detention, until the replevying, which, as the goods may be replevied immediately, are merely nominal, and a small amount to cover the expense of the replevin bond.

The declaration being delivered, and a rule to plead being given, and a demand of plea made, the defendant either confesses the action, or suffers judgment by default, or pleads or demurs to the declaration. In the first case, final judgment is entered for the sum confessed. In the second case, interlocutory judgment is signed, and a writ of inquiry issues to assess the amount of the damages which the plaintiff has sustained by reason of the taking and detaining of his property. If the goods have been restored to the plaintiff, the damages will be measured by the inconvenience and the expense incurred in getting them back; if, as is seldom the case, they have not been restored, the amount of damages will include the value of the goods at the time of their being taken.

Thirdly, the defendant may plead or demur to the declaration. In replevin there is no general issue, properly so called, that is, a plea which puts the plaintiff upon proof of all the material allegations in the declaration. If the defendant plead non cepit, he admits that the goods belong to the plaintiff, and denies the taking only. If he plead that the goods do not belong to the plaintiff, he admits that he took and detained them. The allegation that the defendant detained the goods against sureties and pledges, is considered as a mere form, and not traversable. Therefore, although the action of replevin was given for the purpose of trying the validity of distresses, yet as no proof of any tender of security for the performance of a duty distrained for can be required from the plaintiff, the action of replevin may, in effect, be maintained upon any species of wrongful taking; and in Ireland this form of action is not unfrequently resorted to as a mode of trying a disputed right of property in goods. But where the taking was not wrongful, an action of replevin does not lie, as where the defendant acquired the possession by delivery from the plaintiff, although the possession has been wrongfully continued, for which injury the proper remedy is an action of detinue (Com., *Dig.*, 'Replevin,' A.); though even in the case of a bailment (consignor against consignee), Lord Redesdale, then chancellor of Ireland, refused to quash a writ of replevin.

In ordinary cases, the defendant avows in his own right, or makes cognizance, as bailiff to his employer, for rent, or for some other duty or cause, for which a distress is allowed by law [DISTRESS], in doing which he may set up any ground of distress, though differing from that expressed at the time when the distress was made.

The plaintiff may reply to the defendant's plea as in other cases [PLEADING]; but inasmuch as an avowant, or a person making cognizance, is not merely a defendant, but a party seeking to recover something, the plaintiff's answer to an avowry or cognizance, which is in the nature of a declaration for the right or duty withheld, is called a plea in bar to such avowry or cognizance; the defendant's answer to which plea or bar is called a replication.

The pleadings in replevin vary according to the nature of the claim which formed the subject of the distress, and the circumstances under which the plaintiff is enabled to meet such claim. (Com., *Dig.*, 'Plead.,' (3 K); Selw., *N. P.*, 'Replevin;' Wilkinson *On Replevin.*)

If upon issue joined, a verdict is found for the plaintiff, the jury usually assess the damages; but if they omit to do so, a writ of inquiry issues to assess damages for the taking and detention, and also for the value of the goods, if it appear either by the pleading or by a suggestion by the plaintiff on the roll that the goods have perished or are still detained. But when the taking was lawful, and the detention only wrongful, no damages are given for the taking, as where goods are distrained damage feasant (wrongfully encumbering the defendant's property) and are impounded after tender of sufficient amends. Upon a judgment for the plaintiff on demurrer, a writ of inquiry issues to assess the damages, framed, as in other cases, with reference to the state of the record. Where there is judgment for the defendant upon verdict or demurrer, or the plaintiff is nonsuited, the judgment directs that the defendant shall have the goods restored to him without being again subject to being replevied, which is called a return irreplevisable; and by 17 Car. II., c. 7, on distress for rent, if the plaintiff in replevin by plaint, or writ depending in any court at Westminster, be nonsuited before issue joined, the defendant making a suggestion in nature of an avowry or cognizance for such rent, the court is directed, upon his prayer, to award a writ to inquire what rent is in arrear, and the value of the goods and cattle distrained; and on the return of the inquisition the defendant is to have judgment to recover the arrears of rent, if the goods, &c. distrained amount to that value, otherwise to the value of the distress, with full costs; and if the plaintiff be nonsuited after avowry or cognizance, and issue joined, or a verdict be for the defendant, the jury are to inquire the amount of rent in arrear, and the value of the distress; and if judgment be for the defendant on demurrer, the court is to award a writ to inquire the value of the distress, and the defendant is to have judgment for the arrears mentioned in the avowry or cognizance, if the distress amount to so much, otherwise to the value of the distress, and his costs.

If upon a replevin, either by writ or plaint, or upon a writ of retorno habendo after judgment, the sheriff returns that the cattle, &c. are driven away (eloigned, elongata) so that he cannot replevy them, a writ may issue commanding the sheriff to make reprisals by taking the cattle, &c. of the distrainor, and to detain them until he is able to replevy the cattle, &c. of the distrainee. This process, which is now nearly obsolete, was called a capias in withernam, or a capias by way of counter-taking, from *wither* (against; in German, *wider*) and *nam*, a taking or distress. A special action of trespass also lies for removing a distress so that it cannot be replevied. This latter offence was formerly called a 'vee,' or 'vetitum namium,' by which term is to be understood, not, as might be supposed, a forbidden distress, but a distress forbidden or refused to be replevied.' (2 *Inst.*, 140.)

If after goods have been replevied, and before the suit has been decided, the defendant makes another distress for the same cause, such second distress is called a recaption, and the course is to sue out a special writ for the restoration of the goods and for the punishment of the recaptor; since, whether the first taking was right or wrong, the defendant is not justified in thus anticipating the judgment of the court. It is not material whether the second taking be of the same goods or of other goods, provided they belong to the same party, and are taken for the same cause; but if the landlord distrain the goods of A, who replevies, and afterwards, finding the goods of B upon the land, he distrains them for the same rent, no writ of recaption lies. B can only replevy or bring an action of trespass or trover.

At common law, if the plaintiff was nonsuited, although the defendant became entitled to a return of the goods, yet the judgment was not that the return should be irreplevisable, as in a judgment upon a verdict where the right had been tried. The plaintiff might have again sued out a replevin, and so after several successive nonsuits. To put an end to this vexatious proceeding, the statute of Westm. II., c. 2, gave the plaintiff a writ of second deliverance instead of a new replevin, in which, if the plaintiff in any manner fail in his suit, the defendant will have judgment for a return irreplevisable. In other respects the proceedings in the action of second deliverance are similar to those in the action of replevin.

REPLICATION. [PLEADING.]

REPORTING. [NEWSPAPERS, p. 195.]

REPORTS (in Law) are relations of the proceedings of courts of justice. They contain a statement of the pleadings, the facts, the arguments of counsel, and the judgment of the court in each case reported. The object of them is to establish the law, and prevent conflicting decisions, by preserving and publishing the judgment of the court, and the grounds upon which it decided the question of law arising in the case. The records themselves are not easily accessible to the public, and they contain only the decision itself.

The earliest reports extant are the 'Year-books.' It is said that some few exist in MS. of the reign of Edward I., and a few broken notes are to be found in Fitzherbert's abridgment. A series of these commences, and are now printed, from the reign of Edward II. They were published annually, which explains their name, from the notes of persons, four in number, according to Lord Coke, who were paid a stipend by the crown for the purpose of committing to writing the proceedings of the courts. These early accounts of cases are very short, abrupt, and often confused, especially from the circumstance that it is frequently difficult to ascertain whether a judge or a counsel is speaking. At that time judges were dismissed at the pleasure of the crown, and after their dismissal returned to their previous position of counsel.

The Year-books continue, with occasional interruptions in their series, down to the reign of Henry VIII. The omission during the time of Richard II. has been attempted to be supplied by Bellewe, who collected and arranged the cases of that period which had been preserved by other writers. The Year-books are wholly written in Norman-French, although by the 36 Edw. III., stat. 1, c. 15, it was enacted that all pleadings should be in the English language, and the entries on the rolls in Latin. The Norman-French continued to be used by some reporters even as late as the eighteenth century. The last which appeared in that tongue were those of Levinz and Lutwyche; the former in 1702, the latter, in French and Latin, in 1704. The Year-books of later date have more continuity of style and fullness of discussion: cases are cited, and the decision of the court is given at greater length, with more solemnity and clearness. About the end of the reign of Henry VII. it is probable that the stipend was withdrawn. Only five Year-books exist for the ensuing reign, and none were published after it. Lord Coke observes, you may see no small difference between the cases reported in the reign of Henry VIII. and those previous. Their place was shortly afterwards supplied by reports compiled and published by private individuals on their own responsibility, but subject for some time to the inspection and approbation of the judges, whose testimony to the ability and fitness of the reporter is often prefixed to the Reports. This however soon became a mere form, as appears by the statement of Lord-Keeper North, who speaks slightingly of the Reports in his time as compared with his favourite Year-books.

North had such a relish for the old Year-books that he carried one in his coach to divert his time in travel, and said he chose it before any comedy. He thought the Year-books of Henry VII. the best for the student to begin with, as the law then became more settled; and was of opinion that they were better than the recent Reports, as 'compiled by men solemnly authorised, and not as now, when every ordinary practiser publisheth his Reports as he pleaseth, and the bookseller procureth an imprimatur.—And thus the shelves are loaded with Reports.' (Roger North's *Life of Lord-Keeper North*, vol. 1, pp. 27, 28.)

During the reign of Henry VIII. and his three successors, Dyer, afterwards chief-justice of the Common Pleas, took notes as a reporter. Benloe and Dalison were also reporters in these reigns. In the time of Elizabeth many eminent lawyers reported the proceedings of the courts, and, from the ability with which they acquitted themselves, added to the previously unsettled state of the law, the Reports of about this period have acquired very great authority. Anderson, Moore, Leonard, Owen, Coke, and Croke all lived about this time. But the first printed accounts of cases published by a private hand are those of Edmund Plowden, the first part of which appeared in the year 1571, under the title of 'Commentaries.' [PLOWDEN.] A few years afterwards the executors of Dyer published the notes of their testator under the express name of 'Reports,' being the first published under that title. These were followed, in 1601 and 1602, by those of Sir Edward Coke, which, from their excellence, have ever been dignified by the name of 'The Reports.' During this time reporters did not, as they have done in more modern times, confine themselves to one court. In the same volume are found reports of cases in chancery, in the three superior courts, the court of wards, &c. During the reign of James I., Lord Bacon and Sir Julius Cæsar suggested to the king the appointment of two officers for the purpose of taking notes and minutes of proceedings in the courts. James acceded to the suggestion, and a copy of his ordinance for their appointment, at a salary of 100*l.* each, is still extant. (Rymer's *Fœdera*, 15 Jac. I., 1617.) The ordinance does not however appear to have been acted upon, and Reports continued to be compiled and published by private hands only.

The English language was first used by reporters about the time of Elizabeth. Lord Coke employed it in his 'Commentary upon Littleton.' In his preface he states why he thought it convenient to do so; and adds that his conduct was not without precedent. From the period of Elizabeth down to the present, reports have been published of the proceedings in all the courts. During most of the time contemporaneous reports exist of the same cases, though frequently given under different names. Coke, in his day, thought the following distich applicable:—

> 'Quæritur ut crescunt tot magna volumina legis;
> In promptu causa est, crescit in orbe dolus.'

This is curious as evidencing the number and fecundity of reporters at that time. North also complains of the great number of Reports.

(Coke's *Reports*, Preface to part 3; Dugdale's *Origines Juridicales*; Reeves's *History of the English Law*.)

REPRIEVE (from the French *repris*, withdrawn), in criminal law, means the withdrawal of a prisoner from the execution and proceeding of the law for a certain time. Every court which has power to award execution, has also power, either before or after judgment, to grant a reprieve. The consequence of a reprieve is, that the delivery or the execution of the sentence of the court is suspended. A reprieve may proceed from the mere pleasure of the crown expressed to the court, or from the discretion of the court itself. The justices of gaol delivery may either grant or take off a reprieve, although their session be finished, and their commission expired. A reprieve proceeding from the discretion of the court is usually granted when, from any circumstance, doubt exists as to the propriety of carrying a sentence into execution. This doubt may be created either from the unsatisfactory character of the verdict, the suspicious nature of the evidence, the insufficiency of the indictment, &c., or from the appearance of circumstances favourable to the prisoner. When a reprieve has been granted with a view to recommend to mercy a prisoner capitally condemned, a memorial to that effect is forwarded to the secretary of state, who recommends the prisoner to the mercy of the crown, and to a pardon, on condition of transportation or some lighter punishment. Where it has been granted by reason of some doubts in point of law as to the propriety of the conviction, the execution of the sentence is suspended until the opinion of the judges has been taken upon it. The sentence is then executed or commuted in accordance with their opinion.

There are two cases in which a reprieve is necessarily granted. One is where a woman who has been capitally convicted pleads her pregnancy in delay of execution. Where such a plea is made, the judge must direct a jury of matrons to inquire of the fact; and if they find that she is quick with child, the execution is delayed, either till after her delivery, or proof by lapse of time that she was not pregnant. The other is where a prisoner appears to have become insane between judgment and the award of execution. In such case a jury must be sworn to inquire whether he really is insane. If they find that he is, a reprieve must be granted. (*Termes de la Ley*, 498; Hale, *P. C.*; 2 Hawk., *P. C.*, book ii., c. 51, s. 8, 9; 4 Bl. *Com.*)

In practice a reprieve is thus granted:—Before leaving an assize town, a calendar containing the names, offences, and sentences of the prisoners is prepared by the clerk of assize, and is signed by the judge. If he thinks proper to reprieve any one of them, he writes the word 'reprieved' in the margin of the calendar, opposite to the name of the prisoner, as follows:—

'*Reprieved.*	A. B. for the murder of C. D.	To be hanged.'

If he leaves A. B. for execution, and subsequently reprieves him, he writes to the under-sheriff and the gaoler to say so, and such letter from the judge stays execution.

If the reprieve is sent by the secretary of state, it is under the sign manual of the king.

REPTILES. *Reptilia.* The word reptile, in its general sense, signifies any creature that creeps upon the ground; but when used zoologically, it is confined to the designation of those quadruped, biped, and apod oviparous and ovoviviparous vertebrated animals that breathe by means of lungs principally, and are without hair, feathers, or mammæ. Such animals form the subject of that branch of zoological science termed *Herpetology*.

In mammalogy and ornithology we find that the animals which are treated of under those branches are respectively formed according to one leading type, which, however modified, may be traced throughout the whole chain of beings with which those branches of zoology are conversant. From an elephant to a mouse, from a whale to a porpoise, the same uniform principle of construction may be recognised. The same principle of organization governs the conformation of an ostrich and a humming-bird. But in herpetology we have various types or principles of structure. Not to dwell upon the more obvious differences in the organization of a tortoise and a common snake, we shall find in more cognate creatures, the Saurians for example, a striking variation in structure. The skeleton of a crocodile differs widely from that of a chameleon, as a glance at the figures given in this work of the osseous parts of each will show; and how widely are these again separated from the frogs and toads.

But before we proceed to inquire into the more remarkable differences of structure observable in reptiles, it will be necessary to observe what animals have been included in that class by zoologists.

The antient monuments of the Egyptians prove that the great groups of the tortoises, the lizards, the serpents, and the frogs, as well as their habits, were well known to that people; and the Sacred Scriptures abound in passages (the Old Testament especially) showing that a similar knowledge obtained when they were written. Indeed from the earliest times these forms must have attracted the attention of man; and a natural desire on his part to ascertain which of them were dangerous, and which were innocuous, must have led him to particular inquiry in order to solve the doubt.

In Herodotus and Athenæus, there are not wanting passages indicative of precise notions respecting many species of reptiles.

That this class of animals had employed no small portion of the acute observation of Aristotle, and that he was well acquainted with their form, structure, and habit appears from the great work which has justly immortalised him as a zoologist. We need only refer to the following passages in his 'History of Animals' to be well satisfied of the fact (lib. i., c. 1; lib. ii., c. 10, 17; lib. v., c. 3, 4; lib. viii., c. 2, 17). We find noticed the oviparous quadrupeds, viz. the land and marine *Testudinata*, the crocodiles, the lizards, &c.; the serpents, with an observation that they may be placed at the side of the lizards, as resembling them closely, if we suppose the lizards to be lengthened and deprived of their feet. The frogs are also often mentioned. Aristotle was quite aware of the generation of most of this class; he knew that the viper was ovoviviparous, and states that it brings forth its young alive, having produced an egg internally (*ὁ μὲν ἔχις ἔξω ζωοτοκεῖ ἐν αυτῷ πρῶτον ᾠοτόκησας*); and he indicates what animals should be designated as *amphibia*.

Pliny writes much and elegantly concerning this class; but the best of his observations are borrowed from Aristotle, and his far from well-digested compilation is mixed up with so great a portion of error and so large a measure of credulity, as justly to merit the censure passed by Cuvier on this voluminous and pleasant author, but too often fabulous natural historian.

Darkness settles on the period from the fourth to the ninth century as far as the history of the sciences is concerned; but at that epoch the best Greek works were translated by the Arabs, who thus handed on the most curious known facts, especially those which had any reference to the art of medicine. Again there is a great void till the early part of the sixteenth century, when France produced Belon and Rondeletius, Italy Salviani, and Switzerland that prodigy of erudition, as he is designated by Boerhaave, Conrad Gesner. Two of Gesner's books are devoted to the natural history of reptiles—lib. ii., *De Quadrupedibus oviparis*, and lib. v., *De Serpentium Naturâ*. These treatises are not mere catalogues with cuts; they are learned and elaborate dissertations, in which the antient and modern nomenclature of the object treated of, its form, its geographical position, its manners, its habits, its anatomy, its economical and medical uses, and its mythological history are discussed.

Towards the end of the same century, Aldrovandi appeared. The results of fifty years research in collecting objects of natural history, the drawings which he caused to be made of them, and his diligent studies relative to every point bearing on their history, appeared after his death, which happened in 1605, in fourteen volumes folio. The two books upon serpents and lizards do not appear to have been published till 1640, when they were given to the world by Professor Ambrosini of Bologna: twenty-two chapters are occupied by the serpents, and six only are dedicated to basilisks, dragons, and other lizards, the greater part of which however are fabulous

Jonston's *Historia Naturalis*, edited by Henry Ruysch, son of the celebrated anatomist, under the title of *Theatrium universale omnium Animalium*,* is principally a selection of the remarks of those who preceded him, and he has but few observations which can be called his own: still fewer indeed than Aldrovandus, who does not abound in originality. The fourth book treats of digitated oviparous quadrupeds, and there are two books on the serpents; but if little can be said of his originality, he certainly deserves praise for the attempt at systematic arrangement which his work exhibits, and which has the merit of exactness. His chapters, in point of fact, form a methodical table. Thus we have a treatise on frogs, toads, and tree-frogs; on the lizards, on the tortoises; and on the serpents.

But it is to our countryman John Ray that we owe the first arrangement which can be truly called systematic: in his *Synopsis methodica Animalium Quadrupedum et Serpentini generis*, which first appeared in 1693, we have a classification based on the mode of respiration, the volume of the eggs, their colour, &c. This basis is not indeed strengthened by any description of the habits or organization of the reptiles on which he treats, and cannot but be considered as insufficient; still it is valuable, and has the merit of leading the way to more accurate methods.

The *Amphibia* form, in the last edition of the *Systema Naturæ*, published by Linnæus himself, the third class of the animal kingdom. This class consists of three orders:—

1. *Reptiles*, which are described as *pedati, spirantes ore.*
2. *Serpentes*, which are characterised as *apodes, spirantes ore.*
3. *Nantes*, which are characterised as *pinnati: spirantes etiam branchiis lateralibus.*

The last order, which consists of cartilaginous and other fishes, forms no part of our present inquiry, which is confined to animals included in the two first.

The *Reptiles* are thus designated:—*Os respirans pulmonibus. Pedes quatuor:*—and they consist of the genera *Testudo* (Land, Marine, and Freshwater Tortoises); *Rana* (Frogs and Toads); *Draco* [Dragon]; and *Lacerta*, which includes the Crocodiles and the rest of the Saurians.

The *Serpentes* have the following general character:—*Os respirans tantum pulmonibus. Pedes nulli, pinnæve natatoriæ nullæ. Aures nullæ:* and they comprise the following genera:—*Crotalus* (the Rattle-Snakes); *Boa* (Boas and Pythons); *Coluber*, including all serpents which have abdominal scuta and subcaudal scales, whether poisonous or not; *Anguis*, including the Slow-worms, *Bipes* and other serpents, the poisonous *Cerastes*, &c.; *Amphisbæna*; and *Cæcilia.*

The work on oviparous quadrupeds, published by Klein in 1751—*Quadrupedum dispositio brevisque Historia Naturalis*—requires hardly any notice, and another which made its appearance in 1755—*Tentamen Herpetologiæ*—deserves as little. The latter, notwithstanding its extensive title, treats only of serpents; and the value of the criticisms of this opponent—he cannot be called rival—of Linnæus may be appreciated by his arranging in the same category the Earthworms, Tapeworms, and Leeches.

But it is to the *Specimen Medicum*† presented by Laurenti at Vienna, in order to obtain the degree of Doctor, that we must look for the first well-digested history of reptiles. This remarkable work, which omits the Tortoises, but, in other respects may be said to have formed an æra in the science of Herpetology, is divided into two parts: the first relates entirely to the natural history and characters of the genera; the second is devoted to specific descriptions, and the record of experiments made to detect the existence of poison in some species, and the effect of remedies in certain cases. But though this most able treatise is always quoted as that of Laurenti, it has been attributed to Winterl, a distinguished chemist of Vienna, whose name appears only in the last page of the work as having been the assistant of Laurenti—or rather his *collaborateur*—in his therapeutic experiments.

The author or authors of this valuable book assign the following characters to the class of *Reptiles*, which are described as cold animals, without hairs or mammæ, furnished with lungs, which act without a diaphragm, and generally without ribs, the functions of which are performed by the throat in first drawing in the air and then driving it into the lung; as hybernating for a very long period, not masticating their prey, but swallowing it entire, and digesting it very slowly; as capable of long fasts (often for half the year), et copulâ diu coherentia; as renewing their youth, as it were, by casting their skins; and as objects of suspicion to man, and indeed all other mammiferous animals.

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* This is the most esteemed edition, and was published in 1718, in two vols. fol. Jonston's 'Thaumatographia Naturalis in decem classes distincta' appeared at Amsterdam in 1632. There are several editions of the 'Historia Naturalis.' That of Amsterdam (1657) is in one vol. folio.

† 'Exhibens synopsin Reptilium, emendatam cum experimentis circa venena et antidota Reptilium Austriacorum,' Viennæ, 1768, 8vo.

The Tortoises, as we have seen, are not comprised in the work which bears the name of Laurenti. The reptiles there treated of are separated into three orders, viz. *Salientia*, *Gradientia*, and *Serpentia*.

The *Salientia* consist of the Toads and Frogs; the *Proteus* of Laurenti, which appears under this order, being the larva of the *Rana paradoxa*. The reptiles under the order *Salientia* are characterised as having the posterior feet proper for leaping, the body without scales, the epidermis mucous, the ears hidden by a membrane, neither teeth nor nails (excepting the *Pipa*),* no sexual organs reaching beyond the *cloaca*, and the loss of the tail as a consequence of the metamorphosis. For the genera the reader is referred to Frogs [vol. x., p. 494].

The characters of the second order, *Gradientia*, are the possession of four feet proper for walking, which cannot operate without the elevation of the abdomen from the ground, and a distinct neck and tail. The genera consist of the *Protei*, forming the 5th genus; 6th, the Tritons, or Aquatic Salamanders; 7th, the Terrestrial Salamanders; 8th, *Caudiverbera*, corresponding to the *Uroplates* of Duméril and Bibron; 9th, the Geckos; 10th, the Chameleons; 11th, the Iguanas; 12th, the Basilisks; 13th, the Dragons; 14th, the *Cordyli*, which correspond to the *Agamæ*; 15th, the Crocodiles; 16th, the Scincks; 17th, the *Stelliones*; and 18th, *Seps*, which last conducts us to

The third order, *Serpentia*, which are defined as having a rounded body, in which neck and tail are confounded, a repent progression, dilatable jaws, not solidly articulated, a very extensible œsophagus for the reception and deglutition of a disproportioned prey; and genital organs opposed and placed on the margins of the *cloaca*. The genera are 19th, the *Chalcides*; 20th, the *Cæciliæ*; 21st, the *Amphisbænæ*; 22nd, the *Orvets* (*Anguis*); 23rd *Natrix*; 24th, the *Cerastes*; 25th, the *Coronelles*; 26th, the *Boæ*; 27th, *Dipsas*; 28th, *Naja*; 29th, the Rattlesnakes (*Caudisona*); 30th, *Coluber*; 31st, the Vipers; 32nd, the Cobras; 33rd, the Asps; 34th, the Constrictors; and 35th, the Flat-tailed Serpents (*Laticauda*).

Though there is room for criticism with regard to the distribution of parts of this arrangement and the omission of that great and interesting class of reptiles the *Testudinata*, no zoologist will deny the lucid and natural views of the author, nor accept the *specimen* as any other than a most valuable advancement of herpetological science.

It will be seen that we have omitted the great work of Roesel on Frogs, which being limited to that particular race, is noticed in the article which bears their name. [Frogs.]

Though Scopoli devoted but a few pages to the Reptiles, his observations must not be passed by. The pupil of Linnæus, he showed himself worthy of his master: but at the same time he appears in his arrangement to have been fettered by the principles adopted by the great Swede, though he varied the application of them. In his 'Introduction to Natural History' (1777), in which he commences with the *Infusoria*, and concludes with the *Mammalia*, the *Amphibia* form the tenth tribe, and are divided by him into the true *Amphibia* (Reptiles and Serpents), and false or Ichthyomorphous *Amphibia* (the Chondropterygian fishes). The true Amphibia are separated into Serpents and Reptiles, and the latter are subdivided into two orders, viz those which possess a tail, and those which are deprived of that member (*Ecaudata*). The genera do not differ from those of Linnæus, though the characters of them are otherwise defined, but not improved. Scopoli, in his admiration of the brevity of his great master, has carried his own to the very verge of obscurity.

The Count Lacépède (1788, 1790) divided the Reptiles into three great groups:—

I. *Oviparous Quadrupeds*, subdivided into (1) those which possess a tail, and (2) those which are tailless.

II. *Biped Reptiles.*

III. *Serpents.*

Of the tailed oviparous quadrupeds the Tortoises form the first genus, and are separated into two sections:—1st—those whose toes are united, unequal, and flattened into fins (the Marine Tortoises or Turtles); 2nd, those whose toes are short and moveable, and nearly equal (Fluviatile and Terrestrial Tortoises)—twenty-four species in all. [Tortoises.]

The second genus, comprising the Lizards, consists of those reptiles which have no carapace: they are divided into eight sections or subgenera—the Crocodiles, Tupinambis, Iguana, the true Lizards, the Chameleons, the Geckos, the Chalcides, the Dragons, and the Salamanders—fifty-six species in all.

The second section of the Oviparous Quadrupeds consists of the Frogs and Toads, which are divided into three genera, containing thirty-three species. [Frogs, vol. x., p. 495.]

The second great group, or the Oviparous Bipeds, comprehends those reptiles which have two feet and a tail, and is subdivided into—1st, those which are provided with anterior feet only; 2nd, those which are furnished only with posterior feet.

The third great group, or the Serpents, consists of those reptiles which have neither feet nor fins: they include nine genera. [Serpents.]

But the genera recorded in the system of Lacépède are not the only genera which he has established. Many of a date posterior to that of his system will be found in the *Annales du Muséum* and other works; but in the former principally.

In 1799 the method of Mr. Alexandre Brongniart was read to the French Academy of Sciences, and it seems to have been first published in the 'Bulletin des Sciences,' in 1800; it was afterwards printed among the other Memoirs of the National Institute. His classification may be regarded as a considerable step in advance of those who had preceded him, and had principally confined themselves to external characters, well defined doubtless, but of little moment when compared with those based on organization and habits. Whilst they carefully attended to the presence or absence of tail or feet, they neglected those essential points which spring from generation and development. Brongniart pointed out the approximation of the Tortoises to the Lizards, and even to the Serpents, and was the first to show that the Toads, Frogs, and Salamanders ought to constitute a separate order.

The following are the orders of M. Alex. Brongniart:—

I. *Chelonians* (Tortoises). These are toothless as far as regards implanted teeth, but their jaws are covered with a trenchant horny substance; their body is protected by a convex carapace; their heart has two auricles; their stomach is more voluminous than that of other reptiles, and their intestinal canal is provided with a cæcum;* they copulate, and lay eggs with a solid calcareous covering. The principal nourishment of this order is derived from vegetables.

II. *Saurians* (Lizards). These have implanted teeth, two auricles to the heart, ribs, and a sternum. The male has an external organ of generation, and they perform a true copulation; they lay eggs with a calcareous shell, and the young do not undergo a metamorphosis.

III. *Ophidians* (Serpents). These have long arched ribs. The male has an internal organ of generation; but they perform a true copulation, and lay eggs with a calcareous shell, and their young are hatched in all respects like the parents. They differ from the Saurians in having a heart with but one auricle,† no sternum, a double penis in the male, the shell of the egg soft though calcareous, and no feet.

IV. *Batrachians.* These have but one auricle‡ to the heart, and no ribs, or the rudiments of ribs only, a naked skin without scales, and no feet. The male has no external organ of generation, and no true copulation takes place; the eggs being most frequently fecundated out of the body of the female, are shell-less, and laid in the water. The young are hatched with branchiæ or gills, and in the early stages of their existence differ from their parents.

The method of Lacépède seems to have found more favour in the eyes of M. Latreille than that of M. Alex. Brongniart, which last must have been known to the former when he published his 'Natural History of Reptiles,' in 1801 He places in his *first* division the Oviparous Quadrupeds whose body is provided with feet, dividing them into two sections, according as they have unguiculated or clawless toes, and a scaleless skin. His *second* division is formed by the Serpents; and in his *third*, designated by the name of *Pneumobranchians*, he places the genera *Proteus* and *Siren*, as well as another, which he names *Ichthyosaurus*, which last is only a Tadpole.

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* An error, the *Pipa* is not an exception. [Frogs, vol. x., p. 495.]

* This exists as an exception in the *Chelonia*.

† All serpents are now known to possess two auricles.

‡ But it is divided internally into two chambers.

In 1825, when the science had very much advanced, M. Latreille, in his 'Families of the Animal Kingdom,' published another arrangement, which MM. Duméril and Bibron have digested into the following table:—

HE'MACRYMES PULMONE'ES.

Classes.	Sections.		Orders.	Families.
Reptiles	Cuirassed		Chelonians	Cryptopods (Testudo, &c.).
				Gymnopods (Saurochelys, Trionyx, &c.).
			Emydosaurians	Crocodilians (Crocodiles, &c.).
	Scaly	Saurians.	Lacertiform	Lacertians (Monitor, &c.).
				Iguanians (Iguana, &c.).
				Geckotians (Gecko, &c.).
				Chameleonians (Chamæleo, &c.).
			Anguiform	Tetrapods (Scincus, Seps, Chalcides).
				Dipods (Bipes, Bimanus).
				Apods (Anguis, Ophisaurus, &c.).
		Ophidians	Idiophids	Amphisbænians (Amphisbæna, &c.).
				Cylindrical (Tortrix).
				Coluberians (Acrochordus, Boa, Python, &c.).
				Anguivipers (Bongarus, Hydrophis, Pelamys, &c.).
				Vipers (Crotalus, Berus, Naja, &c.).
			Batrachophids	Gymnophids (Cæcilia).
Amphibia			Caducibranchians	Anurous (Pipa, Bufo, Rana, &c.).
				Urodeles (Salamandra, Triton, Axolotl).
			Perennibranchians	Ichthyoids (Proteus, Siren).

In 1802 and 1803 appeared the 'Traité Général' of Daudin. In this distinguished work (for with some faults, which a happier state than fell to the lot of the unfortunate author [DAUDIN] might have prevented, distinguished it is and will be) the method of M. Alexandre Brongniart is followed, in so far as the division of the Reptiles into four orders. In the three sections of *Chelonians* fifty-seven species are named and described. In the order *Saurians*, Daudin first places *Crocodilus*, with its three subgenera [CROCODILE], and then the genera *Draco*, *Tupinambis* (in which he describes several new species), *Lacerta* (subdivided into the Ameivas, the Collared, Ribanded, Spotted, Gray, Dracenoid, and Striated Lizards—thirty-one species in all, and including the genera *Trachydromus*, *Draco*, *Basiliscus*, and *Agama* (which last is subdivided into five sections), *Seps*, and *Chalcides*. The third order, *Ophidians*, contains numerous and natural genera, some of them rather overloaded, *Coluber* for instance, under which one hundred and seventy-two species are arranged; and others with only one or two. The fourth order, *Batrachians*, appears to have employed his particular attention. [FROGS, vol. x., p. 494.] He includes *Salamandra* and *Triton* in one genus, and assigns a single species to the genera *Proteus* and *Siren*. Such is a mere sketch of the great work of Daudin, founded, as he himself declares, upon his personal examination and study of five hundred and seventeen species.

In the short notice published by George Cuvier, in his 'Tableau Elémentaire de l'Histoire Naturelle' (1798), he divided the Reptiles, like Lacépède, into *Oviparous Quadrupeds*, *Serpents*, and *Biped Reptiles*. Even at this early period we trace the enlarged and penetrating character of the mind of this great zoologist in the leading idea of making the organization of animals the basis of their classification, in the new views regarding the divisions of the orders, and the important reformation in the characters assigned to certain genera up to that time. In 1817, when the first edition of his 'Règne Animal' was given to the world, we find that he had not neglected the interval which had thrown so much light on this branch of zoology, and that, abandoning entirely the systematic divisions which he had adopted in his 'Tableau Elémentaire,' he founds the whole of his arrangement on the structure of animals and their external and internal conformation. In 1829, when the second edition, the last which received his own revision, of the 'Règne Animal' appeared, we find this classification retained, with some slight corrections; and the following is a synoptical table of his method as applied to the Reptiles:—

				Orders.					Families.
Heart with an Auricle.	Double	Limbs: Jaws	Horny, without teeth	*Chelonians*					Chelonians.
			Toothed	*Saurians*....Feet	Ordinary: toes to the number of .	Five before, four behind			Crocodilians.
						Five to four feet: Tongue	Bifurcated, extensible		Lacertians.
							Not extensible: Body.	Ordinary.	Iguanians.
								Flattened	Geckotians.
							Vermiform, very extensible.		Chameleonians.
					Very short, or to the number of four at least				Scincoidians.
		No Limbs		*Ophidians*...Skin	Sealy: eye.	With three eyelids			Anguis.
						Without a third eyelid			True Serpents.
					Naked				Naked Serpents.
	Single.			*Batrachians*					Batrachians.

Most of the leading genera and subgenera belonging to these families will be found under their several heads in this work. We will here only call attention to the *Batrachians*.

				Genera.	Subgenera.
Tail.	None.			Rana	Rana, Ceratophrys, Dactylethra, Hyla, Bufo, Bombinator, Rhinella, Otilophus, Pipa.
	Long. Feet to the number of ..	Four	Lungs without branchiæ	Salamandra	Terrestrial and Aquatic Salamanders, Menopoma, Amphiuma.
			Branchiæ and lungs.	Proteus	Axolotl.
		Two		Siren	

Oppel (who had been a diligent attendant at M. Duméril's course of lectures in 1807 and 1808, and in whose works much of the lessons of the latter are to be traced, as Oppel himself acknowledges), after publishing, in the nineteenth volume of the *Annales du Muséum*, a Memoir on the Ophidiens, and another on the Batrachians, produced in 1811, at Munich, his treatise *Die Ordnungen, Familien, und Gattungen der Reptilien als Prodrom einer Naturgeschichte derselben* (thin 4to.).

The following synoptical table exhibits Oppel's method:—

REPTILIA	Testudinata		Chelonii. Emydæ.
	Squamata	Saurii	Crocodilini. Geckoides. Iguanoides. Lacertini. Scincoides. Chalcidici.
		Ophidii	Anguiformes. Hydri. Crotalini. Viperini. Constrictores. Pseudovipera. Colubrini.
	Nuda	Apoda. Caudata. Ecaudata.	

Other writers besides Oppel have evidently profited by the lectures of M. Duméril, who promises, at the end of the excellent *Erpétologie* by himself and M. Bibron, now in the course of publication, a complete table, setting forth his ideas on this branch of zoology. Those ideas, as far as can be collected from the parts already before the public, are sound and philosophical; being marked by acute observation, minute detail, and deep research, which are made subservient to general and enlarged views of the whole subject.

In 1790 Merrem published a paper in German, with the title of *Materials for a Natural History of Amphibia*,* and in 1820 and 1821 two other papers followed. These papers treat of serpents and several genera of Saurians, and are illustrated with coloured plates. But his system appears to have been published (in 1800) at the suggestion of Bechstein, who had translated Lacépède's 'History of Reptiles' into German; and in 1820 a second edition of this system, which is shown in the following table, made its appearance:—

CLASSES.	ORDERS.	TRIBES.	SUBDIVISIONS.
PHOLIDOTA	*Testudinata*:	with feet	Pinniform. Digitated.
	Loricata (Crocodiles)		
	Squammata	Gradientia	Ascalabotæ. Sauræ. Chalcidici.
		Repentia (Anguis, Ophisaurus, Acontias).	
		Serpentia	Gulones. { Innocui. Venenati. Typhlini.
		Incedentia (Chirotes).	
		Prendentia (Chamæleon).	
BATRACHIA	Apoda (Cæcilia).		
	Salientia (Rana, &c.).		
	Gradientia	with eyelids	Mutabilia (Salamandra, &c.).
		without eyelids	Amphipneusta (Hypochton, or Proteus).

M. de Blainville, in 1816, published, in the *Nouveau Bulletin des Sciences de la Societé Philomatique*, the prodromus of his systematic distribution of the animal kingdom, which he produced, in 1822, in his *Principes d'Anatomie Comparée*. Under the type *Osteozoaria* and the subtype *Ovipara* or *Amastozoaria*, he places the reptiles, which he divides into two classes, viz.: 1, *Reptiles* or *Ornithoïd Squammifers*; 2, *Amphibians* or *Nudipellifers, Naked Icthyodians*.

The first class is separated into three orders:—

I. *Chelonians*, consisting of the genera *Testudo*, *Emys*, *Chelys*, *Trionyx*, *Chelonia*, and *Dermochelys* (Sphargis).

II. *Emydosaurians*, or crocodiles, divided into three subgenera.

III. *Saurophians* or *Bipenians*, which are separated into two suborders:—

A. *Saurians*, consisting of the families of Geckoidians, Agamoïdians (the Normal, as *Agama* and *Basiliscus*, and the Anormal, as *Chamæleo* and *Draco*), the *Iguanoïdians*, *Tupinambis*, and the *Lacertoïdians* (divided into *Tetrapods*, *Dipods*, and *Apods*).

B. *Ophidians*, which are divided into

1. The *Dipods* (Chirotes).

2. *Apods*—α (with numerous teeth), *Pelamys*, *Hydrophis*, the *Vipers*, and the *Lethifers*—β (without venomous teeth), the *Amphisbænas*, the *Climbers* or *Boas*, and the *Colubers*.

The second class, *Ichthyoid* or *Nudipelliferous Amphibians*, is composed of four orders:—

1. The *Batrachians*, divided into two suborders—α (Aquiparous), *Rana*, &c.; β (Dorsigerous), *Pipa*.

2. The *Pseudosaurians* or Salamanders.

3. The *Subichthyans* or True Amphibians (*Proteus*, *Siren*).

4. The *Pseudophidians* (*Cæcilia*).

Mr. John Edward Gray published, in 1825, his *Synopsis of the Genera of Reptiles* and *Amphibia*, in the *Annals of Philosophy*. He considers the *Reptiles*, or scaly-skinned group, and the *Amphibia*, or naked-skinned group, as distinct classes.

The class *Reptilia* are thus defined:—Body covered with scales or hard plates imbedded in the skin; heart with two auricles and one ventricle, respiring by lungs. The blood is cold; the windpipe ringed; the ribs are perfect, and there are several vertebræ; the penis is distinct, sometimes double. The egg is covered with a shell, mostly hatched in the body of the mother.

The orders of the *Reptilia* are divided into two sections:

1.

Body covered with imbedded hard plates.

Ears closed with a valve . . . . Emydosauri.
Ears naked, valveless . . . . . Sauri.

2.

Body covered with scales, or two large shields

Legs 2—4 weak; ears naked . . . Saurophidii.
Legs 0; ears 0 . . . . Ophidii.
Legs 4; body covered with two shields . Chelonii.

Mr. Gray then remarks that 'Mr. Macleay, in his excellent *Horæ Entomologicæ*, has observed that the order of this class appears to assume a circular disposition; the most visible break in this arrangement is in the passage between the snakes and the tortoises; for the connection between the latter order and the crocodiles must be visible to every one, if they only consult Shaw's figures of the *Testudo serpentina*, and compare it with that of the crocodile, for it is in fact a crocodile with a shortened body, covered with united instead of distinct shields, and a bird's beak. The passage from the crocodiles to the lizards by means of the monitors has been long known to naturalists, who have often considered the latter as species of the former genus; and even Linnæus placed them in the same section of his genus Lacerta. The Scincs have always been placed in the same genus or group with the lizards; but their affinity with the slow-worms did not escape the penetrating eye of Linnæus, who observes that the *Lacerta Chalcides* is 'Media inter Lacertas et Angues,' and the union of the genera *Scincus*, *Anguis*, and *Amphisbæna* into an order, although it has not been done by any zoologist that I am aware of, appears to be strictly natural, for the feet in this order exist in such various degrees of development, that the being with or without them appears to be only a family or generic character, and not ordinal. Linnæus placed the genera *Tortrix* and *Eryx* of the true serpents as species of his genus *Anguis*, thus showing that he considered them as nearly allied. So far the passage from one order to the other has been very easy and gradual; and indeed sometimes I have been doubtful, as in the last case, to which order I should refer the genera. There is every reason to believe, from general structure, that there exists an affinity between the tortoises and the snakes; but the genus that exactly unites them is at present unknown to European naturalists, which is not astonishing when we consider the immense number of undescribed animals which are daily occurring. Mr. Macleay thought that these two orders might be united by means of *Emys longicollis* (the long-necked tortoise) of Shaw; but the family to which this animal belongs appears to be the one which unites this class to the crocodile: if I may be allowed to speculate from the peculiarities of structure which I have observed, I am inclined to think that the union will most probably take place by some newly discovered genera allied to the marine or fluviatile soft-skinned turtles and the marine serpent.'

Mr. Gray then proceeds to develop his system as follows:

§ 1. *Body covered with imbedded hard plates; legs distinct, fit for walking.* Loricata, *Gray*, not *Merrem*.

Order I. *Emydosauri*, Blainv.

Ears closed by two longitudinal valves; anus longitudinal; body covered with large imbedded plates; tongue short, adnate; legs four; toes four before, five behind; sternum long; clavicles none; lungs not extended to the abdomen; *living in or near water*.

Families: 1. *Crocodilidæ*. 2. *Ichthyosauridæ*. 3. *Plesiosauridæ*.

Mr. Gray thinks that *Megalosaurus* of Buckland is, perhaps, allied to this order.

Order II. *Sauri*, Blainv.

Drum of the ears naked or covered with skin; anus transverse; body covered with large and small imbedded scales; legs four, toes five, before and behind; sternum short; clavicles distinct; lungs extended into the abdomen; *living mostly on land*.

§ I. *Tongue not extensile.* Ascalabota, Merrem.

Families: 1. *Stellionidæ*. 2. *Geckotidæ*.

§ II. *Tongue extensile.* Sauræ, Merrem.

Families: 3. *Tupinambidæ*. 4. *Lacertinidæ*. 5. *Chamæleonidæ*.

Order III. *Saurophidii*, Gray.

Drum of the ear deep-seated, partly covered terior transverse valve or by the skin; eyes furnished with longitudinal eyelids; skin covered with uniform imbricate scales, or rings of square plates; feet two, or four, small, weak, sometimes wanting; occipital condyle three-cut; lungs two, unequal, or rarely only one; ossa quadrata one on each side;* upper maxilla immoveable.

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* 'Beiträge zur Naturgeschichte der Amphibien.'

§ I. *Body covered with imbricate scales; anus transverse, not terminal; tongue extensile.*

Families: 1. *Scincidæ*, Gray. 2. *Anguidæ*.

§ II. *Body covered with intricate* (imbricate?) *scales; anus terminal.*

Family: 3. *Typhlopidæ*, Gray.

§ III. *Body covered with rings of square scales.*

Families: 4. *Amphisbænidæ*, Gray. 5. *Chalcididæ*.

Order IV. *Ophidii*, Brongn. (Serpentes, Linn.)

The drum of the ear wanting; eyes destitute of the third lid; skin covered with imbricate scales or plates; feet none; chest and blade-bones wanting; ribs encircling the body; body of the vertebra uniting by a convex and a concave surface; the os tympanum or pedicel of the lower jaw moveable, and suspended to another similar bone or mastoid, attached to the skull only by ligaments. The branches of the jaw only united together by ligaments, so as to let them separate more or less from each other, and allow the animal to swallow large bodies; the palatine arches moveable, armed with sharp recurved teeth.

§ I. *Upper jaws with fangs only.* Venati. (Venenati must be meant.)

Families: 1. *Crotalidæ*. 2. *Viperidæ*.

§ II. *Upper jaw with teeth, and with or without fangs; oviparous.*

Families: 3. *Hydridæ*. 4. *Colubridæ*. 5. *Boïdæ*.

Order V. *Chelonii*. (Testudinata, Oppel.)

Body short, enclosed between two horizontal shields, with the head, neck, tail, and four legs, passing out between; mouth toothless, often covered with a horny bill; tongue short.

§ I. *Feet and head retractile into the carapace; carapace solid, covered with horny scales.* Cryptopodi.

Families: 1. *Testudinidæ*. 2. *Emydidæ*, Bell.

§ II. *Feet and head not or only partly retractile into the carapace; carapace mostly soft.* Gymnopodi.

Families: 3. *Trionycidæ*. 4. *Sphargidæ*. 5. *Cheloniadæ*.

Our limits have compelled us to confine ourselves to the orders and families: the subfamilies, the genera, and their subdivisions as marked out by Mr. Gray will be given under their respective heads.

The following table of the affinity of Reptiles is given by this zoologist:—

Normal Groups.	*Annectant Groups.*
Order I.—*Sauri*.	
1. Stellionidæ.	3. Lacertinidæ.
2. Geckotidæ.	4. Chamæleonidæ.
	5. Tupinambidæ.
Order II.—*Emydosauri*.	
1. Crocodilidæ.	3. Plesiosauridæ.
2. ———	4. Ichthyosauridæ.
	5. ———
Order III.—*Chelonii*.	
1. Testudinidæ.	3. Trionycidæ.
2. Emydidæ.	4. Sphargidæ.
	5. Carettidæ (Cheloniadæ?).
Order IV.—*Ophidii*.	
1. Crotalidæ.	3. Hydridæ.
2. Viperidæ.	4. Colubridæ.
	5. Boidæ.
Order V.—*Saurophidii*.	
1. Scincidæ.	3. Typhlopsidæ.
2. Anguidæ.	4. Amphisbænidæ.
	5. Chalcidæ.

The class *Amphibia* are thus defined:—Body with a soft naked skin; heart with one auricle and one ventricle; respiring by lungs and gills, and often by lungs only when perfect; claws none; head articulative to the vertebra by two condyles. Blood cold; windpipe membranaceous; ribs none, or very short and imperfect; egg-skin membranaceous. Animal often changes its form and habit during growth; eggs fecundated after they are deposited, hatched in the water where they are laid. They do not only differ from the perfect animal by having gills, but they often change their external and internal conformation, and generally gain legs.

The following are the orders and families under which Mr. Gray arranges the genera:—

§ I. *Undergoing transformation; gills deciduous; eyelids three, distinct; spiracles none.* Mutabilia, Gray. The larva elongated, respiring by deciduous gills.

Order I. *Anoura*, Dum. (Salientia, Laur.; Batrachians, Blainv.).

Families: 1. *Ranidæ* (subfamilies *Hylina*, *Ranina*, *Bombinatorina*), *Piprina* (Pipina?), *Bufonina*.

Order II. *Urodela*, Dum. (Caudata, Oppel.; Pseudosaurii, Blainv.).

Family: 2. *Salamandridæ*.

§ II. *Not undergoing any transformation; gill none or permanent; eylids two; spiracles distinct.* Amphipneusta.

Order III. (Sirenes, Linn.)

Families: 3. *Sirenidæ* (subfamilies *Proteina*, *Serenina*, (Sirenina?). 4. *Amphiumidæ*.

Order IV. (Apoda, Merrem; Pseudophidii, Blainv.)

Family: 5. *Cæciliadæ*.

In 1831 the same author published, in Griffith's Cuvier (vol. ix.), a 'Synopsis of the Species of Reptiles,' in which he made some alterations in his first classification. He there places the order Testudinata in the first section (*Cataphracta*), and distributes the genera nearly in the same manner adopted by him in his separate publication, 'Synopsis Reptilium,' where he particularly treats of the *Chelonians*. In the second section (*Squamata*) he arranges the Saurians, Ophisaurians, and Serpents.

For the Saurians he adopts Wagler's divisions, depending on the form of the tongue and the manner in which the teeth are placed in the jaws.

The *Amphibia* are still classed separately: in the second section (*Amphipneusta*), which undergoes no metamorphosis, are placed the *Protei*, comprehending *Hypochton*, *Menobranchus*, *Phyllidra*, or *Siredon*, *Siren*, to which Mr. Gray approximates the *Pseudobranchians*, *Amphiuma*, to which he approximates the *Abranchians* (*Protonopsis*, Barton), and the *Cæciliæ* (*Siphonops*, Wagler; *Ichthyophis*, Fitzing; and *Epicrium*, Wagler).

In the *Synopsis of the Contents of the British Museum* (1840), Mr. Gray has again considerably modified his method, and, as we think, improved it. The *Reptilia* forming the third class are thus arranged.

§ I. Squamata.

Order I. Sauria.

A. *Leptoglossæ*.

Families: 1. *Monitoridæ*. 2. *Helodermidæ*. 3. *Teidæ*. 4. *Lacertinidæ*. 5. *Zonuridæ*. 6. *Cercosauridæ*. 7. *Chirocolidæ*. 8. *Chamæsauridæ*. 9. *Chalcidæ*. 10. *Scincidæ*. 11. *Gymnophthalmidæ*. 12. *Pygopidæ*. 13. *Rhodonidæ*. 14. *Acontiadæ*. 15. *Typhlopsidæ*.

B. *Pachyglossæ*.

Families: 16. *Geckotidæ*. 17. *Iguanidæ*. 18. *Agamidæ*. 19. *Chamæleonidæ*.

Order II. Ophidia.

A. *Venenosa*.

Families: 1. *Crotalidæ*. 2. *Viperidæ*.

B. *Innocua*.

Families: 3. *Colubridæ*. 4. *Boidæ*. 5. *Hydridæ*.

§ II. Cataphracta.

Order III. Chelonia.

Families: 1. *Testudinidæ*. 2. *Emydæ*. 3. *Chelydæ* 4. *Trionycidæ*. 5. *Cheloniadæ*.

Order IV. Emydosauri.

Family: *Crocodilidæ*.

Order V. Amphisbænia.

Families: 1. *Trogonophidæ*. 2. *Chirotidæ*. 3. *Amphisbænadæ*.

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* Common to Reptiles generally, as well as to other animals which have an *os quadratum*.

With the exception of the Paris collection, that of the British Museum is more rich in *Reptilia* than any other public or private museum.

MM. Carus and Ficinus have, in their zoological arrangement, adopted very nearly the classification of Merrem and the principles of Oken for the Reptiles.

In the method proposed by Dr. Harlan, in the 'Journal of the Academy of Natural Sciences of Philadelphia,' he adopts the four orders of *Batrachians, Ophidians, Saurians*, and *Chelonians*.

The Batrachians are divided into three sections, or suborders, according to the respiratory functions. In the first suborder the opercula are indicated by a slit in the cuticle, as in *Amphiuma* and *Menopoma*. In the second division the persistent branchiæ are present, and there are many slits in the skin of the neck; this division includes *Siren* (3 species) and *Menobranchus* (2 species). In the third the species have lungs only in the adult state, so that the branchiæ and their slits disappear; the tail is persistent, and there are teeth in both jaws (*Salamandra, Triton, Frogs*, and *Toads*).

In the dichotomous or binary method proposed by Mr. Haworth (*Philosophical Magazine*), there is little more to be observed than that the labours of preceding writers, especially Merrem, are carried out in it, as indeed he himself allows.

The 'Neue Classification der Reptilien' of Fitzinger was published at Vienna, in 1826. This work, the result of much anatomical and physiological study, has always held a prominent place in the history of Herpetology, and its leading principles will be seen in the following table:—

CLASSES.	ORDERS.	TRIBES.	FAMILIES.
REPTILIA.	Monopnoa.	I. Testudinata	1. Carettoides. 2. Testudinoides. 3. Emydoides. 4. Chelydoides. 5. Trionychoides.
		II. Loricata.	6. Ichthyosauroides. 7. Crocodiloides.
		III. Squammata	8. Ascalabotoides. 9. Chamæleonides. 10. Pneustoides. 11. Draconoides. 12. Agamoides. 13. Cordyloides. 14. Tachydromoides. 15. Ophisauroides 16. Chalcidoides. 17. Ameivoides. 18. Lacertoides. 19. Scincoides. 20. Anguinoides. 21. Amphisbænoides. 22. Typhlopoides. 23. Gymnopthalmoides. 24. Ilysioides. 25. Pythonoides. 26. Colubroides. 27. Bungaroides. 28. Viperoides. 29. Crotaloides. (*Saurians* and *Ophidians*.)
		IV. Nuda	30. Cæcilioides.
	Dipnoa.	V. Mutabilia	31. Ranoides. 32. Bufonoides. 33. Bombinatoroides. 34. Pipoides. 35. Salamandroides.
		VI. Immutabilia	36. Cryptobranchoides. 37. Phanerobranchoides.

In 1828, Ritgen's classification of Reptiles appeared in the 'Nova Acta Nat. Cur.,' to which we refer those of our readers who may wish to consult it. This classification is not much attended to. Not that it is inexact, but the author crowds particulars under one general denomination to excess; and his nomenclature is absolutely forbidding. The words *Chersopholidophides, Hydropholidophides*, and *Cacopholidophides*, used to designate groups of Serpents; and *Bdallipodobatrachians, Phyllopodobatrachians*, and *Didactylobatrachians*, to distinguish groups of Frogs and Toads, may be taken as examples of the terms fabricated by Ritgen, and he uses some still less euphonous.[*]

Wagler, whose early and violent death deprived zoological science of one of its brightest ornaments, published his 'Naturalisches System der Amphibien,' founded upon the organization of the animals, at Munich, in 1830.

In this system the *Amphibia* consist of eight orders:—

I. The Tortoises. II. The Crocodiles. III. The Lizards. IV. The Serpents. V. The Orvets. VI. The Cæciliæ. VII. The Frogs; and VIII. The Ichthyodes.

The *Tortoises* (*Testudines*) consist of but one family, *Hedræoglossæ*, having the tongue attached to the whole concavity of the jaw, which comprises three tribes, distinguished by the structure of the feet. 1, *Oiacopods*, or those with fin-shaped feet; 2, *Steganopods*, or those with moveable toes, united by a loose membrane; and 3, the *Tylopods*, or those whose toes are immoveable, of the same length, and enveloped in the skin of the feet.

II. The *Crocodiles* consist of the Caimans (*Champsa*), the true Crocodiles (*Crocodilus*), and the Gavials (*Ramphostoma*): and here he would place the fossil genera *Teleosaurus, Steneosaurus, Saurocephalus*,[*] and *Phytosaurus*.

III. The *Lizards*. These consist of four families: 1, the *Platyglossæ*, or those whose tongue is fleshy, flat, and free at the top; 2, *Pachyglossæ*, those whose tongue is thick and nearly entirely adherent to the concavity of the jaw; 3, *Antarchoglossæ*, whose tongue is slender, free, and extensile, but is not enclosed in a sheath at its base; 4, *Thecoglossæ*, whose exsertile tongue enters at its base into a kind of sheath.

The genera belonging to this order are extremely numerous, and some of the families are divided into tribes according to the form of the body, or the manner in which the teeth are disposed upon the edges of the jaws.

IV. The *Serpents*, consisting but of one family, comprise ninety-seven genera.

V. The *Orvets* (*Anguis*), consisting but of one family, comprehend the genera *Acontias, Chirotes, Chalcis, Lepidosternon, Amphisbæna*, and *Blanus*.

VI. The *Cæciliæ*, consisting also but of one family (*Hedræoglossæ*), comprise the genera *Siphonops, Cæcilia*, and *Epicrium*).

VII. The *Ranæ* are divided into two familes, the *Aglossæ* and the *Phaneroglossæ*.

VIII. The *Ichthyodes*, comprehending but one family *Hedræoglossæ*) consist of the genera *Amphiuma, Siredon* (Axolotl), *Hypocthon* (Proteus), *Necturus, Menobranchus*, and *Siren*.

In 1832, Professor Müller of Bonn published his *Beiträge fur Anatomie und Naturgeschichte der Amphibien*. (*Zeitschrift für Physiologie von Tiedemann und Treviranus*, Heidelberg). Much interesting detail relating to the history of reptiles is here entered into, but the Professor treats more especially of the *Batrachians* and *Serpents*. He divides the *Amphibia* into two great orders, consisting of the *scaly* and the *naked*.

Scaly Amphibia.	*Naked Amphibia.*
Occipital condyle simple	Occipital condyle double.
True ribs . .	None or rudimental.
Auricle of the heart double . . .	Single.[†]
Internal ear with round and oval fenestræ	Oval only.
With a distinct cochlea	None.
Penis of the males simple or double .	None.
No metamorphosis .	Most frequently a distinct metamorphosis.
No branchiæ . .	Distinct branchiæ, or with persistent or not permanent holes.
Skin scaly, scutcheoned or cuirassed .	Naked.

Professor Müller divides the *Serpents* in accordance with their anatomical structure.

The *Microstomes*, or those which have a not dilatable mouth, correspond very nearly to the *Homoderms* of M. Duméril. They are separated into four families: 1, the *Amphisbænoids*; 2, the *Typhlopins*; 3, the *Uropeltaceans*; 4, the *Tortricins*.

The second suborder (*Macrostomes*) corresponds with the *Heteroderms* of M. Duméril. These are divided into seven families: 1, the *Oligodonts*; 2, the *Holodonts* (*Python*, &c.); 3, the *Isodonts* (*Boa, Pseudoboa*, &c.); 4, the *Heterodonts*, (*Dendrophis, Coronella*, &c.); 5, *Amphiboles* (*Dryophis, Dipsas*, &c.); 6, the *Antiochalinans* (*Bongarus, Naja*, &c.); and 7, the serpents with three sorts of teeth, and in which all the mandibular teeth are perforated and venomous (*Elaps, Scytale, Crotalus*, &c.).

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[*] It is said that Ritgen meant this essay as a sly satire on the increasing cacophony of naturalists; if so, it seems to have been a perilous joke, of which those who conduct the' *Nova Acta* never dreamed; for they printed it in earnest, and so it has been received by zoologists.

[*] This is a sauroid fish.

[†] Davy, 'Edinburgh new Philosophical Journal,' 1828, discovered the double auricle in the Toad and Frog; and he is confirmed by Martin Saint-Ange, and Weber. Professor Owen has shown that though the auricle in the Siren appears simple, it is in fact separated into two by a complete septum.

The work is well illustrated, especially with good osteological and other anatomical figures.

In 1833, the first part of Schinz's *Naturgeschichte und Abbildungen der Reptilien* was published at Leipzic: in 1834 it was concluded. It brings down the information to the time of its publication, is well digested and well illustrated with coloured figures of the true reptiles and amphibians, mostly from good originals, but some from nature, and will be found very useful, especially as a book of reference.

Mr. Swainson (*Natural History of Fishes, Amphibians, and Reptiles*, in Lardner's *Cyclopædia*) places the *Amphibia* and the *Reptilia* in different classes.

He gives the following as 'a natural arrangement of the class of amphibia, according to Professor Bell:'—

Order I. Amphipneura (Amphipneusta?) (*Proteus, Siredon, Menobranchus, Siren, Pseudobranchus*). Order II. Anoura (Frogs and Toads). Order III. Urodela (*Salamandrina, Salamandra, Tritonella, Molge*). Order IV. Abranchia (*Menopoma, Amphiuma*). Order V. Apoda (*Cæcilia*).

The same author gives the following as a 'Synopsis and Natural Arrangement of the Class of Reptilia:'—

Order I. Emydosaures—*Crocodiles* (*Crocodilus, Champsa, Stenosaurus*). Order II. Chelonides—*Tortoises* (Families: Chelidridæ, *Crocodile Tortoises*; Testudinidæ, *Land Tortoises*; Emydæ, *River Tortoises*; Trionycidæ, *Soft Tortoises*; and Chelonidæ, *Sea Turtles*). Order III. Elanosaures (Enaliosaurs?)—*Fish Lizards* (*Plesiosaures, Icthyosaures, Saurocephalus, Pterodactylus*). Order IV. Ophides—*The Serpents* (Families: Hydrophidæ, *Water Serpents*; Crotalidæ, *Poisonous Serpents*; Coluberidæ, *Snakes not poisonous*; Anguidæ, *Slow-Worms*; and Amphisbænidæ, *Blind-Worms*). Order V. Saures—*The Lizards* (Families: Chamæleonidæ; Iguanidæ, *Thick-Tongued Lizards*; Lacertidæ, *Slender-Tongued Lizards*; Agamidæ; and Scincoidæ.

In the same year Professor Bell published his interesting *History of British Reptiles*. He considers the *Reptilia* and *Amphibia* as distinct classes, and justifies his opinion by a reference to their characters, which appear to him to be sufficiently marked and important to warrant their separation.

The Reptiles considered in Mr. Bell's history are necessarily limited, and the families *Cheloniadæ, Lacertidæ, Anguidæ, Colubridæ*, and *Viperidæ* are the only groups noticed. But, in his *Introduction*, the author delivers an opinion which, from his acknowledged skill in this branch of natural history, is worthy of all respect, and which is decidedly adverse to what has been called the Quinary system, a system regarded with an unfavourable eye by Continental zoologists generally, and by many in our own islands. 'Those,' says Professor Bell, 'who have made the most philosophical attempts to ascertain the natural system, the grand and harmonious plan upon which all organic creation is believed to have been formed, have concurred in considering the *Reptilia* as constituting a group of equal value in the vertebrate division of the animal kingdom with the *Mammalia* and *Birds*. It may be safely predicated that, if the system to which I more particularly refer be true, all the groups of equal rank must be founded upon characters of equal value and importance. That if, for instance, the group of Mammalia and that of Birds be equal to each other, each of the other classes—that is to say, every other group of the same rank—must be equal to each other; and also, that the subordinate groups in each of these classes must exhibit the same mutual relations in every case. But if it can be shown that in one class so called two *ordinal* groups exhibit as great a discrepancy in their relative plan of organization as any two classes do, then the relation of the former to either of the latter is not and cannot be the same as that which exists between the latter two. Yet in this predicament stand the three first classes of the *Vertebrata*, the relation of the *Mammalia* and *Birds* being much stronger and more obvious than those of the *Reptilia* to either, and the two groups of the latter which I have just sketched, the *Tortoises* and the *Serpents*, being nearly or quite as far removed by their structure from each other as the *Birds* are from the *Mammalia*. The mode of reproduction is the sole exception of consequence to this view of their relations; and here we have, on the other hand, a close approximation between the *Reptilia* and the *Birds* themselves.

'These considerations appear to me to exhibit insurmountable objections to the consistency and unity of the Quinary arrangement, as representing a uniform and perfect plan or system upon which the animal kingdom was created; and I cannot believe that the occasional occurrence of even striking and important coincidences, which appear on a partial view to prove its truth, are sufficient to counterbalance the evidence of its inconsistency which I have just adduced.'

But the Professor, not without reason, as it appears to us, goes further. 'The relations of these groups' (he has been contrasting the widely different forms in some of the groups of Reptiles) 'seem almost to set all the established principles of classification at defiance; nor is there any one system hitherto promulgated which appears to me satisfactorily to solve the difficulty.'

Professor Bell thus arranges the class *Amphibia*:—

Order I. Anoura (*Rana, Hyla, Bufo*, &c.). Order II Urodela (*Salamandrina, Salamandra, Molge*). Order III. Amphipneusta (*Proteus, Siren, Menobranchus*, &c.). Order IV. Abranchia (*Menopoma, Amphiuma*, &c.). Order V. Apoda (*Cæcilia*).

Mr. Bell states that he does not offer this arrangement either as wholly original or as absolutely natural; but he adds, that it appears to him to be less objectionable than the others which have been proposed.

We confess that, after some consideration and examination, we do not think that the organic differences between the true *Reptiles* and the *Amphibia*, as they are termed, are sufficient to warrant a separation into two distinct classes. The *Amphibia* may be considered as a division or subclass; but it is too much, in our opinion, to say that a Salamander (*Salamandra*) and a Sand Lizard (*Lacerta agilis*) belong to different *classes*.

ORGANIZATION.

Motility.—The motion of *Reptiles* is as various as their structure, and exhibits a great diversity, particularly in the modes of progression. The slow march of the Land Tortoise, the paddling of the *Turtles*, the swimming and walking of the Crocodiles, the Newts, and the Protei, the agility of the Lizards, the rapid serpentine advance of the Snakes, the leaping of the Frogs, offer a widely extended scale of motion. If we add the vaulting of the Dragons and the flying of the Pterodactyles, there is hardly any mode of animal progression which is not to be found among the Reptiles.

Sensibility.—The senses in general are well developed in this class. Touch, taste, smell, hearing, and sight are present in a degree in all, though much more highly developed in some than in others. In *Typhlops*, for instance, the eyes are hardly visible, and in *Proteus* the development of the organ of sight appears to be at its minimum. The Lizards, Serpents generally, and Frogs, are very quick-sighted.[*]

Respiration.—The aëration of the blood is effected variously, either by lungs or gills, but by lungs principally, according to the condition of the Reptile or Amphibian. In the terrestrial Reptiles the air is, so to speak, swallowed, and in some an absorption of air as well as water (in the *Frogs*, for instance) takes place through the skin.

Nutrition; Reproduction of Injured Parts.—Digestion is performed very slowly, and the animals of this class are capable of very long fasts. In many, parts, when injured or entirely removed, are reproduced. In the Newts, for instance, an entire limb and even an eye has been replaced by the resources of the animal.

Generation.—The Reptiles are generally oviparous; but in some cases, those of the Viper, the Slow-Worm, the viviparous Lizard (*Zootoca vivipara*), for instance, they are ovoviviparous. In some, again, as in the Frogs, there is no intromittent male organ; in others, as in the Tortoises and Serpents, the intromittent organ is of considerable size.

Skeleton.—The skeleton of Reptiles is as variable as the very variable forms of the animals themselves. In some, the Crocodile for instance, the skull is a solid bony mass; in others, to take a Python or a Boa for instance, the cranium is composed of a great number of pieces so adapted as to admit of dislocation for the purpose of aiding in the dilatation of parts to facilitate the deglutition of a disproportioned prey. In some the ribs are so highly developed as to become organs of motion (the Serpents); in others (the Frogs), the ribs are entirely absent or rudimental. In some there is not only a true sternum, but also a sort of abdominal sternum, apparently produced by the ossification of the tendinous portions of the recti muscles (Crocodiles). In others there is no sternum at all, though the ribs are well developed (Chamæleons). In some there are four well developed anterior and posterior extremities (Tortoises and Saurians); in others only two, and those not well developed (Chirotes, Bipes); in others none whatever (some of the Ophidians).

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[*] Excepting in the case of the serpents, a short time before t change of skin

The leading differences in the organization of these animals are indicated under the articles treating of them in this work; but in the bones of all of them, whether true *Reptiles* or *Amphibia*, there is a peculiarity of character which enables the skilful comparative anatomist to pronounce at once that a bone is or is not the bone of a Reptile. This is of no small consequence, for it has enabled men so skilled to determine the class to which some of the most interesting and wonderful organic remains detected by the geologist and palæontologist belong.

Fossil Reptiles.

Of all the animals which the wrecks of a former world contain, none exhibit more striking, more gigantic proportions than the fossil Reptiles. As far as this work has hitherto gone, we have endeavoured to make some of these forms familiar to our readers [ICHTHYOSAURUS; IGUANODON; MEGALOSAURUS; PLESIOSAURUS; PTERODACTYLE; &c.]; and we shall continue to add any that may in future claim attention. We shall here merely remark, that there is reason for believing that Batrachians of gigantic dimensions once inhabited our planet.

REPUBLIC is derived immediately from the French *république*, and ultimately from the Latin *res publica*. The Latin expression *res publica* is defined, by Facciolati, to be 'res communis et publica civium una viventium,' and corresponds very closely with the English word *commonwealth*, as used in its largest acceptation for a political society. The Latin word *res publica* might be applied to a community under a monarchical government; thus Augustus is said, in a passage of Capito, a Roman lawyer, to have governed the *res publica* (Gellius, xiii. 12); the word however was more applicable to a society having a popular government than to a society having a monarchical government; thus Cicero denies that the name of *res publica* can be properly given to a community which is grievously oppressed by the rule of a single man: 'Ergo illam rem populi, id est rem publicam, quis diceret tum, quum crudelitate unius oppressi essent universi; neque esset unum vinculum juris, nec consensus ac societas coetus, quod est populus' (*De Rep.*, iii. 31).

A *republic*, according to the modern usage of the word, signifies a political community which is not under monarchical government, or, in other words, a political community in which one person does not possess the entire sovereign power. Dr. Johnson, in his dictionary, defines a republic to be 'a state in which the power is lodged in more than one.' Since a republic is a political community in which several persons share the sovereign power, it comprehends the two classes of aristocracies and democracies, the differences between which are explained under ARISTOCRACY and DEMOCRACY.

The word *republic* is sometimes understood to be equivalent to *democracy*, and the word *republican* is considered as equivalent to *democrat*; but this restricted sense of the words appears to be inaccurate; for aristocratic communities, such as Sparta, Rome in early times, and Venice, have always been called republics.

It has been shown in MONARCHY that the governments usually styled 'limited monarchies' are properly aristocracies presided over by a king; and consequently ought to be referred to the class of republics, and not to that of monarchies, in which they are commonly placed. We observe however that the German writers, who know from their personal experience the character of monarchies strictly so called, sometimes correctly give the name of republican to the government of England since 1688, and to the government of France since 1815.

A vast deal of error and confusion of thought (leading to important practical consequences) has arisen from the capricious and indistinct usage of the words *monarchy* and *republic*.

REPUBLICATION. [WILL.]

REPULSION is that power by which bodies or the particles of bodies are made to recede from one another. Both attraction and repulsion exist in all the particles of material substances, and seem to be properties by which those particles act upon one another when not in contact. The cause of these actions will probably be for ever unknown to us, and the terms are only applied in conformity to the phenomena exhibited. At all sensible distances, bodies, small and great, except in certain states with respect to electricity or magnetism, attract one another; and the intensity of the attraction varies inversely as the square of the distance between the bodies. But the phenomena of light and of elasticity in general, show that at distances which are not appreciable by the eye (perhaps such as are less than [illegible] inch) both attractions and repulsions take place.

In his researches concerning the phenomena of light, Newton, having brought at one time a hair, and at another the edge of a knife, near a small beam of light in a darkened room, found that the particles of light were made to deviate from the rectilinear direction, as if attracted by a force which diminished with the distance of the ray from the hair or knife. The shadow of the latter was bordered with three coloured fringes, of which the nearest to it was formed by inflected rays passing at a distance rather greater than [illegible] inch from the knife-edge; and the second and third fringes by rays inflected respectively at greater distances. (*Optices*, lib. iii.) From these phenomena Newton was led to the opinion (which he proposes as a query) that all material bodies might be assemblages of particles in equilibrio between their mutual attractions and repulsions. He imagined also that a subtle æther, pervading material bodies, was the immediate agent in producing such attractions or repulsions, together with all the circumstances of cohesion, and also those of chemical, magnetical, and electrical actions. The phenomena of nature seem to justify the supposition that an æther pervades all bodies; but it must be admitted that the hypothesis of Newton only removes the difficulty concerning the actions of the particles of bodies a step further, since we are equally at a loss to account for the existence of the powers in those particles, and in the æther itself.

The reality of a distance between the particles of bodies, whether solid, fluid, or gaseous, admits of no question; for the differences in the densities of these classes of bodies can only be conceived to arise from the different extent of the intervals between the particles. By the process of cooling, all bodies, with certain exceptions in particular cases, become contracted in volume; and the mixing of two given volumes of different fluids (as water and sulphuric acid) produces a volume less than the sum of the two separate volumes. These effects manifestly depend upon the approach of the particles to one another, and are therefore inconsistent with the supposition that they were originally in contact.

It is natural to ask if there be such a thing as mathematical contact in nature, and it may be answered that we have no evidence of such a condition. [COHESION.] Besides the continual diminution of volume produced in the cooling of bodies, the Newtonian experiment of pressing a convex lens of glass upon the surface of a glass mirror affords evidence that the lens, at the point of nearest approach, and under a very great pressure, is not in contact with the mirror; and it has been supposed that the distance between them, at that place, is then not less than [illegible] inch. (Robison, *Mechan. Phil.*) It seems to follow that a vast force of repulsion must be in action between the particles of bodies when they are as near together as mechanical power can bring them; and it can be easily conceived that such repulsive force may be the immediate cause of the sensation of touch.

It has been said that the mixture of certain different fluids produces a diminution of volume, but it must be observed that a contrary effect frequently takes place. Some of the metals, when mixed together in a melted state, produce a volume greater than the sum of the component volumes; and melted metals, on becoming solid, like water on being frozen, expand in volume. The latter effect may arise from the crystals, on being formed, placing themselves across one another so as to leave comparatively large intervals; but the other can only be caused either by a diminution of the attractive power which the particles exert on one another, or by its being changed into a power of repulsion. One of these latter circumstances must also be the cause of the great augmentation of volume which takes place when the components of some bodies are disengaged from each other. It is said that if the parts of an olefiant gas were separated, the sum of the separate volumes would be four times as great as the volume of the compound. (Turner, *Elements of Chemistry.*)

It is right to observe that the word repulsion is often applied to phenomena which are in reality the results of attraction. A small quantity of quicksilver being laid on a glass plate assumes a spherical form, instead of spreading over it in a thin surface; and this was once supposed to arise from a repulsive power in the glass, whereas it is owing to the attraction of the particles of quicksilver for one another being greater than the attraction of the glass for the quicksilver. Again, when a small sewing-needle is placed on the surface of water, it remains there without sinking, and the water is depressed about the needle as if it were repelled by the steel; in fact however the trough is caused by the weight of the needle, which displaces the particles of water, but is not great enough to overcome their attraction for each other. Also, when two balls, one of them of glass, which is capable of attracting water, and the other of burnt cork, which is not, or only in a very small degree, are placed near one another in water, the latter seems to be repelled from the former; but the cause of the phenomenon is that the ring of elevated water about the glass assumes on the exterior a conical surface, so that when the cork ball is brought near enough to the other to be partly on the slope, it immediately slides off by its gravity.

The elasticity of bodies is a result either of attractive or repulsive powers, or both. For example, when a steel rod is bent, the particles on one side will be forced towards, and on the opposite they will be drawn from one another; in recovering itself, a force of attraction will be exerted on the latter side, and of repulsion on the other; and this may be considered as an evidence that in the insensible spaces between the particles of bodies attractions and repulsions prevail according as the distances between those particles are varied. While the change of figure in the rod is small, so that the displacement of any two particles is but a small part of their whole distance from one another, the attractions and repulsions exerted by the force applied are proportional to that force; and upon this principle depends the observed isochronism in the oscillations of a watch-balance, whatever be the extent of the arcs of vibration. The expansions of solids and fluids by heat, and the elastic powers of gas at different temperatures, are consequences of the repulsions residing in the particles of caloric, or induced by the latter in those of the bodies with which they are combined. [ELASTICITY; GAS; HEAT.] The repulsive power existing in the air which is condensed in nitre, produces, on being combined with heat, a velocity of expansion equal to about 7000 feet per second; and the force of pressure resulting from it is thought to be equal to 2000 times the pressure of the atmosphere. (Hutton, *Tracts.*) The repulsive force which produces some of the electric explosions in the atmosphere is supposed to be much greater. But the forces both of attraction and repulsion by which the particles of light are deflected from their course when they impinge on a refracting or reflecting surface are enormous; and Sir John Herschel computes that they exceed the force of gravity in the ratio of 2×10^{44} to 1. This is on the hypothesis of radiation; and that philosopher observes that on the undulatory hypothesis the numbers are equally high.

The circumstances of electrical attractions and repulsions are shown in the article ELECTRICITY; and the results of experiments prove that the intensities of these forces in the electric, galvanic, and magnetic fluids, like that of general attraction, vary inversely as the squares of the distances of the bodies.

Boscovich has ingeniously represented the series of alternate attractions and repulsions supposed to be experienced by a particle of matter within the very small distances between that particle and another, by a curve consisting of several bends crossing and recrossing an axis in points at various distances from the origin, which may be supposed to be the place of the second particle above mentioned. The ordinates of this curve on one side of the axis represent attractions, and those on the other side repulsions; the places of crossing being supposed to be those at which the first particle would be at rest. Beyond the small distance above mentioned, this axis becomes an asymptote to the curve, and the ordinates of the curve here represent the general law of attraction (the inverse square of the distances). Near the origin of the axis the ordinates represent repulsions; and these ordinates constantly increase till they become infinite, so that a right line drawn through the place of the second particle, perpendicular to the axis, is an asymptote to this branch of the curve.

REQUEST, COURTS OF (sometimes called *Courts of Conscience*), are local tribunals, founded by act of parliament to facilitate the recovery of small debts from any inhabitant or trader in the district defined by the act.

As all the acts are made upon the same model, the most easy method of explaining the functions of these courts will be to show the general provisions of those acts.

In the first place a board of commissioners is appointed, often in corporate towns consisting of one or two aldermen, with a certain number of householders as assessors. To this board is given the power of summoning a debtor, upon the complaint of the creditor, of taking the evidence of the creditor and his witnesses upon oath, of determining on the amount due, and issuing a summons or order to the debtor to pay that amount, either in one sum or by instalments. Finally, they have usually the power of distress on goods, or of imprisonment during a limited time, if their order for payment is not obeyed. In London their jurisdiction is confined to cases where both parties are inhabitants, and the same restriction may be found in some of the older acts; but usually it is sufficient that the debtor should be an inhabitant, or should be 'seeking his livelihood' within the jurisdiction.

The sum to which the jurisdiction of these courts extends is usually 5*l.*, often only 2*l.* (in London and Bath it is 10*l.*), and the debt may arise either upon simple contract, a balance of accounts, or as a compromise of a larger debt; but there is usually a proviso in the acts that a larger debt shall not be split into fragments to bring it within the jurisdiction of the court, although the creditor may reduce a larger demand to such a sum as the court can award, provided he is satisfied with the smaller amount in discharge of his whole debt.

The acts usually provide that if a party within the jurisdiction is sued in one of the superior courts, and the plaintiff recovers from him only the sum which the local court could have awarded, the plaintiff shall pay full costs to the defendant. The acts also reserve to a landlord the right to distrain for rent, and also prohibit the courts from interfering in matters touching the right to land or the occupation of it, or in matters belonging to ecclesiastical courts, or to tithes: usually, too, gambling debts are excluded, and sometimes tavern debts incurred on Sunday. The courts have jurisdiction over persons under age, and, on the other hand, can usually grant summonses for wages due to minors. Attorneys are not exempted from the jurisdiction of the court, but they are usually prohibited from practising in it, and they are not liable to payment of costs for suing in superior courts. Most of the acts contain a clause prohibiting the removing of the proceedings to superior courts.

The first Act for the establishing of a Court of Requests is the 1 James I., c. xv., confirming the court which had already been established in London by an act of the common council, at least as early as the reign of Henry VIII., if indeed it had not been established by antient usage. (Tidd Pratt's 'Abstract of the Acts of Parliament relating to Courts of Request,' for a list of the places which have such courts.)

RE'QUIEM (*Requies*, Lat., *rest*), the name of a Mass sung in the Romish Church for the repose of the dead, beginning *Requiem æternam*, and in the Roman Catholic liturgy called *Missa pro Defunctis*.

RESCRIPT. [ROME—*Roman Law.*]

RESCUE, in Law ('rescous,' from the old French word *rescourser*, 'to recover'), is the unlawful and forcible setting at liberty a person or goods then in lawful custody. A rescue may be either a criminal offence or a civil injury, according to the circumstances under which it is effected. The character of the criminal offence is determined by the character of the offence committed by the person rescued. If, for instance, a party has rescued a traitor or a felon, he has committed the offence of treason or felony; but as the treason or felony of the person rescued cannot be assumed to have been committed until after his conviction and judgment, it is not proper to arraign the rescuer for such offences until after judgment of the principal offender. But it is said that the rescuer may be indicted for a misdemeanour even before such judgment.

A rescue committed under other circumstances than those above stated is a misdemeanour.

An indictment for a rescue must set out the circumstances under which the person, &c. was arrested, and the rescue effected, so as to show that all things existed necessary both in fact and intention to create the offence of rescue, and to enable the offender to disprove them.

Such was the state of the common law on this subject. Many statutes have been passed, some very limited in their application, which do not materially vary the character of the offence, the proceedings, or the punishment. Of these the most important and general in their application are 25 Geo. II., c. 37, relating to the rescue of a person convicted of murder, or his body after execution; 1 & 2 Geo. IV., c. 88, which applies to persons rescuing or assisting to rescue from the lawful custody of any constable or other person whatsoever any person charged with or suspected of or committed for any felony, or on suspicion thereof, and regulates also the amount of punishment to which a rescuer is liable; and 5 Geo. IV., c. 84, relating to the rescue of prisoners sentenced to transportation, by which also it is provided that the conviction of the principal offender may be proved by a certificate from the proper officer. The stat. 6 Geo. IV., c. 5, relates to the land-forces of her majesty, and c. 6, to marines.

Previously to the abolition of arrest on mesne process (1 & 2 Vic., c. 110), if a prisoner in custody of the sheriff on mesne process was rescued, the sheriff might make a return to that effect, which freed him from further responsibility. The rescuers were liable to an attachment for a contempt, and also to an action at suit of the plaintiff. On the action it was necessary to prove the original cause of action, the writ and warrant, and the arrest. To entitle himself to damages, the plaintiff must have shown the subsequent insolvency or disappearance of the defendant. The law as to this subject is probably still the same as to those cases where under the act in question an arrest is still permitted on mesne process.

Where a party arrested on judicial process, as upon a capias ad satisfaciendum, &c., or goods taken upon a fieri facias are rescued, the sheriff cannot return that there has been a rescue, and either he or the gaoler is in all cases, except where the rescue is effected by the king's enemies, answerable in an action by the plaintiff. This liability of the sheriff is concurrent with the liability of the rescuers themselves, the plaintiff having the option to sue either the rescuers or the sheriff.

By the 2 Will. & Mary, st. 1, c. 5, upon rescue of goods distrained for rent, the person grieved may by action on the case recover treble damages and costs against the offenders or any of them, or the owner of the goods, if found to have come to his use or possession. In an action under this statute the plaintiff must show the demise, the rent in arrear, and the rescue. In all cases, in order to constitute a rescue, the arrest must be lawful. Thus, if the rent due has been tendered before the distress is made, &c., then the custody of the goods, &c. being unlawful, no rescue can be committed.

(Com., *Dig.*, 'Rescous;' Hale, *P. C.*; Hawk., *P. C.*; Russell, *On Crimes*; Matthews, *On Criminal Law*.)

RESHT. [Persia.]

RESIDUAL, an expression which gives the remainder of a subtraction, as $a-b$.

RESIDUAL PHENOMENON, a term lately brought into partial use, to signify that part of a phenomenon which is left, when every part which can be explained or accounted for is removed. This residual phenomenon [Observation] may be all the observer's error, or may be partly the effect of some undiscovered law and partly the error of the observer.

RESIDUARY LEGATEE. [Legatee.]

RESIGNATION. [Benefice.]

RESIN (*Rosin, Colophony*). [Turpentine.]

RESINA. [Naples.]

RESINS are secretions of plants, which are probably all in a fluid state; but become solid either by the evaporation of their more volatile parts, or by the absorption of oxygen. They are distinguished from true balsams by the absence of benzoic acid [Balsams], and from gum-resins [Gum-Resins] by the absence of gum, their complete insolubility in water, and their requiring alcohol for perfect solution. Some are soluble in cold alcohol, and these are termed *resins*; others are soluble only in boiling alcohol, and termed *sub-resins*; but the two are often also associated in the same substance. Many volatile oils, by long exposure to the air, or merely by a reduction of temperature, deposit a substance termed a *stearopten*, which is analogous to resin. [Camphor.] Where a considerable quantity of volatile oil coexists with a resin, a honey-like consistence is preserved, and the resin is termed *soft-resin*. When a very large portion of oil is present, a fluid condition exists, and *turpentine* is the proper designation.

Resins are the produce generally of the most complex and highly organised plants, seldom found in acrogens, except ferns, rarely in endogens, and most abundantly in certain tribes of exogens. They are mostly found in the older and permanent parts of plants, and more copiously the older the individual tree is; nevertheless they are occasionally found in herbaceous plants, and even in the most perishable parts of these. Thus the leaves of the Laretia acaulis (Selinum acaule) secrete resin, forming an exudation, and accumulating into pieces weighing from half to one drachm or more. (Meyen, *Reise*, i., p. 315.) The resins sometimes exude spontaneously; but more commonly they are procured by incisions in the bark. They are fusible at a low temperature, and inflammable, burning with a copious smoke and agreeable perfume; hence their employment as incense or to form pastiles.

Taken internally they are stimulant, promoting secretion of the skin and kidneys; externally, they are rubefacient. Some resins are dangerously caustic, such as euphorbium. The most important medicinal resins have been already treated of. [Boswellia; Elemi; Guaiacum; Mastich; Olibanum.] Several are of great utility in the arts to form varnishes. [Copal; Mastich.] A great variety of vegetable remedies are indebted for their most useful properties to the resin which they contain, in conjunction with other principles, such as jalap, scammony, &c. [Convolvulus.]

RESISTANCE is a power by which motion, or a tendency to motion, in any body is impeded or prevented. When a weight or pressure acts upon a beam or bar in any direction, the tenacity by which the particles of such material oppose that action constitutes a resistance of one kind. [Materials, Strength of.] Again, when a body is made to move on another, the inequalities of the surfaces of both create a resistance of a different kind. [Friction.] When a body moves in a fluid, the inertia of the fluid particles displaced by it produces a third kind of resistance.

This last branch of the subject of resistances has already been in part considered. [Hydrodynamics, p. 393, col. 1.] In that article there is given a general expression for the measure of the resistance made by a fluid against a plane surface which is either perpendicular or inclined to the direction of the motion, together with a few results of experiments on the resistences experienced by bodies of various forms and lengths in moving through water. The relations between spaces and times in the vertical ascent and descent of bodies when acted on by gravity and resisted by a fluid are given in the article Projectiles, Theory of; and, for the pressure against a cannon-ball moving in air, see Gunnery, p. 491, col. 2.

In investigating the resistances of fluids against bodies moving in them, it is customary in elementary writings, for the sake of simplicity, to consider the particles of fluid as unconnected with each other by contact or by any law of attraction, so that, when struck, their reactions may be considered as taking place perpendicularly to the striking surface of the moving body, whatever be the position of this surface with respect to the direction of the body's motion, and after the impact their action is supposed to cease. Such are called discontinuous fluids, and in these the motion produced in the particles by the collision is the measure of the resistance. Newton shows (*Principia*, lib. ii., prop. 35) what would be the resistance experienced by a cylinder moving in the direction of its axis in a discontinuous fluid; the cylinder and particles of fluid being elastic, so that the latter on being struck are reflected back with a velocity double the velocity of the cylinder; and he explains that, if the particles of fluid are not reflected, but are moved forward by the cylinder with a velocity equal to its own, the resistance is but half the former. But this hypothesis is far from being conformable to the constitution of fluid bodies in nature, the particles of these being connected by mutual actions. The elastic fluids, as air, at any place in the atmosphere are always in a state of compression from the weight of the column vertically above that place; and the particles of non-elastic fluids, as water, exert in every direction pressures which depend upon the distances of the particles below the surfaces of the fluid in the vessel, river, or ocean. In passing through a fluid of this kind (called a continuous fluid) a body strikes only the fluid particles which are nearest to it; these strike those beyond, and so on; and Newton proves (lib. ii., prop. 35, schol.) that in this case the resistance to a cylinder is only half the last-mentioned resistance, or one-fourth of the first.

In all these resistances however it is supposed that the particles on being struck are repelled perpendicularly to the front of the moving body; but, in fact, the particles of the fluid are in part repelled from the front in oblique directions, and, on account of the compressed state of the surrounding fluid, these particles not being able immediately to escape laterally, there is produced in front more or less condensation, and consequently an increase of resistance. The pressure of the fluid against the sides of the moving body creates also a resistance from friction; and when the velocity is very great, the fluid not falling towards the hinder part of the body so fast as the latter moves, the pressure there which would serve to counterbalance the resistance in front, is in part or wholly removed. On these accounts it is that military projectiles are subject to such vast retarding forces. It is computed that a 24-pounder ball experiences a resistance equal to 800 lbs. when its velocity is equal to 2000 feet per second. Like effects take place in the movement of boats or ships; when the velocity is great, the water accumulates in front, and flowing off from thence obliquely, it carries away some from the sides, and, causing the surface of that which is near the stern to be rather lower than the general level, it there produces a diminution of pressure, while there is an excess in front on account of the accumulation.

In order to find the pressure of a fluid against a body which is terminated in front by a curve surface, an expression must be obtained (by means of the equation of the surface) for the area of an elementary portion of that surface, and this must be multiplied by the cube of the sine of its inclination to the line of motion. The product being multiplied by $\frac{v^2 D}{2g}$ [HYDRODYNAMICS], and the whole integrated between the proper limits, the result will express the required resistance.

Again, in investigating the motion of a body on an inclined plane when resisted by friction and the pressure of the atmosphere, the general equation of motion $\frac{d^2 s}{dt^2} = g - a \frac{ds^2}{dt^2}$ may be employed. Here s is the space described in the time t, $\frac{ds}{dt}$ is the velocity acquired in the same time, and $\frac{d^2 s}{dt^2}$ is the differential expression for accelerative or retardative force. If the body were to descend vertically, g, the force of gravity (= 32·17 feet), would alone be the force producing the motion; and the equation, being integrated, would give the relation between the spaces described and the times of description when the body descends or ascends in a resisting medium. In the first of these cases g should be positive, and in the second negative. In order to adapt the equation to the descent of a body on an inclined plane, let θ be the inclination of the plane to the horizon; then $g \sin. \theta$ would represent the accelerative force on the plane if there were no friction. But since friction is proportional to the pressure ($= g \cos. \theta$) on the plane, and is independent of the velocity, let h be put for the coefficient of friction and represent a fractional part of the pressure; then we shall have $hg \cos. \theta$ for the retardation produced by friction. a is the coefficient of the resistance due to the pressure of the atmosphere; it depends on the form and magnitude of the moving body, and not on its weight; and the resistance is supposed to be proportional to the square of the velocity. Thus the above equation becomes

$$\frac{d^2 s}{dt^2} = g \sin. \theta - hg \cos. \theta - a \frac{ds^2}{dt^2};$$

or, since the two first terms of the second member are constant, representing them by A, it becomes $\frac{d^2 s}{dt^2} = \mathrm{A} - a \frac{ds^2}{dt^2}$. Integrating this equation by successive approximations, or otherwise, we obtain in terms of t the values of $\frac{ds}{dt}$ (the velocity) and of s (the distance on the plane), either when the body sets out from a state of rest, or when it sets out with any given initial velocity. From these values, by means of the data obtained from good experiments, the values of h and a might be found; and thus the effects of friction might be obtained separately from those which are due to the resistance of the air.

In M. de Pambour's 'Practical Treatise on Locomotive Engines,' there is given, p. 154, an account of some experiments in which a number of waggons, both singly and in trains, were made, by gravity, to run down a double inclined plane; and these, since the motions were not produced by steam or any power which is liable to irregularity, appear to be the most convenient for obtaining the separate values of h and a by means of the above equation. The waggons, or the trains, set out from a state of rest at the summit, and, with the velocity acquired at the foot of the upper plane, they were allowed to run down the second, whose inclination to the horizon was very small (2′ 2″), till, by friction and the resistance of the air, the motion ceased. On making $\frac{ds}{dt} = 0$ and s, equal to the distances given by the experiments on the lower plane, the mean value of h for seven trains of waggons was found to be ·00215, or $\frac{1}{465}$ of the whole weight of a train; and that of a was ·000029. The mean value of h from the equations $\frac{ds}{dt} (= 0) = \mathrm{A}t + \mathrm{V}$, and $s = \frac{1}{2} \mathrm{A}t^2 + \mathrm{V}t$ (V being the velocity at the top of the lower plane); that is, its value on the supposition that it includes both friction and the resistance of the air, was found to be ·00333, or $\frac{1}{300}$ of the whole weight. Hence the resistance of the air, which is due to the mean velocities, becomes ·00118, or $\frac{1}{847}$ of the whole weight. The mean velocity may be considered as about 12 miles per hour, or 17·6 feet per second.

The above value of h, and this coefficient of the square of the velocity in the term expressing the value of the air's resistance, agree very nearly with those which result from an experiment of Dr. Lardner on the Whiston plane (whose gradient is $\frac{1}{96}$), where the terminal velocity of a train, that is, the uniform velocity acquired when the resistance arising from friction and the air became equal to the force of descent on the plane, was found to be 31½ miles per hour.

The following rule for determining the gross resistance (considering the whole as due to friction) is investigated by De Pambour. 'When a body, from a state of rest, descends down two or more inclined planes till it stops by the effect of friction, the value of the friction is equal to a part of the weight of the body which is expressed by the quotient of the whole height descended vertically, divided by the whole distance passed over on the planes.' The mean resistance found by this rule for the same trains is ·00367 ($\frac{1}{272}$) of the whole weight; and the small discrepancy between this result and that which was found from the two equations above, arises from the resistance of the air being involved in the previous determination of V. It is not supposed however that the absolute values of the terms which have been obtained for the friction and the pressure of the air will serve with precision for trains of a different kind; but, till more extensive experiments have been made, they may have some utility in showing nearly the proportion between those causes of resistance.

The probability, after all, of being able to obtain general formulæ for the resistances experienced by railway trains is at present very small. The best mathematicians have long been foiled in the effort to express analytically the conditions of a very simple body (a cannon ball) moving through the air; and the problem which embraces the ever-varying circumstances attending the motion of a train of carriages is much more complex. The force with which the air acts depends on the form of the leading carriage or engine, upon the condensation of the air in front, and upon its friction along the sides of the carriages. But besides these actions, which it would be difficult to estimate, the air between every two carriages, and even in the interior of open ones, is put in motion, and produces sensible pressures against the fronts, the transverse partitions, and the interiors of the back faces. Winds blowing contrary to the direction of the motion increase the resistance to be overcome; and even those which are oblique or perpendicular to the sides, by pressing the wheels against the rails, add considerably to the friction.

In order to exhibit a comparison of the resistances experienced by a railway train when ascending and when descending an inclined plane, we have taken the first of the examples which have been given in the table in the article Railway. In this the gradient is $\frac{1}{177}$, or the inclination of the plane to the horizon is 19′ 25″. The weight of the whole train being estimated at 80 tons, we have 80 × sin. 19′ 25″ = ·452 tons for the moving power of gravity in descending, or the resistance of gravity in ascending; and 80 × cos. 19′ 25″ = 79·999 tons for the constant pressure on the rails. Now the retardation from friction, both in ascending and descending, being estimated at ·00215 of the pressure by the above investigation, we have ·172 tons for the constant resistance on this account. The resistance of the air being found to be ·00118 of the pressure when the velocity is 12 miles per hour, we get ·00412 for the resistance when the velocity is 22·25 miles, and ·01423 when the velocity is 41·32 miles; and these numbers being multiplied by 79·999, give, respectively, ·33 tons and 1·138 tons, for the resistance of the air in ascending and descending.

Then, for the descending motion, subtracting from the sum of the resistances produced by friction and the air the moving-power of gravity, the remainder is 0·858 tons. And for the ascending motion, adding together all the three resistances, the sum is 0·954 tons. The difference is about $\frac{1}{10}$th of a ton, or $\frac{1}{800}$th of the whole weight, and expresses the excess of the resistance experienced by the engine in the ascent above that which it experiences in the descent. If the resistances in the ascent and descent had been computed on the supposition that the motions were affected by gravity and friction (taking the latter at $\frac{1}{300}$ of the pressure, as if it included the resistance of the air), the former being, as before, = ·452 tons, and the latter ·267 tons; the moving-power in descending would have been ·185 tons, and the resistance in ascending ·719 tons. The difference (which, in this case, is the sum) would have been ·904 tons, or nearly $\frac{1}{90}$ of the whole weight. These results will suffice to show that the diminished resistance of the air compensates, in a considerable degree, for the retardation produced by gravity when a train moves on an ascending rail; but numerous and more varied experiments must yet be made before it will be possible to determine how far it would be advantageous to use gradients instead of incurring the expense of making level lines of road.

The method of finding the resistance which an engine opposes to the effort made by the steam to put it in motion, is as follows:—Multiply the area of one of the two equal pistons in square inches by the pressure of the steam on a square inch of the piston in each cylinder, when that pressure is just sufficient to cause the engine to move; the product is the pressure on each piston. Then, since the piston makes two strokes while the wheel of the engine turns once round, the velocity of the piston is to that of the engine as twice the length of the stroke is to the circumference of the wheel; and, the resistances being inversely proportional to the velocities, we have—

circumf. of wheel : twice the length of the stroke ::
pressure on both pistons : the resistance, or inertia, of the engine.

But the resistance increases with the load which the engine has to draw; and, in order to determine it when attached to a train, the above proportion may be used; but the pressure on the pistons, instead of being found as before, must be taken when the engine and train are observed to have a uniform motion. Then the fourth term of the proportion, being diminished by the known resistance of the train, will give the resistance of the engine alone.

From the experiments of Mr. Telford, the following values of the resistances experienced by loaded carriages on level roads have been determined. On a good pavement the resistance is $\frac{1}{70}$ of the weight of the carriage and load; on a broken surface of old flint, $\frac{1}{33}$; on gravel, $\frac{1}{13}$; and on a well-constructed railway, from $\frac{1}{280}$ to $\frac{1}{250}$.

By experiments made on the force (of traction) required to give motion to vessels on canals, it is found that the resistance varies nearly as the cube of the velocity; and this great deviation from the general law of resistances is probably caused by the re-action of the sides of the canal against the water displaced by the vessel. It deserves however to be mentioned, that when the velocity of the vessel is considerable, the resistance has been found to experience some diminution, perhaps on account of the water momentarily displaced, from its inability to escape laterally, becoming condensed, and thus giving superior buoyancy to the vessel: the immersed part being less, the pressure of the water against the front will also be less.

Mr. Barlow observes that, with small velocities, the force of traction on canals is less than on railways; and when the velocity is equal to four miles per hour, the forces are equal. Beyond this velocity the advantage is in favour of the railway.

RESOLUTION. [Solution.] The resolution and solution of a question are, in common language, the same things. The word is also used as opposed to Composition.

RESOLUTION, in music, the passing of a discord into a concord. [Discord; Harmony.]

RESPIRATION, or the process of breathing, is that by which changes are effected in the common nutritive fluid of the body by its being brought into contact with the atmospheric air. It is one of the processes by which organic beings are peculiarly distinguished, and is probably carried on in some form by all of them. In the present article it will be considered only with reference to the mode in which it is performed in the animal kingdom, and particularly in man.

The common effect of the respiration of all animals is to remove some of the oxygen from the air which they breathe, and to replace it by carbonic acid gas derived from the blood. When one or more animals are enclosed successively in a vessel containing a given quantity of atmospheric air, the proportion of oxygen in it gradually decreases, till the air is no longer capable of supporting life, and the carbonic acid which is given off from the animal in place of the oxygen acts upon it as a poison. This result has often been obtained by experiments on animals, and is unhappily not unknown in the history of human suffering. In the memorable case of the Black Hole at Fort William in Calcutta, 146 persons were shut up in the evening in a dungeon measuring 18 feet by 14, and having only two small apertures for the admission of fresh air. Of the whole number, only 20 survived till the following morning. These were they who were placed nearest to the apertures: the rest were gradually suffocated by the carbonic acid, which was given off in their respiration more rapidly than the oxygen was renewed by the admission of fresh air.

Oxygen is the only gas by which respiration is supported. It is constantly supplied by the atmospheric air, of whose volume it forms a fifth part, and which is breathed in a free state by mammalia and amphibia, and in solution or mixture in water by fishes and the other truly aquatic animals. Pure oxygen however is not fit for breathing; it destroys life after a few hours, and an animal placed in it dies before it is all replaced by carbonic acid. The nitrogen of the atmosphere dilutes the oxygen to the degree which appears the best suited for respiration; and as the former gas has not its quantity materially altered by being breathed, it is probable that this dilution is the only purpose which it serves in relation to the present function.

There are three chief forms of organs for respiration: *lungs*, which are made up of branched tubes and cells placed within the body; *gills*, or *branchiæ*, which are vascular processes developed on some part of the exterior of the body; and *tracheæ*, which are tubes that ramify to extreme minuteness, and are dispersed through nearly all the organs of the body. By the first and last of these organs the free air is in almost all cases respired; by the second the air is mixed with water. The essential part of the process of respiration however is the same in all: it will therefore be unnecessary to describe here the varieties of the respiratory organs in different classes of animals, and the more so, as they have been already considered in the general description of each class and of many genera, and since the relation of each kind of organ to the circulatory system in the same class has been pointed out in the article Heart.*

In man, whose lungs may be taken as a type of those of all mammalia, they are thus formed:—The trachea, or windpipe, is a rounded tube continued from the larynx [Larynx], and commencing about an inch above the upper edge of the breast-bone. Its front and sides are chiefly composed of portions of cartilage forming about three-fourths of rings an eighth of an inch wide; and its back part consists of transverse and longitudinal fibres of elastic (and, according to some, muscular) tissue. The rings are connected by tough cellular and elastic tissues, and by numerous strong longitudinal bands; and the whole tube, as well as its farthest ramifications, is lined by a mucous membrane continued from the larynx, and covered on its free surface by a fine epithelium composed of cells with vibrating ciliæ attached to them.

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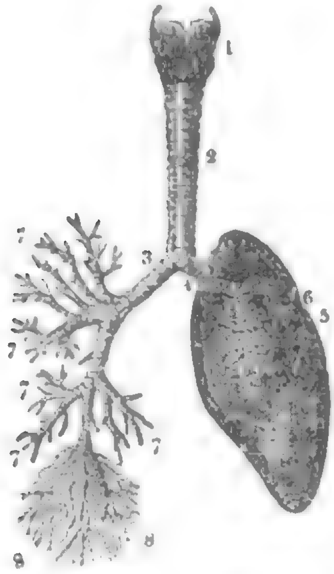
* It is almost essential to the comprehension of either, that these two articles should be read together. The writer would here also strongly recommend the reader who has not access to the parts of the human body, to examine the parts described here and in most of the anatomical articles in the bodies of some animal, especially the sheep, calf, or pig.

The trachea divides into two main branches, the bronchi, one of which goes to each lung, and in it divides into smaller and smaller branches, whose structure is in all essential respects similar to that of the trachea (*fig.* 1). Around the extremity of each of the finest branches of the bronchial tubes there are arranged a number of delicate rounded cells or vesicles, all opening into the end of the branch, but having no communication with each other. On the walls of these cells the blood circulates in the minutest capillary divisions of the pulmonary artery and veins, and it is also in these cells that the air, which is admitted to them through the bronchial tubes, comes nearly into contact with the blood. The mode in which the blood is conveyed to the lungs is detailed in the article **Heart**. The pulmonary artery arising from the right ventricle carries to the lungs all the blood that has been circulating through the body; one main branch goes to each lung, and, accompanying the bronchus, divides, like it, to extreme minuteness. At the last its branches terminate in the capillaries, which are arranged in the most delicate network on the walls of every pulmonary cell. Each of these cells is about $\frac{1}{30}$ of an inch in diameter; the capillary vessels are about $\frac{1}{3000}$ of an inch in diameter; and the network which they form is so close that its meshes are not more than $\frac{1}{370}$ of an inch wide. In its passage through these the blood undergoes the changes which convert it from venous to arterial, and render it again fit for the maintenance of life. [Blood.] From the capillaries it passes into the pulmonary veins, and through them to the left side of the heart.

Fig. 1.

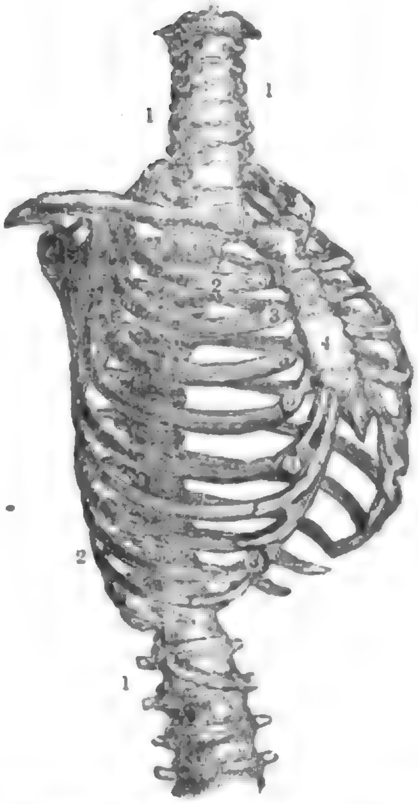


1, the larynx; 2, trachea; 3, right bronchus; 4, left bronchus; 5, left lung, the fissures denoted by the two lines which meet at 6, dividing it into two lobes, and the smaller lines on its surface marking the division of the lobes into lobules; 7, large bronchial tubes; 8, minute bronchial tubes terminating in the air-cells or vesicles.

The lungs are thus mainly composed of air-cells and of branches of the pulmonary artery and veins. Each lung is divided into two or three large portions called lobes (the right lung has almost always three lobes, the left two), each of which receives one of the main divisions of the bronchus, artery, and vein; and these are again divided into lobules, the outlines of some of which are marked by the angular figures on the surface of the lung. Lastly, the cells are grouped together in still smaller lobules not more than a quarter of an inch in diameter.

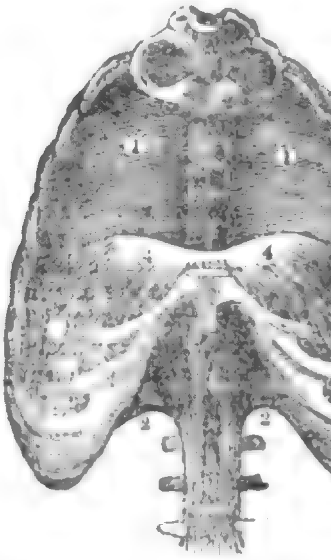
The lungs are placed in the two principal cavities of the chest. The annexed figure (*fig.* 2) represents the bony frame-work of the chest, bounded behind by the spine and the ribs as far outwards as their angles, in front by the sternum, or breast-bone, and the cartilages of the ribs, and on each side by the bodies of the twelve ribs. The space which is left below in the skeleton is, in the entire subject, filled up by the diaphragm, a large muscle represented in *fig.* 3 whose form may be roughly compared to that of the expanded part of an umbrella having its concavity downwards. The diaphragm forms a moveable partition between the cavity of the chest and that of the abdomen, permitting only the passage of certain vessels, &c. from the one to the other. By its alternate contractions and relaxations it increases and diminishes the capacity of the chest.

Fig. 2



1, spinal column; 2, ribs; 3, cartilages of ribs; 4, sternum.

Fig. 3.

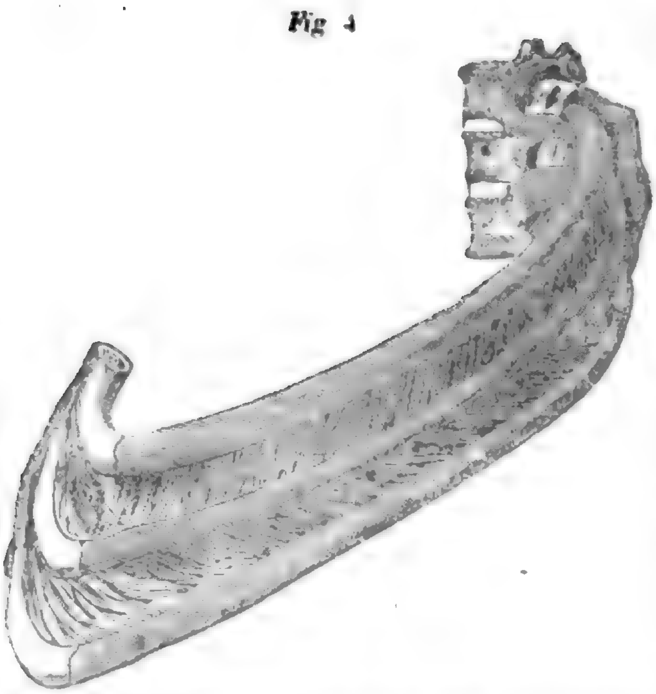


1, cavities of the thorax; 2, portion of cavity of the abdomen; 3, lateral or muscular portions of the diaphragm; 4, central or tendinous portion of the diaphragm.

The spaces between the several ribs are filled by the intercostal muscles, of which two are represented in the subjoined figure. Between each two ribs there are two layers of muscle, the fibres of each of which cross those of the other. The fibres of the outer layer, which are represented between the two upper ribs in the annexed figure, pass obliquely from above downwards, and from behind forwards: those of the inner layer, here drawn between the two lower ribs, pass with a similar obliquity from before backwards.

The upper aperture of the chest between the spine, first ribs, and sternum (*fig.* 2) is that at which the trachea passes into the chest to the lungs, and at which the great arteries of the head, neck, and arms pass out of the chest from the aorta. The spaces left between these and the bones are occupied by the œsophagus, by certain muscles

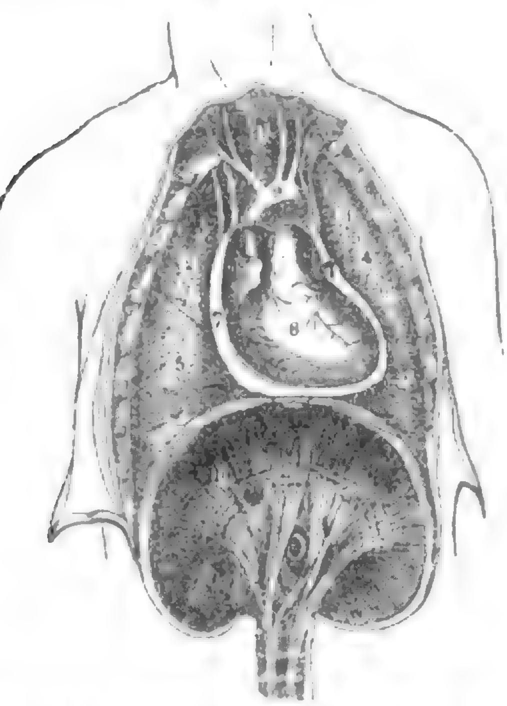
Fig 4



and nerves, by the great veins of the upper part of the body, and by cellular tissue.

The whole chest thus forms a cavity closed on all sides, but permitting the passage of certain tubes (the trachea, œsophagus, blood-vessels, &c.) through its walls. This cavity contains within it three subordinate cavities; the middle one contains the heart in the pericardium, and each of the two at the sides contains one of the lungs. These are called the pleural cavities.

Fig. 5.



1, the trachea; 2, the right lung; 3, the left lung; 4, fissures, dividing each lung into, 5, large portions termed lobes: 6, smaller divisions termed lobules; 7, pericardium; 8, heart; 9, aorta; 10, diaphragm separating the cavity of the thorax from that of the abdomen.

Each lung is as it were hung into the cavity appropriated to it by its bronchus and by the trunks of its pulmonary artery and veins, which, enclosed together by cellular tissue, form what is called the root of the lung. The lung exactly fills the cavity in which it is placed, so that their surfaces are everywhere in contact, or separated only by the very small quantity of fluid necessary to keep them sufficiently slippery to move upon each other without difficulty. For the sake of more easy motion, the wall of the cavity is lined and the surface of the lung is covered by a fine smooth membrane, the pleura, which is arranged like other serous membranes [Membrane], that is, having lined the cavity, it is reflected upon the root of the lung, and then passes over its surface and those of its great divisions or lobes.

The pleural cavities are completely closed on all sides, so that no air can enter them, but the lung in each communicates with the external air by its bronchus, which leads to the trachea and larynx; and hence, when the chest is enlarged by the contraction of the diaphragm, the elevation of the ribs, &c., the air passes not into the cavity of the chest, but through the windpipe into the interior of the lung. It is as if one had a pair of bellows with the valve closed, and the tube of the nozzle opening, not as it usually does, into all the space enclosed by the boards and leather, but into a bladder contained within that space. In this case, when the handle of the bellows is raised so as to enlarge the cavity, the air will pass into the bladder, and distend it so as to keep it everywhere in contact with the interior of the cavity containing it.

The acts of breathing are—*inspiration*, by which air is drawn into the lungs, and *expiration*, by which it is again expelled from them. In inspiration the muscles that are attached to and form part of the walls of the chest contract, and by raising the ribs and sternum, and flattening the diaphragm, increase its capacity. The air within the lungs (which are never empty even after the deepest expiration) is thus for the instant rarefied; but by the proportionally increased pressure of the atmosphere upon the upper part of the larynx, a fresh quantity of air immediately passes into the air-tubes, and maintains the equilibrium of pressure between the air within and that without the lungs.

As soon as the action of the muscles of inspiration has ceased, expiration commences; the lungs, distended in inspiration, contract by their own elasticity, and expel a volume of air which, in ordinary circumstances, is equal to that which they had just previously received. As fast as they contract, they are followed by the walls of the chest, which collapse partly by their elasticity, and partly by the pressure of the atmosphere upon their exterior, which, when the lungs begin to contract, is no longer exactly balanced by the pressure exerted through the medium of the lungs upon their interior. The lungs having thus contracted to a certain extent, the parts are restored to the same condition as before inspiration, and in ordinary circumstances that action is soon again commenced.

The enlargement of the cavity of the chest in common inspiration is thus effected: the diaphragm (*fig.* 3, 5) contracts; its muscular fibres, which are attached on the one hand to the interior of the lower ribs, the tip of the sternum, and the front of the spine, and on the other around a tendon (4, *fig.* 3) in its middle, shorten, and thus (as the first set of attachments are fixed) they draw down the middle of the muscle, lessen its convexity towards the chest, make it flatter, and press its under surface upon the contents of the abdomen, so that the abdominal walls become more prominent At the same time, or just previously, the intercostal muscles contract; the two upper ribs, being quite or nearly fixed at one end to the spine, and at the other to the upper part of the sternum (*fig.* 2), serve as fixed points towards which the upper intercostal muscles contracting draw the second ribs; these being thus fixed, the second pair of muscles contract, and draw up the third ribs; and so on through the whole of the ribs, the lowest serving, at the same time that they are drawn upwards, for fixed points, towards which the diaphragm, contracting all round its tendon, may draw down its middle part and become flatter.

The effect of the contraction of the intercostal muscles is not so much to approximate the ribs (which would decrease the capacity of the chest) as to force them further outwards and forwards, and thus give the chest a greater width and depth at each part. In *figs.* 2 and 4, it is seen that the ribs descend obliquely outwards and forwards from the spine, and then ascend towards the sternum. They increase in obliquity as they are taken from above downwards, and, except the four last, they also increase in length in the same succession. The length of the arc represented by each rib from the spine to the sternum is fixed, for the substance of the ribs is bony or cartilaginous, and almost unyielding; when therefore one rib is fixed, and the intercostal muscles between it and the one next below it contract, they must not only draw the latter upwards, but must also turn it somewhat outwards, and raise the sternum, which is fixed to its anterior extremity. The direction of the rib becomes less oblique, but its length remaining the same, the distance from the spine to the moveable sternum must be increased at the same time with the distance from each rib to the corresponding one on the opposite side.

By these actions the cavity of the chest is increased in every direction in height, by the descent of the diaphragm; in width, by the turning outwards of the ribs; in depth, by the ascent of the sternum. In quiet inspiration the greater part is effected by the diaphragm; in deep inspiration not only are all the muscles already mentioned contracted, but a number of others capable of raising the ribs are called into play, and the capacity of the chest is thus yet further increased in the manner just described.

In their medium state the lungs of a person of ordinary size, and in good health, contain about twelve pints of air; in perfectly easy breathing, about a pint is drawn into them at each inspiration; but from this the quantity may vary to as much as seven pints, according to the force of inspiration, increased as it is, for example, when preparing for a great muscular effort, or during singing, or before coughing.

Quiet expiration does not need any muscular exertion; the elasticity of the lungs, of the cartilages of the ribs, and of the other parts distended in inspiration, is sufficient to restore them all to their previous state. A limit is set to the collapse of the lungs by the unyielding tissues of the walls of the chest. These cannot follow the contracting lungs beyond a certain extent, and the elasticity of the lungs is not sufficient for them to overcome the unbalanced pressure of the atmosphere upon their interior, which it would be necessary for them to do before they could contract from the interior of the walls of the chest. If a wound be made into either pleural cavity, the lung at once collapses completely, and expels nearly all the air it contained; for in this case the atmospheric pressure being admitted alike to the exterior and the interior of the lung, its elasticity has but little to overcome, and the air-cells and tubes immediately contract to the smallest size of which they are capable. By the same means, when both pleural cavities are opened at once, death speedily follows in consequence of the collapse of both lungs and the suspension of all breathing.

The limit which the rigidity of the walls of the chest sets to the elastic collapse of the lungs is never reached in ordinary respiration, nor in extraordinary cases, except by the influence of other expiratory powers besides those of the lungs. These powers are supplied chiefly by the muscles of the abdomen, which contract with great force, and through the medium of the contents of the abdomen force up the diaphragm to an unusual height into the chest, at the same time that certain muscles capable of depressing the ribs and sternum draw them down and decrease the capacity of the chest in its depth and width. Efforts of this kind are observable in coughing, sneezing, and all other strong expiratory acts.

Such are the movements of respiration These however are less important than the chemical changes effected in it, and are even not observed in certain classes of animals, in which the latter are nevertheless constantly carried on. The object of the movements of respiration is the constant renewal of the air in the bronchial tubes and cells. It has been already said that the lungs always (even after the most forcible expiration) contain some air. It is therefore not probable that that which is inspired passes at once to the air-cells, but rather that being drawn into the finer bronchial tubes, it mixes with the air already contained in them, and only gradually arrives at the cells. There is probably a kind of undulation of the volumes of air drawn in and again in part expelled at each complete act of respiration; and we cannot conceive how the air in the cells would be constantly renewed were it not for the tendency of the different kinds of gas to mix according to the laws of diffusion of gases discovered by Dalton, and so fully illustrated by Dr. Graham. The air in the cells contains a large quantity of carbonic acid; that drawn into the tubes in inspiration contains but little of that gas, but one-fifth of oxygen, and thus, independently of the movements of respiration, there must always be a tendency of the carbonic acid towards the atmosphere and of the oxygen towards the air-cells.

With respect to the actual changes in the blood, it was long doubtful whether that fluid contained any gases dissolved in it, and as many of the best chemists failed in their endeavours to extract any, it was commonly supposed that the carbonic acid produced by respiration resulted from the separation of carbon by the blood in the lungs and its immediate union with the oxygen of the air. But to this opinion was opposed the fact, that carbonic acid is given off from the lungs of frogs when they are placed in gases that contain no oxygen, as for example pure hydrogen or nitrogen. Many theories of respiration were therefore proposed, but all failed to explain its phenomena so long as gases could not be found in the blood. Of late years however it has been rendered highly probable, by the experiments of Stevens, Magnus, and others, that the blood does hold gases in solution, which may be separated from it by agitating it with another gas (according to the laws of mixture and displacement of gases dissolved in fluids), or by placing it in nearly an absolute vacuum. The theory of Desprez and Hassenfratz, which had been discarded, is therefore now generally received; and it is believed that the chemical changes of respiration consist essentially in the removal of a portion of the carbonic acid dissolved in the venous blood, and the absorption of an equal or rather larger portion of oxygen from the air; and that these changes are effected not by any vital act of secretion, but by the tendency to mixture of the different gases, which is not obstructed by the delicately porous tissues of the air-cells and the capillary vessels.

It appears from the experiments of Magnus (which are in great part confirmed by those of Stevens, Hoffmann, Gmelin, Bertuch, and Bischoff), that the mean quantity of gas contained in the blood is equal to $\frac{1}{10}$ of its whole volume. In venous blood the average quantity of carbonic acid is about $\frac{1}{16}$, that of oxygen about $\frac{1}{25}$, and that of nitrogen about $\frac{1}{100}$ of the volume of the blood; in the arterial blood their respective quantities are $\frac{1}{16}$,* $\frac{1}{30}$, and $\frac{1}{71}$. (Müller's *Physiologie*, vol. i., ed. 2.) It follows therefore that the purpose of respiration is chiefly the absorption of oxygen, and not merely the removal of carbonic acid from the blood; a conclusion which is also rendered probable by the fact that frogs placed in hydrogen or nitrogen die as if suffocated, although as much carbonic acid is given off from their lungs as when they breathe in atmospheric air.

The constant process of respiration effects changes in the blood that are of the first importance to life and health. The watery vapour exhaled from the blood as it passes through the lungs more nearly in contact with the atmosphere than it is at any other part of the system, amounts, according to the experiments of Lavoisier and others, to nearly 8000 grains in 24 hours. The quantity of carbonic acid given off during the same time is estimated to be at the least 14,930 cubic inches, or 8534 grains, containing 2820 grains of carbon; and the quantity of oxygen absorbed amounts in different circumstances to from ⅛ to ⅓ more than that of the carbonic acid given out. Nitrogen appears to be in some circumstances exhaled, and in others absorbed; but on this point the results of experiments are at present far from conclusive.

Dr. Prout has shown that the quantity of carbonic acid separated from the blood varies at different periods of the day; it is greatest between 11 A.M. and 1 P.M., and least between ½ past 8 P.M. and ½ past 3 A.M. Its quantity is also diminished by anxiety and other depressing passions, by exercise, by strong drinks, or vegetable food; but it is increased when the barometer is low.

The suspension of respiration by any causes produces asphyxia, or suffocation. The oxygen of the blood is essential to the maintenance of the life of the parts in which it circulates, and an excess of carbonic acid in it acts as a poison. It has been already stated that animals die in hydrogen though the carbonic acid is given off; these perish for want of oxygen. Others are destroyed by the excess of carbonic acid; as those who die after breathing the same atmospheric air for some time, but before all its oxygen is consumed, and those who die in an atmosphere containing an abundance of oxygen, but at the same time charged with a large portion of carbonic acid. The phenomena of asphyxia, and the peculiar conditions on which it depends, are considered in a separate article. [ASPHYXIA.]

RESPIRATOR, or breath-warmer, an instrument recently invented and brought into use by Mr. Julius Jeffreys, for giving warmth to the air drawn into the lungs in breathing, and thereby enabling invalids to enjoy the benefits of exercise in the open air without injury or inconvenience.

The common practice of wrapping up the lower part of the face in a woollen covering warms the air inhaled through it very imperfectly, and in an unwholesome manner, by mixing with it a portion of the impure air exhaled from the

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[*] The fact that in Magnus's experiments the arterial blood was found to contain more carbonic acid than the venous, shows that though they may be sufficient to establish this explanation of respiration, all the details of the process still require to be more carefully examined.

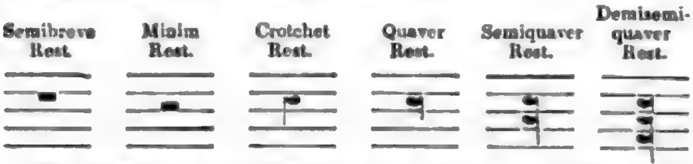
lungs, and detained in its bulky folds. A woollen wrapper, being a non-conductor of heat, can act in no other way. In the respirator this disadvantage is avoided by causing the air discharged from the lungs to pass through several layers of very fine wire, fixed so near together that the breath passing through them is almost infinitely divided, its warmth being abstracted by the metal, which, being an excellent conductor of heat, freely imparts it to the fresh cold air drawn, or, as it were, filtered through it. The compactness of the instrument is such that there is no room for the lodgment of the impure air expelled from the lungs, and consequent contamination of that inhaled; and the condensation of moisture on the wires corrects the injurious dryness of the atmosphere in some northerly winds.

The means by which these objects are attained in the respirator display much ingenuity in contrivance, and no ordinary degree of skill in the execution. The inventor considers it necessary that about twenty layers of metal-work should be used, and, in order to make the instrument as light and compact as possible, each layer is required to be exceedingly thin. The apparatus usually consists of from eight to twelve frames of sheet-silver or other metal, about three inches and a half long, one inch and a half wide, and $\frac{1}{300}$th part of an inch thick; the metal of which is pierced away by machinery so as to leave merely a narrow frame containing six vertical bars of $\frac{1}{30}$th and five horizontal bars $\frac{1}{70}$th of an inch wide. On both sides of each of these frames a layer of wires an inch and a half long and $\frac{1}{150}$th of an inch thick is soldered, care being taken to connect each wire, not only with the top and bottom bars of the frame, but also with each of the five horizontal bars. The wires are laid about $\frac{1}{300}$th part of an inch apart, and are so numerous that a large respirator of high power contains 2000 feet of wire, divided into about 12,000 pieces, and soldered to the frames at more than 80,000 distinct points. The frames or lattices of wire-work, are fixed parallel to each other, and kept a short distance apart by small studs of a substance which is a slow conductor of heat, so that the inner layer is always kept, as nearly as possible, at the temperature of the air expelled from the lungs, and each successive layer diminishes in warmth, till the outer one is nearly as cold as the external air. The curious and philosophical application of a non-conducting medium between the metallic screens is essential to the perfect action of the instrument, as without it the heat would be equally diffused, and no part of the metal-work could retain more than half the temperature of the breath. By this arrangement the air inhaled, finding each layer of wire warmer than the preceding, is gradually raised, in respirators of the highest power, to the greatest attainable temperature. The most powerful respirators have twenty-four layers of wire-work, those of medium power sixteen, and the lowest power eight. The whole of the wire-work is bent into a curved form, and enclosed in a bordering or case of soft leather, which is made to fit closely to the face of the wearer, so as to prevent the entrance of air otherwise than through the metal-work, and to hold the latter in such a position that the lips do not come in contact with the wires. An outer covering of silk or other material is added, having an aperture in which is inserted a very thin plate of silver, perforated with minute holes, and to which a dark colour is imparted by a chemical operation, to serve as a screen to the wire-work, which it hides without impeding the passage of air as most textile fabrics would do. Recently however a very fine and open woollen fabric has been made use of in lieu of the perforated plate, to suit the wishes of some persons to whom the appearance of the instrument was an objection. The common or *oral* respirator covers the mouth only; but a variety called the *orinasal* respirator encloses the nostrils also. A piece of sponge attached to the lower edge of the instrument collects the moisture condensed from the breath, and it, as well as the metal-work and leather mounting, may be detached from the outer covering and cleaned when necessary.

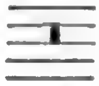
Owing to the complicated and delicate construction of the respirator, for the manufacture of which novel machinery has been required, its price has necessarily been rather high; but some have been lately made of inferior materials at a price within the reach of the poorer classes, in the hope that a very large demand may meet the cost of production. Notwithstanding its recent introduction (the patent having been obtained in 1836), it is already extensively used, and has enabled many who were unable to bear exposure to the severity of an English winter, to face the severest weather with impunity, and even with benefit to their general health; its efficiency having led some patients to designate it a 'portable warm climate.' The orinasal respirator is chiefly used for sleeping in, as it frequently affords relief from distressing night coughs arising from irritation of the air-passages, and enables patients to enjoy undisturbed rest. In addition to the comfort afforded by it, the respirator is expected to prove a preventive of diseases of the lungs; and it has been found beneficial by some for indoor use, because, by economising the animal heat, it promotes a genial warmth in the limbs. It should be stated that the respirator occasions no obstruction to the voice.

RESPONDE'NTIA. [BOTTOMRY.]

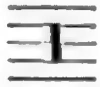
REST, in music, a character denoting silence; a cessation of sound equal in duration to the note represented by the *rest*. As there are six musical characters called notes, so there are as many rests. Ex.:—



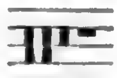
The breve rest, to be found in old music, is a short thick bar connecting two lines. Ex.:—



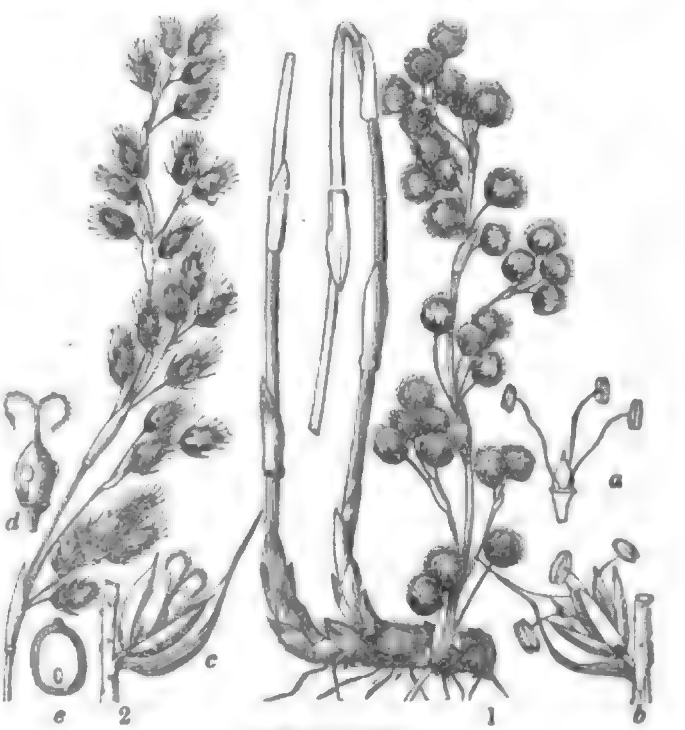
In separate vocal and instrumental parts, a character uniting three lines, and indicating a rest four bars in duration, is employed. Ex.:—



The following is the manner of directing a silence, or rest, of eleven bars, in any of the modern times or measures:—



RESTIA'CEÆ, a natural order of plants, principally inhabiting the southern hemisphere, and nearly related to the Cyperaceous order of Europe. They abound at the Cape of Good Hope and in New Holland, where they form a hard, wiry, rushlike herbage. They have in general a scaly, creeping, rhizoma, or root-stock, simple stems clothed with the sheaths of abortive leaves, and glumaceous flowers with a tolerably regular structure. The floral envelopes generally consist of 4 or 6 glumes in two rows. The stamens are two or three; the ovary for the most part 2-3-celled, with a single ovule in each cell. The fruit is either a nut or a



Restio tetraphyllus.

1, the male; *a*, the stamens and abortive ovary; *b*, the same enclosed within the floral envelopes. 2, The female; *c*, the flower; *d*, the ovary with abortive stamens; *e*, a section of the ripe seed, showing the embryo.

3-celled seed-vessel; the seeds are pendulous, and the embryo is a small lenticular body lying within albumen at the end of the seed most remote from the hilum. In almost all cases the sexes are separate. The hard texture of some species renders them suited for thatch for houses, but they are of no other use.

RESTITUTION (in Law) *of lands.* Where a forcible entry or detainer of lands is on inquiry duly found, or after conviction under an indictment for a forcible entry, the court before whom the inquiry is made, shall cause *restitution* of the lands to be made to the party who has been turned out of possession. (Com., *Dig.*, 'Forceable Entry,' D 5, &c.)

Restitution of stolen goods. By 7 and 8 G. IV., c. 29, s. 57, if any person guilty of a felony or misdemeanor under that act, in stealing, converting, or receiving any property, shall be indicted for such offence by the owner or his executor, and convicted, the property shall be restored to the owner, and the court before whom the person shall be convicted shall have power to award writs of restitution for the property, or order it to be restored in a summary manner. Provided that if it shall appear that any valuable security shall have been *bonâ fide* paid or discharged by some person liable to pay it, or being a negotiable instrument shall have been *bonâ fide* taken or received by transfer or delivery by some person for a valuable consideration, without any reasonable ground to suspect that it had been stolen, &c., then the court shall not order the restitution of such security.

Before this act, the owner was in all cases entitled to restitution on conviction for a felony, but not for a misdemeanor. During the period between the theft and the conviction, or acquittal or death of the prisoner, the ownership of the property is suspended. (2 *Inst.*, 711; Horwood v. Smith, 2 *T. R.*, 750; Burn's *Justice*, 'Restitution.')

Restitution also formerly took place where the heir of one attainted of treason was relieved from the consequences of the attainder. (3 *Inst.* 'Restitution.')

RESTORATIONS, in Architecture, a term applied to drawings intended to show antient buildings according to their original design, as made out from their existing remains, aided by such descriptions or hints as are to be obtained from classic authors, or from the representations of them on coins. In some cases the building itself will afford sufficient data for a complete restoration of it upon paper; but in others, considerable research and study are requisite, and, after all, the restoration will be chiefly conjectural. Even the best preserved architectural monuments of antiquity are in fact only comparatively entire, and are more familiar to the student in their restored than in their actual form; for many of them present only masses of ruins, which it would be a work of time and study to investigate without the assistance of the drawings of those who have already done so. For our knowledge of some edifices we are now entirely indebted to the labours of those who had made drawings of them both in their actual state and in what they have supposed to be their original one, even the remains of them having disappeared since their time. Restorations are frequently also very necessary in order to give an accurate idea of buildings which, although still entire, have been greatly altered and disfigured by having been adapted to other uses—by modern additions or spoliations. Such is the case with the Pantheon at Rome, which now presents little more than the mere carcass of the antient structure, having been stripped of all its bronze work and sculpture, and modernised in its interior with much that is in a very inferior taste, to say nothing of the two belfries that form such barbarous excrescences to the exterior. [PANTHEON.] This edifice has accordingly been frequently made the subject of *restorations*. Zahn and others have made some interesting restorations of private mansions at Pompeii, for which there exist tolerably sufficient if not complete data, both as regards the buildings themselves and their interior decorations, besides various articles of their furniture. But there are many things in regard to which it is now hopeless to look for satisfactory evidence in any remains of antient structures; and among them is the *scena* or stage of a Greek or Roman theatre, relative to which very little that can be safely depended upon is now known: nothing more in fact than a few of the permanent decorations, which of course do not go far towards elucidating the entire arrangement and construction of that part of such edifices; consequently we are quite at a loss to understand what was their stage apparatus, and what were the contrivances resorted to for the machinery which was occasionally requisite. Besides the changes which buildings themselves have undergone, either through decay or from accidental causes, there are others which are hardly considered as belonging to the province of architectural restorations, namely, those of *locality*, by which term we understand not the mere situation, but all the surrounding objects—the entire scene or view, of which the edifice now remaining was the principal feature. Thus, though we can form a tolerably exact idea of the Parthenon, and also of the other buildings on the Acropolis, and are at no loss as to their relative situation, all the rest is a mere blank, which we are now wholly unable to fill up so as to complete the entire scene with all its details, and which therefore may be compared to a picture from which all but the heads of the figures have been effaced.

RESULTING USE. [USE.]

RESUSCITATION (from *resuscito*, to arouse, to revive), the restoring to animation of persons apparently dead. Under this term, strictly speaking, should be considered the restoration of all cases of suspended animation, whether arising from disease or as a result of asphyxia; yet it is chiefly made use of to designate the recovery of persons from this latter condition. The symptoms, physiological conditions, and causes of asphyxia are fully described under that head; the treatment of it generally, and of its different varieties, was reserved for the present article. Although the suspension of all the vital actions of the system which takes place in asphyxia has originated from the temporary interruption of a single function, yet the derangement which has followed is of so complicated a nature, and extends to so great a number of important organs, that the mere re-establishment of the function primarily disturbed is not immediately followed by the restoration of the rest, and by the removal of all the mischief. The mere introduction of fresh air into the lungs cannot at once restore the action of the heart, or of the diaphragm, and of the other muscles which are concerned in respiration, because these muscles have lost either the whole or the greater part of their irritability, in consequence of having been supplied with venous instead of arterial blood. While the first and principal object is to bring the blood contained in the pulmonary vessels under the influence of atmospheric air, attention must at the same time be paid to the state of the circulation, and to the restoration of those powers by which that function, as well as respiration, is to be carried on. The first of these objects can be accomplished by the artificial inflation of the lungs; the second is to be attempted by the judicious application of stimulants to various parts of the body. The details of these processes have been already given in the article DROWNING. But asphyxia may also occur from the presence of foreign bodies in the larynx, which mechanically prevent the inflation of the lungs through the natural passage; in this case the operation of tracheotomy must be resorted to, and the pipe of the bellows must be introduced into the windpipe through the opening thus artificially made. In addition to the employment of artificial respiration, and the use of external and internal stimulants, many physicians have recommended blood-letting; but besides the doubtful advantage which sometimes may accrue from this practice, it is not always possible, and such is especially the case if the asphyxia is of long continuance. In general, the effects of blood-letting would be injurious, and it is now rarely had recourse to unless there are very unequivocal indications of great pressure on the brain. Whatever may be the means that we employ they should be persevered in till the signs of death are no longer equivocal. Dr. Currie, in his 'Observations on Apparent Death,' recommends their being persisted in for at least six hours; the French writers mention the commencement of rigidity of the limbs as the only criterion of the hopelessness of continuing our efforts. The first signs of returning animation are slight convulsive twitchings in the muscles of respiration, which give rise to gaspings and sighings. By degrees these spontaneous efforts become more regular, and natural respiration is restored; and together with it the circulation returns. The first return to sensation is usually attended with great suffering, and the utmost attention is required to guard against the dangerous symptoms which sometimes show themselves at this period; in illustration of which we may quote the following case, mentioned by Dr. Paris:—A corporal of the Guards was seized with cramp as he was bathing in the Thames, and remained for several minutes under water By judicious assistance however he was recovered, and appeared to those about him to be free from any danger, when he was attacked with convulsions, and expired. Had the respiration been artificially supported at this period, so as to have maintained the action of the heart until the black blood had returned from the brain, it is probable that the life of the soldier might have been preserved.

Treatment of particular kinds of Asphyxia.—This is to be conducted upon the general principles before explained, which must be varied only according to the particular condition of the body at the time. If the temperature is much below the natural standard, as after immersion in water, the application of heat must by no means be neglected. On the contrary, should the temperature of the body be at or above its natural standard, no more powerful excitant can be used than cold water: hence the dogs which are made the subject of experiment at the Grotto del Cane are usually plunged into a neighbouring lake after exposure to the mephitic gas, as a means of hastening their recovery. It is in the treatment of persons apparently dead from hanging, or other modes of strangulation, that a small quantity of blood drawn from the jugular vein is useful in unloading the vessels of the brain; but the depletion must be merely sufficient to effect this object, and must not be carried to the extent of weakening the powers of life.

RETAINER. [EXECUTOR; SERJEANT-AT-LAW.]

RETARDATION. [ACCELERATION.]

RETE'PORA. [POLYPIARIA.]

RETFORD, EAST, a borough in the North Clay division of the wapentake or hundred of Bassetlaw, in the county of Nottingham, in England, 128 miles in a direct line north-north-west of the General Post-Office, London, or 142½ miles by the Edinburgh and York mail-road through Ware, Huntingdon, Stamford, Grantham, and Newark; in 53° 19′ N. lat. and 0° 56′ W. long.

East Retford stands on the right or east bank of the river Idle, a feeder of the Trent. The area of the borough and parish (for the two are coincident) comprehends only 130 acres (the greater part of which is built over), but the town extends into the adjacent parishes of Clareborough and Ordsall: and the village of West Retford, which is on the opposite side of the river, and is connected with East Retford by a bridge, may be regarded as a portion of it. The borough had, in 1831, 507 houses, inhabited by 525 families; 38 houses uninhabited, and 1 building: the population was 2491, scarcely any part of it agricultural: Clareborough (one of the parishes forming the liberty of Southwell and Scrooby) had an area of 3870 acres; 477 houses, inhabited by 501 families, 28 houses uninhabited, and 2 building, with a population of 2106, about one-fourth agricultural: Ordsall (in the Hatfield division of Bassetlaw wapentake) had an area of 1930 acres; 186 houses, inhabited by 190 families, 14 uninhabited, and 5 building, with a population of 809, about two-thirds agricultural: and West Retford (in the same division) an area of 1080 acres; 150 houses, inhabited by 152 families; and 2 houses uninhabited, with a population of 593, about one-fifth agricultural: making a total of 7110 acres; 1320 houses, inhabited by 1368 families; and a gross population of 5999.

The town thus composed consists of several streets, the principal of them converging not far from the head of the bridge on the East Retford side. The streets (in the borough at least) are well paved, and lighted with gas. The houses both in East and West Retford are very good. The chief extension of the town of late years has been on the south side of the borough, in the suburb of South Retford, in Ordsall parish. The church of East Retford, dedicated to St. Swithin, is large and handsome, with a lofty square tower: it is of various dates, and exhibits the different styles of Gothic architecture. It was antiently larger, but portions of it have been pulled down. West Retford Church is small, with a tower and an elegant crocketed spire. Clareborough and Ordsall churches are both remote from the town; but in the suburb of Moorgate, in Clareborough parish, a chapel-of-ease has been built in the later Gothic style. There are several dissenting places of worship. The town-hall is a neat and commodious building: there are a theatre, a news-room, a free-school, and one or two ranges of almshouses. There is scarcely any kind of manufacture carried on, the business of the town being a retail trade for the supply of the surrounding agricultural district. Formerly there was a good deal of malting; afterwards the manufacture of hats was introduced; and the late Major Cartwright established a worsted-mill, which gave employment at one time to 600 people, but ultimately failed. The market is on Saturday, and is in autumn well supplied with hops, of which many are grown hereabout: there are two yearly fairs; and one great market for horses, black cattle, cheese, and hops. The river Idle is not navigable at this part of its course; but the Chesterfield Canal passes close to the town, and opens a communication with the Trent.

The borough is said to be a borough by prescription: various charters have been granted by Henry III. and succeeding sovereigns. At the time of the Report on Municipal Corporations, petty-sessions weekly and quarter-sessions for the borough were held. The Court of Record had fallen into disuse. The corporation, under the Municipal Reform Act, consists of 4 aldermen and 12 councillors, and the town is not to have a commission of the peace, except on petition and grant.

This borough sent members to parliament, 9 Edward II.; but for a long time after that period, its right was suspended or disused. In 13 Elizabeth it returned members again, and has done so ever since; but in consequence of a parliamentary inquiry into the corruption practised at the election in 1826, the suffrage was extended to the freeholders of the hundred of Bassetlaw. The number of voters on the register in 1834-5 was 2459; in 1835-6, 2835.

The living of East Retford is a vicarage, of the clear yearly value of 140*l.*, with a glebe-house; that of West Retford is a rectory, of the clear yearly value of 364*l.*, with a glebe-house.

There were in the borough, in 1833, eleven day-schools (one of them an endowed grammar-school), with 293 scholars; and two Sunday-schools, with 377 children. The three parishes of West Retford, Clareborough, and Ordsall contained one boarding-school, with from 12 to 14 scholars; twelve day-schools, with 240 or 250 scholars; and six Sunday-schools, with about 609 children. The grammar-school, though wealthy, was comparatively inefficient, through abuse and consequent litigation.

RETHEL, a town in France, capital of an arrondissement in the department of Ardennes, on the north or right bank of the Aisne, 117 miles from Paris by the road through Soissons and Reims, and 27 miles from Mézières, the capital of the department.

This town is supposed to have been built on the site of a Roman fort. In the middle ages it was under its own counts, and was made, in 1581, the seat of a duchy conferred by Henri III. on Charles de Gonzague, duke of Nevers, whose descendants sold it to Cardinal Mazarin. It was taken by the Spaniards, A.D. 1650 and 1655; the second time it was retaken by Turenne. Its territory was called Le Rethelais. The town stands on a hill sloping down to the river, over which there is a wooden bridge communicating with the suburb of Les Minimes, on the opposite bank of the river. There are three other suburbs; and the town is entered by three old gates. The streets are tolerably wide and well laid out, but steep; the houses, usually of two stories above the ground, are of wood, and rather meanly built. There are two large squares or places; one of them, the market-place, is large, and has a good market-house. There are two parish churches, and two other churches or chapels. The church of St. Nicholas has a tolerably handsome steeple.

The population of the commune, in 1826, was 6147; in 1831, 6585; and in 1836, 6771. It is a busy little place; woollen yarn is spun, and as water is employed as the moving-power, two small streams which flow into the Aisne are turned to good account in this way: cachemires, woollen cloths, kerseymeres, flannels, merinos, and other woollens are woven. There are tan-yards and curriers' shops, breweries, and iron-forges. Considerable trade is carried on by means of the canal of Ardennes, which opens or will open a communication between the Meuse and the Aisne. The neighbourhood of the town is fertile, yielding timber and pasturage, and containing stone-quarries and iron-mines. There are six fairs in the year.

Rethel has a high school, an agricultural society, an hospital, an asylum for old people and foundlings, two prisons and a theatre. There is an agreeable promenade on the banks of the river planted with elms.

The arrondissement of Rethel contains 124 communes

Google

it is divided into six cantons or districts, each under a justice of the peace: the population, in 1831, was 65,845.

RETI'CULUS, or **RETICULUM RHOMBOIDA'LE** (the rhomboidal network formerly used to divide the field of a telescope), a southern constellation of Lacaille, situated directly between the great stars of Argo and Eridanus.

Character.	No. in Catalogue of		Magnitude.
	Lacaille.	Astron. Society.	
β	292	425	4
δ	313	450	5
γ	317	455	5
α	329	485	3
ε	331	489	5
θ	336	500	5
η	340	514	5

RETI'FERA, M. de Blainville's first family of his order *Cervicobranchiata*. [CERVICOBRANCHIATA.]

RE'TINA. [EYE.]

RETINASPHALTUM occurs in irregular opaque masses of a pale brownish-yellow colour, having a glistening lustre and imperfect conchoidal fracture. It is soft and brittle, melts when placed on hot iron, smokes, and afterwards burns with a bright flame, emitting a fragrant odour. Partly soluble in alcohol, leaving an unctuous residue. It is more nearly allied to bitumen than any other substance. Specific gravity 1·1 to 1·2.

That found near Bovey Tracey in Devonshire has a dry earthy texture; that from Wolchow in Moravia is hard and resinous. According to Hatchett, it contains—

Resin soluble in alcohol . .	55
Insoluble bituminous matter .	41
Earthy matter	4
	100

RETORT, a chemical vessel in which distillation or decomposition is effected by the application of heat; for different purposes retorts are made of glass, earthenware, and metal.

Glass retorts are usually of the annexed form, with a receiver attached; they may be employed for the preparation of such products as do not require any extraordinary degree of cold for the condensation of their vapour: such a liquid is nitric acid. In this cut *a* represents the body of the retort, *b* the neck, and *c* is the receiver, secured to the retort by means of lute. To prepare this acid, nitrate of potash is carefully conveyed by the neck into the body of the retort, and then sulphuric acid is added to it by means of the retort funnel *d*, which prevents any of this acid from remaining in the neck of the retort, and being washed down by and contaminating the nitric acid, as it condenses and passes into the receiver. In this case, when heat is applied to the retort, nitric acid and water rise together in vapour from the body of the retort, and are condensed in the neck; but when the product is more difficult of condensation, the neck of the retort is lengthened by placing an adapter *e* between it and the receiver, to both of which it is secured by lute; it being understood that the wider end slips over the aperture of the retort, and the narrower one is admitted into the mouth of the receiver. In some cases condensation is accelerated by causing a small continuous stream of water to fall on the neck of the retort.

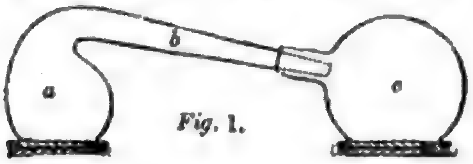
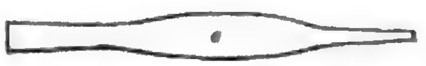


Fig. 1.

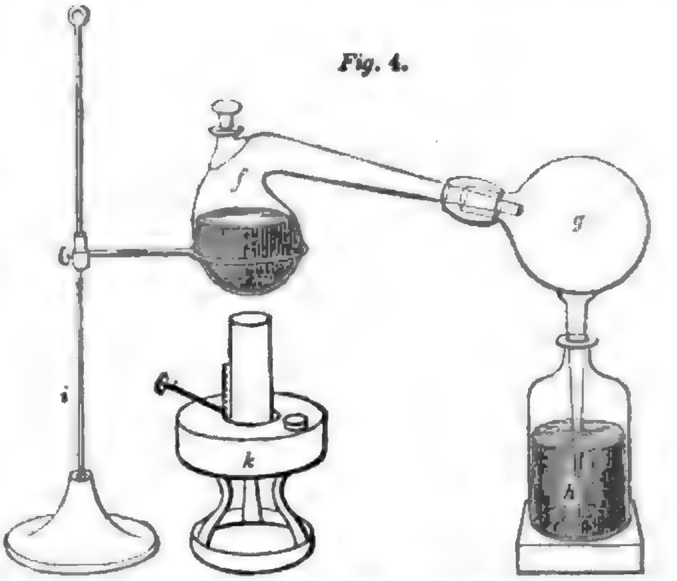
Fig. 2.

Fig. 3.



A stoppered retort *f* is sometimes used instead of a plain one; these retorts are more expensive, but much more convenient than common ones; for both the dry and the liquid substances to be employed in the operation are passed into the body of the retort through the aperture, which is afterwards secured by a stopper, without having recourse to the retort funnel. Frequently also a quilled or tubulated receiver is used instead of the plain one above described: this is represented by *g*; the tube is inserted into a bottle *h*, and this, when ammonia or other very volatile or difficultly condensible products are distilled, dips into water, or the receiving bottle itself is immersed in water kept cold by ice or by a freezing mixture, as when hydrocyanic acid is distilled: *i* is the stand which supports the retort, and *k* is the lamp by which heat is applied to it.

Fig. 4.



Glass retorts and receivers are made of various sizes, capable of containing from a few ounces to several gallons, and both flint and green glass are used in their manufacture. Usually, instead of applying heat by a lamp, retorts are heated in a sand-bath, and sometimes they are subjected to the direct action of the fire; but before this they are very commonly protected by a coating of lute. [LUTE.]

In general, when the application of the higher temperatures is required for distillation or decomposition, earthen retorts are employed. In preparing hydrofluoric acid, lead is used; and in concentrating sulphuric acid, platina retorts are now largely employed, and would be universally so, were it not for their very high price.

In the destructive distillation of coal [GAS LIGHTING] iron retorts are used, and also, on the small scale, for obtaining oxygen from the peroxide of manganese, and various other chemical operations.

RETRENCHMENT, in Fortification, is a work constructed within another, in order to prolong the defence of the latter by impeding or preventing the formation of lodgments when the enemy has gained possession of it; or to afford protection to the defenders till they can retreat with safety or obtain a capitulation. In the latter respects the interior work is called by the French engineers a *reduit*.

Every principal work in permanent fortification is provided with its retrenchment or reduit; and some of these, as the reduit of the ravelin, and of the re-entering places of arms, are constructed at the same time as the work itself, while others, as the retrenchments within a bastion, are generally executed but a short time before they are wanted.

In 1552, when Metz was besieged by Charles V., the Duke of Guise, who commanded in the town, by constructing new ramparts within the old, as fast as the latter were destroyed by the besiegers, succeeded at length in compelling the emperor to raise the siege; and at the siege of Candia (1666-1669), the Venetians raised a rampart from one curtain to the next in rear of the gorge of the bastion St. Andrea, so that, long after that bastion was breached and taken, the town continued to hold out. Such prolonged defences are now rare, and the governor of a fortress is considered as having fulfilled his duty if he do not surrender till a breach has been made in the rampart of the enceinte; though if the bastion were retrenched, he might sustain an assault without any risk of being refused a capitulation, or of seeing the town given up to be plundered.

In the event of the assailants gaining the top of the breach, the defendants would be able to retreat within the retrenchment, the fire from which might then be concentrated upon the enemy while confined within the comparatively narrow space between the faces of the bastion.

The kind of retrenchment proposed by Cormontaigne for the bastion of a fortress is a rampart or parapet extending across the interior of the work in a right line, or rather in the form of a tenaille. [X, Fortification, vol. x., p. 377.] Its extremities join the faces of the bastion at 20 or 30 yards in front of the shoulders, by which means the flank is left quite free, so that all its artillery can be employed in the defence of the main ditch, and there is room between the retrenchment and the shoulder of the bastion for two guns, by which the interior of the ravelin and the ditch of its reduit might be defended, if necessary, even after the enemy had made a lodgment in the bastion.

As the retrenchment in this situation is liable to be enfiladed by a battery of the besiegers on the glacis before the collateral bastion, it is proposed that another should be formed in rear of the gorge of the bastion attacked; and as in this case there would be sufficient room, the retrenchment may be in the form of a front of fortification with a revetted scarp and counterscarp.

The ditch in front of a retrenchment, as at X [Fortification], is cut quite through the parapet of the bastion, in order to prevent the enemy, after the assault at the breach, from passing along the top of that parapet, and getting to the rear of the retrenchment. This opening of the parapet does not however go lower than the level of the cordon of the scarp revetment, in order to avoid diminishing the height of that scarp, and thus offering a facility to the enemy, should he attempt to escalade the work at that place.

Cormontaigne proposed to retrench small bastions by constructing within them cavaliers of the same form as the bastion itself, and having a command of 5 or 6 feet above it. The fire from this high parapet might give the work some advantages during the progress of the siege; but from its figure a cavalier appears to be less proper than a retrenchment in the form of a tenaille, for the defense of the terreplein at the top of the breach.

It is evident that full bastions like A [Fortification] must be more convenient for being retrenched than those which are of the kind called hollow, as B; since less earth is wanted to raise the retrenchment to the required level, and the scarps are covered by the opposite side of the ditch from the view of the enemy at the top of the breach. The most simple manner of retrenching a hollow bastion would be that of retaining the rampart on the interior side, where it is usually 10 or 12 feet high, by a wall, and cutting a deep ditch at the foot; then forming a traverse across the terreplein of the rampart on each face (at 20 or 30 yards from the salient angle of the bastion) with a ditch in front. The enemy, in gaining the top of the breach, would then find himself arrested by these obstacles, and exposed to the fire of the defenders, till ladders and the support of a large body of troops could be obtained. The bastions of Ciudad Rodrigo, Badajos, and St. Sebastian were retrenched in this manner when those fortresses were besieged by the British and their allies during the Peninsular war.

Vauban, having observed that the ravelin was sometimes abandoned by the defenders previously to an expected assault, on account of the difficulty of retreating across the main ditch under a fire from batteries on the glacis before the bastions, constructed, in the interior of that work, another, which might afford the defenders protection till the coming night would permit them to retire in safety. This work was at first only a wall, pierced with loop-holes for musketry and covering the steps at the gorge: but when Vauban increased the size of the ravelin, he made this reduit, or retrenchment, to consist of a rampart and parapet similar to those of the ravelin itself, as at Neuf Brisac; and Cormontaigne subsequently enlarged the work, so as to render it a second ravelin, as at Y [Fortification]. This spacious retrenchment contributes much to the prolongation of the defence of the ravelin, since it is capable of containing a large body of troops; and each of its flanks can carry three guns, whose fire might be directed against the counter-battery at the salient of the bastion, or might serve for the defence of the breach in the face of the latter, should the enemy attempt to make an assault before he has obtained possession of the reduit. But to take this last, it would be necessary to breach its faces either by artillery or by mining; and the passage of its ditches would be difficult under a close fire from the ramparts near the shoulders of the neighbouring bastions.

In order that the defenders might be able to retain possession of the extremities of the ravelin, near the main ditch, after the salient part may have been taken, retrenchments, or coupures, as they are called, similar to the traverses, *t*, *t*, &c., are recommended to be formed across the terreplein of the ravelin. Behind these some of the defenders may retire, and keep up a fire against the enemy's lodgment near Z.

When Vauban had enlarged the re-entering places of arms, L [Bastion; Fortification], he retrenched the interior with stockades, which, by covering the steps leading from the ditches in their rear, protected the retreat of the defenders of the covered-way; and Coehorn appears, about the same time, to have constructed brick walls, provided with loop-holes, in the places of arms, at Bergen-op-Zoom, for the same purpose. But Cormontaigne, in order to render the defence of the places of arms more obstinate, and to secure more effectually the retreat of the defenders of the covered-way, constructed reduits, as W [Fortification], with parapets of earth 12 or 14 feet thick; and he revetted the sides of their ditches, in order to diminish the risk of a surprise: he also gave them flanks, which he made perpendicular to the covered-way, that a fire of light artillery or musketry might be directed from them against the enemy while attempting to crown the salients of the ravelin. These reduits moreover cover the shoulders of the bastions and the portions of the curtain which might be seen and breached by a fire directed between the flanks of the bastions and the tenailles; and their faces are directed so that they cannot be enfiladed. The crest of their parapet is about four feet higher than that of the glacis in their front.

The advanced works about a fortress are recommended to be retrenched with round-towers of masonry, provided with upper and lower tiers of loop-holes for musketry. These are called *safety redoubts;* and in Montalembert's 'Fortification Perpendiculaire,' such towers are constructed, to carry artillery, within the rampart of the enceinte.

For retrenchments in field fortification, see Blockhouse.

RETROGRADE, moving backwards, as opposed to Direct. In astronomy all motion from east to west is retrograde: thus the apparent motion of the heavens is retrograde, and the earth's diurnal motion, which causes it, is direct.

RETURN OF CATTLE, &c. is a term applied to the restoration of cattle, &c. distrained, to the party by whom they were distrained, after it has been ascertained that the distress was rightfully taken. The restoration of the cattle, &c. distrained to the owner is not called a return, but a replevin. [Replevin.]

RETURN OF WRITS. When process [Process] issues, the party to whom it is directed is commonly required to do a specified act, to certify the court in what manner the command has been executed, and at the same time to produce or *return* the process itself. Hence the whole answer to the process is called the return. In most cases, this is a duty performed by the sheriff. [Sheriff.]

RETZ. [Loire Inferieure.]

RETZ (JEAN FRANÇOIS PAUL DE GONDI), CARDINAL DE, descended of a rich and powerful house, was born in October, 1614. Destined by his father to the church, in the hope of his obtaining the archbishopric of Paris, then held in succession by two members of his family, he was compelled to enter upon a profession repugnant and unsuitable to his ardent, unscrupulous, and intriguing temper. His youth was sullied by debauchery, while at the same time his theological studies were prosecuted with success and distinction; but in the history of the contests of parties in Greece and Rome, he found a more congenial pursuit, and brilliant and seductive examples of what he most coveted, political ability and success. His first political connection was with the Comte de Soissons, to the success of whose revolt he looked forward for the means of abandoning his profession. Disappointed by the death of that nobleman, he resumed with more regularity his ecclesiastical studies and employments; and gained the good opinion not only of the clergy of Paris, but of Louis XIII., who, on his death-bed (1643), named Gondi coadjutor to his uncle the archbishop of Paris. He devoted himself zealously to discharge the external functions of his office; and by this regularity, and by his profuse distribution of alms, established his popularity with the citizens. The bent of his mind however is shown by his answer to one who reproached him with prodigality: 'Cæsar, at my age, owed six times as much as I.' His conduct made him an object of suspicion to the court; and though on the first breaking out of the disturbances of the Fronde he rendered active and valuable assistance to the royal cause, still his sincerity was not credited; and he was driven by the distrust of the court, co-operating with his own ambition, to become, not indeed the avowed leader, but the moving spirit of the popular party. 'Before noon to-morrow,' he said, when his resolution was formed, 'I will be master of Paris:' and he kept his word. This was the eminence to which the dreams and studies of his youth had led him to aspire. 'I am convinced,' he says in his Memoirs, 'that it requires greater qualities to be a good party leader, than to be emperor of the universe.' Throughout the wars of the Fronde, a busy period of domestic contest, he maintained his ascendency [FRONDE]; and he has earned from one of his biographers the praise of being the only person who in those troubles sought not gain, but reputation. The praise of generosity towards his bitterest personal enemies is also due to him. The war was closed by the return of the court to Paris, in October, 1652. Tempting offers were made to induce Gondi, who had now risen to the rank of cardinal, to quit his see and repair to Rome, with the title of ambassador; but while he hesitated, and sought to make terms for his friends, he was arrested, Dec. 19, without resistance on the part of the Parisians, who, by this time, were well wearied of civil war. For some time he was very closely confined at Vincennes. By resigning his archbishopric however, to which he had now succeeded by the death of his uncle, he purchased his removal to the château of Nantes, from which he effected his escape into Spain (1654), with singular boldness and good fortune. From Spain he repaired to Rome, where, in spite of the opposition of the cardinals attached to France, he supported the consideration due to his talents, and, it is said, decided the election of Pope Alexander VII. Having revoked his resignation, he maintained during some time his vicars in the administration of the archbishopric; and at last, by its surrender in exchange for other benefices, after leading for some years a wandering life, he effected his reconciliation with Louis XIV., and his restoration to France. The remainder of his life was spent chiefly in retirement, in works of charity and piety. He sold his estates, and, reserving a sum sufficient for his maintenance, devoted the bulk of his revenues to the payment of his debts; which he thus liquidated, to the great amount, as it is calculated, of more than four millions of francs, modern money. Mad. de Sévigné, who was intimate with him during his latter years, speaks with enthusiasm of the charms of his conversation, the elevation of his character, and his mild and peaceable virtues. We must conclude therefore that reflection and adverse fortune had worked a great and salutary change in his disposition. He died at Paris, Aug. 24, 1679.

His political writings, being chiefly of the nature of pamphlets, are forgotten: as an author, his reputation rests on his Memoirs, written, Voltaire says, with an air of grandeur, an impetuosity and inequality of genius, which are the picture of his conduct. The memoirs of Joli, the cardinal's secretary, also contain copious materials for the biography of De Retz.

The following character of De Retz is from the pen of his political adversary the celebrated Duc de la Rochefoucauld:—'Paul de Gondi has great elevation of spirit, and more ostentation than real greatness of courage . . . He appears ambitious, without being so: vanity has prompted him to great attempts, almost all of them at variance with his profession. He has raised the greatest troubles in the state, without any regular plan of profiting by them; and far from declaring himself the enemy of Mazarin, to occupy his place, his only object has been to appear formidable to him, and to please himself by the false vanity of being in opposition to him. He has borne his imprisonment firmly, and has gained his liberty by his own boldness alone. . . . He has taken part in several conclaves, and his conduct has always increased his reputation. His natural turn is to indolence: he labours with great activity in the matters which press on him, and reposes carelessly when they are finished. That which has most contributed to his reputation, is the knowledge how to set his faults in the best light.'

REUCHLIN, JOHN, an eminent German scholar, was born in 1455, at Pforzheim, in the dominions of the margrave of Baden. He was admitted in boyhood as a chorister of that prince's chapel, and, having gained his notice by aptitude in learning, was sent by him to Paris in 1473, as companion to his son. At Paris, Reuchlin prosecuted his studies with advantage, especially in Greek; and not to follow minutely his wandering course, we find him successively at Basle, Orleans, Poitiers, and lastly, Tübingen, where, having previously taken his degree in law, he commenced practice as an advocate, about 1481. In 1482 he visited Rome, and other of the chief towns of Italy, as secretary to the count of Würtemberg, enjoyed and profited by the society of the most learned men of the age, and was received at the court of Lorenzo de' Medici with distinguished respect. On his return to Germany, he took up his abode at Stuttgard; and, from 1484 to 1509, filled a variety of high legal and diplomatic functions. In the latter year he became entangled in a long and harassing dispute, arising out of an edict obtained by Pfefferkorn, a converted Jew of Cologne, authorising him to examine and burn all Jewish books containing anything against the Christian religion. Reuchlin, on being referred to, gave his opinion decidedly against the justice of this measure; and in answer to a work of Pfefferkorn, entitled 'Speculum Manuale,' wrote the 'Speculum Oculare,' in 1511. This book was censured by the Cologne, Paris, Louvain, and other universities, and involved him with the Inquisition, before which, in 1513, he was summoned to appear at Mainz. Reuchlin appealed to the pope; and the pope referred the matter to the bishop of Spire, who pronounced the 'Speculum Oculare' to be neither dangerous to the church nor favourable to Judaism. Still the universities persisted in their condemnation, and even ordered the book to be publicly burnt; and in 1516 the cause was still in course of hearing at Rome, when it was stopped by the pope, and the disputes consequent on the rise of the Reformation prevented its being revived. In the troubled times which followed, Reuchlin had his share of distress and poverty. In 1518 he accepted, and held for a short time, the Greek and Hebrew professorships at Wittenberg; and he afterwards taught Greek and Hebrew at Ingolstadt for somewhat less than a year. In 1520 or 1521 he was appointed to the same chairs at Tübingen, a pleasant gleam over the close of his troubled life; for every comfort and facility were afforded to him, and crowds of students from all parts of Germany testified the respect in which his name and learning were held. Infirmity and sickness however soon compelled him to resign this employment, and he died at Stuttgard, June 30, 1522.

As a scholar, Reuchlin's name stands high among the men of his age. He was suspected of a leaning towards the Reformed doctrines, which the liberality of his views on the Jewish question no doubt tended to confirm. Be this as it may, he never separated himself from the Roman church. His numerous writings comprehend some elementary works on Hebrew, esteemed in their day, but of course long since obsolete; and some treatises on the cabalistic art. His fluency and purity in speaking both Greek and Latin were great, and highly admired.

REUSS is a principality in the interior of Germany, consisting of a part of the antient Voigtland, which was governed by the ancestors of the princes and counts of Reuss. It is situated between 50° 20′ and 51° N. lat., and between 11° 40′ and 12° 20′ E. long. It is divided by the circle of Neustadt, which belongs to Saxe-Weimar, into two portions, of which the southern is much the largest; the lordships of Greitz, Burg, Schleitz, and Lobenstein, with the bailiwick of Saalburg, form the southern portion, bounded on the north and east by Saxony and Saxe-Weimar, on the south by Bavaria, and on the west by Saxe-Coburg and Schwarzburg Rudolstadt. The principality of Gera, which is the northern part, is bounded on the north by Prussia, on the south by Saxony, and on the east and west by the different parts of Altenburg. The area of the whole is 580 square miles, and the population in 1838 was 101,800.

The country, especially the southern part, is mountainous, being traversed by the Erzgebirge and the Thüringerwald, here called the Frankenwald, in which the Sieglitzberg is 2300 feet, and the Culm 2260 feet in height. There are many extensive well-cultivated valleys, of which the two great valleys watered by the Saale and the Elster are the most fruitful. There are also fine forests of pine and other timber, and rich pastures. The natural productions are corn (but not sufficient for home consumption), garden vegetables, fruit, hops, flax, and timber; horned cattle, sheep, game, and fish. The mineral kingdom yields iron, copper, lead, some silver, alum, gypsum, vitriol, and salt. The inhabitants are very industrious, and have manufactures of woollen, calico, stockings, hats, earthenware, china, tobacco, alum, vitriol, and have breweries and iron-works. [GERA.] They carry on a considerable trade with the adjacent countries; they export also cattle and timber. The public schools are on a good footing; there is a high school at Gera, a lyceum at Schleitz, and a Latin school, a seminary for the education of schoolmasters, and another for the clergy at Greitz.

The family of the princes and counts of Reuss is very antient, and may be traced back as sovereign princes to the eleventh century. This family has been repeatedly divided and subdivided into numerous branches; it now consists of two principal lines, the elder and the younger, and some collateral lines. The elder line, that of Reuss-Greitz, possesses the lordships of Greitz and Burg, and part of the district of Reichenfels. The prince resides at Greitz, a town containing 6200 inhabitants. The possessions of the younger line, that of Reuss-Schleitz, are considerably more extensive than those of the elder, but this line being subdivided, the revenue and territory are also divided, though only the prince of Reuss-Schleitz is considered as sovereign.

Branches.	Area of Territory in Sq. Miles.	Population.	Prince's Revenue. £
1. Reuss, elder line . .	143	32,000	14,000
2. Reuss, younger line, viz.:			
a. Reuss-Schleitz .	128	20,500	20,000
b. Lobenstein Ebersdorf . .	163	28,500	18,000
c. Gera . . .	151	30,800	20,000
	585	111,800	72,000

The branch of Gera having become extinct in 1802, the princes of Reuss-Schleitz and Lobenstein administer the affairs of the country in common, and divide the revenue equally between them. All the princes of Reuss have borne the name of Henry ever since the eleventh century. At first they were distinguished by some appellation, such as the elder, the younger, the rich, the fat; and in the sequel by the ordinal numbers. In 1668 it was agreed that the two lines should reckon separately. In 1701 both lines began with the new century with No. I.; but in 1801 the younger line began a new series with No. I., while the elder continue to count on. All the subjects of both lines are Lutherans, except about 500 Moravians and 370 Jews. The government is monarchical, with estates on the antient German model. In 1813 both lines joined the German Confederation; Reuss, together with Hohenzollern, Liechtenstein, Schaumburg-Lippe, Lippe-Detmold, and Waldeck, has one vote (the sixteenth) in the diet of the Confederation; in the full council each line has one vote. The elder furnishes a contingent of 223 men, the younger of 522 men, to the army of the Confederation. Each pays 250 florins annually to the federal treasury.

(Hassel; Cannabich; Stein; Hörschelmann; *Conversations Lexicon.*)

REUTLINGEN is the chief town of a bailliwick of the same name in the circle of the Schwarzwald, in the kingdom of Würtemberg. It is situated in 48° 29′ N. lat. and 9° 12′ E. long., at the foot of Mount Achalm, on the river Echatz, in a beautiful and fertile country. It is surrounded with moats, lofty walls, and towers, and has four principal gates, but within these few years the walls have been broken down in several places. Without the walls there are three small suburbs. The interior of the town is regularly laid out, but it is not a very pleasant-looking place, the houses being neither large nor handsome. Considerable improvements have however been made. The only remarkable building is St. Mary's church, built in the Gothic style entirely of freestone, which was founded in 1273, and finished in 1343. The steeple, which is very handsome, is said to be 325 feet high. Besides St. Mary's there are three other churches. The town-house is a considerable edifice, and the building called the Chancery, formerly a Franciscan convent, but now converted into government offices, is a very large structure.

Reutlingen is a thriving town. The inhabitants, now nearly 12,000, have considerable manufactures of woollen cloths, cotton, leather, hats, cutlery, &c. In the neighbouring country are raised some fruit and corn, in which, as well as in their own manufactures, the inhabitants carry on a considerable trade. Reutlingen was famous as the chief seat of literary piracy in Germany; but this scandalous species of pilfering is now prohibited by law in Würtemberg.

In 1240 Reutlingen, with a territory of fifteen square miles, became a free imperial city, and continuing faithful to the Swabian emperors, bravely defended itself against their adversaries. In 1305 it obtained the right of being a place of refuge for persons who had committed involuntary homicide. It afterwards joined the Swabian Union, and in 1505 placed itself under the protection of Würtemberg, on which it obtained, in 1506, the right of not admitting any Jews. In 1519 Duke Ulrich of Würtemberg besieged and took it, but was expelled by the Swabian Union. In 1530 it was one of the five free imperial cities that subscribed to the Confession of Augsburg. It lost its rights as a free imperial city by the treaty of Luneville, and by the recess of the empire of 1803 it was assigned to Würtemberg.

REVAL, or REVEL (in Russian, *Kolywan*, and in Esthonian, *Tallin*), the capital of the Russian government of Esthonia, is situated in 59° 26′ N. lat. and 24° 35′ E. long., on the Gulf of Finnland. It is very strongly fortified, and in 1824 the harbour was made capable of receiving the Russian Baltic fleet. It has much the appearance of many of the towns of Northern Germany, with narrow irregular streets and dark old-fashioned houses. The best part of the city is the part called the Dom, which is in fact a distinct portion, being surrounded with walls and towers in the old style. It is on an eminence called the Domberg, on the west side of the city, commanding an extensive view of the sea. Most of the houses of the nobility are in this part. There are likewise two extensive suburbs. In all there are 1900 houses, of which 1000 are in the suburbs; and 15,000 inhabitants, a large proportion of whom are Germans. The principal public buildings are the churches, of which there are six Russian, one Roman Catholic, and five Lutheran including the cathedral, which has a very lofty and handsome steeple.[*]

There are numerous public and private schools, a gymnasium founded by Gustavus Adolphus in 1631, a theatre, a naval and military hospital, and a Bible society. The manufactures are cotton goods, hats, stockings, leather, powder, starch, needles, earthenware, looking-glasses, &c. There is also a cannon and bell foundry. Reval has a very considerable trade, which is chiefly in the hands of opulent German houses. Above one hundred merchantmen annually arrive in the course of the season, and leave before the winter sets in.

REVELATION (removal of a covering, or discovery) signifies, in theology, a preternatural or extraordinary communication made by the Deity to men. Every communication so made, without limitation as to the subject-matter of it, is of course a revelation; but we shall restrict the use of the term here to communication of knowledge pertaining to religion; that is, knowledge of the relation in which man stands to the Deity, and the will of the Deity respecting him. The fact of a revelation supposes a want, partial or entire, of religious knowledge on the part of man, which he is himself unable to supply. Whether the absence of such knowledge should be attributed to the absence of faculties requisite for attaining it, in the original constitution of man, or to the loss or depravation of those faculties, is a question with which the present subject is not necessarily concerned. It is assumed that he who believes a revelation to have been made, believes it to have been needed; and the admission or denial of this need will materially influence the inquirer as to the amount of other evidence which he may require in support of any particular revelation. A doubt respecting the need will make him cautious in accepting anything which professes to be a revelation. A full persuasion of it will oblige him to accept that which amongst others most recommends itself to his judgment. It is hardly necessary to observe that the fact of a revelation supposes also the being and providence of a God. There must have been an answer to the question whether there is a God, before the question whether he has made a revelation can arise.

The evidence of a revelation may be considered with reference to the party to whom it is first and immediately made; to those who have their knowledge of it immediately from him; and to those who possess only a recorded account of it. It should seem that in the case of the first recipient, the only evidence fully satisfactory must be something external to himself, or unequivocally presenting itself to the judgment of his senses. For so far as we know, or have reason to believe, there is no kind of internal consciousness which alone affords a test by which a preternatural communication may be detected in the mind. It is not meant, nor is it necessary to suppose, that in the case of repeated communications to the same individual there must be a repetition of the external proof. For in the first communication, so ascertained, the means might be given of ascertaining the character of all future communications. When the first recipient communicates what he has received to others, he must produce evidence similar in kind to that which establishes the reality of it to his own conviction; in other words, the miraculous sign must here also accompany the communication, or have previously stamped credibility on the party commissioned to make it. To him this kind of evidence is a security that he is not deceived; to others, that he is neither deceived nor a deceiver. We are supposing a general publication and permanent knowledge of the revelation in the world; for it is conceivable that a few persons to whom the character of the publisher, moral and intellectual, was well known, might not unreasonably be satisfied with his bare assertion of the revelation and the circumstances attending it: but this would obviously be insufficient where the revelation claimed to be received by whole communities aud future generations.

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[*] Stein's 'Lexicon,' published 1820, says the cathedral was destroyed by lightning on the 28th of June, 1820, but Hörschelmann and Cannabich, in 1830 and 1835, describe it as still existing.

Those who live at a time remote from that in which the revelation was given, must rely, as to the evidence which first established its origin, on historical testimony; which must be tried by the common rules belonging to that subject. If it is asked why preternatural intervention is claimed in behalf of those to whom the revelation is delivered by the first receiver of it, and dispensed with in the case of those to whom only the record of it has descended, the answer is, that a miraculous fact is a subject for historical testimony; and if confirmed by that, conveys to future generations the same kind of security which it was intended to afford to those who witnessed it. It should be observed that in some cases the miraculous character of a revelation may be established subsequently to, and at any distance of time from, its first publication, as in the case of the fulfilment of a prediction; and by any preternatural fact which, however separated in time, is connected necessarily with the revelation.

In saying that a miracle is the proper test of a revelation, we do not mean to exclude every other kind of proof. We mean only that a miracle is that one species of proof which cannot be spared. Many circumstances may be supposed to have place in a revelation, which would contribute greatly to confirm its reality, and which might with some minds have more influence in inducing acceptance than even the proof of miraculous agency.

The matter of a revelation especially is an important element in the general mass of proof on which it should rest; and this perhaps deserves a little further consideration. It may at once be admitted that men, being in the position in which they must be supposed as needing a revelation, cannot know beforehand what this revelation should be. Indeed the very necessity we have supposed for miraculous intervention supposes an inability in the first instance to distinguish, by the mere matter of a revelation, whether it be or be not of divine origin. Neither can it be fairly assumed that men, enlightened by the discoveries of a real revelation, must be competent judges of the internal marks which distinguish it as such, so as to be able to say universally what God would or would not have revealed, and what could have been discovered only by him. For this would require men to be placed in a position which, as objects of a divine revelation, they cannot fairly be supposed ever to occupy. In order to appreciate fully the merits of any system of instruction or moral government, it is obviously necessary that all its ends should also be fully comprehended and appreciated; as in the case of a complicated machine, all the purposes which it is intended to answer must be known, if we would comprehend the use of all the contrivances employed in it. The moral machine which we are considering must be examined from the same elevated point of view from which it is contemplated by its author, before we can assure ourselves that we are competent to sit in judgment on all its provisions. And the case here is not as the case of human instruction, where the learner may become as wise as the teacher. When men have been enlightened up to the highest point of knowledge to which we can suppose them capable of attaining, there must still be an interval between the human subjects of the divine government and the supreme governor not only of the world which they inhabit, but of the universe, of all that is and all that shall be; an interval such that the system of his government can be brought only partially, and to a very limited extent, within the field of human vision. And the connection of that part of his government in which we are placed, with others, cannot be known at all, though the fact of the connection can hardly be doubted. But when all this has been granted, there still remains to the matter of a revelation an important place among the circumstances which may contribute to confirm or disprove its pretensions to a divine origin.

It is not, we believe, disputed that the actual position and prospects of men among existing things, the fact and conditions of their existence, present difficulties which, when considered with reference only to what is, has been, and from experience of the past may be expected to be in the world, admit no solution which will perfectly satisfy inquirers. There are anomalies which perplex and baffle our reason, and there is a want of something to explain or remedy or encourage, which men have not been able to supply; and the supposition of a presiding Providence is of itself so far from removing these difficulties, that it discovers some and aggravates others. Now, whatever coming in the shape of a communication from God should appear to throw light on this darkness, to afford a clew out of the labyrinth, would bring with it a reasonable prejudice in favour of its pretensions: and if, further, from what we know of the history of man, the progress of human knowledge, and the achievments of human intelligence, we might fairly infer that its discoveries were beyond the reach of man's natural powers, then this internal mark would amount to a proof of a very cogent kind. On the other hand, an entire absence of this mark, an entire failure to satisfy our demands on this head, would at least be a discouragement to belief, which it would require the strongest evidence on the other side to overcome.

Again, there may be positive disproof of the pretensions of a revelation from the matter of it. There are notions respecting the deity and moral obligation, the violation of which in a professed communication from God would produce at once a persuasion of imposture which no kind or degree of evidence on the other side could remove. This part of the subject it is not easy to handle satisfactorily, being encumbered with metaphysical as well as moral and theological difficulties. Whether there is in man an innate notion of a deity, and a conscience or moral sense, are questions with which we shall not meddle. It is assumed that men have in fact a notion, however planted or learnt, of a distinction between right and wrong, as something eternal and immutable, and certain persuasions respecting the nature and attributes of the deity, so as to be able to say with confidence that certain things cannot be attributed to God, certain things could not have been taught or commanded by him. This measure of religious knowledge, which we suppose men naturally to possess, or by the use of their natural reason to be capable of attaining, constitutes what is commonly called natural religion, in contradistinction to revealed: and we mean to say that a real revelation cannot be at variance with enlightened views of this natural religion, and must in a certain sense be founded upon it. Men will and should compare the subsequent revelation with the original gift. The comparison indeed will not always issue in the same result. There have ever been among men notions of a deity and moral obligation so discordant and contradictory, that an assigned attribute or command which would recommend an offered revelation to some, would be a disproof to others; and it may be said that when we speak of enlightened views of religion we mean in fact the views which we happen to entertain. Neither can we completely separate by a broad and distinct line genuine moral instincts, or discoveries made by the legitimate use of faculties given to us for the purpose of making them, from prejudices dependent on varying circumstances, and depraved or artificial habits of thought; and it must be acknowledged that whilst none, as we have already observed, can judge universally what is and what is not inconsistent with the notion of a communication from God, there are some who are incapable of judging at all in this matter. Yet it cannot be said that the test we have proposed, so far as we have admitted its application, is therefore useless and practically unsatisfactory, without disallowing on the same grounds appeals necessarily made and universally accepted in analogous cases which will readily suggest themselves, to natural laws, to the notions, feelings, and opinions of men. Neither is there any real difficulty from the supposed vagueness of the expression when we speak of enlightened views of natural religion. It is probable that the greater number of men now existing believe that the sun and moon are equally distant from the earth. To them a *physical* revelation which confirmed this supposition would not be objectionable, whilst it would be rejected on that ground alone by those who had what we may venture to call more enlightened views of the subject. It would have been tried by them and condemned on the legitimate application of a sufficient test: nor on the trial of a revelation of religious truths ought a test founded on worthy notions of the deity gained from natural religion to be considered less valid because there may have been and still may be whole communities of men capable of accepting a revelation which proposed to them deities in human form, possessing all the human passions, and freely indulging them all. It can hardly be said that we appeal more truly to nature when we appeal to her in a debased rather than in an improved condition; and it may be that those notions to which in a certain state of society we give the preference, ought not to be considered so much in the light of acquisitions made by refinement, as of natural instincts extricated and set at liberty from a state of inaction to which perverted habits had confined them. That in allowing the use of the test in question it is impossible absolutely to fix the limits of a safe and legitimate application, is a disadvantage necessarily belonging to such a subject, from which a process of rigid demonstration is excluded.

We have spoken of a miracle as the test of a revelation, without attempting a definition, believing the common notion of it to be sufficiently accurate for our purpose. For the distinctive character of a miracle, and the possibility of proving it by evidence, the reader may consult the article MIRACLE in this work, and the authors referred to at the end of it. It is presumed that the purpose of the miraculous test is evident. A certain person is converted to the belief of certain truths by an appearance, undoubtedly miraculous, in the sky. The miracle is to him a proof that his conversion is from God. He teaches to others the truths which he has been made to believe; and in doing this performs miracles. These are a proof to them that he is commissioned by God to teach what he delivers; recorded and duly attested, they prove the same to those who have not witnessed them. All the parties, in accepting the test, would reason in the same manner, namely, that the laws of nature could be changed only by God, the author of them, or by his permission; and that he would not change them or permit them to be changed for the purpose of establishing a falsehood

The question may perhaps be raised, whether, the necessity of a revelation being admitted (and with the proofs of this we have no concern in this article), we must also admit the necessity of its being known to be such by those to whom its contents are proposed. We have shown that the matter of a divine revelation cannot be expected to be fully and altogether subjected to the judgment and expectations of men: and we shall only observe further, that a religion for men who need the interposition of a revelation, must contain not merely abstract truths ending in themselves, but such as convey motives and rules of conduct; which, in order to their practical effect, must be held with the constraining force of a belief that they have been authoritatively proposed by one who has the power to enforce their acceptance.

To the question, 'has a revelation been actually made?' the Christian believes that he has an answer in the possession of the Holy Scriptures, or the books of the Old and New Testament. An account of the contents of these books and an examination of the evidences of the Christian revelation form, of course, no part of the subject of this article. The proofs which we have insisted on as requisite to establish the reality of a revelation generally, must, if rightly assigned, be applicable to this particular one.

We insisted on the primary evidence of miraculous agency in the communication, with corroboration from the matter communicated, the miraculous agency to be so exhibited to the witnesses as to be capable of proof from testimony to others. Particular revelations may be supposed, according to the circumstances under which they were given, and the nature of their contents, to admit various topics of evidence; almost all of which however will probably be found to resolve themselves into one or other of these two, though all inquirers may not agree in the classification. We should place for instance under the head of proof from preternatural manifestations, the fulfilment of prophecy in cases supposed to be beyond the reach of human foreknowledge or conjecture; the attested existence of persons exhibiting qualities, moral or intellectual, in kind or degree, not exemplified or to be expected in others of the human race; conduct of men, natural under the supposition that they were conscious and had proof of a divine commission, but otherwise unaccountable according to any known motives of human action.

The purpose and value of what may be called the corroborative evidence as distinguished from that founded on miraculous agency can hardly be overlooked. Between the highest degree of certainty with which a fact can be invested by evidence, and the faintest probability, there is room for every shade of assurance.

Now it is notorious both that different minds are differently affected by the same evidence, and that some minds seem peculiarly constituted by nature to admit the full force of one mode of proof, whilst they are comparatively insensible to another; so that it might happen that whilst to one inquirer the testimony which supported the story of the miraculous facts seemed so strong as to supersede the necessity of confirming his belief in the revelation by the evidence which the matter of it might supply, and which perhaps he might be little able to appreciate, another might rather feel that the miracles were so far proved as to complete the satisfaction which he had already derived from the other source.

The Christian revelation, which may be considered as forming one subject with the Jewish, from the wide field over which it is spread and the miscellaneous character of its contents, must necessarily supply, in large abundance, matter for examination in the way of evidence. An enumeration, which however does not pretend even to approach completeness, of the constituent parts of the body of evidence belonging to it, together with the proper mode of using them and estimating their joint force, may be found shortly but very clearly proposed in the first of Mr. Davison's 'Discourses on Prophecy.' Before we leave this part of the subject, we would observe, what seems sometimes to be overlooked, that an action may itself be a revelation. It would not be improper to say that the birth, death, and actions, even more than the discourses of Jesus Christ, were a revelation, of which the Apostles, who taught what are called the doctrines of Christianity, were only the interpreters. Of these doctrines it is not our business to treat, but we will select one as the subject of a few observations, merely with a view to illustrate what was said in a former part of this article, on the disposition of mind with which we must necessarily regard the pretensions and evidences of a professed revelation, according as we recognise, or not, a need which men have of extraordinary information on the subject of religion. The doctrine we select is that of the immortality of the soul and a future state of rewards and punishments. Without assuming the probability or improbability of this doctrine, we suppose it to be notorious that the immortality of the soul, or some kind of continued existence after bodily death, with liability to a state of happiness or suffering, has been very generally believed, in one shape or other, in all parts and at all periods of the world; and that this doctrine is distinctly delivered and prominently set forth in the New Testament. There is as little doubt that before the time of Christianity, either the notions commonly received of a future state were so irrational, or the belief of it so faint and unassured, that for the most part it had comparatively little effect on the moral feelings and conduct of men; and that on the other hand, wherever the Christian revelation has been published, this doctrine, whether true or false, has not only been firmly received with little variation in the manner of understanding it, but has influenced the conduct of many, happily or not, in the most important respects, and regulated the whole course of their lives. It is plain that those who regarded the distinct and authoritative announcement of this doctrine to be among the things especially needed by mankind, and those who considered it to be either useless or mischievous, would be very differently impressed by the general body of evidence in favour of the revelation.

Among professed revelations which have been the ground of a national religion, it may be doubtful whether we should place the mythological systems of antient Greece and Rome. They are indeed avowedly founded on traditional accounts of certain transactions between gods and men; but from the nature of the transactions, of the supernatural beings concerned in them, and the purposes of the interference, we may doubt whether the discoveries supposed to be made belong to the notion of a revelation according to our definition of the word, or the usual acceptation of it. The same for the most part may be said of the mythology of the Hindus and of the northern nations of Europe. But there can be no doubt that the religion of Mohammed, as taught in the Korán, professes to be founded on a revelation in the strict sense of the word, such as may be subjected to the same tests which we have supposed to be applicable to all revelations.

In passing from the Christian revelation itself to the written record of it, a new and important question is opened to us. The revelation may have been made to the persons who profess to have received it: but in recording it also, were they preternaturally assisted, or were they left to the use of their natural memories, and the guidance of their unassisted judgment? In other words, we are met by a question respecting what is called the inspiration of the books of Scripture, or, more properly, of the persons who wrote them. By this word we are to understand, not the preternatural infusion of revealed truths into the minds of the writers (which however would not be inconsistent with the original meaning of the word), but preternatural assistance in recording what had been so infused. This distinction should be observed. St. Paul, if we believe his own declaration, received immediately from God a message to men. He may be supposed to have delivered this message orally or in writing to others from memory; and in that case he would have been a deliverer and they receivers, in the strictest sense of the words, of a divine revelation; but the message, so delivered would not in theological language have been an inspired message, that is, spoken or written under inspiration. It is beside our purpose to defend or impugn the doctrine of the inspiration of Scripture generally, or, out of the various theories which have been put forth, to advocate one in preference to the others. We only wish to do something towards clearing away certain fears and difficulties, which seem to beset and mislead many in the very outset of the inquiry, and to offer a few suggestions as to the principle on which the inquiry should be conducted, to those who are not very conversant with the subject.

In the case of most persons educated in the Christian faith, their first introduction to the Bible is accompanied by an assurance that it was dictated by God, and is *therefore* true; and this is told them at a time when its claims, as an authentic history, independently of its inspiration, neither are nor can be explained to them. This early impression, perhaps unavoidable, that the Scriptures are to be received as true, *only* because they are the Word of God, is probably retained for the most part without question, in spite of its inconsistency with the method and object of books which are given, almost as universally as the Bible, to all educated persons for the purpose of establishing their faith on rational grounds. Hence they are habituated from the very nursery to confound in their minds two questions essentially distinct, the divine origin of the Christian religion, and the divine origin of the scriptural records of it. All might easily remove this confusion by simply answering the question, what would be the natural course of our inquiries, and by what steps should we arrive at conviction of the divine origin of the Christian religion, if the volume of the New Testament were for the first time put into our hands for examination, at an age when we were capable of making it? It is obvious that we should not begin with assuming the inspiration of the writers; for that would be assuming the very point in debate, assuming that for which we had not as yet a shadow of evidence. But neither is it of their inspiration that it would be our first object to find evidence; for such evidence could not at first be obtained. If we ever came to the conclusion that they were inspired, it must be because either the very supposition of a revelation from God included in it the supposition of a revelation on the part of those who communicated it, or because all the writers themselves claimed inspiration, or some, whose claims we had already allowed, attributed it to the rest. In the former case we must *first* have believed that a revelation was made; in other words, that the origin of the religion was divine: in the other, if we assent to the claim of inspiration, we must *first* have admitted the credibility, the veracity of those who make it; that is, if we believe them to be inspired because they say so, we must have had reason for believing what they say, on other ground than that of their inspiration. It seems then that it would be our first object to establish not the inspiration, but the credibility of the sacred writers apart from their inspiration. We should proceed from the establishment of their credibility, to inquire, in the second place, if they were inspired. The result, in short, to which we have actually come is this: the New Testament is put into our hands for examination, and we find that the claims of Jesus and his followers to a divine commission rest on the miracles which they are said to have performed. Our belief of the fact of the miracles depends on the credit we attach to the story of the witnesses. If that is substantially true, Jesus came from God. With the arguments by which the credibility of the gospel history is proved we have here no concern. It is plain that it is not proved by the inspiration of the authors. Some confusion seems to have arisen from a strange mistake respecting the kind of satisfaction which the inspiration of the sacred writers, when established, is capable of supplying. It does not confirm their veracity, it only implies their accuracy. It secures us from their mistakes, not from their falsehood. Now if it should be argued that without inspiration we can have no assurance that they were not mistaken, when they tell us that they saw a man dead on the cross, laid in his grave, and afterwards alive, it may be asked, how can they be secured from their liability to mistake, when they tell us that they are inspired? It is at least as likely that they should be mistaken in the one case as in the other. The obvious truth is, that if we cannot rely on their veracity when they vouch for miracles, we can trust none of their assertions, and admit none of their claims; and if they might be mistaken as to the fact of a miracle, they might be equally mistaken in their claim of inspiration for themselves or for others.

It is hardly necessary to observe that the various methods followed by writers on the evidences of the Christian religion are all in conformity with the view that has been taken of this subject. They endeavour to show the genuineness and authenticity of the books of the New Testament, the fidelity, disinterestedness, and integrity of the writers; to point out their means of information as human historians, and to confirm the accuracy of their accounts by comparison with other records. The question of inspiration forms no part of their inquiry. It is beside their object, which is to prove the divine origin of Christianity; and this is fully proved if their arguments are satisfactory.

It is not meant, of course, that all who are brought to a conviction of the truth of Christianity, arrive at it in the same manner. It is sufficient for our argument that it may be reached in the manner we have supposed. In short, on whatever support the believer himself may eventually feel that his faith habitually reposes, if he should ever be impelled by any motive to trace his conviction to a source from which it can be shown to others by reasoning that it may legitimately flow, he will find that he must rely, in the first instance, on the credibility of the sacred writers, however established, considered as uninspired historians. With this foundation laid he may commence an inquiry into the proofs of their inspiration; and he may pursue it with a full assurance that to whatever result it may lead, the divine origin of his religion is already secured; that he has in possession a revelation from God, truths divinely communicated to men. We may seem to have taken unnecessary pains to establish a point too plain to be disputed. Our justification must be, that it does not seem to have been so plain to some even of those who have written on the subject, and are occasionally quoted as authorities, and who have been led, apparently by the confusion which we deprecate, into unwarrantable insinuations of infidelity against those who differ from them in opinion.

If the question should be asked, where, when the divine origin of the religion is supposed to be established on the credibility of the sacred writers, we should look for proof that the books which are the records of it were written under the security of inspiration? the natural answer would be that it must be looked for in the books themselves, from the claims, declarations, and intimations of the writers. When, for example, one of the evangelists has recorded a distinct promise made by their master to his Apostles, of a divine gift for the declared purpose of assisting the memory and enlightening the understanding, the inference seems to be unavoidable that those to whom the promise was given must have written with more than natural advantages. The argument founded on the necessity of inspiration to render the sacred books effectual for the purpose for which they were intended, ought not perhaps to be slighted. We have seen indeed that the supposition of the divine origin of the religion does not necessarily require the admission of inspiration; yet the peculiar character of the contents of the books, together with the service they were destined to perform, may raise a presumption in its favour. The direct testimony however from the writers themselves must be principally regarded. But when commencing the examination, whilst the evidence is yet to be found, we must be careful to estimate correctly the degree of authority which ought in this stage of the inquiry to be attributed to the words of Scripture. They are not yet proved to be the words of God. The declarations of the writers must be received and interpreted fairly and liberally, as the solemn declarations on a solemn subject, of honest and credible writers, ought to be received and interpreted. If the evidence which we seek to obtain from them cannot be obtained in this manner, it cannot be obtained at all. To search Scripture for proofs of its inspiration whilst at the same time we assume it to be inspired, is a proceeding so obviously absurd, that if experience did not teach us otherwise, any caution against it would seem to be unnecessary. But even when this strange error is not committed, declarations of the sacred writers, apparently bearing on this subject, may be and often are improperly summoned to the cause. When a writer professes to have received secret suggestions from the deity, that is, to be the subject of inspiration in one sense of the word, he is represented as claiming it in the other, as though the privilege of receiving communications necessarily implied the privilege of infallibility in recording them. This confusion has been noticed on another occasion.

That most popular argument for the inspiration of a particular book, founded on testimony borne to the purity and integrity of the canon of Scripture, may be soon disposed of. When it has been proved that a book forms part of what is called the canon, it may follow that it forms part of Scripture. This will not carry us far when the question to be decided is, what are the claims of Scripture to inspiration?

There is one mode of proof, besides those already mentioned, which ought perhaps to be noticed, as being much in favour with some theologians, namely, an appeal to what is called the tradition of the church. There are some advocates of inspiration, in the strictest sense and most unlimited application of the term, who allow, or rather contend, that the proof of it rests mainly, if not entirely, on the testimony of tradition. An examination of the value of this testimony would oblige us to enter more largely, than would here be expedient, on the important question of ecclesiastical tradition generally. We shall content ourselves with saying that, in this case at least, we greatly doubt, for many reasons, the sufficiency of the witness, and are not satisfied, even where it speaks to the purpose, that its words have always been rightly understood. However this may be, it is plain that this mode of proof also supposes the question of the divine origin of the Christian religion to be independent and to have precedence of the question of inspiration.

We shall close this article with a brief notice of the three most popular theories of inspiration, which are distinguished from each other more in respect of the extent to which they attribute inspiration, than in respect of any difference in the meaning assigned to the word.

That which is called verbal inspiration supposes each word in the Bible, as we now have it, with due allowance made for mistakes of transcribers, to have been irresistibly dictated by the Spirit of God, the writers being only vehicles of words and thoughts not their own. This notion of inspiration has undoubtedly still its advocates; but we are not aware that it is at present maintained by any divine of repute. According to another theory, somewhat modifying the former, the writers were allowed to exercise their own judgment in the choice of their words; but in the meaning of each sentence, from the first verse of Genesis down to the last of the Revelations, they have been secured by supernatural interference from the least particle of error. This theory, which is not without support from well-known theologians, represents perhaps more nearly than any other the popular creed. Lastly, there are many, and amongst them divines of great eminence and reputed orthodoxy, and not a few distinguished prelates of the English church, who limit the extent of inspiration as commonly received, and suppose that parts of Scripture may have been written with the liability to error incident to ordinary histories; those for instance which are purely historical, and contain no religious truth. As to the degree in which this limitation is to be admitted, and the number and length of passages to be excepted from the sanction of inspiration, there is of course room for diversity of opinions, which affords apparent ground for objection to the theory itself. The advocates of the two former theories contend that a latitude for choice is allowed which is capable of a dangerous abuse. The truth of the allegation cannot be disputed; but perhaps it is not possible by any device to exclude the danger which alarms them. The canon of Scripture has not been ascertained to us by an authoritative revelation, nor has the purity of the text been absolutely secured by providential interference. A liberty is thus left, which in these cases also may become dangerous to those who are willing to abuse it. Some however may think that the test of sincerity and right intention, and the means of probationary discipline which the allowance of such a measure of discretion affords, is apparently in harmony with what we have been taught of God's moral government of the world. On the other hand it is objected to the advocates of the more rigid theories, that the faith of the believer is exposed to still greater danger by the forced constructions and violent treatment of the text which their systems have often induced them to employ.

It is plain that reliance on the truth of the Scriptures generally, as containing a divine revelation, can in no respect be strengthened by the belief in plenary inspiration. On the other hand, since those who have identified in their minds the plenary inspiration with the truth of the Bible, must with the one abandon the other, the indisputable detection of even a geographical or chronological error, however unimportant in itself, of a discrepancy between the sacred writers, irreconcileable by any legitimate process, as to a single circumstance, however minute and trivial, in recording the same fact, must destroy their faith; and hesitation as to the possible removal of such difficulties must impair or disturb it. It is absurd to suppose that any theory of inspiration can reconcile us to such a quantity of error as would overthrow the credibility of ordinary historians; for the presence of it in the Scriptures would be fatal to the only evidence on which their inspiration in any sense can be reasonably maintained.

It might perhaps have been expected that we should notice a certain classification of the phenomena of inspiration of which many theologians are fond, certain distinctions in kind, under the titles of impulsive, suggestive, superintending, and many others. The truth is, we think them to be of very little value on any view of the subject. They seem to have been adopted by theologians who hold the theory of plenary but not verbal inspiration, from a wish to remove the necessity of supposing a greater quantity or degree of miraculous agency than the occasion required.

We have drawn none of our materials from the writings of a class of theologians who, regarding the Scriptures as in some sense, not very clearly defined, vehicles of religious truth, exclude all notion of revelation which is not equally applicable to discoveries made by human intelligence, and who give no credit to assertions of miraculous interposition, whether in conveying knowledge or attesting facts. Whatever consideration may be due to the writers, some of whom are men of ingenuity and research, their speculations could hardly have an appropriate place in the subjects to which this article is confined. [RATIONALISM.]

REVELATIONS, BOOK OF. [APOCALYPSE.]

REVELS, MASTER OF THE, an officer in noblemen's and other great houses, appointed *pro tempore* to manage the Christmas diversions from All-hallow-eve to Candlemas-day; more ordinarily called the *Lord of Misrule*. In the royal household however the master of the revels was a permanent officer, and was called Master or the Tents and Revels or Masks and Revels, whose business it was to keep the tents and pavilions belonging to the king, which were often, if not always, carried with the king upon removes and progresses. This officer had also the keeping of the dresses and masks which were used in entertainments given at court, and he was to provide such new ones as were wanted.

The permanent office of master of the revels was first instituted in the reign of Henry VIII. Queen Elizabeth divided the mastership of the revels into several offices, which, as vacated by death, were to be re-united. In 1663 we find two masters of the toils, tents, hayles (*i.e.* halls or temporary buildings), and pavilions, who again occur in 1674.

See the 'Archæologia,' vol. xviii., p. 318, &c., and 'The Loseley Manuscripts,' edited by A. J. Kempe, Esq., 8vo., Lond., 1836. Various papers in illustration of the office in Queen Elizabeth's time are contained among the Lansdowne MSS. in the British Museum. See also MS. Addit., Brit. Mus., 5750. No mention of this office has been found subsequently to the reign of King Charles II.

REVERSION. By a reversion, in the widest sense, is meant a right of property the enjoyment of which is to commence at some future period, fixed or depending on contingencies, and is to continue either for ever or during a term either fixed or depending on a contingency: anything in fact which is to be entered on, or which may be entered on, at a future time, is a reversion in books which treat on the value of property. The legal sense of the word is more restricted.

Thus an assurance of 100*l.*, or a contract to pay 100*l.* at the death of a given individual, is 100*l.* in reversion to the executors of that individual. Our object in this article is to treat of this most common species of reversionary contract, life insurance or assurance. At the time when the article INSURANCE should have appeared, the mania for forming new companies was at its height, which made us judge it advisable to defer the consideration of the subject, that the list which we proposed to give of such companies might be more complete.

The value of a reversion depends in a very easy manner upon the value of the corresponding annuity; that is, any given sum, say 100*l.*, to be received *when* a given event arrives, depends for its value upon that of 100*l.* a year to be received *till* the event arrives. Suppose, for example, that money makes five per cent., and that an annuity, say upon a life, is worth 14 years' purchase, upon the method of calculation explained in ANNUITY, p. 49. That is, 100*l.* paid a year hence, and again two years hence, and so on as long as the life lasts, is now worth 1400*l.* Required the value of 100*l.* to be paid at the end of the year* in which the life drops. We must now reason as follows:—Suppose a perpetual annuity of 100*l.* a year is to be enjoyed by A during his life, and by his legatees after him. By hypothesis A's portion is now worth 1400*l.*, and (money making five per cent.) the annuity for ever (INTEREST) is worth 20 years' purchase, or 2000*l.*; consequently the legatees' interest is *now* worth 2000−1400, or 600*l.* But at the end of the year of death the legatee will come into 100*l.* current payment, and a perpetual annuity worth 2000*l.*; for the remainder of a perpetual annuity is also a perpetual annuity: his interest will *then* be worth 2100*l.* Hence we have ascertained that 2100*l.* at the end of the year of death is now worth 600*l.*; and the rule of three then gives the value of any other sum: thus 100*l.* at the end of the year of death is now worth $\frac{600}{21}$*l.*, or 28*l.* 11*s.* 5½*d.* Hence the following easy

RULE.—To find the value of a given reversion, subtract the value of the same annuity from that of a perpetual annuity, and divide the difference by one more than the number of years' purchase in a perpetual annuity: or multiply the excess of the number of years' purchase in a perpetual annuity over that in the life annuity by the reversionary sum, and divide as before.

Next, to find what premium should be paid for the reversion. A premium differs from an annuity in that a sum is paid down, and also at the end of every year: consequently it is worth one year's purchase more than an annuity. In the preceding question, the annuity was worth 14 years' purchase; consequently the premium now is worth 15 years' purchase. But the present value of all the premiums is to be also the present value of the reversion, or 28*l.* 11*s.* 5½*d.*, whence the premium should be the 15th part of this, or 1*l.* 18*s.* 1*d.* Hence to find the premium, divide the present value of the reversion by one more than the number of years' purchase in the life annuity. But when, as most commonly happens, the premium is wanted without the present value, the following is an easier

RULE.—Divide the reversionary sum separately by one more than the number of years' purchase in the perpetual annuity, and one more than the number of years' purchase in the life annuity: the difference of the quotients is the premium required. Thus if in the preceding example we divide 100*l* by 20+1 and by 14+1, or by 21 and 15, we find 4*l.* 15*s.* 3*d.* and 6*l.* 13*s.* 4*d.*, which differ by 1*l.* 18*s.* 1*d.*, the same as before.

The life we have been tacitly considering, when we talked of an annuity being worth 14 years' purchase, at five per cent., is one of about 36 years of age. The first impression must be, that the proposed premium is ridiculously small. Make it up to 2*l.*, and it will be 50 years before the premiums reach 100*l.* Some such consideration must have moved the law officers of the crown, in 1760, when they refused a charter to the Equitable Society, then charging a premium of about 4*l.* at the age of 36, on account of the lowness of their terms. But it is to be remembered that those who receive the premiums are to invest them immediately at five per cent., and are to invest the interest, thus making compound interest; persons aged 36 live, one with another, about 30 years, which is sufficient time for the premiums, with their interest, to realize 100*l.* for each person, one with another.

We now show the manner in which a simple result of calculation answers its end. To simplify the case, suppose an office starts with 5642 individual subscribers, each aged 30 years, the mortality among them being that of the Carlisle Table. [MORTALITY, p. 416.] The bargain is for a short assurance, as it is called, of 20 years, and of 1000*l.*: that is to say, the executors of each one who dies within 20 years are to receive 1000*l.* at the end of the year of death. Money makes three per cent. once a year. According to the table then, there are 57, 57, 56, &c. deaths in the successive years, and the following is the result, the proper premium being calculated at 11*l.* 12*s.* 3½*d.* each person, or more exactly 11,614*l.* 16*s.* for 1000 persons. It is supposed that there are no expenses of management. By P is meant that premiums are paid, and the number paid precedes the letter: by *y*, that a year's interest is received, and by *c*, that claims, in number as stated, are paid; small letters denote a transaction at the end of a year, and the large letter one at the beginning; the age of the parties paying premiums is in parentheses at the beginning. Fractions of pounds are neglected, one pound being written for everything above ten shillings.

	£		£
(30) 5642 P	65530	Bt. over +	42783
y	1966	(34) 5417 P	62917
	67496		105700
57 *c*	57000	*y*	3171
	10496		108871
(31) 5585 P	64869	55 *c*	55000
	75365	+	53871
y	2261	(35) 5362 P	62279
	77626		116150
57 *c*	57000	*y*	3485
+	20626		119635
(32) 5528 P	64207	55 *c*	55000
	84833	+	64635
y	2545	(36) 5307 P	61640
	87378		126275
56 *c*	56000	*y*	3788
+	31378		130063
(33) 5472 P	63557	56 *c*	56000
	94935	+	74063
y	2848	(37) 5251 P	60989
	97783		135052
55 *c*	55000	*y*	4052
+	42783		139104

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* Assurance companies usually pay in a few months after proof of death, which gives a trifling advantage to the assured, not worth considering in a very elementary statement of the question.

	£
Bt. over	139104
57 c	57000
+	82104
(38) 5194 P	60327
	142431
y	4273
	146704
58 c	58000
+	88704
(39) 5136 P	59654
	148358
y	4451
	152809
61 c	61000
+	91809
(40) 5075 P	58946
	150755
y	4523
	155278
66 c	66000
–	89278
(41) 5009 P	58179
	147457
y	4424
	151881
69 c	69000
–	82881
(42) 4940 P	57378
	140259
y	4208
	144467
71 c	71000
–	73467
(43) 4869 P	56553
	130020
y	3901
	133921
71 c	71000
–	62921

	£
Bt. over –	62921
(44) 4798 P	55729
	118650
y	3560
	122210
71 c	71000
–	51210
(45) 4727 P	54904
	106114
y	3183
	109297
70 c	70000
–	39297
(46) 4657 P	54090
	93387
y	2801
	96188
69 c	69000
–	27188
(47) 4588 P	53288
	80476
y	2414
	82890
67 c	67000
–	15890
(48) 4521 P	52510
	68400
y	2052
	70452
63 c	63000
–	7452
(49) 4458 P	51779
	59231
y	1777
	61008
61 c	61000
	8

At the outset the office receives 65,530*l.* from the 5642 persons assured; this is immediately invested at 3 per cent., and yields 1966*l.* by the end of the year, making 67,496*l.* But at the end of the year the claims of the executors of 57 persons who have died during the year are to be satisfied, which requires a disbursement of 57,000*l.*, reducing the society's accumulation to 10,496*l.* The contributors who are left, 5585 in number, now pay their second premiums, 64,869*l.*, so that, these being immediately invested, the company has 75,365*l.* at interest during the second year. This yields 2261*l.*, so that by the end of the year 77,626*l.* is accumulated. Then comes the demand of 57,000*l.* on behalf of 57 contributors deceased during the year, which reduces the accumulation to 20,626*l.* This is more than it was at the same time last year, which is denoted by +. In this way the company goes on, accumulating to an amount which would lead a person unacquainted with the subject to conclude that the premium must be too large: in fact ten years give an accumulation of 91,809*l.* But now the state of affairs begins to change; the contributors have been diminishing, while the claims have been increasing, until the yearly incomings no longer equal the outgoings. The accumulations then come in to make good the difference in such manner that by the time the remaining contributors come to be 50 years of age, and the claims of 61 who died in their fiftieth year have been satisfied, there only remains 8*l.* of the 91,809*l.*; and this 8*l.* is merely the error arising from omitting shillings, &c. in the calculation. Something of the same kind must take place in every office which dies a natural and a solvent death; the only difference being that, when new business ceases, instead of a number of contributors all of the same age, and under similar contracts, both ages and contracts vary considerably.

There are certain tables which are variously named (sometimes after Mr. Barrett, the inventor, sometimes after Mr. Griffith Davies, the improver; sometimes after D and N, letters of reference used in them), but which we call commutation tables. They are described in the 'Treatise on Annuities,' in the *Library of Useful Knowledge*, and a copious collection is given: also in an article in the 'Companion to the Almanac' for 1840. They very much exceed in utility those which preceded them; and we shall here give part of one of them, namely, that for the Carlisle Table, at 3 per cent., which contains the materials for judging of the demands made by an insurance company in cases involving one life only. Opposite to each age of life are three rows of figures in columns marked D, N, and M: and by M (x) we mean the number in column M opposite to the age x.

Age.	D.	N.	M.	Age.
0	10000·00	173198·26	4664·129	0
1	8214·56	164983·70	3169·954	1
2	7332·45	157651·25	2527·103	2
3	6656·74	150994·51	2064·957	3
4	6217·63	144776·88	1819·735	4
5	5863·15	138913·73	1646·351	5
6	5591·04	133322·69	1545·0149	6
7	5361·53	127961·16	1478·3414	7
8	5159·58	122801·58	1432·5557	8
9	4976·34	117825·24	1399·5998	9
10	4806·85	113018·39	1375·0447	10
11	4645·89	108372·50	1354·0945	11
12	4488·83	103883·67	1332·3517	12
13	4336·30	99547·37	1310·5613	13
14	4188·18	95359·19	1288·7444	14
15	4043·73	91315·46	1266·2792	15
16	3901·65	87413·81	1241·9757	16
17	3762·60	83651·21	1216·5650	17
18	3627·75	80023·46	1191·3070	18
19	3497·56	76525·90	1166·7847	19
20	3371·89	73154·01	1142·9766	20
21	3250·56	69903·45	1119·8620	21
22	3133·96	66769·49	1097·9425	22
23	3021·40	63748·09	1076·6614	23
24	2912·74	60835·35	1056·0002	24
25	2807·84	58027·51	1035·9408	25
26	2706·12	55321·39	1016·0019	26
27	2607·95	52713·44	996·6438	27
28	2512·32	50201·12	976·9753	28
29	2417·93	47783·19	955·7580	29
30	2324·43	45458·76	932·6867	30
31	2233·93	43224·83	909·8874	31
32	2146·73	41078·10	887·7522	32
33	2063·09	39015·01	866·6387	33
34	1982·87	37032·14	846·5062	34
35	1905·57	35126·57	826·9601	35
36	1831·09	33295·48	807·9833	36
37	1759·00	31536·48	789·2243	37
38	1689·22	29847·26	770·6864	38
39	1621·71	28225·55	752·3727	39
40	1555·78	26669·77	733·6727	40
41	1490·82	25178·95	714·0293	41
42	1427·46	23751·49	694·0911	42

Age.	D.	N.	M.	Age.
43	1365·96	22365·53	674·1726	43
44	1306·84	21078·69	654·8342	44
45	1250·00	19828·69	636·0591	45
46	1195·62	18633·07	618·0875	46
47	1143·60	17469·47	600·8886	47
48	1094·08	16395·39	584·6747	48
49	1047·41	15347·98	569·8728	49
50	1002·99	14344·99	555·9583	50
51	960·707	13384·278	542·8920	51
52	919·395	12464·883	529·5612	52
53	879·047	11585·836	515·9924	53
54	839·663	10746·173	502·2108	54
55	801·433	9944·740	488·4371	55
56	764·144	9180·596	474·4915	56
57	727·792	8452·804	460·3956	57
58	691·828	7760·976	445·6299	58
59	655·419	7105·557	429·3712	59
60	618·338	6487·219	411·3795	60
61	580·223	5906·996	391·2752	61
62	543·165	5363·831	371·1165	62
63	507·618	4856·213	351·3896	63
64	473·982	4382·231	332·5389	64
65	441·875	3940·356	314·2372	65
66	411·379	3528·977	296·6107	66
67	382·422	3146·555	279·6357	67
68	354·803	2791·752	263·1551	68
69	328·468	2463·284	247·1545	69
70	303·240	2160·044	231·4936	70
71	279·203	1880·841	216·2889	71
72	255·119	1625·722	200·3366	72
73	230·813	1394·909	183·4619	73
74	206·585	1188·324	165·9566	74
75	182·483	1005·841	147·8717	75
76	160·245	845·596	130·9482	76
77	139·558	706·038	114·9284	77
78	120·936	585·102	100·3722	78
79	104·637	480·465	87·5951	79
80	89·5602	390·9053	75·5660	80
81	76·3678	314·5375	64·98221	81
82	64·2223	250·3152	55·06098	82
83	53·5795	196·7357	46·28874	83
84	44·1701	152·5656	38·43998	84
85	36·0741	116·4915	31·63048	85
86	28·8845	87·6070	25·49154	86
87	22·6179	64·9891	20·06629	87
88	17·2112	47·7779	15·31836	88
89	13·0366	34·7413	11·64505	89
90	9·92975	24·81154	8·91787	90
91	7·12856	17·68298	6·40590	91
92	4·94352	12·73946	4·42849	92
93	3·45567	9·28379	3·084616	93
94	2·48520	6·79859	2·214797	94
95	1·80961	4·98898	1·611594	95
96	1·34696	3·64202	1·201650	96
97	1·02344	2·61858	·917362	97
98	·772823	1·845761	·696555	98
99	·589532	1·256229	·535773	99
100	·468295	·787934	·431707	100
101	·353621	·434313	·330672	101
102	·245230	·189083	·232580	102
103	·142852	·046231	·137345	103
104	·046231	·000000	·044884	104

To find the value of an annuity of 1*l.* on a life of any age, divide the N of that age by its D. Thus, at the age of 35 the value of an annuity of 1*l.* is N(35)÷D(35), or 35126·57 ÷1905·57, or 18·433*l.*, or 18*l.* 8*s.* 8*d.* Thus, the following formulæ will be readily understood:—

Value of an annuity which is to commence immediately: that is, which is to make the first payment in a year (age x) .	$\frac{N(x)}{D(x)}$
Value of an annuity which is to commence in n years; that is, to make the first payment in $n+1$ years, if the party be then alive (present age x) . .	$\frac{N(x+n)}{D(x)}$
Premium for such an annuity, payable now and n times in all	$\frac{N(x+n)}{N(x-1)-N(x+n-1)}$
The same premium, payable $n+1$ times	$\frac{N(x+n)}{N(x-1)-N(x+n)}$
Value of a life annuity for n years; or payable n times at most .	$\frac{N(x)-N(x+n)}{D(x)}$
Present value of an assurance of 1*l.* at death . . .	$\frac{M(x)}{D(x)}$
Premium for the same . .	$\frac{M(x)}{N(x-1)}$
Present value of an assurance of 1*l.* at death if after n years .	$\frac{M(x+n)}{D(x)}$
Premium for the same, payable $(n+1)$ times . . .	$\frac{M(x+n)}{N(x-1)-N(x+n)}$
Present value of an assurance of 1*l.* at death if within n years	$\frac{M(x)-M(x+n)}{D(x)}$
Premium for the same, payable n times	$\frac{M(x)-M(x+n)}{N(x-1)-N(x+n-1)}$

As an instance, let us take the case of the last formula, which was proposed at the beginning of this article: the age is 30, and the term of insurance 20 years; we have then to divide the excess of M(30) over M(50) by the excess of N(29) over N(49):—

$$\begin{array}{llll} M(30) & 932{\cdot}6867 & N(29) & 47783{\cdot}19 \\ M(50) & 555{\cdot}9583 & N(49) & 15347{\cdot}98 \\ \hline & 376{\cdot}7284 & \text{div. by} & 32435{\cdot}21 \text{ gives } {\cdot}0116148: \end{array}$$

this is for 1*l.*, giving 11·6148*l.*, or 11*l.* 12*s.* 3½*d.* for 1000*l.*, and 11,614·8*l.* to be the total premium for 1000 persons.

Question.—If the office insure a large number of persons (for the whole life or a term) at the premium p (the age being x), what will be their accumulation in n years, upon the suppositions the working of which has been shown in the example already given; it being supposed that £A is insured to every one who dies? The answer is in the following formula: for every person who, according to the tables, is alive at the end of the term of n years, there is remaining in the office, after all claims have been paid up to the end of the n years, and before the $(n+1)$th premium is paid, the sum

$$\frac{p\left\{N(x-1)-N(x+n-1)\right\}-A\left\{M(x)-M(x+n)\right\}}{D(x+n)}$$

As an example we shall verify the accumulations of 10 years in the instance referred to; in which $p=11{\cdot}6148l.$, $A=1000l.$, $x=30$, $n=10$.

$$\begin{array}{lr@{\qquad}lr} N(29) & 47783{\cdot}19 & M(30) & 932{\cdot}6867 \\ N(39) & 28225{\cdot}55 & M(40) & 733{\cdot}6727 \\ \hline & 19557{\cdot}64 & & 199{\cdot}0140 \\ & \times 11{\cdot}6148 & & 1000 \\ \hline & 227158{\cdot}1 & & 199014{\cdot}0 \\ & 199014{\cdot}0 & & \\ \hline & 28144{\cdot}1 & & \end{array}$$

$$D(40) \quad 1555{\cdot}78)28144{\cdot}1(18{\cdot}09002$$

$$\begin{array}{r} \times 5075 \\ \hline 91806{\cdot}84 \end{array}$$

The answer is, that the reserve of premiums for each person of the 5075 then remaining is 18·09002l., which for the whole is 91806·84l. The rough answer in the scheme worked out at length is 91,809l.

Now, this 18·09l., or 18l. 1s. 10d., is what is called the value of each man's policy at the expiration of the ten years; or the *very utmost* the office could afford to give him to surrender all claim, and to keep his future premiums to himself. But what is the nature of his claim on the office? Evidently this, that he has a right to make them give him a guarantee for the next ten years on payment of a premium of 11l. 12s. 3½d., which could not be done at so low a rate for a new comer. Compute the premium for a person entering at 40, and insuring 1000l. for 10 years; that is, divide 1000 times M(40) − M(50) by N(39) − N(49), and the answer will be found to be 13·800l., or 13l. 16s. If then any party aged 40, having been in the office ten years, were to put another person of the same age in his place at his own premium, he would obviously make that person a present of the difference between 11·6148l. and 13·800l., at once (since a premium is to be paid immediately), and for nine succeeding years, if the latter should live so long. And 13·800 − 11·6148 is 2·1852, while an annuity of 2·1852l. for nine years, at the age of 40, is worth N(40) − N(49) divided by D(40) and multiplied by 2·1852, or 15·903l. Add to this 2·185l. for the immediate difference, and we get 18·088l., differing only a halfpenny from 18·090l., the sum which the office has in reserve. If then the person who is to take the place of the insured at 40 years of age, were to pay him an equivalent, he must, besides taking on himself the future premiums, pay the retiring member 18·090l., which is therefore the value of the latter's policy. The last formula will always give the *accumulation* value of a policy, whether for the whole life or for a fixed term.

The preceding contains the most material calculations which are necessary in the management of an office, or rather, in forming an opinion on the management of an office. It is to be remembered that all which has hitherto been said supposes the rates of mortality and interest to be absolutely known and invariable, the parties to enter on their birthdays, and all claims to be adjusted at the terminations of whole years from the time of entry. We now proceed to the application.

An assurance company is a savings' bank, with a mutual understanding, presently to be noticed, between the contributors. To make out this proposition, let us suppose that A borrows money, and insures his life for the amount as a security to his creditor. For this he has to pay a premium. If life were certain, the office of the company would be to receive and invest these premiums, which would be calculated in such a manner as with their interest to amount to a sum sufficient to discharge the loan in a settled time. At the end of this time the creditor (who has been all this while receiving interest for his money from A) calls upon A to make his claim upon the office, and repay the loan with the money received. If such an office existed, life being certain, the rationale of the proceeding would be that the creditor, though tolerably confident of A's power and willingness to make any yearly payment, whether of interest or instalment, will not trust him steadily to lay by and improve yearly instalments, but requires that he should make his instalments payable to third parties, who are engaged not to return them on demand until they amount to a sum sufficient for the discharge of the debt. Such an office certainly could not exist, on account of the uncertainty of individual life. As soon however as it is known that the duration of masses of individuals can be calculated with tolerable accuracy, there is a remedy for the individual uncertainties. Let a large number of debtors, similarly situated with A, agree to be guarantees for one another; that is, let each of them pay during his life not only his own instalments, but such additional sums as will provide the means of meeting the deficits of those who die, and the savings' bank thus constructed will become an assurance-office. Of course it matters nothing whether these debtors pay their instalments to a person agreed on among themselves, or go to a company which undertakes the management of such concerns. And again, it makes no difference whether the instalments are for liquidation of debt, or to accumulate a provision for widows and children. We have taken the case of debtors, because in such a case an office looks more like a mere indemnity-office than when its contributors enter for the benefit of their families: still however, in the former case, it is evident that the premiums are partly instalments of debt, partly sums intended to make good the deficiency of the life-instalments of those who die.

Let us now suppose a company to be formed for the simple purpose of assuring lives. Their business is to invest the premiums of those who assure with them; their receipts will consist entirely of current premiums and interest on the investments of the old ones; and their outgoings will contain expenses of management, payment of claims, purchase of their own policies, and (possibly) losses by bad investment.

There is one question which is generally settled at the very outset, namely, whether the company is to be what is called mutual, proprietary, or mixed.

A mutual company is one in which the members stand bound to each other, and constitute the company themselves. In such a company no capital is, generally speaking, raised at the outset, except a small sum for necessary expenses at starting. This however is not necessarily the feature of a mutual company; for if its members choose to constitute themselves an investment company as well as an assurance company, they may, without losing their *mutual* character, require every assurer to be also a shareholder. In a mutual company the profits of course are divided among the assured.

A proprietary company is one in which a body of proprietors raise a capital and pledge it for the payment of claims, in case the premiums are not sufficient: for this security they receive, in addition to the interest of their own capital, the profits of the assurance business. It has long been proved that, with proper tables of premiums, and a fair amount of business at starting, this capital is an unnecessary security; and the only reason which could now make such an office desirable, would be the lowness of its premiums. Of course it matters nothing to the assured how they are paid, as long as they are paid; the capital may be diminished, but the assurer cares for nothing except its exhaustion before his turn comes. This must be the sole consideration with a person who is tempted by low premiums to a purely proprietary office: the nominal capital signifies nothing; it is upon the amount of assurance to which it (with the premiums) is pledged that the solvency of the office depends. Generally speaking however we believe it will be found that the purely proprietary offices have not allowed themselves to run much risk.

A mixed office is one in which there is a proprietary company, which does not take all the profits, but a share; the rest being divided among the assured. The only good effect of the capital upon the condition of the assured in such a company is this:—that the directors, having fixed capital as well as premiums, may justifiably seek for investments which a mutual company must avoid. Having the capital to make good purely commercial losses, they may perhaps attempt to get a higher rate of interest, and of course take more risk of loss; the assured, who are sharers in the whole of the profits, since the profits of premiums and profits of original capital are not distinguished, come in for their share of the extra profits of the capital. But no such attempt at gaining higher interest by secondary securities should be made until a sum sufficient (with future premiums) to meet all claims is invested in the very safest securities which the state of society offers.

There is much confusion in the ideas of many persons about interest, arising from not distinguishing between interest and other returns. The following remarks may serve to explain our meaning:—

Interest is the return which is made for the use of money, when the owner entirely relinquishes its management, and believes he has undoubted security for its return. 'Interest,' says Mr. M'Culloch, 'is nothing more than the net profit on capital.' The same author goes on to say, 'the rate of interest on each particular loan must of course vary according to the supposed solvency of the borrowers, or the degree of risk supposed to be incurred by the lender.' But here the acute writer from whom we quote, after setting out with the accurate definition of the political economist, proceeds to use the word in the common sense, in which it is no longer the net profit of capital. For this variation in the rate of interest (so called), this addition for possible insolvency, is or is meant to be only as much as will make every debtor who does pay contribute towards the bad debts of those who do not. Nothing then is netted by the increase for suspicion of insolvency, in the long run, and one debt with another; so that, abiding by Mr. M'Culloch's definition of interest as the correct one, we should propose to call the additional sum debt insurance. To this we must add, that when a person employs his own money, as in trade or manufactures, he also gains that additional return which a borrower counts upon reserving to himself after paying the interest (and debt insurance, if any) to his creditor. This is neither interest nor debt-insurance, but is of the nature of salary, by which name it might be called. Perhaps it would be best to retain the term interest in its general loose signification, and to subdivide it, for accuracy, into pure interest or net profit, debt-insurance, and salary.

In the construction of a table of premiums, three points must be left to the judgment of the constructor, the rate of interest, the table of mortality, and the addition to be made for expenses of management and probable fluctuation, or discrepancy between the predictions of the table and the events which actually arrive. The third point would not arise if, as was once the case, the table of mortality made life much worse than the actually prevailing state of things shows it to be. Security against adverse fluctuation is thus taken in the choice of the table; and this was done by the older offices, which chose the Northampton Table;—by the Equitable, for instance. (Compare the mean duration of life in the Northampton Table with that of the Equitable experience, in MORTALITY.) But we hold decidedly by the method of choosing a true table, and augmenting the premiums given by it as a safeguard against fluctuation; and for this reason, that wrong tables are usually unequally wrong, making different errors at different ages, and thus augmenting different real premiums by different per-centages.

According to the Carlisle Table (which we prefer for the purpose), of 5642 persons alive at the age of 30, 3018 are alive at 65, whence the chance of living till the second age is 3018 ÷ 5642 or ·5525. Now by applying calculation to this question, we find that an office which would have practical certainty (thousands to one for it) that, as far as this instance is concerned, the office should not be injured by adverse departure of events from tables, must make provision for twenty-five deaths, at least, in the period abovementioned, more than the tables predict, out of 250 persons at the commencement. And this even on the supposition that the table itself can be certainly reckoned upon as representing the law of mortality of the whole insurable population. It would be a very long process indeed to apply calculation in detail, so as to form a well supported idea of the proper amount of precaution against fluctuation; and the question is mixed up with another, to which we proceed.

The rate of interest to be assumed is an element which requires the greatest caution. It must be a rate which can actually be made, and therefore prudence requires that it should be something below that which may reasonably be looked for. To show how powerful an agent it is, we shall repeat the example already given, of the 5642 insurers for twenty years, on the supposition that the office which charges as for 3 per cent. finds itself able to make 3½ per cent.

	£
(30) 5642 P	65530
y	2294
	67824
57 c	57000
	10824
(31, 5585 P	64869
	75693
y	2649
	78342
57 c	57000
+	21342
32 5528 P	64207
	85549
y	2994
	88543

	£
Bt. over	88543
56 c	56000
+	32543
(33) 5472 P	63557
	96100
y	3354
	99464
55 c	55000
+	44464
(34) 5417 P	62917
	107381
y	3758
	111139
55 c	55000
+	56139

	£
Bt. over +	56139
(35) 5362 P	62279
	118418
y	4145
	122563
55 c	55000
+	67563
(36) 5307 P	61640
	129203
y	4522
	133725
56 c	56000
+	77725
(37) 5251 P	60989
	138714
y	4855
	143569
57 c	57000
+	86569
(38) 5194 P	60327
	146896
y	5141
	152037
58 c	58000
+	94037
(39) 5136 P	59654
	153691
y	5379
	159070
61 c	61000
+	98070
(40) 5075 P	58946
	157016
y	5496
	162512
66 c	66000
—	96512
(41) 5009 P	58179
	154691
y	5414
	160105
69 c	69000
—	91105
(42) 4940 P	57378
	148483
y	5197
	153680

	£
Bt. over	53680
71 c	71000
—	82680
(43) 4869 P	56553
	139233
y	4873
	144106
71 c	71000
—	73106
(44) 4798 P	55729
	128835
y	4509
	133344
71 c	71000
—	62344
(45) 4727 P	54904
	117248
y	4104
	121352
70 c	70000
—	51352
(46) 4657 P	54090
	105442
y	3690
	109132
69 c	69000
—	40132
(47) 4588 P	53288
	93420
y	3270
	96690
67 c	67000
—	29690
(48) 4521 P	52510
	82200
y	2877
	85077
63 c	63000
	22077
(49) 4458 P	51779
	73856
y	2585
	76441
61 c	61000
	15441

It thus appears that the office leaves off with an accumulation of 15,441*l.* nearly; and if it be lucky during the first years, it may be said to be safe (as we find) against any fluctuation for which there is an even chance, by the increase of interest alone.

Take what amount of precaution we may, an office must, at first starting, depend upon something either of capital or guarantee. Even a mutual office must raise something at the outset. Tables must be constructed with very large additions to the calculated premiums, which are to meet the very earliest contingencies alone; indeed it is difficult to say what addition would be too large. But this point it is unnecessary to insist on, since we can hardly suppose it possible that any set of men would found an office with no resource except premiums from the very commencement. Supposing proper precautions to be taken, we imagine that an addition of 25 per cent. to premiums calculated from the Carlisle Tables at 3 per cent. per annum, is sufficient to place a mutual office upon a sound footing, and to give a very great prospect of a return in the shape of what is called profit. In never has been found that an office charging at this rate has been without surplus of some kind.

This surplus has been called by the inaccurate name of profit, whereas it is really that part of the security against fluctuation of interest and mortality which has been found to be unnecessary. In mutual offices it is to be returned to the assured in an equitable manner; in purely proprietary offices it is really profit to the proprietors, whose capital has yielded them the ordinary interest, since by hypothesis none of it has been necessary to meet claims, and they therefore share among themselves the residue of the premiums. It is impossible to avoid this surplus in a well-constituted office, for the mathematical line which separates surplus from deficiency cannot be expected to be attained, so that those who would not have the latter must take care to have the former. It is usual among the offices to adopt a plan for increasing this surplus, which we will now describe.

Two rates of premiums are adopted, the one less than the other. Those who pay the higher rate are to have a share of the surplus; those who pay the lower rate have nothing but the nominal sum for which they assure. If the table of lower rates yield a surplus (which it is supposed it will do), that surplus goes to augment the final receipts of those who assure for profits. This scheme may be very well practised by a proprietary company, or by an old mutual company, but whether it is a good plan for a young mutual company to adopt, may be a question.

The public has been much misled by a notion that assurance companies must accumulate large profits, and the Equitable has been constantly cited as the proof. Now all who would form an opinion on this subject must remember that the circumstances of the Equitable are very peculiar. It realized large accumulations, in the first instance, by an excess of caution, commendable at the time, but since proved to be unnecessary. Of late years, newly assured parties are allowed to share in these accumulations, on condition that they are first assured in the office for a large number of years, taking the chance of receiving less than their premiums are really worth. This however is not the question here; we merely stop to remind the reader who is disposed to form a general opinion about offices, because the executors of A, B, and C receive two or three times the sum for which those persons were nominally insured, that this only happens because D, E, and F, who died during the days of a caution which has since been shown to be unnecessary, did not get their share of the then existing surplus.

The expenses of management are relatively trifling when the office has obtained a large amount of business, but they bear heavily on young offices during the first years. The most formidable expense of all, at least to many, must be that of advertising; and this is a point on which it is well worth while to dwell.

When a tradesman advertises, he sacrifices, in the expense of the advertisement, a part of the profit which he would have had if his customers would have come without the advertisement. The only question for him is, whether it is better to turn his money more quickly with a smaller profit, or to wait longer and make a larger one; and that the first is found to be the best plan in many cases, the frequency of advertisements fully proves. It is purely a question for the tradesman to settle for himself, and the customer has no interest in the matter. But in the case of the assurance office, the matter is very different. If, in looking at a tradesman's advertisement, we should ask, *Who pays for this advertisement?* the answer would be easy; it is the tradesman himself, out of his own profits. But if we ask the same question with reference to the advertisement of an assurance company, the answer must be that it is paid out of the premiums of the assured. When the company is proprietary, the case is so far like that of the tradesman that it is paid out of surplus of premiums, which the assured will never get in any case; but when the company is one which is to return all or part of the profits to the assured, the latter may be certain that, *ceteris paribus*, his share will be larger the less the company advertises. There is a set-off certainly of this kind; the more business a company gets, the less heavily do the necessary charges of management bear upon the assured; so that, up to a certain point, advertising may be a beneficial outlay, since the necessary expenses of management, plus those of advertising, may be less when divided among the assured before the advertisement together with those who are brought by the advertisement, than the first of the former alone would be when divided among the first of the latter alone. But this must have a limit; for if not, the older offices would have continued their advertisements daily up to the present time: and even with regard to the proprietary company, which might perhaps consistently advertise a great deal more than the mutual company, there is yet this to be said, that a great quantity of advertising shows their premiums to be very profitable, for how else could they do it? and in such a company there is no return to the assured.

Again, when the advertisement is of this kind that it invites the public attention to lower rates of premiums than are charged elsewhere, and when such advertisement is very frequently repeated, the prudent assurer will naturally be disposed to ask how, if the premiums be so much reduced, this heavy expense of advertising is to be borne. When a tradesman advertises cheaper goods than his neighbours, we know that he relies upon making a very small profit upon his capital ten times in a year, instead of a larger profit two or three times. One per cent. is a small profit, but one per cent. per diem looks very like 313 per cent. per annum, excluding Sundays. But the assurance-office is of a very different kind of business: imagine a savings' bank advertising every day in the newspapers that it is a savings' bank, and will receive deposits; it is very clear that from and after the point at which the deposits so obtained relieve the necessary and constant charge of management, as above described, all advertisement is anything but beneficial to depositors. When therefore an assurer is induced by frequently repeated advertisements at last to deliberate upon going to an office, let him remember that this quantity of advertisement bodes him no good in itself, and let him look out as to whether there is any countervailing advantage: if he can find none, let him, for his own sake, take a little trouble to search out an office which advertises less, and perhaps he will find it performs more. It is very easy to spend five thousand a year in advertising. Our limits will not allow us to speak of the *commission* (so called) which most offices give to those who bring them business. This practice has been frequently attacked, and very feebly defended. All we say to those who assure is, insist upon having it for yourselves, and do not come worse off than your own agents would do, if you employed any. (On this point see the *Dublin Review* for August, 1840.)

The division of the profits (so called), that is, the method of returning to the assured the surplus of their premiums, with their accumulations of interest, has been the subject of much discussion. Offices have adopted very different modes of proceeding in this respect: some keep this surplus for the older members; some divide it by addition to the policies made annually, or at periods of five, seven, or ten years; some apply it in reduction of premiums as fast as its value is ascertained. Most, or all, of the methods followed by the offices seem to be fair, that is, they make the chance of surplus the same for one member as for another, at least of those who enter at the same age: if there be anything inequitable, it arises when the premiums are disproportioned at different ages, so that the surplus is differently levied upon different classes of members. Leaving this however, we shall proceed to inquire what may be the probable amount of surplus in an office charging premiums made from the Carlisle Table at 3 per cent., with 25 per cent. added, taking the most favourable suppositions. Let the mortality be no greater than that in the table, let there be no expenses of management, and let the office be able to net 4 per cent. compound interest. Then we find that the office is in reality charging for the following sums, under the name of 100*l.*; that is to say, all the preceding suppositions being correct, the office might undertake to pay the following sums instead of the 100*l.* minimum which they do really guarantee. The sums are only roughly put down, within a pound or thereabouts.

Age.	£.	Age.	£.	Age.	£.
20	166	35	157	50	148
25	163	40	155	55	144
30	160	45	152	60	141

There is an inequality here which arises from the supposition of the office gaining a greater interest than was supposed in its tables; and it is obvious that the young assurer must make that excess of interest more beneficial to the office than the old one. Consequently where an office realises some of its surplus by excess of interest, there is equity in giving the one who entered young somewhat more than the one who entered later in life. But this has never been the principle on which any office made its divisions: some distinguish those who have been a long time in the office from those who enter newly, and the greater number of those so distinguished must have entered younger than the greater number of the undistinguished; but the intention of the office has no reference to age at entry, but only to time of continuance.

The true method of determining the actually existing surplus must have some connection with that which would be followed if the company wished to break up, dividing its assets fairly among the assured. Let us suppose the stock of the company, all that it actually has or could realise, to be worth half a million, and that the premiums which the existing contributors would pay are valued at another half million, while the claims of these contributors are valued at 750,000*l.* Consequently there is a million to meet 750,000*l.* or 133⅓*l.* can be given for 100*l.* Now suppose that instead of breaking up, the office wishes to know how much it can afford to give in payment of a claim of 100*l.* The first question is, how did this surplus arise?—the office has in possession or prospect 250,000*l.* more than what is estimated to be absolutely necessary. If this surplus really arose out of the natural operation of the premiums, &c., it is clear that the office is now in a condition to pay 133⅓*l.* for 100*l.* Supposing this done for the current year, the valuation of the next year will point out what alteration, if any, is necessary. This mode of division is the safest in the long run, because any excess in one year will be compensated in future years. Another mode is to divide the surplus of 250,000*l.* among the existing policies, in equitable proportions; and a third is to consider it as advance of premium on the part of the existing contributors, and to diminish their future premiums as if they had actually made such advance. It is not however our present purpose to extend an article already longer than we had intended it to be, by entering into a lengthened explanation on this point.

We shall end by a table of the various assurance offices which are actually doing business in London, as complete as our means of knowledge enable us to make it: we cannot answer for its being perfectly complete. But, the present article being intended for the assurer, and not for the office, we make the following remark.

The benefits of life assurance (which is in reality a large combination of small sums for the purpose of beneficial investment, with a contract among those who invest that the inequalities of life shall be compensated so that those who do not live their average time shall be sharers in the good fortune of those who exceed it) and the moral considerations which should induce every friend of his species to promote and extend it, are of course not the particular motives which actuate the founders of such offices, though no doubt they have them in the same degree as others. To bring business to a particular office becomes their interest and their object; and every possible mode of investment has been held out to engage the attention and suit the particular objects of the assurer. To this of course, in general, we do not object: for instance, when a company proposes twenty different kinds of assurances, it is enough for the public that the terms of each kind are sufficiently high, and yet not too high. But it sometimes happens that among the proposals which are held out for the assurer's acceptance, are to be found some which altogether militate against the moral principles of assurance: these are prudence, foresight, and present self-denial for the attainment of ultimate prosperity and of present security against the chances of life. When an office announces that it is willing to leave a part of the premium in the assurer's hands, on his paying interest for it in advance, the office in the meanwhile holding the policy as a security,—what is it but enticing a person to assure for more than he can afford to do, and to borrow money for the purpose of paying the premiums? The office may, with caution, make itself secure; but it throws upon the customer the strong probability of future disappointment. When the time comes for thinking of the repayment of the advances which the office has virtually made, the assurer will frequently find himself obliged to sell that policy to the office which he had counted upon for the benefit of his family. Now out of the purchase money must be deducted the sums in arrear to the office (upon which interest has always been paid in advance); and when the assurer comes to put his balance against what he has actually paid, he will see that he never did a more imprudent act. The office is not to blame for anything but having thrown the original offer in his way; they have only lent him money on the same terms as they would have lent it to others; and they may say, and truly, that it was his own fault if he engaged in an imprudent speculation. But is it not then a fault to entice others to imprudence, knowing how much more easily men are induced to be imprudent than to be prudent?

Name of Office.	When instituted.	Nominal Capital subscribed.	Proportion of Profit given to the Assured.	Periods of Division.	Sum Assured is paid, after Proof of Death, within	Age.			Age.			Age.		
						20.			40.			60.		
		£				£	s.	d.	£	s.	d.	£	s.	d.
Active	1839	500,000			1 month	1	16	5	3	1	6	6	13	11
Albion	1805	1,000,000	none		30 days	1	15	9	3	2	3	6	7	3
Alfred	1839		four-fifths			2	3	7	3	7	11	6	7	4
Alliance	1824	5,000,000		5 years	3 months	1	16	11	3	6	6	7	14	11
Amicable	1706	none	all	annual	3 months	2	0	6	3	5	9	7	6	6
Argus	1834	300,000	none		3 months	1	11	2	2	13	9	6	6	6
Asylum	1824	240,000		5 years	6 months	1	11	9	2	17	1	6	10	9
Atlas	1808	1,200,000		7 years	3 months	2	3	7	3	7	11	6	7	4
Australasian, Colonial, and General	1839	200,000	one-half	5 years		1	10	3	2	15	3	6	3	9
Britannia	1837	1,000,000	none		1 month	1	12	5	2	15	1	6	9	1
British Empire	1838	500,000		5 years	3 months	1	16	11	3	4	7	6	15	11
British Colonial	1839	500,000	four-fifths	5 years	3 months	1	17	4	3	5	0	7	4	9
British Commercial	1820	1,000,000		7 years	3 months	2	3	7	3	7	11	6	14	11
Caledonian	1805	150,000	four-sixths	7 years	3 months	2	1	6	3	5	6	6	5	4
Church of England	1840	1,000,000	four-fifths	7 years	3 months	1	17	4	3	3	6	7	7	6
City of Glasgow	1839	750,000	two-thirds		3 months	1	19	5	3	4	6	6	12	3
Clerical, Medical, and General	1825	500,000		5 years	3 months	2	0	6	3	3	8	6	7	2
Crown	1824	1,500,000	two-thirds	7 years	3 months	1	19	11	3	4	7	6	7	2
Eagle	1807	1,000,000	four-fifths	7 years	3 months	2	2	6	3	4	4	6	18	2
Economic	1823	200,000	three-fourths	5 years	6 months	1	14	7	2	19	9	7	0	7
Edinburgh	1823	500,000	four-fifths	5 years	3 months	1	17	4	3	3	2	6	15	8
English and Scottish Law	1839	1,000,000	two-thirds	7 years		1	19	6	3	6	6	7	4	6
Equitable	1762	none	two-thirds	10 years	3 and 6 months	2	3	7	3	7	11	6	7	4
European	1819	1,000,000	two-thirds	7 years	3 months	1	19	0	2	4	3	6	11	1
Family Endowment		500,000				1	17	9	3	5	9	6	7	11
Freemasons'						1	17	9	3	2	10			
General, Life, and Invalid	1839	500,000				1	13	6	2	19	2	7	2	3
Globe	1803	1,000,000	none		3 months	2	3	7	3	7	11	6	7	4
Guardian	1821	200,000		7 years	3 months	2	1	0	2	5	0	6	7	2
Hand in Hand	1836		one-fifth	6 years	3 months	2	3	7	3	7	11	6	7	4
Hope	1807	1,000,000	two-thirds	7 years	3 months	2	3	7	3	7	11	6	7	4
Imperial	1820	750,000	two-thirds	10 years	3 months	2	3	7	3	7	11	6	7	4
Law Life	1823	1,000,000	four-fifths	7 years	3 months	2	3	7	3	7	11	6	7	4
Legal and General	1836	1,000,000	four-fifths	at first 6, then 7 years	3 months	2	0	4	3	5	11	6	19	6
Licensed Victuallers'	1836	150,000												
London, Edinburgh, and Dublin	1840	500,000	two-thirds	5 years	3 months	1	17	4	3	5	0	7	4	9

Name of Office.	When instituted.	Nominal Capital subscribed.	Proportion of Profit given to the Assured.	Periods of Division.	Sum Assured is paid, after Proof of Death, within	Age. 20.			Age. 40.			Age. 60.		
		£				£	s.	d.	£	s.	d.	£	s.	d.
London Life	1806	none	one-fifth	annual	3 months				3	15	0	7	8	0
London and Westminster	1839	500,000		5 years		1	19	1	3	6	3	6	12	6
Metropolitan	1835	none	all	5 years	3 months	1	19	6	3	6	4	6	11	6
Minerva	1836	1,000,000	four-fifths	5 years	3 months	2	1	0	3	5	6	6	7	2
Mutual	1834	none	all	annual	3 months	1	19	11	3	7	6	7	2	0
National	1830	500,000	two-thirds of one-fifth	annual	3 months	2	3	6	3	8	0	6	7	6
National Endowment	1838	500,000			30 days	1	16	3	3	2	0	6	5	6
National Loan Fund	1837	500,000	two-thirds	after 3 years, annual		1	17	4	3	5	3	7	8	4
National Provident	1835													
North British	1809	1,000,000	two-thirds	7 years	3 months	2	1	0	3	4	11	6	7	2
North of Scotland	1839	1,000,000			3 months	1	18	10	2	19	5	6	12	9
New Equitable	1840	800,000			3 months	1	16	10	3	3	5	6	6	6
Norwich Union	1808	none		7 years	3 months	2	0	6	3	3	6	6	7	3
Palladium	1824	200,000	four-fifths	7 years	3 months	2	3	7	3	7	11	6	7	4
Pelican	1797		one-half	7 years	3 months	1	16	1	3	2	8	7	11	7
Productive	1840		all	annual	2 months	2	2	2	3	7	11	6	14	4
Promoter	1826	240,000	none		6 months	1	11	8	2	17	0	6	12	10
Protector	1835	1,000,000	three-fourths	5 years	3 months	2	1	0	3	5	0	6	7	2
Protestant Dissenters'		1,000,000			3 months	2	0	0	3	7	0	7	0	0
Provident	1806	250,000		7 years	3 months	2	3	7	3	7	11	6	7	4
Rock	1806	2,000,000	two-thirds	7 years	8 months	2	3	7	3	7	11	6	7	4
Royal Exchange	1722	745,000	none		on proof	2	3	6	3	8	0	6	7	3
Royal Naval, Military, and East India	1837	500,000	four-fifths	7 years	3 months	2	3	2	3	7	8	7	0	4
Scottish Union	1824	5,000,000	two thirds		3 months	1	18	6	3	5	0	6	7	10
Scottish Widows' Fund	1815	none	two-thirds	7 years	3 months	2	1	6	3	5	6	6	5	4
Sun	1810		one-half	7 years	3 months	1	16	11	3	6	6	7	14	11
Union	1714	300,000	one-third	7 years	3 months	2	3	7	3	7	11	6	7	4
United Kingdom		1,000,000	two-thirds	5 to 7 years	3 months	1	18	8	3	3	4	6	17	9
United Mercantile and Travellers'									3	4	11	7	4	9
Universal	1834	500,000	three-fourths	after 5 years, annual	3 months	1	18	8	3	3	0	6	13	2
University	1825	600,000	four-fifths	5 years	3 months	2	1	5	3	4	7	6	7	4
Victoria	1838	500,000				1	16	11	3	6	6	6	19	0
West of England	1807	600,000		5 years	3 months	1	19	3	3	1	3	6	5	0
Westminster	1792		5 per cent. at the end of 5 yrs.	1 per cent. ann.		2	3	7	3	7	11	6	7	4
Westminster and General			four-fifths	5 years	3 months	2	1	8	3	4	6	6	7	4
Yorkshire	1824	500,000			3 months	1	14	4	2	19	9	6	6	0

REVERSION OF SERIES. In the nomenclature of mathematics, which is far from being consistent with itself, the words *reversion* and *inversion* are sometimes confounded. Thus the term by which we describe the square root, as connected with the square, is, that each is an INVERSE process to the other; but if y be a given series of powers of x, the determination of x in a series of functions of y is not called inversion, but reversion. Various points connected with reversion (to keep the common term) will be met with in TAYLOR'S THEOREM and SERIES; the present article is meant purely for reference upon the most usual case of the problem, which is not sufficiently developed in elementary works; that is, enough of the result for reference is not put down.

The problem is as follows:—Given $y=ax+bx^2+cx^3+ex^4+fx^5+\ldots$; required x in a series of the form $Ay-By^2+Cy^3-Ey^4+\ldots$. It will be proper first to put down the coefficients in connection with the exponents to which they belong, as follows:—

1	2	3	4	5	6	7	8	9	10	11
a	b	c	e	f	g	h	k	l	m	n
A	B	C	E	F	G	H	K	L	M	N

It will be convenient, instead of writing the resulting series $Ay-By^2+\ldots\ldots$, to let it be $Aa^{-1}y-Ba^{-3}y^2+Ca^{-5}y^3-Ea^{-7}y^4+Fa^{-9}y^5-Ga^{-11}y^6+Ha^{-13}y^7-Ka^{-15}y^8+La^{-17}y^9-Ma^{-19}y^{10}+Na^{-21}y^{11}-\ldots\ldots$ We then have

$A=1$

$B=b$

$C=2b^2-ac$

$E=5b^3-5abc+a^2e$

$F=14b^4-21ab^2c+3a^2(2be+c^2)-a^3f$

$G=42b^5-84ab^3c+28a^2(b^2e+bc^2)-7a^3(bf+ce)+a^4g$

$H=132b^6-330ab^4c+60a^2(2b^3e+3b^2c^2)-12a^3(3b^2f+6bce+c^3)+4a^4(2bg+2cf+e^2)-a^5h$

$K=429b^7-1287ab^5c+495a^2(b^4e+2b^3c^2)-165a^3(b^3f+3b^2ce+bc^3)+45a\ (b^2g+2bcf+be^2+c^2e)-9a^5(bh+cg+ef)+a^6k$

$L=1430b^8-5005ab^6c+1001a^2(2b^5e+5b^4c^2)-715a^3(b^4f+4b^3ce+2b^2c^3)+55a^4(4b^3g+12b^2cf+6b^2e^2+12bc^2e+c^4)-55a^5(b^2h+2bcg+2bef+c^2f+ce^2)+5a^6(2bk+2ch+2eg+f^2)-a^7l$

$M=4862b^9-19448ab^7c+8008a^2(b^6e+3b^5c^2)-1001a^3(3b^5f+15b^4ce+10b^3c^3)+1001a^4(b^4g+4b^3cf+2b^3e^2+6b^2c^2e+bc^4)-286a^5(b^3h+3b^2cg+3b^2ef+3bc^2f+3bce^2+c^3e)+22a^6(3b^2k+6bch+6beg+3c^2g+3bf^2+6cef+e^3)-11a^7(bl+ck+eh+fg)+a^8m$

$N=16796b^{10}-75582ab^8c+15912a^2(2b^7e+7b^6c^2)-12376a^3(b^6f+6b^5ce+5b^4c^3)+2184a^4(2b^5g+10b^4cf+5b^4e^2+20b^3c^2e+5b^2c^4)-273a^5(5b^4h+20b^3cg+20b^3ef+30b^2c^2f+30b^2ce^2+20bc^3e+c^5)+182a^6(2b^3k+6b^2ch+6b^2eg+6bc^2g+3b^2f^2+12bcef+2c^3f+2be^3+3c^2e^2)-78a^7(b^2l+2bck+2beh+c^2h+2bfg+2ceg+cf^2+e^2f)+6a^8(2bm+2cl+2ek+2fh+g^2)-a^9n$

We have given these coefficients to an extent which many will think useless, and in fact it will not often be necessary to employ all that are here given. But we have two objects in view: first, to enable those who want these coefficients to refer to them; secondly, to point out the great advantage of some methods which are never given in elementary works, and are not so much known and practised as methods of such utility and power should be.

The usual way of obtaining these results is to take the series $x=Aa^{-1}y-Ba^{-3}y^2+\ldots\ldots$, and in it to substitute the value of y, namely, $ax+bx^2+\ldots$. This would give

$$x=\frac{A}{a}(ax+bx^2+\ldots)-\frac{B}{a^3}(ax+bx^2+\ldots)^2+\ldots,$$

the two sides of which equation must be identical; giving

$$A=1,\quad A\frac{b}{a}-B\frac{1}{a}=0,\quad\text{or } B=b;$$

$$\frac{A}{a}c-\frac{2B}{a^2}b+\frac{C}{a^2}=0,\ \text{or } C=2b^2-ac,$$

and so on; but this process would become intolerably tedious and liable to error after a few steps; that which we have followed in forming the preceding coefficients [TAYLOR'S THEOREM] would have enabled us with comparatively little difficulty and small risk of error to double their number. It also gives the law of the coefficients, which is as follows:—

1. What sort of terms enter into M, the coefficient of y^{10}? Write down every way in which $2(10-1)$, or 18, can be made up of $10-1$, or 9, numbers, and, taking the letters

belonging to these numbers from the table, we have the literal parts of the different terms of the coefficients. Thus—

18 is made up of the nine numbers 1, 1, 1, 1, 2, 2, 2, 2, 6, the letters of which are $a, a, a, a, b, b, b, b, g$: accordingly, $a^4 b^4 g$ is the literal part of one of the terms of M. And similarly for every other combination of nine numbers which makes 18.

2. What is the coefficient of any given term? Say that y^n is the power to which the term belongs, and that $a^\alpha b^\beta c^\gamma \ldots$ is the literal part of it. The coefficient required is as follows:—

$$\frac{(n+1)\ (n+2) \ldots\ldots (2n-\alpha-2)}{(1.2.3\ldots.\beta)\ (1.2.3\ldots.\gamma)\ (1.2.3\ldots.\delta)\ldots.}$$

Thus, to verify the numerical coefficient of $a^6c^2e^2$ in N, the coefficient of y^{11}, we must calculate ($n=11$, $\alpha=6$, $2n-\alpha-2=14$),

$$\frac{12\ .\ 13\ .\ 14}{(1.2)\ (1.2)}, \text{ which is } 6.13.7, \text{ or } 546,$$

and 182×3, the coefficient in the table, is also 546.

2. The sign of any term is positive or negative according as the power of a which it contains is even or odd.

We may thus verify any one term, and the coefficients may be sufficiently verified, as to typographical* correctness, by remembering, that if $a=b=c=\&c.=1$, we should have $A=B=C=\&c.=1$; for $y=x+x^2+x^3+\ldots$ gives $x=y-y^2+y^3-\ldots.$ The result of the use of the preceding table, distinguishing the positive from the negative parts, is

$$x=y-y^2+(2-1)\,y^3-(6-5)\,y^4+(23-22)\,y^5-(99-98)\,y^6$$
$$+(452-451)\,y^7-(2140-2139)\,y^8+(10397-10396)\,y^9$$
$$-(51525-51524)\,y^{10}+(259430-259429)\,y^{11}.$$

The preceding is a particular case of the following general problem, which frequently occurs, and is very complicated in its details. Given $y^m=ax^m+bx^{m+1}+cx^{m+2}+ex^{m+3}+fx^{m+4}+\ldots.$; required a series for x in powers of y. Let it be assumed that

$$x=$$

$$A\frac{y}{a^n}-B\frac{y^2}{a^{2n+1}}+C\frac{y^3}{a^{3n+2}}-E\frac{y^4}{a^{4n+3}}+F\frac{y^5}{a^{5n+4}}-\ldots..$$

n being $1 \cdot m$. Then $A=1$, $B=nb$:

$$C=n\frac{3n+1}{2}b^2-n\,ac$$

$$E=n\frac{4n+1}{2}\,\frac{4n+2}{3}b^3-n\frac{4n+1}{2}\,2abc+n\,a^2e$$

$$F=n\frac{5n+1}{2}\,\frac{5n+2}{3}\,\frac{5n+3}{4}\,b^4-n\frac{5n+1}{2}\,\frac{5n+2}{3}\,3ab^2c$$
$$+n\frac{5n+1}{2}\,a^2\,(2be+c^2)-n\,a^3f$$

Methods of obtaining all these series are given in TAYLOR'S THEOREM.

REVERSION. 'Reversion of land is a certain estate remaining in the lessor or donor, after the particular estate and possession conveyed to another by lease for life, for years, or gift in tail. And it is called a reversion in respect of the possession separated from it; so that he that hath the one, hath not the other at the same time, for being in one body together, there cannot be said a reversion, because by the uniting, the one of them is drowned in the other. And so the reversion of land is the land itself when it falleth.' (*Termes de la Ley.*) Thus if a man seised in fee simple conveys lands to A for life, or in tail, he retains the reversion in fee simple. The distinction between a remainder and a reversion has been explained in REMAINDER. In all cases where the owner of land or the person who has an estate in land, grants part only of his estate, he has a reversion; and as the grantee holds of him, there is tenure between them, and the grantor has a seignory by virtue of having a reversion. When a man grants all his estate to another, or grants a particular estate to A, and various remainders over, remainder to F in fee, he has no reversion left, and therefore he has no seignory since the passing of the statute of Quia Emptores. The remainder-men also who precede the remainder-man in fee, do not hold of such remainder-man, but of the lord of the fee of whom the original owner held. The word reversion is often used inaccurately, and it is sometimes necessary to recur to its strict legal signification.

Before the passing of the statute De Donis, if a man seised in fee simple granted his lands to a man and the heirs of his body, he had no reversion, for the grantee was considered to have a conditional fee. But since this statute, an estate to a man and the heirs of his body has always been considered to be a particular estate.

If a man grants a lease of lands in possession, at common law, he has no reversion until the lessee enters by virtue of his lease, for the lessee has no estate until he enters; but if the term of years is created under the Statute of Uses, as by bargain and sale, the lessee has a vested estate by virtue of the statute, without entering on the land, and consequently the lessor has a reversion. It is said that a reversion cannot be created by deed or other assurance, but arises from construction of law. This means that a reversion is not created by the act of the party who conveys part of his estate, but is a legal consequence of his acts. If a man seised in fee simple limits his estate to another for life or in tail, remainder to himself in fee or to his own right heirs, he has not a remainder, but a reversion. Yet by a recent statute (3 and 4 Wm. IV., c. 106) the effect of such a limitation is to vest such remainder in fee in the settlor by *purchase*, and he is not to be considered to be entitled to it as his former estate or part thereof.

A reversion is a vested estate, which may be granted or conveyed, and charged like an estate in possession; and in some cases the reversioner in fee may bring an action, as well as the tenant in possession, for an injury to his inheritance.

Fealty is an inseparable incident to a reversion. There may or may not be a rent reserved, but fealty is always due from the owner of the particular estate to the reversioner, and it cannot be separated from the reversion, though the rent, if there is one reserved, may be separated from it. [RENT.] Reversions which are expectant on estates for years are subject to dower and courtesy; but this is not the case with reversions expectant on a freehold estate.

By a recent act (3 and 4 Wm. IV., c. 104), reversionary estates or interests in lands, tenements, and hereditaments, corporeal and incorporeal, are assets to be administered in courts of equity for the payment of a person's debts both on simple contract and on specialty, when such person shall not by his last will have charged such estates or interests with or devised them subject to the payment of his debts.

When a reversion expectant on an estate tail comes into possession, it is liable to the leases made by those who were at any time entitled to the reversion, and to the covenants contained in such leases. All particular estates, except an estate tail, are subject to merge in the reversion, when the particular estate and the reversion are united in the same person. Formerly when an estate tail was converted into a base fee, and the remainder or reversion in fee in the same lands became united in the same person, the base fee was subject to merger in the reversion: but by the 39th section of 3 and 4 Wm. IV., c. 74, when such union takes place, and there shall be no intermediate estate between the base fee and the remainder or reversion, 'the base fee shall not merge, but shall be *ipso facto* enlarged into as large an estate as the tenant in tail, with the consent of the protector, if any, might have created by any disposition under this act, if such remainder or reversion had been vested in any other person.' Before this statute, when a base fee thus merged in the reversion, the reversion became an estate in possession, and liable to all the leases and charges of those who had at any time been entitled to it.

REVETMENT, in permanent fortification, is a wall of brick or stone retaining the mass of earth which constitutes the rampart, generally on the exterior side only, or retaining the earth which forms the opposite side of the ditch. The exterior faces of these walls are considered as the scarp and counterscarp of the ditch.

In and before the time of Vauban the scarp revetments were raised from the bottom of the ditch to the top of the parapet; but the part which was visible above the glacis being destroyed by the enemy's artillery, and the parapet in consequence partly ruined soon after the commencement of the siege, that engineer in most of his works raised his revetments no higher than the level of the crest of the glacis, or about 7 feet above the natural ground; the exterior of the parapet was then left at such an inclination to the horizon (45° in general) that the earth would support itself. The ditch of a fortress being about 18 feet deep, the height of the scarp revetment was consequently 25 feet, and this was considered sufficient to afford security against the danger of having the rampart escaladed. At present it is recommended that the main ditch should be 24 feet deep, and in this case the scarp revetment is above 30 feet high. In constructing the fortifications of Neuf Brisac, Vauban made the revetments of the scarps both of the enceinte and of the reduit of the ravelin, as high as the top of the parapet; but these works being covered by the counterguard or the ravelin, their revetments would be unseen by the enemy at a distance, and therefore not liable to the objection above mentioned.

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* Should there be any error, it will be mentioned in SERIES.

The form usually given in profile to revetments of masonry may be seen at M and N, *fig.* 2, Bastion; the first is the revetment of the counterscarp, and the other that of the scarp. The rectangular parts are sections through the counterforts or buttresses which are built up with the walls in order to strengthen them, at intervals of about 15 feet from each other. Scarp revetments, whose tops are as high or higher than the crest of the glacis, are called full revetments; while such as are no higher than the level of the natural ground are called demi-revetments.

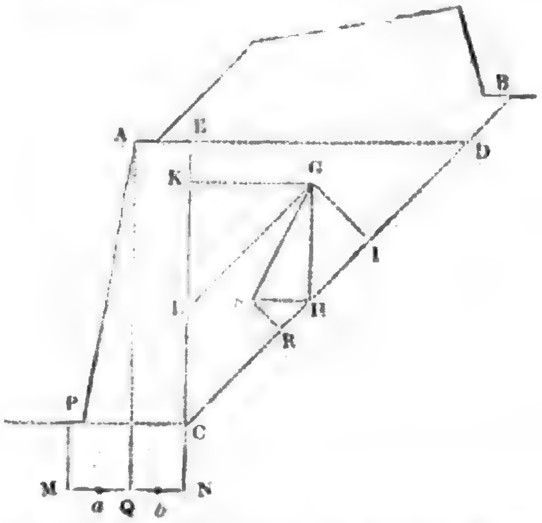
In order that the revetment might most effectually resist the pressure of the earth which it is to support, Vauban gave to the exterior face of the wall a slope, whose horizontal breadth was equal to one-fifth of the height; this was subsequently reduced to one-sixth, and not long since there were thought to be some advantages in making the face vertical.

In laying the foundations of revetments in defective soils, the same methods are used as in the construction of civil edifices; and in all cases the courses of stones or bricks are laid obliquely to the horizon, inclining down towards the part under the earth which is to be supported, in order that the pressure of the latter may be more directly resisted. But as the bed-joints of brickwork when so disposed allow the rain to penetrate, and the seeds of grass to lodge in them, it is thought that the wall is more speedily degraded when so built than when the courses are laid horizontally; therefore in order to unite the advantages of direct resistance and durability, it is customary to place the courses obliquely, but to lay one row of bricks in each course at the face of the wall in a horizontal position.

The exterior and interior faces of the revetment, or retaining wall of a dock, have in a vertical section the form of concentric arcs of circles, with their convexities towards the land; and this form is given them that the stones may be able to resist the hydrostatical pressure of any water which, when the dock is full, may get behind the wall, and which may be prevented from escaping when the dock is made dry.

Some of the ramparts of Coehorn, and all of those which Carnot proposed for his fortresses, are formed of earth unsupported by revetments; and even the opposite side of the ditch, instead of being faced with a steep wall, is by the latter engineer cut with a gentle slope from the level of the natural ground to the bottom of the ditch. But the fortifications of Coehorn are provided with wet ditches, which prevent the besiegers from getting to the foot of the rampart by surprise; and in those of Carnot a high detached wall covered by a counterguard of earth puts it out of the power of the enemy, while that wall stands, to get across the ditch. Without such obstacles the unreveted rampart would afford great facilities to the enemy in an effort to carry the fortress by assault. Its exterior slope must form at most an angle of 45° with the horizon, that the earth may support itself, and consequently it may be easily ascended; and any palisades or other impediments which the defenders might place on it would soon be displaced or destroyed by the batteries of the enemy. Besides these evils, the exterior slope, from its breadth, occupies a great portion of ground; it consequently obliges the engineer to contract the space enclosed within the works, and thus to sacrifice in some measure the convenience both of the inhabitants and the garrison.

In order to investigate the conditions of stability in revetment walls, let EBC be a vertical section through the mass of earth retained by the wall; BC being the slope which earth is supposed to assume when unsupported, and let AEMN be a section of the wall, PC being the level of the bottom of the ditch, and MN being the bottom of the foundation. Imagine G to be the centre of gravity of the section ECB; draw GL parallel to BC and GK parallel to the horizon: then, by the resolution of forces, KL and GK will have to one another the same proportion that the weight of the unsupported prism of earth (of any thickness) bears to its horizontal pressure. Let W be that weight; then $\frac{\mathrm{KG}}{\mathrm{KL}}$ will express that pressure, and $\frac{\mathrm{KG}}{\mathrm{KL}}.\mathrm{W}.\mathrm{KN}$ will be the momentum or power by which the earth tends to overturn the wall about M.



Imagine the vertical line AQ to be drawn; then the form and dimensions of the part AMQ of the wall are known; and let it be required to find the breadth QN of the rectangular part AN, so that the resistance of the whole shall be equal to the momentum of the supported earth. Suppose the centre of gravity of AMQ to be found, and let it be vertically over a. The centre of gravity of the rectangular part is vertically over b, the middle of QN; and let Qb be represented by x. Then if g be the specific gravity of the wall, we have by mechanics, $\mathrm{AMQ}.\mathrm{M}a.g+\mathrm{AQ}.\mathrm{M}b.g.x$ for the resistance of the wall; consequently equating this expression with the above momentum of the earth, the value of x, and therefore of QN, can be found. But great uncertainty exists respecting the position of the line of rupture BC, from our ignorance of the allowance to be made for the effect of friction on the tendency of the earth to slide downwards. Experiments have led to the opinion that this effect is equal to half the pressure of the earth perpendicularly upon the inclined plane which it would assume if unsupported; and that value is frequently adopted.

In order to find the magnitude which the triangle EDC should have when the supported earth exerts the greatest pressure against the wall, the following process may be used; the earth above AD being at present, for simplicity, supposed to be removed. Imagine G to be the centre of gravity of that triangle, and the vertical line GH to be drawn; then GH may represent the weight of the unsupported earth, and let it be resolved into the pressures represented by GI and IH, the former perpendicular to the slope, and the latter coincident with it. Imagine HS to be drawn to represent the re-action of the wall AMN, and let it be resolved into the forces represented by SR and RH, perpendicular to and coincident with the slope, respectively. Then, IH representing the force with which the prism of earth would tend, if without friction, to slide down DC, RH represents the re-action by which the wall resists that force; while GI and SR represent the pressure and reaction perpendicular to DC. Consequently, the friction being supposed to be equal to half the pressure, we have $\frac{1}{2}(\mathrm{GI}+\mathrm{SR})$ for the effect of friction; and in the case of equilibrium, $\mathrm{IH}=\mathrm{RH}+\frac{1}{2}(\mathrm{GI}+\mathrm{SR})$.

Let $\mathrm{EC}=h$, $\mathrm{ED}=z$, $\mathrm{HS}=p$, and let g be the specific gravity of the earth; then $\frac{hgz}{2}$ expresses the weight of the prism whose section is EDC, and whose thickness is unity, and which was represented by GH; and the triangles GIH, HSR being similar to ECD, we get by proportions

$$\mathrm{IH}=\frac{h^2gz}{2\mathrm{CD}},\ \mathrm{HR}=\frac{pz}{\mathrm{CD}},\ \mathrm{GI}=\frac{hgz^2}{2\mathrm{CD}},\ \text{and}\ \mathrm{SR}=\frac{ph}{\mathrm{CD}}.$$

These values being substituted in the above equation, the value of the pressure HS or p will be found to be $\frac{h}{2}g\cdot\frac{2hz-z^2}{2z+h}$. Now this quantity is to be a maximum; therefore making its differential relatively to z equal to zero, the value of z will be found to be $\cdot618h$; whence $p=\cdot1908gh^2$. If this equation be differentiated relatively to h, the result will express the horizontal pressure against an elementary portion of the wall at a variable height (which represent by h) above C: therefore multiplying by h and integrating, we get $\cdot1272gh^3$ for the whole force exerted by the earth to overturn about M a wall whose height EC is represented by h, when that force is a maximum. When there is a parapet above AD, its weight, expressed by the product of the area of the section multiplied by g must be added to the above expression for the weight of the prism EDC in the preceding investigation, in order to obtain the value of the expression which is represented by GH.

Instead of making a revetment in the form of a simple wall, it is customary to build buttresses or counterforts at intervals from each other on the side next to the supported earth; consequently the thickness of the wall itself may be rather less than that which would result from the above equation. In order to determine it, if we assume, for example, that the distance from the centre of one counterfort to that of the next is fifteen feet, the area of a horizontal section fifteen feet long and taken at the mean height of the wall, if the face has a slope, together with the area of the like section through the two half-counterforts, may be equal to the area of a section of the simple wall (of the same length) as determined by the above investigation; then deducting one-fifth of that quantity for the two half-counterforts, the remainder divided by 15 will give the required breadth of a horizontal section at the part between the counterforts. It should be observed however that the thickness of a brick revetment which is to resist the fire of a battering-train should not be less than seven or eight feet. It is usual to make the depth of a counterfort equal to the mean breadth of the wall; and to give it greater thickness at the part which joins the wall than at the other extremity.

Counterforts serve in part as props to keep the wall from inclining in consequence of partial compressions in the cement; but chiefly by extending the breadth of the base at intervals they increase, at the places where they are formed, the length of the arm of the lever by which the weight of the wall resists the lateral pressure of the earth. The usual connection of the bricks or stones in the wall with those of the counterforts allows this advantage to be extended in nearly an equal degree to the parts which are situated between the counterforts. But in order that the connection may be more complete, it has been recommended to connect the tails of every two counterforts by a wall curved on the plan, and having the convex side towards the earth which is to be retained. Again, the nearest sides of every two counterforts have occasionally been connected by two or more arches, one above another; by which means the mass of retained earth is in part supported, and the lateral pressure of the whole is diminished.

Revetments in which the counterforts are connected in either of those ways are said to be counter-arched; and it is recommended that arches of the latter kind should be formed in the mass of the parapet above the cordon of the scarp. It is also recommended that the masonry of the arches in the rampart should be but slightly connected with that of the revetment wall; since then the greater part of the rampart and parapet will remain supported by the arches even after the revetment has been demolished by the artillery of the besiegers.

REVOLUTION. This well known term is applied in astronomy to the manner in which a detached body moves round another, as a planet round the sun; but the motion of connected particles of matter round an axis, such as the diurnal revolution of a planet, is more usually called ROTATION.

In pure mathematics the word revolution is applied to the angle moved over by a line which revolves round a point from any one position to that position again; it is therefore a synonym for four right angles.

REVOLUTION OF 1688. [WILLIAM III.]

REY, JEAN, a French physician, was a native of Bugue on the Dordogne. In 1630 he published, at Bazas, a town about 30 miles south-east of Bordeaux, a book under the following title: 'Essays de Jean Rey, Docteur en Médécine, sur la Recherche de la Cause pour laquelle l'Estain et le Plomb augmentent de poids quand on les calcine.' To this inquiry it appears that Rey was incited by a letter from Sieur Brun, prefixed to the work, as the cause 'qui a donné sujet au présent discours.' M. Brun states that on subjecting melted tin to the air in a pot, he found that it increased very considerably in weight, and applied to Rey to explain so unexpected a fact, and he afterwards made a similar experiment with lead, and with a corresponding result.

Rey, after refuting all the different explanations of this increase of weight which had been advanced, says, in his 16th essay, 'I have now made the preparation, laid as it were the foundation of my answer to the Sieur Brun's demand, namely, that having put *two pounds six ounces* of fine English tin into an iron vessel, and heated it strongly in open air for six hours, stirring it continually, without having added anything, he obtained *two pounds thirteen ounces* of a white calx, which at first occasioned him great surprise, and the desire to ascertain whence these seven ounces of increase were derived; now, to augment the difficulty, I say that we must not only inquire whence these seven ounces are derived, but moreover, whence that which has replaced the loss of weight necessarily arising from the enlargement of the volume of the tin by its conversion into calx, and from the vapours and exhalations that have evaporated. To this question then, resting on the foundations that I have laid, I answer, and proudly maintain, that this increase of weight comes from the air, thickened and made heavy, and in some measure rendered adhesive on the vessel, by the violent and long-continued heat of the furnace, which air mixes with the calx (its union being assisted by the continual stirring), and attaches itself to its smallest particles, no otherwise than as water when sand is thrown into it makes it heavier by moistening it and adhering to its smallest grains.'

In the 11th and subsequent volumes of the Royal Institution Journal, Mr. Children has given translations of various essays of Rey, which are extremely well worth perusal by those who are curious in the history of chemical discovery. We have already mentioned that Rey's work first appeared in 1630, and it was greatly neglected till 1777, when a new edition appeared, and it is remarked by Mr. Children that the 'copies of this reprint disappeared in a very sudden and remarkable manner,' and the fact has led to a suspicion that it was effected by Lavoisier and his friends, to avoid the imputation of plagiarism in his celebrated work which appeared about three years afterwards.

Mr. Children and Dr. Thomson however are both inclined to give full credit to the assertion made by Lavoisier that he knew nothing of Rey's Essays when he originally undertook his experiments.

REYNOLDS, SIR JOSHUA, born at Plympton, July 16, 1723, of an antient family of the county of Devon, was the son of the Rev. Samuel Reynolds, rector of Plympton St. Mary, and master of the free grammar-school there. This celebrated painter was originally intended by his father for the medical profession, but he manifested when still a child so great a taste for drawing, that his father was induced to abandon his intention. Reynolds's natural inclination to the arts was much strengthened by studying the Jesuits' Perspective, but was finally confirmed, and became a passion, through the perusal of Richardson's treatise on painting, and he was from that time resolved to become a painter. He was accordingly, in 1741, in his eighteenth year, placed by his father for four years with Hudson, the principal portrait-painter of that time. The plan of instruction adopted by this painter, that of setting his pupil to copy Guercino's drawings, had a decided influence upon Reynolds's future taste, and was unquestionably one of the principal causes of the difficulty which he ever after experienced when drawing from the life, and especially from the naked figure. Reynolds and his master did not agree, and they separated in an unfriendly manner when half the period of the engagement had expired. Reynolds returned into Devonshire, and upon this slight foundation commenced his career as a portrait-painter, at Plymouth Dock. He was fortunate in obtaining the patronage of Lord Mount Edgecombe, whose influence was of the utmost service to him in procuring him introductions to the most distinguished naval officers of that port, amongst whom was Captain (afterwards Admiral Lord) Keppel, a connection that proved subsequently most valuable to him. Many naval and military officers sat to him for their portraits at this time; and he exhibited at this early stage of his career decided traces of his future style. The portraits of William Gandy of Exeter, which he greatly admired for their bold and effective manner, tended not a little to confirm that taste which his previous education from Guercino was so well calculated to engender. After the death of his father, in 1746, Reynolds came to London, where he took apartments and commenced practice in St. Martin's Lane, then a favourite quarter with painters. In 1749 he accompanied Commodore Keppel as that officer's guest, in the Centurion, to the Mediterranean; and after a delay of two months at Minorca, where he resided with the governor, General Blakeney, and during which time he painted the portraits of several naval and military officers, he embarked for Leghorn, and prosecuted his journey to Rome.

Perhaps, with the exception of Flaxman, no English artist of eminence ever took so much experience with him to Rome as Reynolds did; yet, when he first saw the grand works of Raphael in the Vatican, he was greatly disappointed. However, as he himself has recorded, he did not for a moment suppose that Raphael owed his reputation to the ignorance or caprice of mankind, but he felt his own ignorance, and stood abashed. All the undigested notions of excellence which he had brought with him from England were to be eradicated from his mind; he felt that he had originally formed a false opinion of the perfection of art; 'and that if those works had really been what he expected, they would have contained beauties superficial and alluring, but by no means such as would have entitled them to the great reputation which they have so long and so justly obtained.'

Notwithstanding this candid confession, the conviction seems to have had little or no influence upon his own manner in after-life, for he never possessed one single quality in common with Raphael.

Reynolds never made a practice of copying pictures or taking sketches of whole compositions, as is the habit with many young painters. He very properly considered copying a 'delusive kind of industry;' yet he was in the habit of selecting parts of compositions which were of striking excellence, or from an attentive study of which he imagined he should derive substantial benefit. It was in studying the various great works in the Vatican, particularly those of Michael Angelo and Raphael, that he contracted a severe cold which caused a deafness for the remainder of his life. From Rome he went to Florence, Bologna, Parma, Modena, Milan, Padua, and Venice, where he lodged with Zuccarelli, the landscape painter. The great masters of Venice, Titian, Paul Veronese, and Tintoretto, had a far greater influence upon Reynolds's future practice than the great works in Rome. The rich effect of Venetian tone and colour were much more suited to his genius or taste, which decidedly inclined to the florid or ornamental; and however much his better judgment may have induced him to extol the grandeur of the Roman school in his discourses, it was the magnificence of the Venetian that captivated him, that guided his practice, that excited his emulation. From Venice he went through Turin to Paris, where he made a short stay, and returned to Plymouth towards the end of the year 1752, after an absence from England of three years and a half. At Plymouth he painted two portraits, one of which was of the Rev. Zachary Mudge, vicar of St. Andrews, and the old friend of his father.

By the advice of his early patron, Lord Mount Edgecombe, Reynolds returned to London, and again took apartments for a short time in St. Martin's Lane, where he painted his celebrated portrait of Joseph Marchi, in a Turkish dress, a young Italian whom he had brought with him as an assistant from Rome. This picture, which was painted in a florid style somewhat after the manner of Rembrandt, attracted much attention, and among other visitors his old master Hudson went to see it, who, having examined it somewhat closely, is reported to have said, with an oath, 'Reynolds, you don't paint so well as you did when you left England.' This has been invariably imputed to Hudson as an expression of envy, yet it would be very difficult to reconcile an approbation of that head with his own practice, which was in a style diametrically opposed to it. Reynolds himself in after-life, upon seeing some portraits that he had painted thirty years previously, is said to have regretted that he had made so little progress. His execution in early life was very different from that of his latter years; his earlier manner was considerably more modest and less bold than his later, and proportionably more true to nature in consequence.

Reynolds's practice as a portrait-painter being now very considerable, he took a house in Great Newport Street, where he continued some years. One of his first works of value was a portrait of the then Duke of Devonshire, but that which established his fame as the first portrait-painter of his country was a full-length of his friend Commodore Keppel standing upon the sea-shore. It was about this time that he contracted an intimacy with Dr. Johnson, which only ended with the death of the latter. When Reynolds painted in St. Martin's Lane, his prices were for a head 10 guineas, a half-length 20 guineas, and for a whole length 40 guineas; in Newport Street they were at first respectively 12, 24, and 48 guineas, but his practice increased so rapidly that in 1758 he raised his price to 20 guineas for a head, and in 1760 to 25 guineas, the other sizes being in proportion.

At this period he was in the habit of receiving six sitters a day, and he valued his time at five guineas an hour. In 1761 he purchased a house in Leicester Square, where he fitted up an elegant painting-room, and built a spacious gallery for his rapidly-increasing collection of works of art; and here he resided the remainder of his life. His practice had now become so great, that he employed several assistants, of whom Marchi, the Italian, and Peter Toms, the celebrated painter of draperies, were the principal. This year the first public exhibition of works of art took place, in the room of the Society of Arts, in which Reynolds had four pictures; and in the exhibition of the following year, in Spring Gardens, he exhibited his portrait of Lord Ligonier on horseback (now in the National Gallery), and one of Sterne. These pictures, though not to be compared with his later performances, from a peculiarity of style and a richness of effect which distinguished them from the works of other artists, attracted universal attention, and established Reynolds as the favourite of the public. In 1762 he painted his celebrated picture of Garrick between Tragedy and Comedy; it was bought by the earl of Halifax for three hundred guineas, and has been engraved by Fisher. Dr. Johnson, in a letter written this year to Baretti, says, 'Mr. Reynolds gets six thousand a year.' In 1764 Reynolds and Johnson instituted the Literary Club, which was then limited to twelve members: Goldsmith and Burke were of the number.

Upon the foundation of the Royal Academy, in 1768, Reynolds was unanimously chosen president, and the honour of knighthood was conferred on him upon the occasion. The Academy was opened on the 1st of January, 1769, and the president delivered an appropriate discourse in commemoration of the event. Lecturing was no part of the duty of the president; it was a task which Sir Joshua imposed upon himself. He delivered altogether fifteen of these discourses, which have been translated into several languages, and have been generally and deservedly well received: they are too well known to require any particular comment here. They are certainly in many respects admirable; yet, with much sound and original criticism, they contain much also that is questionable.

In 1770 Sir Joshua raised his price for a head to thirty-five guineas. In 1773 he painted his celebrated picture of Count Ugolino with his Sons, from Dante: it was purchased by the duke of Dorset for four hundred guineas, and has been engraved by Dixon. This same year he proposed his plan of decorating St. Paul's Cathedral with a series of historical pictures, which was readily acceded to by Dr. Newton, bishop of Bristol and dean of St. Paul's; but Dr. Terrick, bishop of London, put a stop to the whole scheme, upon the plea that it was an introduction of popery: the other artists who had agreed to contribute works were West, Barry, Dance, Cipriani, and Angelica Kauffmann. This year is also memorable for two honorary distinctions which were conferred upon Sir Joshua; he was created Doctor of Civil Law by the university of Oxford; and was elected mayor of his native town, Plympton, a circumstance which gave him great gratification, and he presented the corporation with his portrait upon the occasion. About this time also he was elected member of the Imperial Academy of Florence, to which body he also sent his portrait. In 1779 he ornamented the ceiling of the library of the Royal Academy, in its apartments in Somerset House, with an allegorical painting representing Theory seated on a cloud, with the inscription 'Theory is the knowledge of what is truly Nature,' written upon a scroll in her hand. In this year he raised his price to fifty guineas for a head, which continued to be his charge during the remainder of his life.

In 1780 and the following years, Sir Joshua was engaged upon his great designs for the celebrated window of New College Chapel, Oxford, consisting of seven compartments for the lower range, containing the allegorical figures of the four cardinal and the three Christian virtues, Temperance, Fortitude, Justice, Prudence, Faith, Hope, and Charity; and above them the Nativity, lighted after the manner of the famous 'Notte' of Correggio. These designs were executed on the glass by Jervis of Dublin. The original design for the Nativity was purchased by the duke of Rutland for twelve hundred guineas, and was destroyed by the fire at Belvoir Castle in 1816: there is an engraving of it by Earlom.

In 1784 Sir Joshua painted his magnificent allegorical portrait of Mrs. Siddons as the Tragic Muse, a picture of its class perhaps unrivalled. According to Northcote, Sir Joshua valued this portrait at a thousand guineas; but it was purchased by W. Smith, Esq., for seven hundred: it has been engraved by Hayward. Upon the death of Allan Ramsay, this year, Sir Joshua was appointed principal painter in ordinary to the king. This year also he lost his old friend Dr. Johnson, who appointed him one of his executors, and bequeathed him his great French dictionary of Moreri and his own corrected folio copy of his English dictionary.

In 1786 he painted his Infant Hercules strangling the Serpents in the Cradle, for the Empress Catherine of Russia: it was sent to St. Petersburg, with two sets of Sir Joshua's discourses, one in French, the other in English, in 1789; and the following year, the Russian ambassador, Count Woronzow, presented him with a gold box, having the portrait of the empress upon the lid, set with large diamonds. His executors afterwards received fifteen hundred guineas as the price of the picture. This picture, which was remarkable for its rich effect of colour and forcible chiaroscuro, was the principal of Sir Joshua's historical pieces, and met with universal applause from the critics of the day. Even the eccentric Barry approved of it: he said 'the prophetical agitation of Tiresias, and Juno enveloped with clouds, hanging over the scene like a black pestilence, can never be too much admired, and are indeed truly sublime.' The effect of the tone and colour cannot be better expressed than by a painter of the day, who said that 'it looked as if it had been boiled in brandy.' The leading features of the composition were apparently taken from the 'Iconic' of the younger Philostratus on the subject: it has been engraved in mezzotinto by Hodges.

Sir Joshua painted three pictures for Alderman Boydell's Shakspere, the Cauldron Scene in Macbeth, Puck in Midsummer Night's Dream, and the Death of Cardinal Beaufort. For the first of these pieces the alderman paid Sir Joshua one thousand guineas, for the second one hundred, and for the third five hundred guineas.

Towards the end of 1791, a tumour, accompanied with inflammation, formed over his left eye; and being apprehensive lest the right should also be affected, he felt it necessary to desist from any further practice in his profession. He accordingly sent a letter to the council of the Academy, intimating his intention of resigning the office of president, on account of bodily infirmities; but he was induced to retain it upon the appointment of West as a deputy. He never again however resumed the chair; but died a few months afterwards, after a painful illness, of a disease of the liver, Feb. 23rd, 1792, in the sixty-ninth year of his age; and on his body being opened by Hunter, his liver was found to be more than double its natural size.

The body of Sir Joshua Reynolds, after lying in state in Somerset House, was buried with great pomp in St. Paul's Cathedral, where, some years after, a statue, executed by Flaxman, was erected to his memory.

The principal portion of his property, which amounted upon the whole to 80,000*l.*, he bequeathed to his niece, Miss Palmer, who shortly afterwards was married to the earl of Inchiquin, subsequently created marquis of Thomond. His collection of works of art sold for about 17,000*l.*, including several of his own works, and many unfinished and unclaimed portraits.

When we consider Sir Joshua's expensive habits and his liberal disposition, this large property enables us to form some idea of the immense patronage that he enjoyed. Upon the whole, his career from the beginning to the end exhibits an example of uninterrupted and brilliant prosperity that has perhaps never been surpassed. There are engravings from upwards of seven hundred of his works, mostly in mezzotinto. Northcote has given a list of about three hundred of his principal performances.

The day after Sir Joshua's death his eulogium from the pen of Burke, who was one of his executors, appeared in the papers. The following are extracts from this eloquent panegyric:—

Sir Joshua Reynolds was on very many accounts one of the most memorable men of his time. He was the first Englishman who added the praise of the elegant arts to the other glories of his country. In taste, in grace, in facility, in happy invention, and in the richness and harmony of colouring he was equal to the greatest masters of the renowned ages. 'He possessed the theory as perfectly as the practice of his art. To be such a painter he was a profound and penetrating philosopher.' 'His talents of every kind, powerful from nature, and not meanly cultivated by letters, his social virtues in all the relations and all the habitudes of life, rendered him the centre of a very great and unparalleled variety of agreeable societies, which will be dissipated by his death. He had too much merit not to excite some jealousy, too much innocence to provoke any enmity. The loss of no man of his time can be felt with more sincere, general, and unmixed sorrow.'

'As to his person,' says Northcote, 'in his stature Sir Joshua Reynolds was rather under the middle size, of a florid complexion, roundish blunt features, and a lively aspect; not corpulent, though somewhat inclined to it, but extremely active; with manners uncommonly polished and agreeable. In conversation his manner was perfectly natural, simple, and unassuming.' He was never married.

Sir Joshua Reynolds's literary productions, besides his discourses, were three contributions to the 'Idler,' some notes to Mason's translation of Du Fresnoy's 'Art of Painting;' a few notes for Dr. Johnson's edition of Shakspere, and his remarks upon the works of the Dutch and Flemish painters during his tour through Flanders and Holland in 1781. These last are full of admirable criticism, and display a rare discrimination of merits and demerits according to the intents and means of the various painters. It was during this tour that he first learnt to appreciate the wonderful powers of Rubens; he says of him, 'he was perhaps the greatest master in the mechanical part of the art, the best workman with his tools that ever exercised a pencil.' Several complete editions of his works have been published.

The partiality of British criticism has, with few exceptions, awarded Sir Joshua unqualified praise; he has been said to combine the beauties of Titian, of Rembrandt, and of Vandyck. 'To the grandeur, the truth, and simplicity of Titian,' says Northcote, 'and to the daring strength of Rembrandt, he has united the chasteness and delicacy of Vandyck.' That he combined many of the excellencies of the two former cannot be questioned, yet in style and execution he was more artificial than Titian, and in effect less powerful than Rembrandt; and he was certainly as conspicuous for their defects as for their beauties. It remains however yet to be shown that there are in the works of Sir Joshua any traces of the purity and severity of Vandyck, not to mention the powerful drawing and exquisite modelling, by which Vandyck has so well proved that individuality is eminently consistent with breadth and grandeur.

Reynolds has been justly said to be the founder of the British school of painting. Through a happy combination, and a judicious and powerful application of qualities, whether originating in natural feeling or acquired by selection from other masters, he struck out a new path in portrait, and by uniting graceful composition and breadth of light and shade with a rich and mellow tone of colouring, he invented a style of his own. This was a style, through its novelty and richness of effect, well calculated to captivate the taste of a public accustomed to the dry and feeble manner of the painters immediately preceding him, whether a Hudson, a Jervas, or a Kneller. But these attractive qualities, being the chief aim of the painter, naturally involved the sacrifice of those more solid properties of art through which alone true expression and individual character can be thoroughly attained, which we find more or less so well illustrated in the heads of Holbein, Raphael, and Vandyck, and which must always be imperfectly given when the features, though admirably placed, are merely indicated, however rich the colour, and owever great the effect. The beauties of Sir Joshua's style were displayed to most advantage in the portraits of females and children, particularly the latter; and perhaps they are displayed to their utmost in the large fancy-piece of three ladies decorating a terminal figure of Hymen, in the National Gallery.

A great continental painter and critic (Mengs), whose own style however bordered upon an insipid imitation of the antique, has asserted that the principles and style of the English Reynolds were superficial and alluring. Although there may be less truth in this assertion than the foreign painter might have wished to imply, yet there is infinitely more in it than the partiality, or perhaps rather the biassed judgment of the English critic has hitherto enabled him to perceive. Reynolds's principal object was *effect*, yet with it he endeavoured to unite individual character; indeed his principle was that the likeness and individual character depended more upon the 'general effect' than upon the 'exact expression of the peculiarities or minute discrimination of the parts.' To this dangerous principle may be traced the characteristic defects of his style, of which the Holy Family, in the National Gallery, is a remarkable specimen. His great fear of falling into 'the vulgar error of imitating nature too closely,' and, while aiming at individuality, attaining only 'littleness,' led him into the opposite extreme of acquiring breadth at the expense of nature, by an almost total neglect of modelling. The endeavour to combine breadth with individuality to any great degree, with the means which Reynolds brought to the task, must have inevitably failed in every instance where the individual was not of a striking or marked character, as was the case in 'Lord Heathfield,' an admirable subject for Sir Joshua's pencil. These deficiencies might be concealed, but not supplied by any merits however great. When art differs from nature it is no longer an imitation of nature, but simply art; and notwithstanding the great vivacity of Sir Joshua's portraits, they are preeminently *works of art*; for instance, upon entering an apartment or a gallery which may contain specimens of his pencil, the hand of the artist is the first thing that strikes our attention, which is equally the case with engravings after his works: this is perhaps the only really infallible test of manner. The style of Raphael, who was the least mannered of all painters, because the most true to nature (Perugino's manner must not be confounded with Raphael's style), affords in this respect a striking contrast to Sir Joshua's; even the few specimens of his great works, in the collection of Marc Antonio's prints in the British Museum, show this satisfactorily.

Perhaps the greatest solecism in the current criticism upon Reynolds's style, and one of his reputed services to art, is that he 'exalted portrait to the dignity of history.' Now, whatever dignity an historical piece may possess must be obtained from the human character, whether it exist collectively or merely individually, and it can only be acquired through the principles of portraiture, of which character, and therefore its quality or inherent dignity, constitutes the essential principle. This has been well and often illustrated by Velasquez, Vandyck, and the great Italian masters in portrait, and in a much more eminent degree than it was ever done by Reynolds; perhaps in this respect Sir Joshua's most successful portrait is that of Lord Rodney. It is a quality generally less evident in portrait than in history, since it requires far greater skill to arrange effectively a single figure where the means are so limited, than to obtain a comparatively grand effect when some story is to be told through a variety of actors. In such case however the dignity of the whole can only arise from the individual dignity of the distinct or most important actors; for although it is an essential quality of grand composition, dignity forms no part of grouping. This may be illustrated by two great examples:—Paul, in the Cartoon of Paul preaching at Athens; and Andrea Doria, in the portrait by Sebastian del Piombo. The former would lose no portion of its proper dignity if separated from the surrounding groups; nor would the grand figure of Andrea Doria acquire any additional dignity, if the figures, which the imagination may suggest as appropriate actors in the scene, were supplied.

So great has been the influence of Reynolds's works, and so deeply has his style affected opinion upon art in England, that it has become the recognised standard of excellence in portrait. During the prevalence of such a conventional system of art or imitation, the true fountain of all criticism, an impartial comparison with nature in all her variety, cannot exist. The ambition of the young aspirant is to imitate the style or to catch the peculiarities of the universal favourite; he studies the works of artists rather than those of nature, and thus neglects the very means by which his models attained to fame and excellence. In England, Reynolds supplanted nature, and he became the painter's model. Hence arose that style of art denominated the English school, which is conspicuous for many of the defects of its founder and for few of his beauties; and necessarily so, for where unqualified admiration confounds beauties with defects, the only result of indiscriminate imitation must be the propagation of the defects alone, which, being the more evident and palpable, are so much the more easy of imitation. Thus Reynolds's *manner* became the English *style*. This circumstance is the greatest tribute that could be paid to his really great powers, for few artists have formed a school, fewer still have led a nation. All things however that are not founded upon the solid basis of truth, but only on imperfect or partial views of nature, can have no permanent effect, and the influence of Reynolds over British taste is now rapidly declining. The noble designs of Flaxman, by directing taste into another channel, and pointing out other objects of excellence, are calculated greatly to improve the character of poetic and historic art; though the effects of these truly classic compositions will be more conspicuous in the works of the rising generation of artists.

The deficiencies of Sir Joshua's style are more striking in his historical pieces than in his portraits. Its great characteristic, *effect*, and effect founded upon colour, is incompatible with the qualities peculiarly characteristic of the grand style — simplicity, severity, and dignity of expression, which can only result from the union of a grand style of design with a subdued colour. It has been often remarked that Sir Joshua's enthusiastic admiration, expressed in his discourses, of the works of Michael Angelo and the Roman school, strangely contrasts with his own style and practice, for the various styles of art certainly do not exhibit a greater contrast than that which exists between the florid *unfinish* and feeble line of Reynolds, and the sombre colour and the vigorous design of the Roman school. Reynolds's apology for this inconsistency of principle and practice was, that he suited his style to the taste of his times; yet it is an incontestible fact that he himself formed this taste. And although it is doubtful whether he preferred present prosperity to future fame, the style which he adopted has determined the ultimate fate of his works. To use his own words, 'Present time and future may be considered as rivals, and he who solicits the one must expect to be discountenanced by the other.'

A detailed account of events and incidents of Reynolds's life is given in the elaborate work, in two volumes, by Northcote.

REYNOLDS. [THEOLOGY.]

REZAT, THE CIRCLE OF THE (*der Rezatkreis*), in the kingdom of Bavaria, is situated between 48° 41′ and 49° 45′ N. lat. and between 10° 5′ and 11° 40′ E. long. It is bounded on the north-west by the circle of the Lower Main, on the north-east by that of the Upper Main, on the east by that of the Regen, on the south by that of the Upper Danube, and on the west by the kingdom of Wirtemberg. The area is about 3000 square miles. The circle is traversed by several chains of hills, to which recent geographers have given the name of the Franconian Jura. With the exception of some few points, they are of no considerable elevation. These hills are capable of cultivation, and their sides are covered with forests. No other circle in Bavaria contains so many fertile valleys and such a rich soil. Of the great German rivers only the Danube just touches the circle for a short distance on the south, and receives, of the other rivers, only the Wernitz and the Altmühl. The principal river is the Regnitz, which is formed by the junction of the Rednitz and the Pegnitz, the latter again being formed by the junction of the Upper and the Lower Rezat. All the other rivers fall into the Regnitz, which itself falls into the Main near Bischberg, in the circle of the Upper Main.

No circle in the kingdom is better cultivated or more productive than the Rezat. All kinds of corn are cultivated, as well as millet, pulse, garden fruits, flax, hemp, tobacco, madder, and hops, and in such abundance that all, except madder, produce a surplus for exportation. The forests are very considerable. Most of them consist of firs, but there are some woods of oak, elm, &c.

The breed of cattle is a chief source of the wealth of the inhabitants, and is perhaps the best in the kingdom. The oxen (which are employed in agriculture, as well as horses) are large, strong, and very numerous; the breed of horses has been much improved by foreign importation; the breed of sheep continues to be improved by the importation of Merinos. But few swine and bees are bred, the people in these parts having a dislike to both. Large game, as deer and wild boars, is scarce; but small game, hares, partridges, &c., abounds. Domestic poultry is not so much bred as it might be. Fish abound both in the rivers and meres. There are no lakes. The circle is not rich in minerals. It produces very little iron, but has some useful kinds of stone, marble, clay, &c. It produces no salt, since Gerabronn has been ceded to Wirtemberg.

Of all the circles of Bavaria this has indeed the greatest number of manufactories, and contains several great manufacturing towns [FURTH, NURNBERG, SCHWABACH], and some of smaller importance (Erlangen [ERLANGEN], Roth, Dinkelsbühl), yet the products of the circle are almost entirely agricultural; the manufactures of woollen, cotton, linen, leather, stockings, &c. in the small towns, and by the country people, being quite unimportant.

The Rezat is the most densely peopled circle in Bavaria. The inhabitants, now 550,000, with the exception of the Jews and a few foreigners, are of German descent, and speak the High German-Franconian dialect. At least four-fifths of the inhabitants are Lutherans; the Calvinists are few. Of other religious persuasions, the Roman Catholics are the most numerous. The Jews are also numerous.

We take this opportunity to observe, that the king of Bavaria has changed the names of all the circles, or rather restored the antient historical names, as follows:—

	Late Names.		Present Names.
1.	Circle of the Isar.		Upper Bavaria.
2.	,, ,,	Lower Danube.	Lower Bavaria.
3.	,, ,,	Rhine.	The Palatinate.
4.	,, ,,	Regen.	Upper Palatinate and Ratisbon.
5.	,, ,,	Upper Main.	Upper Franconia.
6.	,, ,,	Rezat.	Middle Franconia.
7.	,, ,,	Lower Main.	Lower Franconia and Aschaffenburg.
8.	,, ,,	Upper Danube.	Swabia and Neuburg.

A few, but inconsiderable, changes have been made, by taking some districts from one circle and giving them to another.

RHÆ'TIA appears properly to have comprehended the whole country between the north of Italy and the Danube, and consequently to have included Vindelicia. Dion Cassius (liv., 22), in his account of the conquest of the Rhæti and Vindelici by Drusus and Tiberius, only mentions the Rhæti. Strabo often speaks of them (iv., p. 193, 206; vii., p. 449) as if they were only one people; and Tacitus in several passages appears to include Vindelicia in the province of Rhætia. In the time of Augustus however these two countries formed two separate provinces (Vell. Pater., ii., 39; Aurel. Vict., *Epit.*, c. i.; comp. Suet., *Aug.*, 21), of which Rhætia was bounded on the west by the Helvetii, on the east by Noricum, on the south by Gallia Cisalpina, and on the north by Vindelicia, from which it was separated by the Brigantinus Lacus (Boden See, or the Lake of Constance) and the river Œnus (Inn). It included the greater part of the Tyrol and the eastern cantons of Switzerland. The province of Vindelicia is treated of in a separate article.

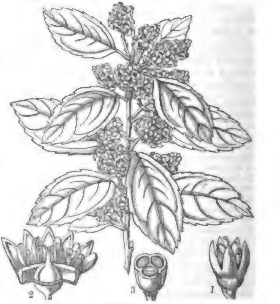
The Rhæti are said to have been a Tuscan people, who were expelled from Italy by the Gauls, and who settled in the country afterwards called Rhætia, under a leader named Rhætus. (Plin., iii. 24; Justin, xx. 5; Liv., v. 33.) They are first mentioned by Polybius (xxxv. 10, § 18) as one of the people through whose country there was a passage across the Alps. They were a brave and enterprising race, and for a long time committed constant robberies in Gaul and the north of Italy. Augustus at length sent Drusus against them (B.C. 15), who subdued the southern part of the country, and delivered Italy from their depredations; but as they still continued to trouble the province of Gaul, Tiberius also was sent against them, who attacked them near the Boden See, and reduced the whole country. The greater part of their youth was carried away, and only sufficient left to cultivate the land. (Dion Cassius, liv. 22; Strabo, iv. 206.) The victories of Drusus and Tiberius are celebrated by Horace (*Carm.*, iv. 4, 14).

The great chain of the Alps passes almost through the centre of this province, and was called the Alpes Rhæticæ (Tac., *Germ.*, c. 1; *Hist.*, i. 70), which were inhabited almost to the top by different tribes of the Rhæti (Strabo, vii. 392). Several large rivers rise in these mountains, of which the most important are the Rhenus (Rhine), the Athesis (Adige), the Addua (Adda), and the Œnus. The valleys between these mountains were very fertile, and were particularly celebrated for their grapes, from which excellent wine was made. (Strabo, iv., p. 206.) The Rhætian wine was the favourite wine of Augustus. (Suet., *Octav.*, 77.)

The Rhæti were divided, according to Pliny (iii. 24), into many states or tribes. Of these the most important were: the Lepontii, in the south-western part of the province (Cæs., *Bell. Gall.*, iv. 10; Strabo, iv., p. 204); the Tridentini, in the south-eastern; the Gerauni, whom Horace (*Carm.*, iv. 14) mentions, east of the Lepontii; the Vennones, near the sources of the Attagis (Etsch), which flows into the Athesis; the Brixentes, north of the Tridentini; the Brenni, or Breuni, north of the Rhætian Alps; and the Brigantii, in the north-western part of the province, on the borders of the lake Brigantinus. The only town of any importance in Rhætia was Tridentum (*Trent*) on the Athesis, the capital of the Tridentini.

RHAGÆ. [PERSIA.]

RHAMNA'CEÆ, a natural order of Exogens, remarkable for having a valvate calyx, hooded petals, opposite to which their stamens are inserted into the tube of the calyx, and a superior or half-inferior fruit which is either dry or fleshy. The species are all shrubs, with small greenish or inconspicuous flowers. Those most common in this country are the Rhamnus frangula (Black Alder), Rhamnus catharticus (Buckthorn), Paliurus australis (Christ's Thorn), and the evergreen Alaternus, a kind of Rhamnus. The useful species are of some importance: Rhamnus catharticus and several others have purgative berries; Rhamnus infectorius yields the French berries of the shops employed for dyeing yellow; the fruit of the Jujube, Zizyphus jujube and vulgaris, is subacid and eatable, and the species are cultivated for it in the south of Europe and the temperate parts of Asia; Zizyphus Lotus gave its name to the Lotophagi, or Lote-eaters, of Africa; and Rhamnus frangula is extensively cultivated for the manufacture of charcoal. [PALIURUS; RHAMNUS; ZIZYPHUS.]



Rhamnus Alaternus.

1, a flower about to expand; 2, a flower cut open to show the position of the stamens and petals; 3, a transverse section of a fruit, and seeds.

RHAMNUS, or Buckthorn (the word is Greek, Ῥάμνος), a widely diffused genus of the natural family of Rhamnaceæ, chiefly found in the temperate parts of Europe, in Siberia, and in the Himalayas at elevations of 6500 feet also in the New World, and at the Cape of Good Hope.

The genus is characterised by having an urceolate 4-5-cleft calyx. Petals wanting, or emarginate. Anthers ovate, 2-celled. Disk thin, overspreading the tube of the calyx. Ovary superior, 3- or 4-celled. Styles 3 or 4, distinct or united. Fruit fleshy, with 3 or 4, or, in consequence of abortion, 2 fibrous indehiscent stones.

The berries of one species, the Rhamnus catharticus, have long been known for their purgative properties, and still continue to hold a place in several Pharmacopœias. This property is participated in by those of other species, as well as by their inner bark. The berries of several species of Rhamnus form articles of commerce from the Mediterranean, under the name of French, Turkey, and Persian berries, grains d'Avignon, &c., being valued on account of the colouring-matter which they yield, and which varies from yellow to green. This M. Brongniart supposes to be owing rather to different degrees of ripeness than to essential differences in nature. Sap-green is a mixture of the juice of these berries with those of some others. R. infectorius, saxatilis, amygdalinus, catharticus, and Clusii are the species generally employed; some for dyeing morocco leather of a yellow colour, others for dyeing wool, and the bark of some for striking a black with the salts of iron. The Lycium of the antients is supposed by some to have been a species of Rhamnus [Lycium]; hence also one species has been called R. Lycioides: it has a hard yellow wood. Another, R. theezans, is said to be employed as a substitute for tea even in China.

RHAMNUS CATHA'RTICUS (called also Spina cervina, hence Buckthorn), an indigenous shrub, flowering in May, and ripening its berries in September, at which time they are collected. The berries are about the size of a peppercorn, black externally, but within of a deep violet, the pulp enclosing three or four seeds. The taste is nauseous and repulsive at last, though at first sweetish and only bitter. They contain a peculiar extractive, a colouring principle, acetic acid, and gum. The fresh and dried berries, the expressed juice, or a syrup prepared from them, all possess purgative properties, exemplified in that form which has led to the designation *hydragogue*. Its action is attended with much sickness, griping, and thirst. All the forms of exhibition are objectionable, but particularly the berries, either fresh or dried: yet this acrid and almost poisonous article is retained in practice, and is a common domestic medicine, especially for young children, the most unsuitable of all for its employment. It should be restricted to the arts, in which it is serviceable, being the source of the pigment called sap-green or bladder-green.

The berries of several different shrubs are said to be substituted for those of the R. catharticus; a circumstance which is fortunate, if any more harmless are made to replace them. Buckthorn berries are themselves used to adulterate cubebs.

RHATANY. [Ratany; Krameria.]

RHAZES, or **RAZES**, the common Latinized name of one of the most famous of the antient Arabic physicians, who is also sometimes called Rasæus, Rases, Rasis, Razæus, Razeus, Razi, Rhases, Rhazeus, Rhazis, or Arrasi. His names (as given by the anonymous author of the 'Arabic. Philosoph. Biblioth.,' quoted by Casiri, 'Biblioth. Arabico-Hisp. Escur.,' tom. i., p. 264) were Mohammed Ben-Zakaria Abu-Bekr Al-Razi. He was born and brought up at Rai, the most northern town (according to D'Herbelot, *Biblioth. Orient.*) of Irak Ajemi, and showed from his youth a great inclination for the sciences. He acquired great philological and philosophical knowledge, but chiefly devoted himself to music; and even in his thirtieth year, he was only known for his skill in singing and playing on the guitar. He afterwards, when past the age of forty (Abulfeda, *Annal. Musl.*, tom ii., p. 347) applied himself exclusively to the study of medicine and philosophy, and repaired to Bagdad, where Ibn Zein Al-Taberi was his instructor, from whom he acquired much important information. Upon his return to Rai, he became director of the hospital in that town, and afterwards of that at Bagdad. He was held in great estimation by the contemporary princes, and was called the Galen of his time. He travelled much, and visited both Jerusalem and Africa: he is said also to have visited Spain (Leo Afric., *De Viris Illustr. Arab.*, cap. 6; apud Fabric., *Biblioth. Græc.*, tom. xiii.), where, in passing through the streets of Cordova, he saw a crowd collected round the body of a man who was said to have just fallen down dead. He caused him to be beaten all over with rods, and particularly on the soles of his feet, and thus in less than a quarter of an hour restored him to life. Upon being asked about the invention of this singular remedy, he said that he had seen it used with success in a similar case by an old Arab; and added, that 'experience is of more use than a physician.'[*] To Prince Al-Mansour, to whom he dedicated his work entitled *Ketáb Al-Mansouri*, 'Liber ad Al-Mansorem,' he wished also to present his 'Confirmatio Artis Chimiæ,' and left Bagdad for this purpose. The prince was much pleased, and gave him a thousand dinars;[†] but wished at the same time to see a trial of the discoveries described in the book, and granted a considerable sum for the preparation of the necessary apparatus. The experiments however did not succeed; which so enraged Al-Mansour, that he called him a liar, struck him a violent blow on the head, and ordered him to pack up his things quickly and go back to Bagdad. (Ibn Khallikán, *Vitæ Illustr. Viror.*) This blow is said to have afterwards occasioned his becoming blind, but Abulfaraj (*Hist. Dynast.*, p. 291) and Casiri (*loco cit.*) attribute this misfortune to eating beans. At first he wished to have an operation performed; but as the surgeon could not tell him how many membranes the eye contained, he refused to let him touch his eyes; and when some one represented to him that the operation might nevertheless succeed, he replied, 'I have seen so much of the world, that I am wearied of it.' He was so charitable and liberal, that he often gave money to his poor patients, and lived himself in poverty. He died at an advanced age, either at Bagdad or Rai, A.H. 311, or more probably 320 (A.D. 923 or 932), under the khalifat of Moctader Billah, the eighteenth of the race of the Abbassides. (Wüstenfeld, *Gesch. der Arab. Aerzte.*)

His works amounted to more than two hundred, and the bare titles, as given by the anonymous author quoted above, take up four folio columns in Casiri; of these only those that have been published can be noticed here; and for a more complete account of his medical opinions and practice, the reader may consult Freind's 'Hist. of Physic,' Sprengel's 'Hist. de la Méd.,' and Haller's 'Biblioth. Medic. Pract.' The principal work of his that we possess is called *Al-Háwi*, 'Continens.' An attentive perusal of this book is sufficient to prove that Rhazes could not have published it in its present form, as the diseases are mentioned without the least order; the treatment of many of them is not touched upon; the author is sometimes quoted in the third person (*Rhaz. Contin.*, lib. vi., cap. 1, pag. 125, col. 2; lib. viii., cap. 2, pag. 176, col. 4); and lastly, one meets with the names of several Greek physicians more modern than Rhazes. To all these arguments against the authenticity of the work may be added the important testimonies of Haly-Abbas and Abulfaraj. The former gives Rhazes all the praise he really deserves; but adds, that the 'Al-Háwi' is certainly not the most evident proof of his science and good taste, but that probably he only left the work to his descendants in the form of an unfinished sketch. (Haly-Abbas, *Prolog.*, pag. 6, ed. Lugd., 1523, 4to.) Abulfaraj says positively that the authentic 'Al-Háwi' was never published. (*Chron. Syr.*, p. 172. Ed. Bruns et Kirsch.) Notwithstanding these unanswerable proofs against the authenticity of the work, it cannot be doubted that great part of it was written by Rhazes; and it will always be considered one of the most valuable repositories of the medical science of the Arabians. (Sprengel, *Hist. de la Méd.*) The original Arabic has never appeared; but several Latin translations under the various titles Elhavi, Helchauy, Elchavi, Elkavi, Hawi, &c.) were published in the fifteenth and sixteenth centuries. The first edition is scarce, and was printed at Brescia (*Brixiæ*), 1486, fol., 2 vols., in black letter, with two columns in a page, under the following title: 'Liber Elhavi, seu Totum Continentis Bubikir Zacharie Errasis Filii, traducti ex Arab. in Latin. per Mag. Ferragium, Medicum Salerni,' &c. The last edition is probably that by Hieron. Surianus, Venet., 1542, fol.

The most celebrated of his works is his treatise on the small-pox and measles, which is the oldest account that we possess of these two diseases. 'He was not however the first writer on the subject, for he himself quotes from Aaron and other of his countrymen, who had formerly given imperfect histories of these diseases. The treatment of them, as described by him, is sufficiently accurate and judicious, that is to say, he directs in general to bleed at the commencement, then to give cooling and acidulated draughts, with gentle laxatives, &c.; and he properly recommends to pay particular attention to the throat and eyes.' (Mr. Adams, Append. to Barker's Lempriere, 1838.) Of this little work there is an edition in Arabic and Latin, by J. Channing, Lond., 1766, 8vo. It was printed from a manuscript at Leyden, and Dr. Russell says (Append. to *Nat. Hist. of Aleppo*) that he had the book collated with other MSS. in the East, and that the readings were upon the whole found very exact. It has been translated into several antient and modern languages. A Greek translation was published by Jac. Goupylus, at the end of his edition of Alexander Trallianus, Lutet. Par., 1548, fol., entitled 'Rhazæ de Pestilentia Libellus ex Syrorum Lingua in Græcam translatus.' It was translated into Latin by Georg. Valla, Basil., 1529, 8vo., with Michael Psellus, 'De Victus Ratione;' by Nic. Macchellus, Venet., 1555, 8vo.; by Salomo Negri, the Syrian, assisted by J. Gagnier and Th. Hunt, and published by Dr. Mead, in his work, 'De Variolis et Morbidis,' Lond., 1747, 8vo.; Channing's translation was republished by Haller, in the seventh volume of his 'Medicæ Artis Principes,' Lausanne, 1772. It was translated into French by Sebast. Colin, Poitiers, 1556, and by J. J. Paulet, in the second volume of his 'Hist. de la Petite Vérole,' 1763, Paris, 12mo., and there is an English translation in the English edition of Dr. Mead's medical works.

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[*] A somewhat similar story is told of Asclepiades (Pliny, *Hist. Nat.*, vii. 37; xxvi. 8; Celsus, *De Med.*, ii. 6; Apuleius, *Florid.*, lib. iv., p. 368) and of several other physicians, both in antient and modern times (*Cyclop. of Pract. Med.*, vol. iii., p. 316): among the rest, a very curious one is told by Ibn Abou Osaibiah, *Oioun al-anbá fi tabacat al-atebba*, 'Fontes Relationum de Classibus Medicorum,' cap. 12, of Salih Ben Bahlah, an Indian physician at the court of Haróun Al-Rashíd. [Salih.]

[†] The dinar (derived from the Greek δηνάριον) was a gold coin, equal at first to twenty, and afterwards to twenty-five dirhems (Casiri, *Biblioth. Arabico-Hisp. Escur.*, tom. ii., p. 173); and is commonly supposed to have been worth about a Venetian zecchin (D'Herbelot, *Biblioth. Orient.*), or to a German ducat (Freytag., *Lex. Arab.*). The sum given to Rhazes would therefore amount (if we reckon the dinar as 9s. 4½d.) to £468 15s.

The ten books, dedicated to Al-Mansor, *Ketáb Almansúri*, 'Liber ad Almansorem,' contain a complete system of medicine, drawn from Arabic and Greek sources. The first book is on anatomy and physiology; the second, 'De Significationibus Temperaturarum;' the third, 'De Alimentis et Simplicibus;' the fourth, 'De Sanitatis Tuendæ Ratione;' the fifth, 'De Morbis Cutis, et de Cosmeticis;' the sixth, 'De Victu Peregrinantium;' the seventh, 'De Chirurgia;' the eighth, 'De Venenis;' the ninth, 'De Curatione Omnium Partium;' and the tenth, 'De Febribus.' The writers from whom the work is chiefly compiled are Hippocrates, Galen, Oribasius, Paulus Ægineta, and Aëtius. It contains an excellent treatise on the qualities necessary for a physician (Tract. iv., cap. 32, pag. 78, ed. Lugd., 1511, 8vo.), in which he declares that a person of much learning and little experience is more to be trusted than one of much experience and little learning; for he adds, how is it to be supposed that the private stores of any one individual should be at all worthy to be compared with the accumulated treasures of antiquity? There is also a very curious chapter (Tract. vii., cap. 27, pag. 123) on quacks and impostors, which has been translated and inserted by Freind, in his 'History of Physic.' He is said by Jo. Bapt. Silvaticus (*Controv. Med.*, sec. 14) to be the first person who recommended intoxication once or twice a month (*Almans. Tract.*, iv., cap. 5, pag. 64), which precept was repeated by Avicenna (*Cantic.*, part ii., sec. 34, pag. 393, ed. Venet., 1564), and others, and vigorously opposed at Paris in the seventeenth century, in two theses, by Hommets and Langlois. The ninth book was for several centuries one of the most celebrated text-books for medical students, but, notwithstanding its fame, Sprengel and Haller both declare that it contains nothing original. The Al-Mansor to whom the work is dedicated has by some been supposed to be the caliph of Bagdad, who lived above two centuries before the time of Rhazes, by others a prince of Cordova, who lived long after. Rhazes himself solves the difficulty, and says (*Antidotar. Prolog.*, pag. 78, b. ed. Venet., 1500) that he was a prince of Khorassán (*domino Corascem*), and nephew of the caliph Moktasi, named Al Mansóur Ibn Ishac Ibn Israel Ibn Ahmed. The whole of the Arabic original of this work has never been published, but a small extract (lib. ix., cap. 7) is inserted, with a Latin translation, in Reiske's 'Opusc. Med. ex Moniment. Arab.,' p. 70, sq. The first Latin translation was published with several other of his smaller works, Mediol., 1481, fol., in black-letter; the last edition came out at Basel, 1544, fol. There are also several other works that have been published with the 'Liber ad Almansorem,' *e.g.* 'Liber Divisionum,' 'Aphorismi,' 'De Juncturis,' 'Antidotarium,' 'De Morbis Infantum,' 'Introductio in Medicinam,' 'De Calculo Renum et Vesicæ,' 'De Facultatibus Partium Animalium,' &c. None of these little works contain anything of much importance.

RHEA. (Ornithology.) [STRUTHIONIDÆ.]

RHE'GIUM (in Greek, *Rhegion*, Ῥήγιον), now Reggio, one of the oldest Greek towns in Italy, is situated on the Fretum Siculum, or strait which divides Italy from Sicily. Rhegium was a colony of the Chalcidians, who were joined by a party of Messenian emigrants who left their country during the first quarrel between Messene and Sparta, in consequence of the affair of Limnæ. (Strabo, p. 257.) Its name Rhegion is said to be derived from a Greek verb (ῥηγ-νυ-μι) which means to tear or rend asunder, from a tradition of a physical convulsion by which Sicily became detached from the continent of Italy. (Strab., p. 258.) Both the town and the name probably existed previous to the establishment of the Chalcidian colony, as Diodorus and other antient writers place its foundation in the Heroic times.

After the taking of Ithome, and the end of the first Messenian war, a fresh colony of Messenians, led by Alcidamas, settled at Rhegium about 723 B.C.; and after the capture of Eira, a third party of Messenian emigrants, led by two sons of Aristomenes, joined their countrymen at Rhegium, which became a very populous and flourishing city, and extended its dominion over other towns and districts. Charondas of Catana is said to have compiled a code of laws for Rhegium. The government appears to have been a kind of open aristocracy, which, according to some accounts, was vested in one thousand of the citizens.

About 494 B.C., Anaxilaus, a citizen of Rhegium, of a Messenian family, usurped the supreme power. He took the town of Zancle on the opposite side of the strait, and colonised it with his Messenian countrymen, who gave it the name of Messana. [MESSENIA.] The poet Simonides composed a poem on the occasion of Anaxilaus having gained the prize at the Olympic Games with his mules. Anaxilaus married a daughter of Therillus, tyrant of Himera, who, being afterwards defeated by Theron of Agrigentum, took refuge at Carthage. Anaxilaus and Therillus invited the Carthaginians to the first invasion of Sicily (480 B.C.), which was defeated by Gelon of Syracuse. Anaxilaus died shortly after, and his sons were subsequently driven away from both Messana and Rhegium. The towns then became independent of each other, but remained allied by the ties of a common origin, and both joined the league of Naxus, Leontini, Catana, and other towns of Sicily, of Chalcidian origin, against Syracuse and the other Dorian cities. This contest led to the first Athenian expedition (427 B.C.), which came to the assistance of the allies. The harbour of Rhegium became the station of the Athenian fleet, and the Rhegini joined the Athenian forces. (Thucyd., iii., 86, 88.) After several desultory combats, the Sicilian towns agreed to a peace among themselves, and the Athenian forces returned home. During the second Athenian expedition against Syracuse, which ended so fatally for the Athenians, Rhegium remained neutral. Afterwards a long struggle began between Rhegium and Dionysius the elder, tyrant of Syracuse, which terminated with the ruin of Rhegium. Dionysius, wishing to strengthen himself by alliance with the Greek cities of Italy for his impending contest against Carthage, sent to ask one of the maidens of Rhegium for a wife. The Rhegians, irritated against Dionysius for his treatment of Naxus and Catana, the citizens of which he had driven away, and sold many as slaves, replied that they could only give him the daughter of their public executioner. Dionysius then applied to the Locrians, who gave him in marriage Doris, daughter of one of their chief citizens, and from that time he vowed vengeance against Rhegium. After having defeated the Carthaginians, he sailed from Syracuse with 100 galleys and a large body of men, which he landed near Rhegium. They scaled the walls, and were near taking possession of the town, when a fire broke out, and compelled them to retire. A new expedition from Carthage against Syracuse obliged Dionysius to leave Rhegium in peace for a time. Having again defeated the Carthaginians, Dionysius equipped a fleet of 120 galleys, with an army of 20,000 foot and 1000 horse, with which he landed near Locris, and then ravaged the territory of Rhegium. But the towns of Magna Græcia sent assistance to Rhegium; and a storm arising, in which many of the Syracusan ships were wrecked on the coast, Dionysius was obliged to retire to Syracuse (390 B.C.). The next year he came again to Italy, besieged, took, and destroyed Caulon, defeated an army of the Greek Italian cities, and obliged them to separate themselves from Rhegium, which he besieged again in the following year with a large force. The Rhegians made a brave resistance, but they were compelled to surrender through famine (387 B.C.). Many of the inhabitants were found dead; fifteen thousand of the remainder were sent to Syracuse as slaves; some of the wealthiest ransomed themselves. Python, their commander, was put to a cruel death with all his family by Dionysius, who razed the walls of Rhegium, and obliged the neighbouring towns of Magna Græcia to pay allegiance to him. Under his successor, Dionysius the Younger, Rhegium recovered its independence, and gradually some part of its former prosperity. After the expulsion of Dionysius the Younger from Syracuse, and the death of Timoleon, Rhegium was again besieged by the Syracusans, when Agathocles, himself an exile from Syracuse, came to its assistance with a party of his emigrant countrymen, and obliged the besiegers to raise the siege (317 B.C.). After the death of Agathocles, his numerous Campanian mercenaries, who were called Mamertines, being dismissed from the Syracusan service, took possession of Messana, and of all the property of the former inhabitants.

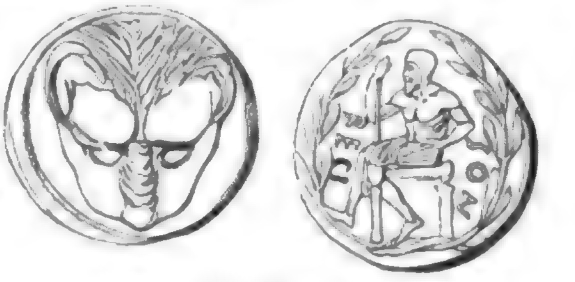
Not many years after, while Pyrrhus was waging war in South Italy and Sicily, Rhegium applied to Rome for assistance. The Romans sent a body of 4000 men, raised in the Latin colonies in Campania. These auxiliaries, finding themselves far from Rome, broke through all the restraints of discipline, and rising against the peaceful inhabitants whom they had been sent to protect, killed most of the men, took possession of their houses and property, and appropriated their wives and daughters to themselves. After the final retirement of Pyrrhus from Italy, the Roman senate sent the consul Genucius Clepsina with an army to punish the traitors. The Campanians defended themselves obstinately, and when at last they surrendered at discretion, they were reduced to a few hundreds, who were all put to death about 270 B.C. This happened shortly before the beginning of the first Punic war. The surviving citizens of Rhegium were restored to their houses and property, and to their municipal independence under the protection of Rome. Rhegium recovered its prosperity, and was a place of importance to Rome on account of its neighbourhood to Sicily. The Aquilian road terminated at Rhegium. The town was almost destroyed by an earthquake just before the breaking out of the Marsian war. In the time of Strabo, Rhegium, Tarentum, and Neapolis were the only towns of the numerous Greek colonies in Italy that retained the Greek language, manners, and customs. (Strabo, p. 253.)

After the fall of the Western empire, Rhegium remained subject to the Eastern emperors, and its archbishop was metropolitan of the whole country of the Bruttii. The Saracens from Sicily took possession of Rhegium, and planted a number of date-trees in the neighbourhood, a few of which have perpetuated themselves to our times. (Swinburne, *Travels in the Two Sicilies.*)

Rhegium was taken by the Normans in the eleventh century, since which time it has always been a part of the kingdom of the Two Sicilies.

In the sixteenth century Reggio was sacked three times by the Turks, in 1543 by Barbarossa, again in 1558, and lastly in 1593. The great earthquake of Calabria, in 1783, completely ruined the town of Reggio; not a single building remained entire. Reggio has been since rebuilt on a regular plan; it spreads along the declivity of a hill down to the sea. A wide street, called La Marina, runs along the sea-shore, and another street, parallel to it, runs through the centre of the town, and is intersected at right angles by various streets. The view of the opposite coast of Messina and its verdant hills, backed by the huge mass of Ætna, is truly magnificent. The Apennines near Reggio are rugged and bare, but the plain around Reggio is extremely fertile, and the ground is very valuable, most of it being laid out in orange and lemon plantations. The extracting of an essence from the rind of the orange and lemon, and the rearing of silk-worms, constitute important branches of industry. Reggio is a great nursery of orange and lemon plants for all parts of the kingdom. The climate is temperate, and the atmosphere remarkably pure. The population of Reggio amounts to nearly 20,000. The inhabitants are lively and sociable, and are mostly in easy circumstances; the women are good-looking, and it is altogether one of the pleasantest towns in the kingdom of Naples. [Calabria.]

The antient port no longer exists. The small craft of modern Reggio anchor a little to the north of the town, opposite the village of Pentimele. Reggio is about eight miles south-east of Messina.



Coin of Rhegium.

British Museum. Actual size. Silver.

RHEIMS. [Reims.]

RHEINPROVINZ. The province of the Rhine is sometimes called Rheinpreussen, or Rhenish Prussia, though this latter name is more generally understood to include the province of Westphalia. It lies between 49° 10′ and 51° 55′ N. lat., and between 5° 55′ and 8° E. long. It is situated on both sides of the Rhine, and comprises the grand-duchy of the Lower Rhine, and the duchies of Juliers, Cleves, and Berg. It was formerly divided into two provinces, the Upper and Lower Rhine. It contains the five governments of Cologne, Düsseldorf, Coblenz, Treves, and Aachen (Aix-la-Chapelle). Except the circle of Wetzlar, which is encompassed by Nassau, Hesse-Darmstadt, and Hesse-Cassel, it is bounded on the north by Westphalia, on the east by Nassau and Hesse-Darmstadt, on the south by France, and by the territories belonging to Bavaria, Saxe-Coburg, and Hesse-Homburg, on the left bank of the Rhine, and on the west by the grand-duchy of Luxemburg, Belgium, and the Netherlands. The area is 10,230 square miles, and the population 2,473,723 inhabitants, or nearly 242 to a square mile.

The northern, eastern, and southern parts of the province are mountainous.

The Hundsrücken, which extends between the Moselle, the Rhine, and the Nahe, forms the west side of the valley of the Rhine and the east side of the valley of the Moselle, and is connected on the south with the Vosges. Its highest point, within the province, is in the Soonwald, which is 2015 feet above the level of the sea.

The Eifel, which is a wild and partly very sterile chain, is a continuation of the Ardennes, and extends between Luxemburg, the Moselle, and the Rhine. In the eastern part there are numerous extinct volcanoes.

The Westerwald is a rude chain, which likewise shows many traces of volcanic action. The most interesting part of it is that called the Siebengebirge near Bonn; some parts of this chain are from 1200 to 1400 feet above the level of the sea.

The principal rivers are the Rhine, the Moselle, and the Lippe, which are navigable; the many smaller streams, most of which fall into the Rhine, are either not navigable or only by very small vessels. There are only two inconsiderable lakes in the province. The climate is temperate; the air on the right bank of the Rhine is pure and healthy; on the left side damp fogs are more frequent, especially in the north-west part, where there are many marshes; on the mountains it is cold. The natural productions of this province are equally numerous and valuable. The higher parts of the mountains are crowned with noble forests, and the declivities are covered with vineyards. The mineral kingdom yields silver, iron, copper, lead, calamine, marble, slate, freestone, millstones, basalt, porphyry, alum, manganese, sulphur, coals, and salt. Where the country slopes to the Rhine there are productive corn-fields and rich pastures; between the mountains there are fertile valleys, where flax, hemp, hops, and tobacco are grown, and fruit and garden produce of every kind are cultivated in great abundance. Game is plentiful, and all the domestic animals are bred in sufficient number.

But the great source of the prosperity of the province is the Rhine, which, from its junction with the Nahe to the village of Hochheim on its right bank, forms the natural boundary between the duchy of Nassau and the government of Coblenz; it then traverses the governments of Cologne and Düsseldorf, and leaves the Prussian territory at Schenkenschanz, opposite the Dutch village of Lobith, having passed through this province as one undivided stream for 180 miles. On the banks are many vestiges of Roman works and ruins of castles of the middle ages. The small rivers and streams are applied to turn mills and to work manufacturing machinery of every kind; for this, says Hassell, is the most industrious (*i.e.* manufacturing) province not only of the Prussian monarchy but of all Germany.

It is perhaps not unsuitable,' says Nemmich, 'to call the duchy of Berg an England in miniature; we find in it a Manchester, a Leeds, a Sheffield, a Spitalfields, a Birmingham.' This was written above twenty years ago, and the comparison is now even more appropriate. [Julich-Cleve-Berg.] The trade of the province is very extensive. The numerous manufactures are particularly described in the articles on the several towns. [Aix-la-Chapelle; Barmen; Dusseldorf; Elberfeld, &c.] With regard to religion, about 1,830,000 are Roman Catholics, 610,000 Lutherans and Calvinists, 2000 Mennonites, and 30,000 Jews. There are 2345 Roman Catholic and 880 Protestant elementary schools, 49 mixed schools, and 59 Jewish schools.

(Dieterici, *Statistische Uebersicht*, &c., 1838; Hassell; Stein; Hörschelmann; *Weimar Almanach*, 1840; Schlieben, *Gemälde der Preussischen Monarchie*; Mayer, *Beiträge zur Statistik der Königlich-Preussischen Rheinlande.*)

RHEIN-HESSEN (that is, Rhenish Hesse) is one of the five provinces of the grand-duchy of Hesse Darmstadt. It is bounded on the north by Nassau, on the north-east and east by the province of Starkenburg (separated however from both by the Rhine), on the south and south-west by Bavaria, and on the west by Rhenish Prussia. It forms one connected whole; only two communes, Kastel and Kortheim, being on the right bank of the Rhine opposite to Mainz. The surface is undulating, alternating with hills, valleys, and small plains. It is a hilly but not a mountainous country; the Rochus, or Hesselsburg, near Bingen, is but a great hill, being only 725 Paris feet above the Rhine. Nearly four-fifths of the country are arable land, one twenty-fifth pasture, almost one-fifteenth vineyards, and less than one twenty-eighth forests. The principal rivers are the Rhine, the Main, and the Nahe, besides which there are several smaller streams that rise in the Vosges or in Mont Tonnerre. The soil is light, and on the bank of the Rhine sandy, but it is everywhere extremely fertile, and the climate is so mild that the country is sometimes called the Wonnegau (that is, the delicious valley). The natural productions are oats, spelt, barley, rye, and millet (of all which, notwithstanding the great population of the country, considerable quantities are exported), flax, tobacco, and potatoes in great abundance. The cultivation of fruit is very general; all the roads are bordered with fruit-trees. Some of the wines are of excellent quality; the quantity produced in ordinary years is very considerable. The forests do not yield sufficient timber for home consumption. Oxen, swine, and poultry are numerous; but there are scarcely any sheep; most of the oxen are employed in agriculture. There are only a few manufactures, which are chiefly of linen, cotton, and leather. The province has a very active and profitable export trade in its own productions, and a good transit and commission trade. The following statement is from the Weimar Almanac for 1840: 'Area 520 square miles. Population (census of 1838) 206,900; the annual increase is estimated at 7500. Religion (in 1832): Evangelical, 87,695; Roman Catholics, 93,764; Moravians, 871; Jews, 7307. Principal towns: Bingen; Mainz; Worms.'

RHEINGAU, THE, is a valley six leagues in length and two leagues in breadth, in the duchy of Nassau, between the Rhine and the Höhe, and extending from Biberach to below Rudesheim. It is formed by the Rheingaugebirge, begins at the village of Nieder-Walluf below Mainz, and ends at the village of Lorrich. It contains about 20,000 inhabitants, and the principal town is Ellfeld. This valley is protected on the north by the Taunus chain of mountains, and is celebrated for its beauty and fertility, and especially as producing the finest Rhenish wines. With regard to the cultivation of the vine, it is divided into the upper and the lower districts, that is, the villages on the heights and those on the banks of the rivers. The strongest wines are produced on the highest eminences; the most wholesome in the middle region; the wines of the valley are not so soon fit for use. The best wines are the Nierenstein, the Johannisberg, the Rudesheim, and the Biberach. That of Hochheim (hock) is generally reckoned among the wines of the Rheingau, though Hochheim is beyond the boundaries of the valley as above described. Much fruit is cultivated on the mountains. At a distance from the banks of the Rhine there are considerable forests.

RHENA'NUS, BEA'TUS, was born in 1485, at Schlettstadt in Alsace. His father, though originally a butcher of Rheinach (whence the name Rhenanus), was a man of considerable property, and gave his son the best education that could be had in those times. After the boy had finished his elementary education, his father sent him to Paris, where he studied philosophy and antient literature. From Paris he went to Strasburg and Basel, and in the latter place he formed an intimate friendship with Erasmus and Gelenius. During his residence at Paris he had been employed in the office of the learned printer H. Stephens, and he occupied himself in a similar manner in the printing establishment of Froben at Basel.

In 1520 his father died, and left him all his property; but although Rhenanus retired to Schlettstadt, he continued his favourite study of the antients with the same zeal; and in order not to be disturbed, he requested and obtained from the emperor Charles V. an exemption from all public offices. He had always objected to marrying, but at last his friends prevailed upon him, and at the advanced age of 61 he married. A few months afterwards he was attacked by a disease, from which he sought relief in the baths of Baden, but as they only increased his sufferings, he returned home, and on his way thither he died, at Strasburg, on the 20th of May, 1547. His body was carried to his native place, and buried there.

Rhenanus is chiefly celebrated as the editor of many antient authors, on whom he bestowed great care, with the view of giving a correct text. The following is a chronological list of most of his editions:—

'Quintus Curtius,' Basel, 1517; 'Maximus Tyrius,' Basel, 1519; 'Velleius Paterculus,' Basel, 1520 (this is the editio princeps of that historian); 'Tertulliani Opera,' Basel, 1521; 'Auctores Historiæ Ecclesiasticæ,' containing Eusebius, Pamphilus, Nicephorus, Theodoret, &c., 1523-25 (reprinted at Paris in 1541); 'Plinius, Historia Naturalis,' Basel, 1526; 'Procopius Cæsariensis, De Rebus Gothorum,' Basel, 1531; 'Tacitus,' Basel, 1533; reprinted in 1544; 'Livii Decades Tres,' Basel, 1535.

Among the original works of Rhenanus we may mention —'Præfatio in Marsilii Defensionem Pacis pro Ludovico IV. Imperatore, adversus iniquas Ecclesiasticorum Usurpationes,' Basel, 1522. This work was published under the assumed name of Licentius Euangelus, sacerdos. 'Illyrici provinciarum utrique Imperio cum Romano tum Constantinopolitano servientis Descriptio,' published at Paris in 1602, together with the 'Notitia dignitatum imperii Romani.' 'Rerum Germanicarum,' libri iii., Basel, 1531: this work has often been reprinted. The edition of Sturm (Basel, 1551) contains a good Life of Rhenanus. He also translated several works from the Greek into Latin, such as some works of S. Gregorius Nazianzenus, part of the writings of Origenes, in the edition of Erasmus, &c.

RHESCU'PORIS. [Thrace.]

RHESUS MONKEY, a species of *Simiadæ*, placed by Cuvier and others among the *Macaques*. [Macacus.]

Description.—Greyish with a yellowish tint on the head and rump, and sometimes over the whole back; face flesh-colour; tail reaching beyond the hough.

Locality, Bengal.

RHE'TICUS. The real name of this individual was George Joachim. He was born February 16, 1514, at Feldkirch, a small town situated a few miles south of Lake Constance, and was surnamed Rheticus from the circumstance of this part of the Tyrol having been antiently inhabited by the Rhæti. When twenty-three years old he was appointed professor of elementary mathematics in the university of Wittenberg, the higher chair being at that time filled by Reinhold; but after teaching there with some repute for about two years, he relinquished his appointment in order to become the disciple and assistant of Copernicus, whose doctrines he advocated with much zeal and personal risk. His letter to Schöner, entitled 'Narratio de Libris Revolutionum Copernici,' wherein he endeavoured to show that the rotation of the earth about the sun is not a mere probable hypothesis, as Copernicus had thought fit to announce it, but an incontestible truth, and asserts that if Aristotle himself were living, he would be the first to acknowledge his error, excited against him the ill-will of the leading advocates of the Ptolemaic system. This letter appeared in 1540, Danzig, 4to.; was reprinted the following year at Basel, and appended to the work of Copernicus, 'De Revolutionibus,' Basel, 1566; and to Kepler's 'Prodromus Dissertat.,' Tübing., 1596. He resumed his professorship in 1541-2; and in the latter year were published his 'Orationes de Astronomiâ, Geographia, et Physica,' Nürnb. He subsequently visited different parts of Germany, taught for some time at Leipzig, and died of apoplexy at Cashau, in the north of Hungary, 4th December, 1576. (Zedler.)

Rheticus has left an indisputable proof of extraordinary industry and devotedness to science in a posthumous work, entitled 'Opus Palatinum de Triangulis à Georgio-Joachimo-Rhetico cœptum, L. Valentinus Otho, principis palatini Frederici IV., electoris mathematicus consummavit, Neostadii in Palatinatu,' 1596, fol. The least important part of this work is the introductory treatise on Trigonometry, in nine books, of which the first four, relating to right-angled triangles, were written by Rheticus, and the other five, on oblique triangles, by his pupil Otho. They comprise four hundred and eighty-one folio pages, which, observes Delambre, might be compressed into ten.

As authors, Delambre declares that Rheticus and Otho were the most prolix and obscure that he had ever met with. After the introductory treatise follows a table of sines, cosines, tangents, cotangents, secants, and cosecants, to every ten seconds of the quadrant, and to a radius of 10,000,000,000. Nearly the whole of this extensive table, which must have been of inestimable value to the astronomer, was the work of Rheticus, though the contrary might be inferred from the statements of Montucla and Lalande. The sines were originally computed by him to fifteen places of figures, and were correct to the fourteenth, as was shown by M. Prony, in the fifth volume of the 'Mémoires de l'Institut;' but only the first ten were inserted in the 'Opus Palatinum.' The table of tangents and secants was not quite complete when Rheticus died. Those which were wanting were added by Otho. The whole were computed to ten places of figures, of which only the first eight could be relied on. Pitiscus subsequently computed the tangents and secants as far as eleven places of figures (Montucla says sixteen), which, with the rest of the table of Rheticus, he published in 1613, under the title of 'Thesaurus Mathematicus.'

It is to the labours of Pitiscus that Montucla ascribes most praise, designating them 'the most remarkable monument of human patience, the more meritorious as it was accompanied by so little glory,' which, observes Delambre, would be true if the name of Rheticus were substituted for that of Pitiscus, whom he considers to have been little more than the editor of the 'Thesaurus Mathematicus.' (See the *Astronomie Moderne*, ii., p. 34.) The only terms employed in the 'Opus Palatinum' to express the several functions of an arc, are base, perpendicular, and hypothenuse; the terms tangent and secant had not then been introduced, and the appellation sine, which had been generally employed by Müller and others, was rejected by Rheticus. The construction of the canon is understood to have commenced in the year 1540.

Rheticus had intended to publish two treatises in German on astronomy and philosophy generally, and had announced a work on chemistry, in seven books, none of which have appeared. In these his chief aim was to abolish hypothesis, and to rest exclusively on observation.

(Zedler, *Grosses Universal Lexicon*, xiv. 812; Kästner, *Geschichte der Mathematik*, i. 561-2; Delambre, *Astron. Mod.*, ii. 1-25; Weiss, *Biog. Univ.*, art. 'Joachim;' see also Adani *Vit. Philos. Germ.*; and Vossius, *De Mathem.*)

RHETORIC (ῥητορική) is a Greek word of similar import to the Latin oratory; but a rhetorician is a teacher of or writer on oratory, and an orator is one who practises the art: Demosthenes was an orator, Aristotle was a rhetorician, and Cicero was both.

English writers, in treating of rhetoric, appear generally to consider it the same as oratory, and perhaps it is difficult to make a distinction between them. Cicero's 'Orator,' 'De Oratore,' and 'De Claris Oratoribus,' are always called rhetorical works. Quinctilian (*Inst.*, ii. 14) speaks of persons who translated the Greek word 'rhetorice' into Latin by 'oratoria' and 'oratrix;' but he objects to the use of both these words, and adopts the Greek word, which, he says, Cicero himself employed to designate certain books (probably the two books 'De Inventione') which he had written on this art. What Quinctilian calls 'rhetorice' is discussed at length under ORATORY, and an account of Quinctilian's work on the same subject will be found under QUINCTILIAN. In the former article it is stated that the treatise of Aristotle on rhetoric is the oldest extant treatise on this art, and one of the most valuable books preserved from antient times. The present article seems to furnish a suitable occasion for giving a short account of Aristotle's work.

Aristotle begins by saying that rhetoric is the counterpart (ἀντίστροφος) of logic, and he defines it to be the faculty (δύναμις) of perceiving on any given subject what is best adapted to persuade. He divides rhetoric into three parts· Persuasion (πίστις, or rather πίστεις), Language or Expression (λέξις), and Arrangement (τάξις). His work consists of three books, of which the first and second treat of persuasion, and the third treats of expression and arrangement.

After premising some general remarks on rhetoric, he treats of persuasion as derived from enthymemes (ἐνθυμήματα). Having stated that there are three kinds of persuasion, the deliberative (συμβουλευτικόν), the demonstrative (ἐπιδεικτικόν), and the judicial (δικανικόν), and that, in reference to each of these, persuasion is both special (ἴδιαι) and general (κοιναί), c. 3, he discusses the subject of special persuasion in each kind: touching the deliberative he inquires whether it be useful, c. 4 to 8; touching the demonstrative, whether it be honourable, c. 9; touching the judicial, whether it be just, c. 10 to 15. He concludes the first book by stating and explaining the modes of producing persuasion without the art of rhetoric, c. 16.

In the second book he proceeds to say that, in reference to certain questions, special persuasion must be considered as depending on the character of the speaker, c. 1; and on the passions of the hearers, c. 2 to 13; as also on the general character of the hearers, such as their passions, their moral habits, their different ages and conditions in life, c. 17 to 19. He closes the discussion of special persuasion by viewing it in connection with questions common to the three kinds of persuasion, such as possibility, fact, futurity, and magnitude, c. 19. He then proceeds to persuasion considered generally and indefinitely, of which he mentions two kinds, example (παράδειγμα) and enthymeme (ἐνθύμημα), adding *gnóme* (γνώμη) as included in enthymeme, c. 20 to 26.

He commences the third book with the second part of rhetoric, namely, expression. He states what is necessary to constitute expression, c. 2 to 4; and describes its various forms, c. 5 to 9. He treats of elegance (τὰ ἀστεῖα), c. 10, 11; and represents the different kinds of expression, c. 12.

He then comes to the third part of rhetoric, which is arrangement. This, he says, consists necessarily of two parts, the proposition of any subject, and its confirmation; but there may be four parts, introduction (προοίμιον), proposition (πρόθεσις), confirmation (πίστις), and peroration (ἐπίλογος). He concludes the work by discussing these four parts of arrangement: introduction c. 14, 15; proposition, c. 16; confirmation, c. 17; peroration, c. 19.

Aristotle's *Rhetoric* is not only the best treatise upon this subject, but a model of profound thinking and reasoning for the investigation of various other subjects.

RHEUM, a genus of plants of the natural family of Polygonaceæ, of which the name is taken from the ῥέον of Dioscorides, and which includes the different species of plants which yield the stalks and root so well known by the name of rhubarb. It is doubted by some whether the root to which the name *rha* and *rheon* was applied by the Greeks was the same as that to which we now apply the name of rhubarb, because the descriptions of the former given by Dioscorides and Pliny do not apply to the latter. It is admitted however that our rhubarb was known to the later Greek physicians, as Alexander of Tralles and Paulus of Ægina, and there is no doubt that the Arabs were well acquainted with it; and it is remarkable that they quote *rheon* as the Greek synonyme of their *rawund*, which is rhubarb, and which they describe as being of various kinds, as Indian, Turkish, Chinese, and from Khorassan. From this it is probable that one kind may have become substituted for another as the communication with the East increased.

Long as rhubarb has been known, it is remarkable that the species of Rheum yielding it is yet unknown; this is in consequence of the best rhubarb, Turkey rhubarb, being only obtained by the Russians at Kiachta from the Chinese. That called Chinese may be the produce of the same, or of a different species, from the northern boundaries of that country. Dr. Royle, after reviewing the different accounts of the commerce of rhubarb, states:—'This would bring the rhubarb country within 95° of E. long., in 35° of N. latitude, that is, into the heart of Tibet. As no naturalist has visited this part, and neither seeds nor plants have been obtained thence, it is as yet unknown what species yields this rhubarb.' Sievers had previously said that his travels had satisfied him that as yet nobody, that is, no scientific person, has seen the true rhubarb plant. The Himalayan and Persian rhubarbs have alone been ascertained.

The different species of rhubarb are important plants, not only on account of the roots being so extensively employed, and so valuable for their medicinal qualities, but also on account of the stalks of the leaves being now so much employed, from their agreeable acidity, in making tarts, &c. As the species are all indigenous in cold parts of the world, that is, from the southern parts of Russia, Siberia, Tibet, the north of China, and the Himalayas, so they may all be grown in the open air of this country, and several are cultivated on account of their stalks. Some also, both in England and France, are cultivated on account of their roots, often for the purpose of adulteration. The genus Rheum is characterised by having an inferior petaloid sexpartite calyx, into the bottom of which the stamens, about nine in number, are inserted; anthers opening lengthwise; ovary superior, with a single erect ovule; styles three, reflexed; stigmas peltate, entire; fruit (achenium) three-cornered, winged, with the withered calyx at the base.

The species which are known and cultivated are the following:—

1. R. Emodi, Wallich, Australe of Don, is found in Kumaon; the root is a valuable medicine, though bearing hardly any resemblance to that of the shops. Stems much branched, 6 to 10 feet high, very thick below, gradually diminishing, and spreading into large panicles, and there rough, with minute warts. Leaves very large, cordate, acute, dull-green, but little wavy, very rough, covered with little hairs. Petioles very rough, furrowed, and very much narrower at the upper than the lower end. Panicles terminal, very long. Flowers blood-red, very small.

2. R. Webbianum, Royle, 'Illust.,' t. 99, Emodi of Meisner, found by Mr. Moorcroft at the height of 12,000 feet above the level of the sea, and by Dr. Royle on the Choor Mountain. Root-leaves large, long-stalked, rather downy above, veiny beneath, margin hairy. Axillary racemes clustered, terminal, panicled; pedicels in threes, twice as short as the ripe fruit

3. R. spiciforme, Royle, 'Illust.,' t. 78, found on the northern face of the Himalayas. Leaves thick, leathery, cordate, blunt, red and netted beneath, and covered with stellate down on each side. Pedicels numerous, clustered, as long as the ripe fruit. The roots are lighter coloured and more compact than those of R. Emodi.

4. R. Moorcroftianum, Royle (Small-Stalked Rhubarb). Leaves and stems covered with short pubescence; petioles deeply furrowed; the stipules as long as the petioles, and very membranous; scales at the base yet longer, extremely thin, and, towards the summits, much torn. This species was found by Messrs Moorcroft and Hearsay near the Niti Pass in the Himalayas, at an elevation of 12,000 feet.

5. R. leucorhizum, Pall. (nanum, Sievers; tataricum, Linn.). A small plant for the genus; the root is white and branched, though said to be equally efficacious with the best sorts. Radicle leaves about three, short stalked, from four to six inches long, and from five to nine broad; smooth on both sides, toothletted at the edge. Flowering stem about two inches high when in flower, afterwards becoming ten to twelve high.

6. R. rhaponticum, Linn. North of the Caspian. According to Guibour, cultivated largely near Lorient, in the department of Morbihan in France, at a place called from that circumstance Rheumpole. Leaves roundish, ovate, cordate, obtuse, but little wavy, very concave, even, very slightly downy on the under side. Panicles very compact and short, always rounded at the ends, and never lax. R. rhaponticum, hybridum compactum, and hybrid varieties of them, are the common garden rhubarbs, of which one is called R. hybridum.

7. R. undulatum, Linn. (rhebarbarum, Linn.). China and Siberia. Leaves oval, obtuse, deep green, with veins purple at the base, often shorter than the petiole, downy on each side 'when young, looking as if frosted. Petiole downy, blood-red, semi-cylindrical.

8. R. caspicum, Fischer (rhaponticum, Ledbour). In the Altai Mountains. Leaves ovate, acuminate, obtuse, cordate, inflexed at the base, thick, very wavy, glossy on the upper but slightly downy on the under side. Petiole pale green, minutely downy.

9. R. compactum, Linn. Tartary and China. Leaves heart-shaped, obtuse, very wavy, deep-green, thick, quite smooth on both sides, glossy on the upper. Sinus nearly closed with parenchyma. Petiole green.

10. R. crassivernium, Fischer. Leaves heart-shaped, acuminate, obtuse, wavy, bullate, deep green, quite smooth, rather glossy above, ribs slightly coloured red, the centre ones above half an inch deep at the base. Petiole dull red, rounded, rather angular.

11. R. palmatum, Linn., generally thought to be the source of the true officinal rhubarb. Near the great wall of China. Leaves roundish, cordate, half palmate; the lobes pinnatifid, acuminate, deep dull green, not wavy, but uneven and very much wrinkled on the upper side, hardly scabrous at the edge, downy on the under side. The flowering stems are taller than those of any other species.

12. R. Ribes, seems to be so named from the Persian name *ribas*, which is as frequently written *rewash*, and which Elphinstone, Burnes, and other travellers notice as being highly esteemed by the Persians, and of which the stalks are prepared in a variety of ways, and considered a great delicacy. For a fuller account of the localities, characters, &c. of these various species, see Royle's *Illustr. Himal. Bot.*; Lindley, *Flora Medica;* and Pereira, *Elements of Materia Medica.*

RHEUM (*Rhubarb*), MEDICAL PROPERTIES OF. As the particular species which yields the officinal rhubarb, and even the precise place of its growth, are not known, the varieties met with in commerce are here described, without attempting to assign them to any ascertained species. There are six well-marked varieties, viz. Russian or Turkey, Dutch-trimmed, Chinese, Himalayan, English, and French. Of the first sort the greater portion at present comes from St. Petersburg, and is denominated Muscovite, Bokharian, or Siberian rhubarb, while a 'part has always formed one of the imports from China into Bokhara, whence passing to Smyrna, it is known in Europe as Turkey rhubarb' (Royle, *Flora of the Himalaya*), which name it commonly bears in the shops. This kind varies much in size and appearance, the pieces being cylindrical, spherical, flat, or irregular, from two to three inches long, one to three broad, and one to three thick. 'The smaller pieces are picked out, being preferred, while the larger pieces and the dust are employed for powdering.' Holes are remarked in many of the pieces, of which one occasionally extends entirely through, the others only partially; the former having been made in order to suspend the piece in drying, the others in examining the quality. This kind, and probably the other sorts, is frequently worm-eaten, owing to the ravages of a small beatle, sinondendrum pusillum. (Kirby and Spence's *Entomology*, i., p. 252.)

Externally the pieces are covered with a bright yellow-coloured powder, which either results from the friction of the pieces during their passage to this country, or from the process of rouncing (that is, shaking in a bag with powdered rhubarb), previous to its exportation. The odour is strong, both of the root and fresh powder, peculiar, somewhat but not pleasantly aromatic. When chewed, it feels gritty, owing to the presence of numerous raphides (or crystals of oxalate of lime, which are present to the amount of between 30 and 40 per cent.); it communicates a bright yellow colour to the saliva, and has a bitter, slightly astringent taste, which to some persons is not unpleasant, as they are in the habit of chewing rhubarb to obtain its tonic effects on the stomach; but this practice is objectionable from the yellow colour it imparts to the teeth and gums.

When the dust which covers the surface is removed, it exhibits a more or less reddish-yellow hue with white lines interspersed, which form beautiful reticulations, best seen on a vertical section, while a transverse section exhibits small star-like spots and depressions of a darker colour. The transverse fracture is uneven, the longitudinal still more so. 'The powder of genuine Russian rhubarb is of a bright yellow colour, verging to red, but as met with in the shops it is almost invariably mixed with the powder of English rhubarb,' which gives it a much lighter colour.

The analysis of this sort shows it to consist of—

Rhubarberine (or bitter principle of Pfaff)	16
Yellow colouring matter (of Henry) . .	9
Bitter extractive	14
Oxidized tannin	1
Mucilage	10
A substance extracted from the woody fibre	28
Oxalic acid	1
Woody fibre	14
Moisture, loss, odorous principle . .	3

The chief chemical distinction between this and English rhubarb is the presence in the latter of a principle termed *rhaponticin*, and 14 per cent. of starch, with a smaller portion of rhubarberin, of yellow colouring matter, and extractive: iodine furnishes a ready distinguishing test, for a 'decoction of Russian, Dutch-trimmed, or Chinese rhubarb becomes, with a solution of iodine, greenish-blue (iodide of starch); after a few minutes the colour disappears, and no iodine can be detected in the liquor by starch, unless nitric acid be previously added; a decoction of English rhubarb is rendered by a solution of iodine intensely blue (iodide of starch), the colour not completely disappearing by standing.' (Pereira.) This difference is clearly dependent on the much greater portion of starch existing in English rhubarb. Inferior rhubarb, or roots cut to resemble rhubarb, and sprinkled over with powdered turmeric, or dyed with it, may be detected by means of boracic acid, or any borates rendered acid, since the colour of genuine rhubarb, or paper dyed with it, is not affected by these re-agents, whereas turmeric-paper is reddened by them. Yellow ochre, with which black and worthless pieces are covered, or which is used to fill the holes in worm-eaten pieces, may be detected by heat, as it burns with a brownish red appearance, and exhibits the characters of a ferruginous earth.

Portions unusually white are occasionally found in the chests of Russian rhubarb, and are presumed to be specimens of *imperial rhubarb;* but nothing certain is known of its origin or relative value.

2. Dutch-trimmed rhubarb, called also by some writers Persian rhubarb, and Batavian, occurs in flat or round pieces, and is not much different in appearance from the preceding, but it reaches Europe through Canton and Singapore. It is said to be very liable to the attacks of a small coleopterous insect, Anobium boleti, and that the holes so made are stopped with yellow ochre.

3. Chinese or East Indian rhubarb, termed in commerce *half trimmed or untrimmed* rhubarb, rarely presents an angular character, but occurs in rounds or flats. 'The best pieces are heavier and more compact than those of the Russian kind, and the odour is much less powerful and less aromatic.'

4. Himalayan rhubarb is not known as a commercial article in this country, nor is it even an article of large consumption in India, where it sells for only one-tenth of the best rhubarb, resembling in quality the Russian, and which is found in India. The finest Russian rhubarb might be introduced and cultivated in the territories of the East India Company, or, as Dr. Royle observes, 'a trade in rhubarb with Tibet or Western Mongolia might be established by means of the Tartars who resort to the hill fairs. This trade might easily be encouraged by the government purchasing all the rhubarb it requires, which might thus be employed for hospital use after crossing the frontiers, instead of, as now, after making a journey of 20,000 miles, or nearly the circuit of the globe.' (*Flora of the Himalaya.*)

5. English rhubarb occurs in two states, '*dressed or trimmed* so as to resemble the Russian kind, and *stick* rhubarb. The first is grown at Banbury in Oxfordshire, and is frequently used for the show-bottles in druggists' windows, and often sold in the streets of London for *Turkey rhubarb*, by persons dressed up as Turks. Stick rhubarb is sold in the herb shops, and is in long pieces.'

6. French rhubarb is not brought into this country.

What is termed *Monk's rhubarb* is not the produce of any species of *rheum*, but of the Rumex alpinus, which grows in Switzerland, Germany, and Mount Taurus, and is more astringent than purgative: it is mostly used by the monks of the Alps, or to adulterate the other sorts.

Large importations of rhubarb are made into this country, partly from Russia, but much more from the East Indies; but the greater part is for re-exportation. The quantity retained for home-consumption, and on which only a duty of one shilling per pound is paid, scarcely constitutes one-fourth of the entire amount.

Rhubarb presents the peculiarity of producing two opposite effects, according to the dose exhibited. In small doses it is tonic and astringent, in large doses purgative, but generally followed by constipation. It is moreover somewhat heating, and therefore unfit for the early stage of inflammatory diseases; on the other hand, its tonic properties render it eminently proper in the later stages of these diseases. In debility of the digestive organs, alone, or better in conjunction with other agents, it is a most valuable remedy; but it is very improper in the form of powder for very young children, as the insoluble woody fibre irritates their delicate stomachs, and contributes to produce that state of irritation under which so many young children sink who are overdosed with domestic medicines. Dr. Reid, from large experience at a public dispensary, stated it as his deliberate opinion, that half the children which died in London under two years of age were killed by mothers and nurses dosing them with rhubarb and magnesia. A more rational proceeding is to regulate the diet of tender infants, especially of such as are not suckled by the mother or a wet nurse; above all, to avoid giving them stimulating drinks or raw fruits.

Several species of rheum, and garden varieties of them, are cultivated for the sake of the petioles of the leaves, which are much used to make tarts in spring. The cooling and gently aperient properties of these render them grateful and beneficial to most persons; but individuals prone to calculous complaints should carefully avoid them, and all vegetables which owe their acidity to oxalic acid, as the formation of the oxalate of lime, or mulberry calculus, may be the consequence of indulgence. This observation applies equally to the species of Rumex which are used as sorrel. [CICER ARIETINUM.] (Pereira's *Mat. Med.*)

RHEUMATISM (from *ῥευματισμὸς*, 'a defluxion'). It is probable that this term was originally adopted during the prevalence of the doctrines of the humoral pathology, when every disease attended with swelling was attributed to the flow of some morbid humour to the part affected. Before the year 1642, rheumatism and gout were usually described as one disease, under the name of arthritis; the distinction between the two is said to have been first accurately made by Bellonius, a physician who suffered much from rheumatism. We shall first treat of articular rheumatism in its acute and chronic form, and then describe some of those affections which, from their greater resemblance to it than to any other disease, have been called rheumatic.

Acute rheumatism, called also rheumatic fever, has been so well described by Sydenham, that we make use of his own words: 'This disease,' he observes, 'happens at any time, but especially in autumn, and chiefly affects such as are in the prime of life. It is generally occasioned by exposing the body to the cold air immediately after having heated it by violent exercise or some other way. It begins with chilliness and shivering, which are soon succeeded by heat, restlessness, thirst, and the other concomitants of fever. In a day or two, and sometimes sooner, there arises an acute pain in some or other of the limbs, especially in the wrists, shoulders, knees: which shifting between whiles, affects these parts alternately, leaving a redness and swelling in the part last affected. In the beginning of the illness the fever and the above-mentioned symptoms do sometimes come together, but the fever goes off gradually, while the pain continues and sometimes increases.' Acute rheumatism varies considerably in intensity and duration; the patient may have considerable fever, and severe pain in nearly every joint, so as to render him perfectly helpless; or the fever may be slight, and the local inflammation limited to one or two joints. There is not always a relation between the severity of the local symptoms and the constitutional disturbance. The duration of this disease depends on the mode of treatment; it may be terminated in a few days, or may endure as many months; in nearly every case the general symptoms cease before the local inflammation is stopped. Acute rheumatism simply, is seldom if ever a fatal disease, but complicated with pericarditis, endocarditis, or pleurisy it is highly dangerous. It behoves us therefore in every case of rheumatism to be on our guard against these complications; they are so frequent and come on so insidiously, that a recourse to the aid of the stethoscope should never be neglected. With respect to what is called chronic rheumatism, it may be either a continuance of acute rheumatism in a milder form, or may originate in this chronic, or, more properly speaking, subacute character. In either case all the characters of acute rheumatism are present, but in a less violent degree; thus, there is a quickened pulse, some increased heat of skin, a furred tongue, and loss of appetite and sleep, the febrile action undermines the general health, while the local inflammation, although indolent, disorganises the joints. This state of things may endure for an indefinite period, or the febrile symptoms may after a time disappear and the morbid action in the joints cease, not however without leaving behind them such ravages as require a special local treatment. Dr. Elliotson has distinguished chronic rheumatism into hot and cold: in the former, the joints affected are above the natural temperature of the other parts of the body, and are relieved by the application of cold; in the latter, the contrary is the case. Whether the pain of the joints is relieved most by hot or by cold applications, it is generally aggravated in cold moist weather, and diminished during an opposite condition of the atmosphere. The only diseases with which rheumatism can be confounded are gout and periostitis: for its distinction from the former of which see GOUT. The term rheumatic, whether properly or not, has been applied to various affections which have very little resemblance to one another, except in being attended with pain; rheumatic gout however is as significant and appropriate a name as could have been devised. It is a disease partaking so strongly of the characters both of gout and rheumatism, that it is impossible to say to which of them it belongs; it may be rheumatism attacking also the small joints, or it may be gout extending to the large; in either case the distinction is not of much importance, as the treatment is the same. When rheumatism is seated in the back, it is called lumbago, from 'lumbus,' the loin; when in the back of the neck, the patient is said to have a stiff neck, or a 'crick in the neck;' when in the head, one half only is usually attacked, and it is called hemicrania. When the pain occupies the more fleshy parts of the limbs, as the muscles or their aponeuroses, the term rheumatalgia is sometimes made use off. In this last-named affection there is neither redness nor swelling, and pain is experienced only when the muscles of the part affected are called into action. Many persons believe that the nerves themselves may be affected with rheumatism, and refer to sciatica and hemicrania as examples. In these cases the pain is generally of an intermittent character; but Dr. Elliotson is of opinion that this intermittence of pain is not peculiar to nervous rheumatism, but is met with also when the aponeuroses of muscles are the seat of the disease, which he believes to be the case in hemicrania. He thus describes hemicrania: 'It usually attacks one half of the organ (the head), and the pain generally comes on in the evening about six o'clock and continues very violently for a few hours. Occasionally when it is intermittent in this way, the parts are hot, swollen, and throb, and the eyes water, but in other cases this is not felt.' Many physicians of eminence deny that the above-named affections are rheumatic, and consider them to be of nervous origin; hemicrania and lumbago they call neuralgia, and rheumatalgia they designate by the term myositis. From this contrariety of opinion we may conclude that little is known respecting the structures actually affected in these varieties of rheumatism; of the morbid changes which they undergo we are likewise in equal ignorance. In the true or articular rheumatism it is the synovial membrane lining the cavity of the joints and the fibrous tissues external to them that principally suffer. The respective degree in which each of these structures is implicated, is not the same in every case. Thus, in one case we shall find the joints distended with fluid, the fluctuation of which is very perceptible to the hand; while in another there shall be swelling, but it will be more diffused and without fluctuation, showing that little or no effusion has taken place into the joint, but that the swelling results from the inflammation of parts external to it. This difference has led some persons to speak of rheumatism as fibrous and synovial, but inasmuch as it is not always easy to determine to which variety the case under examination may belong, and is besides of no practical importance, the distinction is not usually regarded. The fluid which is found in the joints may be either gelatinous or purulent, according to the severity of the inflammation. The synovial membranes which line them are red and thickened; the ligaments external to the joints are thickened and rigid, the limbs frequently contracted, and the muscles wasted. In rheumatic-gout there is often found a deposit of lithate of soda in the joints affected, a proof that, in many cases at least, this disease partakes more of the character of gout than of rheumatism. The appearances presented in the heart and its coverings, where this organ has been attacked, have already been described in the article HEART, DISEASES OF.

Causes of Rheumatism.—Among the causes which predispose to rheumatism must be placed an hereditary tendency and the age and temperament of the individual. The period of life most subject to acute rheumatism is from puberty to 35 years of age, and persons of full plethoric habit are said to be more liable to its attacks than those of an opposite temperament. It is supposed by many among whom may be cited the names of M. Andral (*Anatomie Pathologique*), M. C. Roche (*Dictionnaire de Médécine et de Chirurgie*), and Dr. Barlow (*Cyclopædia of Practical Medicine*), that an absolute or relative condition of plethora is essential to the development of rheumatism; and the blood, according to these authorities, may be either excessive in quantity or altered in quality. 'There are some individuals,' observes M. Andral, 'who naturally make a greater quantity of blood than others. When the blood-vessels contain a greater proportion of the nutritive fluid than is necessary to supply the demands of the different organs, the superabundant quantity becomes a permanent source of excitation to the solids, and at the same time the blood has a remarkable tendency to accumulate in different organs; so that in such a case the whole system is in a general state of excitation, and some of the organs may become the seat of local congestion of various degrees of duration and intensity.' In applying these doctrines to the disease we are considering, he observes, 'If we mark the symptoms and progress of acute rheumatism, we find that very often a well-marked febrile action, with a strong reaction, but without any symptom whatever of local affection, precedes the pain. In a word, there is first an inflammatory fever, and then rheumatism. Next observe the extreme mobility of the rheumatic pains. They run along, in a manner, wherever the blood is distributed; the application of leeches often removes the pain from one part, but it soon shifts to another, and not unfrequently it quits the articulating tissues and fixes on different internal organs, producing, by the derangement of their functions, symptoms more or less severe. It often happens that bleeding from a large orifice puts an end to the disease, as if, by diminishing the mass of blood, it proportionally diminished the stimulus that promoted all these shifting irritations.' It is then, when the body is in this predisposed condition, from any of the before-mentioned causes, that exposure to a continued draught of cold air or a shower of rain becomes the immediate exciting cause of an attack of rheumatism. There can be no doubt however that, besides this condition of plethora, which predisposes to disease generally, there must be a more specific predisposition to the particular disease we are treating of before rheumatism can be produced. Cold may be a cause, and so may be anything else that suddenly disturbs the balance of the circulation; but why the same agent should produce rheumatism in one case, bronchitis in another, pneumonia in a third, and so on, can only be explained by supposing that each individual has some particular organ or organs which are more prone to disease than other parts of his organization.

The treatment of rheumatism must chiefly have reference to the constitutional nature of the disease. Nearly all physicians, from Sydenham downwards, have concurred in the propriety of general blood-letting, the quantity of blood to be drawn depending upon the severity of the attack, the age and constitution of the patient, and the impression produced by this operation upon the disease. The celebrated physician just named was in the habit of taking blood to the amount of ten or twelve ounces, and repeating the evacuation every twenty-four or forty-eight hours, till the disease was subdued; bread and water poultices were applied to the inflamed joints, and abstinence from all stimulating food and fermented liquors was strictly enjoined. In St. Bartholomew's Hospital, phlebotomy to the extent recommended by Sydenham is seldom practised in acute rheumatism, Dr. Latham having observed that the disease is frequently not bettered by the operation, although the patient is considerably weakened.

This eminent physician is in the habit of prescribing a large dose of calomel, as ten grains, in the acute stage of the disorder, and if in twenty-four hours the amelioration is not decided, another similar dose is given; from personal observation of the effects of this treatment, we can pronounce it to be most successful. When the membranes of the heart are affected, local bleeding by leeches or cupping is resorted to, and the patient is brought under the influence of mercury. According to Dr. Elliotson, whether rheumatism be acute or chronic, the treatment should be exactly the same: 'You have only to make two distinctions,—to ascertain whether it is the inflammatory form of the disease: whether the parts are hotter than they should be, and heat does harm; or whether the parts are cooler than they should be, and heat does good.' In the one case he recommends antiphlogistic measures, and in the other stimulants; under the antiphlogistic measures, he comprehends bleeding and the administration of colchicum, the latter to be continued till it purges the patient. During the whole time of the treatment cold lotions are applied to the inflamed joints. In the chronic form of rheumatism the joints are kept hot with flannels and rubbed with stimulating ointments and liniments, while the ammoniated tincture of guaiacum, beginning with half-dram doses, is given three times a day. Dr. Elliotson also considers that mercury is occasionally useful in both kinds of rheumatism. Lumbago and sciatica are most successfully treated by cupping the loins and the parts over the course of the great sciatic nerve, followed by the application of blisters to the same regions, and a general antiphlogistic regimen. In hemicrania great relief is frequently obtained by the application of heat to the part affected, as in wrapping up the head in flannel. Should the pain evince a tendency to return every evening, a large dose of a narcotic should be administered just previous to the paroxysm, and if not relieved in two or three hours, a similar dose must be repeated; we are informed that one grain of stramonium for an adult frequently acts like a charm in this affection. In rheumatalgia, when the parts are not hot, and the pain is not increased by heat, acupuncture and shampooing have been found of great service.

Where the joints are stiff and contracted, from long-continued inflammation, warm bathing, combined with frequent and persevering exercise of them, have been attended with the most signal success.

(Sydenham, *Opera Medica*, 'Tractatus de Podagra et Hydrope;' Andral, *Anatomie Pathologique;* C. Roche, *Dictionnaire de Médécine et de Chirurgie;* Dr. Barlow, *Cyclopædia of Practical Medicine;* Dr. Elliotson, *Practice of Medicine.*)

RHIA'NUS, a Greek poet, was a native of Bena in Crete, and lived about the time of Eratosthenes. He was originally a slave who had a kind of superintendence over a palæstra, but he subsequently became a learned grammarian, and wrote several poems: one of them was a Ἡράκλεια, consisting of four books. (Suidas, v. Ῥιανός; Athen., iii., p. 82.) Another of his poems, called Μεσσηνιακά, contained a poetical description of the second Messenian war, of which we probably possess the substance in the account given by Pausanias in his fourth book. (See especially c. 6; comp. Müller, 'Dor.,' i. 7, 9.) Other poems of Rhianus were the Θεσσαλικά, Ἀχαικά, and Ἠλιακά. Athenaeus (xi., p. 499) also mentions epigrams of Rhianus.

The emperor Tiberius is said to have been very fond of the poems of Rhianus, and even to have imitated them. (Sueton., *Tiber.*, c. 70.) The few extant fragments of his works are collected in Brunck's 'Analecta,' in Jacob's 'Anthologia Græca,' in Gaisford's 'Poet. Græci Minor,' and separately in a little book by N. Saal, under the title 'Rhiani quæ supersunt,' Bonn., 1831. Compare A. Meineke's essay, 'Ueber den Dichter Rhianos,' in the 'Transactions of the Berlin Academy,' 1834.

RHIN BAS, a department of France on the eastern frontier, taking its name from the river Rhine (in French, Rhin), on the bank of which it lies. It is bounded on the north by the department of Moselle and the Rhenish portion of the kingdom of Bavaria; on the east by the grand-duchy of Baden, from which it is separated by the Rhine; on the south by the department of Haut Rhin; on the south-west by the department of Vosges; and on the west by that of Meurthe. Its form approximates to an oblong square or a parallelogram, extending from south by west to north by east along the Rhine, with a projecting portion on the north-west side extending westward across the chain of the Vosges. The greatest length is, from south-south-east to north-north-west, from the bank of the Rhine above Marckolsheim to the bank of the Sarre, above Sarreguemines, 68 miles, or along the bank of the Rhine from the same point to the neighbourhood of Lauterbourg, which is about the same distance. The greatest breadth is in the northern part, from the neighbourhood of Lauterbourg across the Vosges to the neighbourhood of Harskirch, 60 miles. The ordinary breadth however does not exceed 30 miles. The area is estimated at 1800 square miles, being scarcely equal to three-fourths of the average area of the French departments, and being rather greater than the area of the English county of Lancaster (1766 square miles), or rather less than that of Northumberland (1870 square miles). The population in 1831 was 540,213; in 1836 it was 561,851, showing an increase in five years of 21,638, or just about 4 per cent., and giving 312 inhabitants to a square mile. In amount of population it far exceeds the average of the French departments; in density of population it exceeds the average in the proportion of two to one. In both respects it very far exceeds Northumberland, but falls very far short of Lancashire. Strasburg, the capital, is a very short distance from the left bank of the Rhine, on the Ill, a small feeder of that river; 243 miles in a direct line east of Paris, or 294 miles by the road through Meaux, Château Thierry, Châlons-sur-Marne, Vitry, Bar-le-Duc, Toul, Nancy, Lunéville, and Phalsbourg: in 48° 35′ N. lat. and 7° 47′ E. long.

Surface; Geological Character; Hydrography.—The principal ridge of the Vosges is just beyond the western boundary, so that the western side of the department is occupied by the rugged highlands, covered with wood, which form the eastern face of that chain. The projection at the north-western side of the department crosses the ridge in one part so as to include both the ridge itself and the western face down to the valley of the Sarre. The mountain sides are diversified with precipitous rocks, and picturesque valleys watered by small streams, which flow ultimately into the Rhine, except a few which join the Sarre. The mountains are composed of sandstones, limestones, and marls, comprehended in the saliferous group of formations. The lowest member of the group is a coarse red-sandstone (*grès des Vosges*), bearing a close resemblance to the old red-sandstone conglomerate of Monmouthshire, and containing abundance of quartz pebbles, apparently derived from the ruins of the primary rocks which form the nucleus of the Vosges. The upper part of this formation is finer grained, so as to bear a close resemblance to the variegated red-sandstone (*grès bigarré*), extremely similar to the new red-sandstone of England, which rests immediately upon it. Upon this rests the muschelkalk, a light grey or smoke-coloured limestone, with partings of marl; and upon this rest the variegated marles (*marnes irisées*), which are occasionally interstratified with gypsum or limestone. By convulsions subsequent to the deposition of the grès des Vosges, a portion of that formation has been thrown up into bold craggy mountains, while the later formations rest upon the lower portions, several hundred feet below, at the foot of the escarpment.

From the eastern foot of the Vosges, a rich tract forming part of the valley of the Rhine extends to the bank of that river. This part is occupied by the tertiary formations. The immediate banks of the river are in many places marshy.

A very small quantity of coal is procured. There are three iron-works, in which are three forges for producing pig-iron, and eleven forges for the manufacture of wrought-iron. Charcoal is the fuel principally used.

The department belongs entirely to the basin of the Rhine. The greater part is included in the valley watered by that river, and the remaining part, which extends across the Vosges, is drained by the Sarre, which falls into the Moselle, and so ultimately into the Rhine. The Rhine skirts the eastern boundary of the department; it is in this part about as broad as the Thames at London, but the great number of small islands of sand or gravel which occur in its course are very injurious to the navigation, which is carried on by boats of from 20 to 25 tons. These islands are generally wooded. The Rhine yields abundance of fish, especially trout, perch, salmon, carp, sturgeons, and eels. Some particles of gold are brought down by the current.

The principal feeder of the Rhine is the Ill, which rises in the adjacent department of Haut Rhin, near the Swiss frontier, and flows northward, its course being for the most part parallel to the Rhine and a few miles west of it, so that it receives the mountain-streams which flow down the eastern slopes of the Vosges, and thus becomes a considerable river. Nearly 40 miles of its course are in this department, and through the whole of that distance it is navigable. It receives the Liepvrelle, the Scheer, the Andlau, the Eger, the Bruche, into which flows the Mossig, all from the Vosges; passes Schelestat, Benfelden, Erstein, and Strasburg; and joins the Rhine a few miles below the last-named place. It is used for the conveyance of the timber of the Vosges and the other productions of the country. One or two arms of this river branch off from it above Strasburg, and communicate with the Rhine.

The Zorn, which receives the Zintzel; the Moder, which receives another Zintzel; the Surbach, which receives the Eberbach; the Seltzbach; and the Lauter, all flow from the eastern face of the Vosges into the Rhine. The Surbach and the Lauter rise in the Bavarian territory, and the Lauter has its course on the frontier of France and Bavaria, which it separates from each other. The Moder and the Lauter, the longest of these streams, have each a course of about 45 miles; the Moder alone is navigable, and that for only 2 miles. The others are used for floating timber down from the mountains to the low country or to the Rhine.

The course of the Sarre within the department may be estimated at about 20 miles, for nearly 10 of which it is navigable.

There are two navigable canals. The most important is the great canal for joining the Rhône and the Rhine, formerly called Canal de Monsieur. This canal enters the department on the south side from the adjacent department of Haut Rhin, and, running northward along the valley of the Rhine, opens into the Ill just above Strasburg. The canal of the Bruche commences near the junction of the Mossig and the Bruche, and follows the valley of the latter river till its junction with the Ill just above Strasburg.

The official statement of the inland navigation of the department, in 1837, was as follows:—

	Miles.
Navigation of the Rhine . .	90
" Ill . .	51
" Moder . .	2
	143
Canal from the Rhône to the Rhine	33
Canal of the Bruche . .	13
	46

The number of Routes Royales, or government roads, on the 1st January, 1837, was seven; having an aggregate length of 206 miles, viz. 201 miles in good repair, and 5 miles out of repair. The principal road is that from Paris to Strasburg, which enters the department after passing Phalsburg (department of Meurthe), and passes through Saverne and Wasselonne. From Strasburg this road is continued across the bridge of Kell or Kehl on the Rhine into Germany. The road from Paris by Lunéville and St. Dié to Schelestat enters the department a short distance from the last-named town. A road from Colmar follows the course of the Ill, passing near Schelestat and through Benfelden to Strasburg; and another road from Neuf-Brisach follows the course of the Rhine, through Marckolsheim, to the same town. Two roads from Strasburg run northward along the valley of the Rhine to one near the river through Drusenheim, Beinheim, Seltz, and Lauterburg to Speyer (Spire) and Mayenz (Ments or Mayence) in Germany; the other, nearer the mountains, through Brumath, Haguenau, Soultz sous-Forêts, and Weissemburg to Landau and Mainz. A government road crosses the Vosges from Haguenau to the small fortress of Bitche in the department of Moselle. The Routes Départmentales, or departmental roads, had at the same time an aggregate length of 390 miles; viz. 345 miles in good repair, 36 miles out of repair, and 9 miles unfinished. The bye roads and paths have an aggregate length of more than 4500 miles.

Soil, Agriculture, &c.—The soil of the mountains is rocky, and in great degree barren; that of the immediate bank of the river is marshy, but the flat which occupies the intervening space is rich and highly cultivated. About 450,000 acres, two-fifths of the whole area of the department, are under the plough. The produce in wheat is a trifle more than the average produce of the departments of France; but, from the density of the population, it is inadequate to the consumption of the inhabitants. The produce in rye, maslin or mixed corn (wheat and rye), and maize, is about half the average produce of the departments; and the produce in potatoes twice as great as the average. In oats the produce is small, and of barley and buckwheat scarcely any is grown.

Tobacco has been cultivated for two centuries, and, in some soils, is included with wheat and barley in a triennial rotation of crops. As early as the year 1718, the yearly produce of tobacco was about 80,000 cwts. Madder was introduced in the reign of the emperor Charles V., and is now so successfully cultivated, that the madder of Alsace has a preference in the Swiss, French, and English markets. The oleaginous seeds are grown, especially the poppy and the rape, the oil of which is used for domestic purposes in Alsace, Flanders, and Artois, in place of olive-oil. Hemp, which is much prized for cordage for vessels, is grown near Strasburg. There are several hop-gardens about Haguenau, the produce of which is sent over into Germany, and thence re-imported into France as of German growth, the reputation of the German hops causing them to fetch a higher price. The agriculture of the department is however susceptible of much improvement; the agricultural implements are clumsy, except in the neighbourhood of Strasburg; and there are many articles of produce which deserve more extensive cultivation than they now receive.

The meadows comprehend about 140,000 acres, and the commons and open pastures are 50,000 more. The number of horses is nearly twice as great as the average of the departments: they are of a good breed: both oxen and horses are employed in agriculture. The number of cows and heifers far exceeds the average of the departments; but that of oxen and bulls is less than half the average. The number of sheep is comparatively small. There are swine and poultry, especially geese, whose livers are used in making the pies for which Strasburg is famous. The vineyards comprehend 30,000 acres: very little red wine is produced: the best white wines are those of Molsheim and Wolxheim; those of Mutzig, Neuviller, and other places are wines of the second class. The orchards and gardens cover about 15,000 acres. The woodlands are very extensive, amounting to nearly 300,000 acres. A considerable part of the timber is formed into small rafts, and floated down the Rhine to Mainz, where they are united, so as to constitute enormous rafts from 250 to 300 yards long, and 25 to 30 yards broad, conducted each by 300 or 400 men. A part of the timber is sawn into deals and planks in Holland. The abundance of timber supplies not only sufficient fuel for domestic purposes, but also furnishes some for manufactures. It is not however sufficient for the demand, and a considerable quantity of coal is imported to make up the deficiency of wood.

Divisions, Towns, &c.—The department is divided into four arrondissements, as follows:—

Name and Situation.		Area in Sq. Miles.	Population. 1831.	Population. 1836.	Communes.	Cantons.
Strasburg	East & Central	546	205,029	218,839	162	12
Saverne . .	W.	506	108,112	112,260	165	7
Schelestat .	S.	444	131,295	134,887	114	8
Weissemburg	N.	304	95,777	95,873	103	6
		1800	540,213	561,859	544	33

In the arrondissement of Strasburg are—Strasburg, population in 1826, 49,708; in 1831, 49,712; in 1836, 57,885 [STRASBURG], on the Ill; Molsheim, pop. 3225; Mutzig, pop. 3551; and Dachtein, or Dachstein, on the Bruche; Wasselonne, pop. 3649 town, 4191 whole commune; Wangen or Vangen, and Westhoffen, pop. 2363; all on or near the Mossig: Brumath, pop. 3977 town, 4062 whole commune, on the Zorn; and Haguenau, pop. 8280 town, 9697 whole commune; Bischwiller, pop. 5927 [BISCHWILLER], and Drusenheim; all on the Moder, the last at its junction with the Rhine. Molsheim, or Moltzen, is in a wine-growing district at the eastern foot of the Vosges: it is a tolerably well-built town. The townsmen manufacture heavy iron goods, tools, cutlery and other hardwares, and paper; weave cottons and coarse linens; and trade in corn and wine. The manufacture of hardware was introduced in 1817, an workmen were engaged from the grand-duchy of Berg. Mutzig is in a valley near the foot of the Vosges: some of the townsmen are engaged in a government manufactory of fire-arms. Wasselonne has manufactures of woollen yarn, woollen hose, paper, and leather: there are bleach-grounds for linen. Two fairs are held in the year. There are extensive quarries near the town of freestone for building, and of a stone which approaches to marble in its susceptibility of polish. Pottery is made at Westhoffen. Brumath was known to the Romans by the name of Brucomagus, or Brocomagus: it is mentioned by Ptolemy and Ammianus Marcellinus, and in the Itinerary of Antoninus: the medals, sculptured stones, and urns, which have been found abundantly, show that the Romans were fixed here. It was the scene of conflict between the Imperialists and the French in the year 1793. Haguenau was founded by the emperor Frederick Barbarossa, and was one of the Imperial cities of Alsace: its privileges were abolished after the conquest of Alsace by Louis XIV. In 1675 and 1705 it was besieged by the Imperialists: in the second siege they were successful, but the town was retaken by the French soon after. In 1793 the Imperialists and Prussians were defeated near the town by the French, who carried their lines and entered the town. Haguenau is surrounded by old walls, strengthened by towers and a ditch. It has manufactures of cotton yarn and calico; and of woollen cloth, cordage, soap, pitch, tiles, pottery, and earthenware. There are several oil-mills, plaster-mills, madder-mills (a great quantity of madder is grown round the town), tan-yards, and breweries. There are four yearly fairs for cattle and general merchandise. The town has five churches and a Jews' synagogue: a college or high school, a military hospital, and a house of correction for women. Drusenheim, or Druzenheim, is fortified, there is a wooden bridge over the Zorn near the town. There is one yearly fair for hardwares, woollen cloths, and silks.

In the arrondissement of Saverne are Saverne, pop. in 1831, 5106; in 1836, 5352; and Hocfelden or Hochfelden, pop. 2253, on the Zorn; Marmoutier, pop. 2450 town, 2735 whole commune, between the Zorn and the Mossig; Neuwiller, near the Zintzel, which flows into the Zorn; Bouxwiller, pop. 3756, and Petite-Pierre, between the Zintzel (tributary of the Zorn) and the Moder; Ingwiller, pop. 2071, and Pfaffenhofen, on the Moder; Lichtemberg, between the Moder and its tributary the Zintzel; and Saar-Union, pop. 3531, Saarwerden, and Harskirch, on or near the Sarre, in the country west of the Vosges. Saverne was a post of some importance in the time of the Romans, who called it Tabernae. Julian, while he held the command of Gaul, repaired the place and strengthened it, in order to prevent the Germans, with whom he was at war, from penetrating into the interior. It belonged in the middle ages successively to the bishops of Metz and Strasburg, and was counted to be a place of strength; but in the Thirty Years' War, and in that which preceded the peace of Nimeguen, it was repeatedly taken and retaken: the fortifications were razed in 1697. The town stands on the Zorn, at the eastern foot of a steep and high mountain, one of the Vosges. The chief building is the former palace of the bishops of Strasburg, who used to spend their summers here. The townsmen manufacture hardwares, hosiery, and leather; and there are some breweries. The surrounding district is fertile in corn, wine, and pasture: considerable trade is carried on in wood, which is floated down the river. There are three yearly fairs. Saverne has a subordinate court of justice, some fiscal government offices, a college or high school, and an hospital. Marmoutier is a tolerably well-built town, surrounded by an old wall. The townsmen manufacture pottery, tiles, and bricks; there are breweries and bleach houses or bleach-grounds for linen; and a considerable trade in cattle is carried on. Bouxwiller is a busy place: the townsmen are engaged in weaving fustians, linens, and other goods, and in manufacturing hats: they have drying-houses for madder, bleach-grounds, and breweries. There are large works for making vitriol, sulphuric acid, ammonia, and other chemical preparations. There are three yearly fairs. Petite-Pierre is a place of strength amid the defiles of the Vosges: some hosiery is manufactured. Ingwiller has manufactures of madder, potash, starch, soap, snuff, cordage, and hosiery. There are dye-houses and bleach-grounds: there are three yearly fairs for corn and cattle. Lichtemberg is situated adjacent to the glacis of a small fort placed on a height in the midst of a wood. Saar-Union, or Sarre-Union, is divided by the Sarre into two parts: Bouquenom, on the right bank, and Neuf Saarwerden, or Sarrewerden, on the left. There are manufactures of cotton goods, embroidery, leather, and glass; also some dye-houses. The town has a college or high school. The remains of an old castle may yet be seen. Saarwerden, or Sarrewerden, distinguished as Vieux (old) Saarwerden, is so near to Saar-Union, as almost to form a suburb of it, but must not be confounded with Neuf-Saarwerden, which is an integral part of that town. Harskirch has some manufactures of worsted stockings and other woollen fabrics, soap, potash, and tiles: there are some dye-houses and a copper-foundry.

In the arrondissement of Schelestat are Schelestat, pop. in 1826, 9600 commune; in 1831, 9384 town, or 9646 commune; in 1836, 9700 commune [SCHELESTAT]; Benfelden, and Erstein, pop. 3472 town, 3613 whole commune, on the Ill; Marckolsheim, pop. 2265 town, 2344 whole commune, and Rhinau, on or near the Rhine; Châtenois, pop. 3318 town, 3867 whole commune, on the Liepvrelle; Villé and Dambach, pop. 3454 town, 3507 whole commune, on the Scheer; Andlau and Barr, pop. 3720 town, 4514 whole commune [BARR], on the Andlau or its tributaries; Bersh Obernai, pop. 4634 town, 4795 whole commune, and Niedernai, on or near the Eger; and Rosheim, pop. 3683 town, 3772 whole commune, between Obernai and Molsheim. At Benfelden considerable business is done in the tobacco and hemp grown round the town. At Erstein, cotton hosiery, snuff, cordage, tiles, and pottery are made; and there are dye-houses and bleach-houses or grounds for linen: two fairs are held in the year. Marckolsheim has manufactures of linen, breweries, potteries, tile and brick yards. Trade is carried on in hemp and tobacco. Muslins, calicos, coarse linen for wrappers, and paper, are made at Châtenois; and leather, tiles, and hosiery at Villé, where there are also bleach-grounds for linen. At Ober-nai there are copper-works. This town and Nieder-nai are sometimes called respectively Ober and Nieder Ehnheim. At Rosheim, woollen and cotton hose are made, cotton woven, and linen bleached. There are two yearly fairs.

In the arrondissement of Weissemburg are Weissemburg, pop. in 1826, 6146; in 1831, 6097; and in 1836, 5575; and Lauterbourg, pop. 2649, on the Lauter: Soultz-sous-Forêts, pop. 1968; and Seltz, pop. 2183 town, 2267 whole commune, on the Seltzbach; Warth, and Beinheim, pop. 1545, on the Surbach; and Reichshoffen, pop. 2536 town, 2661 whole commune, on the Zintzel, which joins the Moder. Weissemburg, or Wissemburg, is a fortress of considerable strength, and is connected with the 'lines' of Weissemburg, works constructed along the bank of the Lauter to cover this part of France. It was a free imperial town, and was dismantled by Louis XIV., when ceded to him by the peace of Ryswick: its fortifications have however been since reconstructed. It was taken by the Austrians in 1744 and 1793, but was each time retaken. There are several government offices, a Catholic and a Lutheran church, a Jews' synagogue, a college, and an almshouse. Hosiery, straw hats, earthenware, pottery, soap, and leather are made; and there are breweries. Lauterburg is also fortified: it has two churches, a synagogue, two hospitals (one of them a military hospital), ropewalks, breweries, and potash manufactories. At Soultz-sous-Forêts, pottery and pitch are made; the neighbourhood yields good wine, and there is a brine-spring near the town. Seltz is celebrated for its mineral waters, of which 30,000 bottles are sent yearly to different parts. At Reichshoffen are iron-works and a paper-mill. Much madder is grown round the town. At Niederbronn near Reichshoffen are iron-works and paper-mills; also some mineral springs.

The population given above, when not otherwise described, is that of the whole commune, and from the census of 1831.

The department is one of the most industrious in France; the principal manufactures have been noticed in describing the towns. The inhabitants are chiefly of German origin and speak a corrupt German dialect, except in the towns, where French is spoken. The majority are Protestants, either of the Lutheran or Reformed churches; and Strasburg is one of the chief places of education for the Protestant clergy. The number of Roman Catholics is considerable, and there are some Baptists and some Jews. Education is more diffused than in most parts of France: of the young men enrolled in the military census of 1828-29, sixty-two in every hundred could read and write: the average of the departments being less than forty in the hundred.

This department, with that of Haut Rhin, constitutes the diocese of Strasburg, the bishop of which is a suffragan of the archbishop of Besançon. It is in the jurisdiction of the Cour Royale of Colmar, and of the direction of the Académie Universitaire of Strasburg. It belongs to the fifth military division, the head-quarters of which are fixed at Strasburg, and it sends six members to the Chamber of Deputies.

At the period of the Roman conquest this department was occupied by the Nemetes and the Tribocci, two of the German nations which had settled in Gaul under Ariovistus. The part west of the Vosges (the Vogesus or Vosegus of the Romans) was included in the territory of the Mediomatrici, a Belgic nation. In the Roman division of Gaul the department was at first comprehended in the province of Gallia Belgica; and upon the dismemberment of this province, in that of Germania Superior; except that part which lies west of the Vosges, which, on the further subdivision of Belgica, was included in Belgica Prima. Several towns mentioned in Roman writers or documents were within its limits. Argentoratum occupied the site of the modern Strasburg, a corruption of Stratæ-burgus, or Stratz-burg, a name as early as the time of Gregory of Tours. The Tabernæ of the Itinerary of Antoninus and the Peutinger Table is Saverne; the Brocomagus of Ptolemy, Ammianus Marcellinus, and the Antonine Itinerary, is the modern Brumath. The Concordia of the Itinerary of Antoninus may be fixed at Alt-stat (or old town), on the Lauter below Weissemburg: the Saletio of the same authority (Ammianus Marcellinus writes it Saliso) was at Seltz on the Rhine, where the widening of the bed of the river has carried away part of the site of the town: the Helvetus of the Itinerary (called Helcebus by Ptolemy) may be fixed at a place called Ell, on the Ill near Benfelden; and the Argentovaria of the same authority was close on the border of the department near Marckolsheim.

On the overthrow of the Roman empire this part of Gaul was occupied by the Alemanni, Allemanni, or Allemans [ALEMANNI], but on the defeat of this nation by Clovis, in the great batte of Tolbiac or Zulpich (near Cologne), A.D. 496, it passed into the hands of the Franks. In the division of the empire of Charlemagne, it was included in Germany, and continued long to be a part of the empire. The name of Alsace is derived from El-sass, a very antient German name, the first part of which is the name of the river (Ill, antiently El or Hel) which waters the country. Elsass was Latinized into Elisatium and Alsatia. Under the successors of Clovis, Alsace was a duchy, and retained that designation even after the jealousy of Pepin le Bref suppressed the dignity of duke of Alsace. Towards the close of the ninth century Alsace was successively possessed by Hugues, an illegitimate son of Lothaire, king of Lorraine [LORRAINE], and Zwentibold, a natural son of Arnulph, or Arnoul, king of Germany. In the tenth century the duchy was permanently revived and held as a beneficiary dukedom (usually in conjunction with that of Suabia) until near the close of the eleventh century, when it became hereditary. Alsace comprehended what now constitutes the departments of Haut Rhin and Bas Rhin. The hereditary duchy was held by princes of the imperial house of Hohenstaufen from the year A.D. 1080, until the death of Conradin, A.D. 1268. Alsace had long previously, while under its dukes, been divided into the two counties or landgraviates of Nordgaw, or Basse Alsace, and Sundgaw, or Haute Alsace, the former of which was in the latter half of the fourteenth century united to the bishopric of Strasburg. These counties continued, after the extinction of the duchy, until the cession of Alsace to France. [ALSACE.] Several districts of Alsace were however independent of the counts or landgraves, and were under their own lords, especially under the bishops of Strasburg; and several of the towns were free Imperial towns, as Haguenau, Rosheim, Schelestat, Weissemburg, and Strasburg, in this department; Colmar, Münster, and others, in that of Haut Rhin: and Landau, now in the Bavarian territories.

RHIN, HAUT, a department of France, on the eastern frontier, bounded on the north by the department of Bas Rhin; on the east by the grand-duchy of Baden in Germany, from which it is separated by the Rhine; on the south by the territories formerly belonging to the bishopric of Basel, now incorporated with the canton of Berne in Switzerland; on the south-west by the department of Doubs; and on the west by the departments of Haute Saône and Vosges. Its form approximates to a parallelogram, having its greatest extent from north to south. The length of a line drawn from the north-western corner of the department to the frontier of Switzerland near Delemont is 64 miles; the length of a second line drawn at right angles to the first from the south-western corner to Huningue on the Rhine, is 36 miles. The area of the department is estimated at 1572 square miles, which is about two-thirds of the average area of the French departments, and about the area of the English county of Kent. The population, in 1826, was 408,741; in 1831, 424,258; and in 1836, of 447,019; showing an increase in the five years from 1831 to 1836 of 22,761, or rather more than five per cent., and giving 284 inhabitants to a square mile. In amount of population it is considerably above the average of the French departments, and in density of population very far exceeds them; it is exceeded however in both respects by the English county with which we have compared it. Colmar, the chief town, is on the Lauch, a branch of the Ill, 232 miles in a straight line east by south of Paris, or 290 miles by the road through Meaux, Château-Thierry, Châlons-sur-Marne, St. Dizier, Bar-le-Duc, Nancy, Lunéville, St. Dié (or Diey), and Schelestat; in 48° 4′ N. lat. and 7° 23′ E. long.

This department, like that of Bas Rhin, is included between the crests of the Vosges on the west and the banks of the Rhine on the east; its western side is consequently mountainous, while on the east it subsides into the valley of the Rhine. Some of the mountains, called, from their rounded forms, 'ballons' (balls), are lofty. Le Ballon d'Alsace, at the junction of the three departments of Haut Rhin, Haute Saône, and Vosges, has an elevation of 4121 feet; and Le Ballon de Guebwiller, about six or seven miles west of the town of Guebwiller, has an elevation of 4698 feet. The southern portions of the department are covered by the ramifications of the Jura. The highest summits of the Vosges are composed of granitic or other primitive rocks; in the neighbourhood of Giromagny, south of the primitive district, are the sandstones, limestones, and other formations of the carboniferous system. On the east of the primitive formations, on the lower slopes of the Vosges, are the formations of the saliferous system, including, in descending order, the variegated marls, the muschelkalk, the variegated sandstone, and the sandstone of the Vosges; and resting upon these, the oolitic series of formations, which also compose the mass of the Jura. The eastern side of the department, from the foot of the Vosges to the Rhine, is occupied by the tertiary formations. In 1834 there was only one small coal-mine in the department. Granite, porphyry, marble, rock crystal, good freestone, and gypsum are procured; and there are several mineral springs, of which those of Soultzmatt, about ten miles south-south-west of Colmar, are the most important.

Malte-Brun (3rd edit., Paris, 1832) enumerates among the mineral productions of the department, iron, copper, lead, and arsenic; but if his statement is correct, the working of the lead and copper mines must have been given up, as they do not appear in the official reports of the Direction Générale des Ponts et Chaussées et des Mines for 1835. (*Statistical View of the Mining Industry of France*, by G. R. Porter, Esq.; *presented to the British Association for the Advancement of Science*, 1838.)

There were, in 1834, twelve iron-works with five furnaces for making pig-iron, and seventeen forges for the manufacture of wrought-iron. Charcoal was the fuel chiefly if not wholly employed.

The department belongs chiefly to the basin of the Rhine. The Rhine has a considerable breadth, and an average depth of ten to twelve feet The numerous islands in the channel, formed of sand or gravel, are a serious obstruction to the navigation. The various streams which flow from the Vosges are received by the Ill, which, rising in the Jura just within the southern boundary of the department, has a northern course parallel to the Rhine, which it joins below Strasburg, in the adjacent department of Bas Rhin. [RHIN, BAS.]

The navigation of the Ill commences at the junction of the Lauch, close to Colmar; but it is used for floating timber above that point. The Lauch and the Fecht, which join the Ill, are used for floating timber. The Largue, which rises in the Jura, has been made a feeder of the canal from the Rhône to the Rhine. The south-western part of the department belongs to the basin of the Rhône, and is watered by the Halle, the St. Nicholas, and the Savoureuse, which fall into the Doubs. None of these rivers are navigable.

The only canal in the department is that which unites the Rhône (by its tributary the Saône) with the Rhine. This canal enters the department near the junction of the little rivers Halle and St. Nicholas, and runs north-east along the valley of the St. Nicholas to the summit level near Dannemarie; from thence it runs still north-east partly along the valley of the Ill to the basin near Mühlhausen, from whence a branch proceeds to join the Rhine at Huningue near Basel, while the main branch runs northward between the Ill and the Rhine into the department of Bas Rhin. [RHIN, BAS.] This canal was for some time called Canal de Monsieur, but is now more commonly designated from the rivers which it unites.

The inland navigation of the department is officially given in the 'Statistique de la France' as follows: Rhine, 48 miles; Ill, 10 miles; total navigable rivers 58 miles; canal from the Rhône to the Rhine 73 miles; total navigation 131 miles.

The department contains seven Routes Royales, or government roads, having an aggregate length of 215 miles; of which, on January 1, 1837, 183 miles were in good repair, and 32 miles out of repair. The principal roads are those from Paris to Huningue, to Mühlhausen, and to Colmar. The road to Huningue enters the department between Lure and Belfort or Béfort; and passes through Belfort, Dannemarie, and Altkirch, to Huningue. The road to Mühlhausen crosses the Vosges into the department near the source of the Moselle, and passes by St. Amarin and Thann to Mühlhausen, from whence it is continued to Basel. The road to Colmar enters the department on the north near Schelestat, and runs by Guemar to Colmar. A road from Strasburg runs along the valley of the Rhine by Neuf-Brisach to Basel; and another road runs from Colmar by Hallstatt, Pfaffenheim, Rouffach, and Cernay to Belfort. The departmental roads have an aggregate length of 233 miles, of which, on Jan. 1, 1837, 147 miles were in good repair, 56 miles were out of repair, and 30 miles were unfinished. The bye-roads and paths have an aggregate length of 1350 or 1400 miles.

The soil of the department is stony and barren along the bank of the Rhine and in the Vosges; the central part is more fertile; and even amid the mountains there are some valleys of eminent fertility, as those of Giromagny, Masvaux, St. Amarin, and Munster. Cultivation is carried on with great care. Of the whole area of the department, which is above 980,000 acres, nearly 390,000 acres (or about two-fifths) are under the plough: the kinds of grain chiefly cultivated are wheat, barley, and oats: of barley, the produce is considerably above the average of the departments; in wheat and oats it is considerably below the average. In rye and maslin (wheat and rye mixed), and still more in maize and buckwheat, the produce is very far below the average; and in 1827 (when Dupin published his 'Forces Productives, &c. de la France') the cultivation of the potato was scarcely known. The whole grain harvest is by no means equal to the supply of the population, and a considerable quantity of corn is brought in from other departments.

The meadows, which are very rich, amount to 130,000 acres, and the heaths and open pastures to above 70,000 acres. The number of horses, taken absolutely or with relation to the number of the inhabitants, is below the average of the departments; but as compared with the area of the department, it is above the average: the number of horned cattle is above the average in every respect; the number of sheep is comparatively small, and the growth of wool altogether inadequate to the demand: the proportion of Merinos is however unusually great. The vineyards cover about 28,000 acres: the growth of wine is about equal to the consumption: the red wines are all of ordinary quality; but several of the white wines, as those of Guebwiller, Turckheim, Ribeauvillé, Thann, Pfaffenheim, and other places, are very good. The orchards, which cover nearly 15,000 acres, are very productive, especially in cherries, from which an excellent kirschenwasser is made. Pulse, hemp, flax, tobacco, and madder are grown. The woodlands comprehend above 280,000 acres, chiefly amid the Vosges. The abundant supply of wood furnishes fuel for the various manufactures of the department. It is floated down the streams which flow into the Ill or the Doubs.

The department is divided into three arrondissements, as follows:—

Name.	Situation.	Area Sq. Miles.	Communes.	Cantons.	Pop. in 1831.	Pop. in 1836.
Colmar . .	N.	654	139	13	189,589	199,403
Altkirch . .	S.E.	442	159	6	118,513	127,465
Belfort . .	S.W.	476	191	9	116,156	121,151
		1,572	489	28	424,258	447,019

The number of cantons or districts, each under a justice of the peace, appears by a later return to have been increased to twenty-nine.

In the arrondissement of Colmar are the following towns. Colmar, pop. in 1831, 15,131 for the town, or 15,442 for the whole commune; in 1836, 15,958 for the commune [COLMAR]; Guebwiller, pop. 3451 for the town, 3637 for the whole commune: Rouffach, pop. 3900 for the town, or 3979 for the whole commune; Pfaffenheim, pop. 1842; Gueberschwihr, pop. 1608 for the town, or 1635 for the whole commune; Hallstatt, Hertisheim, and Eguisheim, pop. 2162 for the town, or 2183 for the whole commune, on or near the Lauch: Ensisheim, pop. 2335 for the town, or 2568 for the whole commune; and Sainte-Croix-en-plaine, pop. 1703 for the town, or 1729 for the whole commune, on or near the Ill; Neuf-Brisach, pop. 1975 for the town, or 2005 for the whole commune, between the Ill and the Rhine; Bollviller, between the Thann (a feeder of the Ill) and the Neugraberbach (a feeder of the Lauch); Soultz, pop. 3594 for the town, or 4016 for the whole commune, on the Neugraberbach; Soultzmatt, pop. 2830 for the town, or 3139 for the whole commune, on the Ombach (another feeder of the Lauch); Münster, pop. 4002 for the town, 4340 for the whole commune; Wihr-au-val; Wintzenheim, pop. 3003 for the town, or 3245 for the whole commune; Turckheim, pop. 2728 for the town, or 2736 for the whole commune; Ingersheim, pop. 1995; and Guemar, on or near the Fecht Kaiserberg, or Kaysersberg, pop. 2896 for the town, or 3053 for the whole commune; Kientzheim; Ammerschwihr, pop. 2137; and Sigolsheim, on or near the Weiss (a feeder of the Fecht): Riquewihr, pop. 1716 for the town, or 1931 for the whole commune, between the Weiss and the Strengbach (another feeder of the Fecht); Ribeauvillé, pop. 6021 for the town, or 6558 for the whole commune, on the Strengbach, Sainte-Marie-aux-Mines, pop. 5918 for the town, or 9961 for the whole commune, on the Liepvrelle; Saint Hippolyte, pop. 2304 for the town, or 2414 for the whole commune; and Ober-Bergheim, near the northern boundary of the department. Scarcely another arrondissement in France contains so many towns. Guebwiller contains a handsome church, erected in the middle of the last century: the townsmen spin cotton-yarn, weave stockings, gloves, caps, handkerchiefs, calicos, cotton prints, printed shawls, and woollen cloths, and manufacture nails, currycombs, potash, and refined sugar. Rouffach is a walled town, and in the middle ages suffered much from the wars. The townsmen are engaged in spinning cotton-yarn and weaving cottons: they have five fairs in the year. Near the town is the castle of Isemburg, where some of the Frankish kings of the Merovingian race resided. Ensisheim, which is a tolerably well-built town, is also walled and surrounded with a ditch: it has a town-hall of Gothic architecture, and an ex-Jesuits' college, now converted into a poorhouse or house of correction. It was formerly a place of considerable importance, capital of the district of Brisgau, of the Black Forest, and of the Forest towns. In the Thirty Years' War it was repeatedly taken and retaken. The townsmen spin woollen yarn. Neuf-Brisach, or New Brisach, is of importance only as a place of strength: it was built by Louis XIV., to serve as a check to the fortress of Alt-Brisach (Old Brisach) in Baden, on the opposite side of the Rhine, and was fortified by Vauban on the most improved principles. The streets are straight, and the houses regularly built, but low, so as not to be visible outside the fortifications. Bollviller has some cotton-manufactures, and one of the most extensive nursery-grounds in France. It is especially rich in vines, fruit-trees, shrubs, and exotics. Soultz has manufactures of silk ribbon: there is a yearly fair. Soultzmatt has mineral waters, the most frequented in the department; the townsmen spin cotton-yarn, and weave muslins and linens. Münster owes its origin to a Benedictine abbey, founded in the seventh century. It was antiently fortified, and suffered much in the Thirty Years' War. The townsmen are engaged in the manufacture of cottons, plain and printed, muslins, and paper; and carry on trade in cattle, butter, cheese, and kirschenwasser: the master manufacturers are honorably distinguished by their care for the instruction of their workmen. Cottons and woollen goods are manufactured at Wintzenheim, and peat is dug in the neighbourhood. Turckheim, one of the free cities of Alsace, was signalised by a victory of Turenne over the Imperialists, A.D. 1675: it is a small ill-built town: the townsmen trade in the wine of the neighbourhood, which is in good repute. Kaiserberg, founded by the emperor Frederick II., who surrounded it with walls, was antiently a free imperial city. It was repeatedly taken and retaken in the seventeenth century. The town is well built: the manufacture of cotton-yarn, of calicos and other cotton goods, and of machinery for spinning cotton, is carried on. The neighbourhood of this town and of Ammerschwihr produces excellent wines. At Ribeauvillé, cotton handkerchiefs and other cotton goods are manufactured: near the town are the ruins of the castle of Ribeaupierre. Sainte-Marie-aux-Mines (in German, Mariakirch, or Markirch), is, next to Colmar, the most important place in the arrondissement: it is near one of the passes of the Vosges, in an agreeable situation: the Liepvrelle divides it into two parts. It derives its name from the copper and lead mines formerly worked in the neighbourhood, but the working of these has been gradually given up. The chief occupation of the townsmen at present is the manufacture of cotton and woollen yarn, of linens, woollens, and cottons, including handkerchiefs and printed calicos, and of leather and paper. There are extensive bleaching-grounds and some dye-houses. The town has a chamber of manufactures. There are two yearly fairs. St. Hippolyte is defended by a strong castle: it has an hospital.

In the arrondissement of Altkirch are Altkirch, pop. in 1831, 2724 for the town, or 2819 for the whole commune; in 1836, 3028 for the commune; Ferette; and Mühlhausen, pop. 13,187 for the town, or 13,300 for the whole commune [MUHLHAUSEN], all on or near the Ill: Huningue or Huningen, and Gros Kembs or Kemps, on the Rhine; and Landser, between the Ill and the Rhine. Altkirch was built early in the thirteenth century by one of the counts of Ferette. There are some antient towers yet standing. The townsmen manufacture leather, and there is a monthly fair for cattle. The town has a subordinate court of justice and a high school. Ferette has the ruins of an old castle: eight fairs are held in the town in the year. Huningue, or Huningen, was originally a fortress, constructed by order of Louis XIV., and fortified by Vauban: it had barracks for 4000 men. In 1814, and again in 1815, it was besieged by the allies; on the last occasion it was bravely defended by a mere handful of men against a considerable Austrian army it was however obliged to capitulate, and the fortifications were destroyed at the solicitation of the citizens of Basel, within cannon-shot of which town Huningue is situated.

In the arrondissement of Belfort, or Béfort, are Belfort, pop. in 1831, 4537 for the town, or 5753 for the whole commune; in 1836, 5687 for the commune [BEFORT]; Giromagny, pop. 1603 for the town, or 2166 for the whole commune: Delle, on the Halle; Dannemarie, near the Largues; Massevaux, pop. 2531 for the town, or 3053 for the whole commune, on the Doller, a feeder of the Ill; St. Amarin, pop. 1662 for the town, or 1995 for the whole commune; Thann, pop. 3802 for the town, or 3937 for the whole commune; and Cernay, pop. 3407 for the town, or 3416 for the whole commune, on the Thann, another feeder of the Ill. At Giromagny cottons are manufactured, and a monthly fair is held for corn and cattle. At Delle tiles are made, and there are a fulling-mill and a mill for grinding bark; and at Dannemarie there are tanyards and dye-houses. Massevaux, sometimes called Masmünster, has manufactures of cotton yarn and cotton goods, copper-works and iron-furnaces: there are six yearly fairs. There are cotton-manufactories and iron-furnaces at St. Amarin, a town very pleasantly situated: there are two fairs, where hardwares, woven goods, and cattle are sold. Thann has a fine old Gothic church, dedicated to St. Théobald, remarkable for its spire, which is an imitation of that of Strasburg: the ruins of the castle of Enguelbert, near the town, are also deserving of notice. Cotton-yarn and cotton goods, including printed calicos, are manufactured; also machinery, starch, gunpowder, salt, and chemical productions. The town had its origin in the twelfth century, and in the middle ages enjoyed many privileges: it was taken by the Swedes in the Thirty Years' War. Gobel, the archbishop of Paris, who renounced the belief of a God, in the height of the revolutionary frenzy, and perished on the scaffold, was a native of Thann. At Cernay cotton-yarn is spun; calicos, cotton prints, and woollen cloths woven; and iron goods, machinery, and paper are made: there are bleach-grounds for linen. At Morvillard, a village near Delle, are some important wire-works; at Niederbruck are copper and brass works; and at Wesserling, near Cernay, cotton-mills and a factory for cotton prints.

The department is included, with that of Bas Rhin, in the diocese of Strasburg; it is in the jurisdiction of the Cour Royale of Colmar, and in the district of the Académie Universitaire of Strasburg. It is included in the fifth military division, the head-quarters of which are at Strasburg. It sends five members to the Chamber of Deputies. In respect of education, it is in advance of the greater number of the departments. Of the young men enrolled in the military census of 1828-29, 71 in every 100 could read and write; the average number in the whole of the departments was 39 in every 100. Only four departments, Meuse, Doubs, Jura, and Haute Marne, exceeded that of Haut Rhin.

In the time of Cæsar this department, which had probably been antecedently a part of the territory of the Sequani, was in great part occupied by the Rauraci, part of the German subjects or allies of Ariovistus: the northern part was probably included in the territory of the Tribocci, another German people; while the south-western parts abou Belfort were retained by the Sequani. In the Roman division of Gaul by Augustus, the territory of all these nations was included in the Belgic province, although the Sequani were a Celtic people; but in the further subdivision made by the Romans, the territories of the Sequani and Rauraci were included in Maxima Sequanorum: while those of the Tribocci were included in Germania Superior or Prima. Several Gallic or Roman towns were within the limits of the department. Argentovaria ('Αργεντουαρία), which Ptolemy mentions as a town of the Rauraci, and near which the Roman emperor Gratian defeated the Alemanni, or Allemans, A.D. 378, was probably just on the border between Arzenheim and Markolsheim (Bas Rhin). Some antiquarians have endeavoured to fix it at Colmar. The Mons Brisiacus of the 'Itinerary' of Antoninus was on the Gallic side of the Rhine, on or near the site of Alt or Old Brisach, which is now, probably by the river shifting its bed, on the German side. Rufiana ('Ρουφιάνα), which Ptolemy (apparently by mistake) assigns to the Nemetes, was probably at Rouffach. The Stabula, Cambes, Urunci, Larga, and Gramatum of the 'Itinerary' of Antoninus may be fixed respectively at a spot between Ottmarsheim and Bauzenheim, at Gros Kembs, at Ricsen or Rucsen, not far from Mühlhausen; at Largitzen, on or near the Largues, not far from Altkirch; and at Granvillars or Grand Villars, on the Halle, near Delle. The Arialbinnum of the Peutinger Table and the 'Itinerary' of Antoninus, and the Olino Rauracorum of the 'Notitia,' were, the first at Binning, in this department, between Gros Kembs and Basel, the latter possibly at Holé, near Basel.

On the overthrow of the Roman empire, the department was ravaged by the Allemans and the Huns, and subsequently possessed by the Burgundians. On the overthrow of the Burgundian kingdom, it passed to the Franks. In the middle ages it was included in the province of Alsace, long a portion of Germany, but conquered by Louis XIV., and annexed to France. [ALSACE; RHIN, BAS.]

RHINE. This river is, in respect of length, the fourth of European rivers, being inferior to the Volga, Danube, and Dnieper; but if it be viewed as a channel of commerce, it is certainly the first river of continental Europe. It rises in the Alps of Switzerland, in several parts of its course separates that country from Germany, afterwards divides Germany from France, traverses the territories of several princes belonging to the German Confederation, and lastly it drains the plains of Holland, where it reaches the sea by several arms. That portion of the river which lies within or along the boundary-line of Switzerland is called the Upper Rhine; from Basel to Köln, or Cologne, it is denominated the Middle Rhine; and the remainder of the course, to its several mouths, the Lower Rhine.

Upper Rhine.—The river originates in three branches in that elevated chain of the Alps which runs eastward from the mountain-road of St. Gothard through Graubündten, or the country of the Grisons. The most eastern of these three branches, called by German geographers the Vorder

Rhein (Fore Rhine) is considered the principal. It rises in two small lakes, situated on the eastern declivity of Mount Badus, belonging to the St. Gothard's group, about 7500 feet above the sea-level. These lakes are called the Lake of Toma and Lake of Sera. It runs in a ravine like a torrent, and about twelve miles from its source, at Dissentis, where it is met by the second branch, the Mittel (Middle) Rhein, it is hardly more than 3600 feet above the sea. It continues its course for about 40 miles more in an east by north direction, to Reichenau and Chur. At Reichenau the waters are increased by the third branch, called the Hinter (Hinder) Rhein, and at Chur it is nearly 250 feet wide, its waters having been increased by numerous small tributaries. From Chur downwards it is navigated by small flat river-boats, and it begins to run through a valley from one to two miles wide, in a nearly northern direction towards the Boden See, or Lake of Constance. This valley is nearly 50 miles long. About 20 miles north of Chur two mountains come close up to the banks of the river, so as not to leave even space for a road. The eastern is called the Fäscherberg, and the western the Schollberg. Their declivities along the river are extremely steep, and there is reason to suppose that the two mountains at some remote time formed one mass, and that the course of the river was different from what it is at present. In fact a low tract of alluvial ground extends south of the Schollberg westward to the small town of Sargans in St. Gallen, and thence to the Lake of Wallenstadt. Between this lake and that of Zürich there is also a broad tract of level alluvial ground, in which the Linth Canal has been made. As the ground between the present course of the Rhine and the Lake of Wallenstadt is little more than 20 feet above the level of the river, it is supposed that the Rhine formerly took its course through this low ground, and passing through the lakes of Wallenstadt and Zürich, followed the course of the Limmat River, which joins the Aar opposite the village of Rain. When the Rhine is unusually swollen there is some danger of its returning to this its supposed antient bed. In 1817 and 1821 the danger was only averted by the great efforts of the inhabitants of the adjacent places. North of the narrow passage between the Schollberg and Fäscherberg the valley is much wider, and here the river constitutes the boundary-line between the Austrian monarchy and Switzerland. Where the river enters the Boden See it runs through a swampy tract of small extent. [CONSTANZ, LAKE OF.] The river issues from the lake at Constanz, which is 1344 feet above the sea-level, and flowing in a western direction for a few miles, enters the Unter See (Lower Lake), which is about thirty feet lower than the Boden See. In this tract, and as far as Schaffhausen, the Rhine is navigable for large boats, but below the last-mentioned place its waters rush over a rock, which is between 65 and 70 feet high, and this waterfall is called the cataract of Schaffhausen or Laufen. The last name is derived from that of a castle which is contiguous to the waterfall. At Schaffhausen the surface of the Rhine is 1260 feet above the sea-level. Below this cataract the course of the river is very tortuous, between mountains and high hills, but its general direction is towards the west. Nearly fifty miles below Schaffhausen the navigation is again interrupted by a cataract, at the town of Laufenburg, where the bed is narrowed by projecting rocks to about fifty feet. At this point goods must be unshipped, and the barges descend the river by means of ropes. The last and least impediment to navigation in the Upper Rhine occurs near Rheinfelden, about ten miles below Laufenburg, where a rapid of some length occurs, which does not stop the navigation, but is fatal to many boats which navigate this part of the river. It is called the Höllenhacken (Hook of Hell). Below this rapid the river is only 850 feet above the sea; and at Basel only 800 feet.

Numerous tributaries join the Rhine in its upper course above Basel, but none of them are navigable or otherwise remarkable, with the exception of the Aar. This river drains the greater part of Switzerland, and is at least equal to the Rhine in the volume of water which it brings down. The Aar originates in the mountain-masses which lie west of the mountain-road of the St. Gothard, and, from being always covered with snow and glaciers, are comprehended under the general name of Aar-Gletscher, or Aar-Glaciers. The upper part is in a narrow valley between very high mountains, in a general north-west direction, and in these parts it forms a cataract about 150 feet high, which is called the Aarfall, or Fall of the Aar, near the hamlet of Handeck. After a course of about 30 miles, the Aar falls into the lake of Brienz, which is about nine miles long, and somewhat more than a mile wide, very deep, and 2060 feet above the sea-level. After issuing from that lake, the Aar runs hardly three miles before it enters the lake of Thun, which is nearly twelve miles long, and on an average about three miles wide: it is 1875 feet above the sea-level. Issuing from the north-western extremity of the lake, the Aar flows first in a north-west, then in a west, and lastly in a northern direction, traversing the elevated and hilly plain of Bern nearly in the middle. Above the town of Bern it is not much navigated on account of the rapidity of its course, but a considerable quantity of wood is floated down. Below Bern it is navigated by river barges of moderate size. At Aarberg the river approaches the foot of the Jura Mountains, along the base of which it flows in a north-eastern direction as far as Aarau, north of which it enters the mountain-region which separates the plain of Bern from the valley of the Rhine, and in its tortuous course through this hilly tract the waters of the Reuss and of the Limmat join it, before it falls into the Rhine at Coblenz, a short distance above Waldshut. The whole course of the Aar exceeds 160 miles. The Reuss and the Limmat fall into the Aar near 47° 30′ N. lat., and hardly one mile from one another. The Reuss originates between the sources of the Aar and those of the Rhine, in the mountains which lie on both sides of the road that traverses the St. Gothard and its upper course, which is nearly due north, is frequently broken by rapids and cataracts, among which those of Hospital, Andermett, and Amsteg are admired for their beauty. At the village of Klus it leaves the narrow valley, and three miles farther north it falls into the Lake of Luzern, or the Vierwaldstädter See, so much admired for the picturesque beauty of the country which bounds its shores. The form of this lake is extremely irregular: it is 1434 feet above the sea-level. Issuing from the north-western extremity of the lake, the Reuss flows generally in a northern direction, and chiefly through a hilly country, about forty miles to its confluence with the Aar near Brugg. The other great tributary of the Aar brings to it the waters of the lakes of Wallenstadt and Zürich. The former lake is about nine miles long, and more than a mile across, generally from 60 to 80 fathoms deep, and 1422 feet above the sea-level. It is united to the Lake of Zürich by the Linth and a canal. The Lake of Zürich has the form of an arch, and is about twenty-five miles long and two miles wide. It is 1310 feet above the sea. Issuing from the north-western extremity of the lake, the Limmat flows for about twenty miles through a hilly country, in a west by north direction, and falls into the Aar opposite the village of Rain. Both the Reuss and the Limmat are navigable, but on account of the rapidity of their current they are ascended only by empty barges. The Linth and its canal are also navigated.

Middle Rhine.—At Basel, where this division of the river begins, it has entirely left the mountain-region of the Alps and Jura Mountains, and at the same time it changes its western into a north-north-eastern and northern course. It flows in a valley from forty to fifty miles wide, extending between the Black Forest (Schwarzwald) and the mountains connected with it on the east, on the one side, and the Vosges and their northern prolongation the Hardt Mountains on the west, from Basel to Mainz, a distance of nearly 200 miles. At Mainz the surface of the river is only 274 feet above the sea; the fall between Basel and Mainz is therefore 536 feet, or more than 2⅔ feet per mile. At Kehl, in the parallel of Strasburg, the surface of the river is 453 feet above the sea. The distance of Strasburg from Basel is about eighty miles, in which space the river descends 347 feet, or 4⅓ feet per mile. In addition to the great rapidity of the current, the wide bed of the river contains numerous sand-banks and small islands, which are subject to sudden and frequent changes in their form and position. Navigation in this part of the Rhine is accordingly limited. The river barges employed are only from 20 to 24 tons burden, and can only take in a third of that weight in ascending the river, when they must be drawn up. Small steamboats ascend as far as Basel. Between Kehl and Mainz, a distance of more than 120 miles, the fall of the Rhine does not exceed 179 feet, or about 1½ feet per mile. Between Kehl and Germersheim, which places are about fifty miles distant from one another, the islands do not decrease in number, but they increase in size, and are less subject to change Few islands occur north of Germersheim, and the river flows slowly, making large bends. The largest kind of barges used between Strasburg and Mainz are of 100 tons burden, but in ascending they must be drawn up, which is chiefly done by horses.

Between Mainz and Bonn the Rhine runs between two mountain-regions in a narrow valley. This valley, which contains some of the most picturesque scenery on the continent of Europe, is in some parts so narrow, that there is hardly level space enough for a road between the mountains and the banks of the river. The hills along the banks of the stream contain extensive vineyards, the produce of which is known all over Europe under the name of Rhenish wines. The direction of the river from Mainz to Bingen is westward, but below Bingen it runs to the west of north. Within this part there are some dangerous places. At Bingin a ledge of rocks crosses the river, and though the Prussian government has lately somewhat lessened the danger by blasting some of the rocks, yet the impediment is not quite removed, and neither barges nor steam-boats can pass by night or in foggy weather. Near Bacharach, farther down, there is a group of rocks, and opposite St. Goar another ledge, which however is much less dangerous than that near Bingen. Between Mainz and Köln, a distance somewhat exceeding a hundred miles, the river descends 164 feet, or little more than 1½ feet per mile: at Köln it is only 110 feet above the sea-level. Numerous barges navigate within these limits, and the largest of them vary between 120 and 150 tons. The ascent is very tedious, and requires much time.

Numerous tributaries join the Rhine in its middle course. Those which flow into it from the west have a short course, and are not navigable, with the exception of the Moselle, which rises on the western slopes of the Vosges, and runs first north-west, and then north, but the greater part of its course is to the north-east. After a course of 280 miles, it joins the Rhine at Coblenz. It is navigable as far as its confluence with the Meurthe, about 160 miles from its mouth. The upper part of its course lies between hills, the middle part through the plain of Lorraine, and the lower part in a deep valley of moderate width. The slopes of the hills and mountains enclosing this valley are covered with extensive vineyards, which produce the Moselle wine. The largest of its tributaries, the Saar or Sarre, which joins it above Trier, is navigable for large river barges as far as Saarebrück, a distance of about 45 miles from its mouth, and 10 miles more for small barges.

The number of navigable rivers which join the Rhine in its middle course from the right is much greater. The most southern is the Neckar, which rises near 48° N. lat., in the mountainous tracts by which the range called the Rauhe Alp is connected with the Black Forest. Its course for more than 30 miles is northward, and afterwards north-east along the base of the Rauhe Alp for about the same distance. Ten miles above Stuttgard it turns north-west, but below that town its general course is north for about 80 miles, when it turns to the west, and after flowing in that direction 30 miles, falls into the Rhine at Mannheim. The whole course of the Neckar is above 180 miles, and, with the exception of the first 30 miles, lies through a country swelling continually into gentle hills of moderate elevation, which are carefully cultivated, and produce excellent wine. It begins to be navigable at Kannstadt, near Stuttgard, for small barges; but below Heilbronn it is navigated by barges of 20 tons. One of its tributaries, the Enz, which falls into it from the left, is navigable to Vahingen, about 10 miles upwards.

The most important of the affluents of the Rhine is the Main or Mayn, which falls into it opposite Mainz. Its sources are in the Fichtelgebirge, not far from the boundary of Bohemia, where it originates in two branches, of which the northern is called the White and the southern the Red Main. The two branches unite about two miles and a half below Kulmbach, and begin to change their western course into a southern. Not far from Bamberg the river is joined by the Rednitze: it then flows west by north to Schweinfurt, whence it again runs south to Markbreit, and from that place to the north-north-west to Gemünden. From Gemünden it again flows southward, and making a wide sweep, encircles the mountain-region of the Spessart. At Hanau it turns westward, and passing near Frankfort in that direction, joins the Rhine. Though its sources are only about 150 miles from its mouth, the whole course exceeds 360 miles, owing to the numerous large bends. This circumstance renders it one of the most navigable rivers on the Continent. River barges ascend above the mouth of the Rednitz, more than 250 miles from its mouth; and from Kitzingen downwards, it is navigated by vessels of 100 tons burden. The whole course lies through a hilly but rather fertile and well-cultivated country. The Rednitz is the only affluent of the Main which is navigable. The navigation of the larger river barges, from 25 to 30 tons burden, ceases at Forchheim. As no high hills intervene in those parts between the Main and the Danube, a canal, which originally was projected by Charlemagne, is now in progress, which is to extend from Forchheim along the banks of the Rednitz and those of the Altmühl to the Danube. This canal will establish a water communication between the North Sea and the Black Sea.

Farther north the Rhine is joined by the Lahn, which falls into it a little above the mouth of the Moselle at Niederlahnstein: it flows about 140 miles, and is navigable for moderate-sized river boats to Diez, about 20 miles from its mouth, and for smaller boats to Wetzlar, about 70 miles from its confluence with the Rhine. It traverses a very hilly country. The river Sieg, which falls into the Rhine below Bonn, flows about 70 miles, and is navigable to Siegburg, which is about eight miles from its mouth.

Lower Rhine.—From Köln to its mouths, a distance of about 300 miles, the course of the Rhine is through a low level country, though the western declivity of the hills of the Sauerland are near its eastern bank, between Köln and Düsseldorf. The current is extremely gentle, as the whole fall does not amount to much more than four inches per mile, the surface at Köln being, as already observed, only 110 feet above the sea-level. From this town downwards the Rhine may be navigated by sea-vessels from 300 to 400 tons burden; and a few years ago, a vessel cleared out from Köln for New York. But flat river barges are generally used, on account of the numerous sand-banks which narrow the navigable channel.

About 200 miles from its mouth, and soon after it has entered Holland, the Rhine begins to divide into several arms; but before this division, the waters are increased by three navigable rivers, by the Erft from the left, and by the Ruhr and Lippe from the right. The Erft, which falls into the Rhine above Düsseldorf, flows about 60 miles, but is only navigable a few miles above its junction with the Rhine. The Ruhr, whose course is generally to the west for above 100 miles, is navigable for boats about one-half of its course, to Langschede above Schwerdt. Its course being rapid, it has been made navigable by the construction of sixteen locks; it is generally navigated by coal-barges, as the adjacent country contains the richest coal-measures in Northern Germany. The number of these barges is stated to amount to 3000. The Ruhr falls into the Rhine at Ruhrort. The Lippe, which joins the Rhine near Wesel, is somewhat more than 100 miles long, and is navigated from Lippstadt by small river-boats, and from Lünen by large ones.

Near the village of Pannerden, which is within the territories of Holland, the Rhine divides into two arms, of which the southern is called the Waal, and the northern preserves the name of Rhine. Nearly two-thirds of the volume of water run into the Waal, which is more than 210 yards wide, while the Rhine is only 114 yards wide. The Waal runs westward, and the Rhine north-north-west. The Rhine divides again about 12 miles lower down, above Arnheim, into the Yssel, which runs to the north, and the Rhine, which runs off to the west. The Yssel was originally a canal, cut by Drusus, to unite the Rhine with the river which now is called Oulde (Old) Yssel. It falls into the Zuider Zee. The Rhine running westward divides for the third time about 30 miles lower down, at Wyck by Duurstede. The southern arm is called the Leck, and the northern goes by the name of Kromme Rhyn (Crooked Rhine): the Leck is the larger river. The Crooked Rhine runs north-west to Utrecht, where it divides for the fourth and last time. The arm which runs northwards is called the Vecht, and falls into the Zuider Zee; the other, whose name is changed into that of Oulde Ryn (Old Rhine), continues westward through the marshes of Holland, where the waters are used for feeding numerous small canals. It passes through Leyden, and formerly did not reach the sea, being prevented by some sandy dunes which line the shores of this part of Holland; but in 1807 a canal was made through them, and the river now discharges a small quantity of water into the sea at Katwyck, north-west of Leyden.

The Leck, or middle branch of the Rhine, was originally also a canal, made by the Roman general Corbulo; and it existed as such to A.D. 839, when the bed was greatly enlarged by an inundation, and thus it became the principal river, and the true Rhine was reduced to insignificance. It runs from Wyck by Duurstede westward for about 50 miles, when it is joined from the south by a branch of the Maas or Meuse, called the Merwe or Merwede. On approaching the sea, another arm of the Maas, called the Oulde Maas (Old Maas), joins it, and hence to its mouth the wide æstuary of the river is called the Maas.

The Maas or Meuse rises near 48° N. lat., in the French department of Haute Marne, in that ridge of high land which unites the chain of Côte d'Or with the Vosges, and is called Monts de Faucille. Its general direction through France to Sedan is to the west of north; then for a few miles west, and again north, until it reaches Namur, whence it flows first to the north of east to Lüttich or Liege, and thence to the east of north to Venlo and Broekhuizen. From the last-mentioned place it declines to the north-west, and, before it reaches Grave, to the west, in which direction it flows nearly parallel to the Waal for more than 80 miles, approaching that river in one place within two miles. Both rivers unite at Gorkum, and the name of the Waal is merged in that of the Maas. The course of the Maas to its confluence with the Waal is about 460 miles. The Waal runs about 80 miles from the Pannerden to Gorkum. After its junction with the Waal, the Maas likewise divides. The first division occurs a few miles west of Gorkum, near the village of Hardingsvelt. One arm runs southward, under the name of West Kil; and the other, the Merwe or Merwede, to the west. The Merwede afterwards divides again into the proper Merwede and the Oulde Maas, both of which unite with the Leck, as already observed. The West Kil forms the Bies Bosch, a kind of lake, literally strewed with small islands covered with low trees; turning westward it is called Hollands Diep. This Hollands Diep, which is about two miles wide, divides also into two arms, of which the northern, called the Haring Vliet, is about two miles wide; but towards its mouth it widens to three miles, and is called Rivier Flakkee, or Shallow River. The southern arm is known by the names of Volke Rak and Krammer in different places, and is more than a mile across, but full of shoals. Between the two arms of the Hollands Diep is the island of Over Flakkee. An arm of the Krammer runs into the Ooster Schelde. Thus the Rhine reaches the sea by four mouths, the Oulde Rhine, the Maas, the Rivier Flakkee, and the Krammer. The whole country between the arms of the Rhine, after its division at Sterneschanze, is intersected by numerous canals, most of which serve for the purpose of internal navigation, though only for small boats.

The whole course of the Rhine amounts to about 950 miles, of which about 350 are included in the middle course, the upper and lower course not exceeding 300 miles.

The delta of the Rhine is bounded on the east by the Yssel, on the south by the Waal and Maas, and on the other sides by the North Sea and the Zuider Zee: it comprehends the whole of the three Dutch provinces of North and South Holland and Utrecht, and nearly two-thirds of Guelderland. Within these limits it occupies about 4150 square miles; but the whole of this surface is not level or alluvial ground, for nearly the western half of Utrecht, and that part of Guelderland which is between the Rhine, the Yssel, and the Zuider Zee, is slightly hilly, and the soil is not alluvial. When this hilly tract, which occupies about 1128 square miles, is subtracted, the alluvial portion of the delta does not exceed 3030 square miles. To this however must be added the extensive alluvial tracts which line the Yssel, the Waal, and the Maas beyond the limits of the delta as here defined, and occupy about 1000 square miles. If the greater part of the province of Zeeland, which is contiguous to these lowlands (about 500 square miles), and the low tracts on both sides of the Rhine above its division, from Wesel downwards (250 square miles), are added, the whole extent of the low country near the mouths of the Rhine is 4780 square miles. All this country would occasionally be covered with the inundations of the river, or by the sea, if it were not protected by embankments. The river embankments begin at Wesel, in the Prussian province of Düsseldorf, and extend on both sides of the different arms of the Rhine to the sea. These embankments are generally from 25 to 30 feet above the lowest level of the river. In the basin of the Rhine the winter usually lasts from six weeks to two months, during which time the river is covered with ice, and the snow accumulates in the adjacent countries. If the snow has fallen in greater quantities than usual, and is suddenly dissolved by warm rains, the river in a short time swells to an extraordinary height, and lays the contiguous low lands under water. No part of these low lands is more subject to such inundations than the Betuwe, or that tract which extends between the Rhine and Leck on the north and the Waal on the south. When such inundations take place, they are always attended with great loss of property, and sometimes of life, as was the case in the great inundation of 1799. In that year the masses of ice stopped the current, and the water, rising to the level of the embankments, poured over them like a cataract into the adjacent low lands. According to a rough estimate, about one thousand square miles were thus laid under water.

The basin of the Rhine, according to a tolerably accurate calculation, covers a surface of 79,482 square miles, or about 7000 square miles less than the area of Great Britain. The *Upper basin* of the river resembles a triangle, whose base extends, near 46° 30′ N. lat., over 4 degrees of longitude (from 6° to 10° E. long.), and consequently is 180 miles in length. Between 10° and 7° it is formed by the highest ranges of the Alps, and between 7° and 6° by the Jorat mountains and the Jura. The eastern border of the Upper basin extends along 10° E. long. from 46° 30′ to 48°, and is somewhat more than 100 miles long. It is mostly formed by high ranges, which are offsets of the Alps. The third line of the triangle is not a straight line. It begins on the south, near the place where 6° E. long. is cut by 46° 30′ N. lat., and extends along the Jura mountains to Basel and the Schwarzwald in a north-eastern direction, until in approaching 48° N. lat. it turns east and runs in that direction to 10° E. long. This portion of the basin contains 12,820 square miles: viz., of Switzerland, 10,300; of Austria, 860; of Wirtemberg, 360; of Baden, 1300: total, 12,820; and the whole of it, with the exception of a comparatively small tract, is from 1300 to 1400 feet above the sea-level; many parts indeed rise much higher, especially those which are enclosed by the ranges of the Alps.

The *Middle* basin of the Rhine lies between 48° and 51° N. lat. On the west side of the river, its margin extends from the northern part of the Jura mountains westward across the southern parts of the Vosges mountains to the Monts de Faucille, or those heights in which the Seine, Maas, Moselle, and Saône originate. It then continues northward along the ridge of hills which separate the valleys of the rivers Maas and Moselle to the Ardennes, and afterwards north-east over the mountain-region of the Eifel to Bonn. This portion of the Middle basin occupies 18,355 square miles, of which there are

	Sq. M.
In France (departments of Haut Rhin, Bas Rhin, Moselle, Meurthe, and about half of the Vosges)	9,731
In Bavaria (Rheinkreiss)	2,213
In Oldenburg (Birkenfeld)	195
In Prussia (Coblenz, Trier)	4,806
In Luxemburg	1,410
	18,355

On the east side of the river, the outer edge of the Rhine begins near the source of the Danube, whence it extends along the ridge of the Rauhe Alp east by north, until it reaches the place where 10° 30′ E. long. is cut by 49° N. lat. Thence it extends north-east over the hilly plain of Franconia, where several tributaries of the Danube and Rhine interlock, to the Fichtelgebirge (50° N. lat.). In this parallel the basin of the Rhine has attained its greatest width, extending from the source of the Sambre (3° 40′ E. lat.) to that of the Main (11° 40′), about 320 miles. From the Fichtelgebirge the outer border of the basin runs along the Frankenwald and Thüringerwald west-north-west to the sources of the Werra, and thence westward over the Rhön mountains, the Vogelsberg, and Westerwald to the mouth of the Sieg, where it terminates at the Siebengebirge opposite Bonn. The eastern portion of the Middle basin contains 21468 square miles, viz.:—

Of Wirtemberg	5,320
Of Baden	4,644
Of Bavaria	6,944

Of Darmstadt	2,387
Hesse-Homburg	172
Nassau	1,801
Of Prussia (Coblenz)	200
	21,468

Thus the whole of the Middle basin has an area of 39,823 square miles

The Lower basin of the Rhine lies between 50° 40′ and 52° 40′ N. lat., except a long narrow tract which comprehends the Upper basin of its confluent the Maas, and which extends southwards along the western edge of the Middle basin to 48° N. lat., or to the Monts de Faucille. This valley is separated from the basin of the Seine by the Forêt des Argonnes. At this place the basin of the Maas begins to border on that of the Schelde. The watershed between these two rivers extends south-west and north-east, and is formed by a hilly country of moderate elevation, which terminates in the neighbourhood of Maastricht. From this place the watershed between the two rivers extends north-west and west, and is formed by a broad tract of elevated ground covered with moors and heaths. The left portion of the Lower basin contains an area of 15,495 square miles, of which there belong

To France (in the departments of Meuse, Vosges, Ardennes, and Du Nord)	4,551
„ Luxemburg	1,301
„ Prussia (Aachen, Köln, and Düsseldorf)	3,581
„ Belgium (Liege, Limburg, Namur, Hennegau)	4,065
„ the Netherlands (North Brabant)	1,996
	15,495

On the right side of the Rhine, the outer edge of the Lower basin extends from the source of the river Sieg, which is in the Westerwald, north-eastward to the ridge called the Osning. Thence it runs along the northern side of the valley of the Lippe westward over an elevated tract covered with heath. The remainder of the border of this part of the basin is in the moorlands which are drained by the Reege, a confluent of the Vecht, and it terminates in the alluvial tracts which extend northward from Zwoll on the Yssel. The area of the right portion of the Lower basin of the Rhine, including the islands which lie between its arms, amounts to 11,344 square miles, comprehending

Of Prussia (Minden, Münster, Arensberg, Köln, Düsseldorf)	6,725
Of the Netherlands (Guelderland, Utrecht, and Holland)	4,619
	11,344

The whole of the Lower basin of the Rhine covers 26,839 square miles.

Though the basin of the Rhine extends from 46° 30′ to 52° N. lat., nearly the whole of it has the same climate. The distance between the Upper and Lower basin, amounting to about five degrees, is compensated by the greater elevation of the Upper basin. Thus the plains of Switzerland, which are about 1400 feet high, resemble in climate the low countries which lie between 51° and 52° N. lat. The countries in the middle basin, being less elevated in proportion, enjoy a somewhat milder climate than the plains of Switzerland and the low lands near the mouth of the Rhine.

RHINE, ANTIENT (*Rhenus*, Ῥῆνος.) The Romans first became acquainted with the Rhine by the conquests of Julius Cæsar in Gaul, who crossed it twice to punish the Germans. (Cæs., *Bell. Gall.*, iv. 16, 17; vi. 9.) He knew however nothing of the northern or southern part of the river except from report, and appears himself never to have gone farther north than the Scaldis (Schelde), though his cavalry on one occasion reached the country where the Rhine and the Mosa meet. (*Id.*, vi. 33; iv. 15.) According to his account, the Rhine rises in the country of the Lepontii, who inhabit the Alps, and flows rapidly a long distance through the territories of the Nantuates, Helvetii, Sequani, Mediomatrici, Triboci, and Treviri; and when it approaches the ocean it divides itself into many branches, and after forming several great islands, flows into the ocean by many mouths. (*Id.*, iv. 10.)

The campaigns of Drusus and Tiberius in Rhætia and the north-western parts of Germany gave the Romans a more accurate knowledge of the course of this river. According to Strabo, it rises in Mount Adula (St. Gothard), which is part of the Alpes Rhæticæ, and at no great distance from the sources of the Rhône. Thence it flows northwards, and forms marshes and a great lake, by which Strabo must mean the Lacus Brigantinus (Boden See, or Lake of Constance); it afterwards becomes a river again, and flows parallel to the Sequana. It falls into the sea opposite Cantium (Kent), which could be seen from the mouths of the Rhine. Asinius said that the river was 6000 stadia in length, but Strabo thought that it would not be more than half that length if it flowed in a straight line; and that on account of its rapidity not more than 1000 stadia ought to be allowed for windings in its course. (Strab., iv., p. 192, 193, 204; ii., p. 128; i., p. 63.) Tacitus also states (*Germ.*, c. 1) that the Rhine rises in the Rhætian Alps.

Antient writers differ respecting the number of mouths by which the Rhine falls into the ocean. Cæsar, as already stated, says that there are several, but most other writers speak only of two or three. Virgil (*Æn.*, viii. 727), Asinius (Strab., iv., p. 193), and Tacitus (*Ann.*, ii. 6) speak only of two; of which, according to Tacitus, the western is called Vahalis till its union with the Mosa, when it takes the name of the latter river, while the eastern, which forms the boundary between Gaul and Germany, preserves the name of Rhine. Pliny (*Hist. Nat.*, iv. 29), Ptolemæus (ii. 9), and other writers say that the Rhine falls into the sea by three mouths, of which the eastern, according to Pliny, was called Flevum, and the western, formed by the union with the Mosa, Helium; while the middle one, which was only a stream of moderate size, retained the name of Rhine. The channel called Flevum is supposed to have been formed by the canal which Drusus dug to connect the Rhine with the Isala, and by means of which he and Germanicus sailed to the ocean. (Suet., *Claud.*, c. i.; Tac., *Ann.*, ii. 8.) The Isala, increased by the waters of the Rhine, flowed northwards into a great lake called Flevo, on issuing from which it became a river again, and fell into the ocean after forming an island of the same name. (Mela, iii. 2.) In course of time the sea made great inroads upon the land round the mouth of this river, till at length it submerged that part of the country, and became united with the lake Flevo, thus forming the modern Zuider Zee.

(Ukert, *Geographie der Griechen und Römer*, vol. ii., part. ii., p. 147, &c.)

RHINE, circles of the Upper, Middle, and Lower Rhine in the grand-duchy of Baden. [Baden.]

RHINE, THE CIRCLE OF THE, in the kingdom of Bavaria (now the Palatinate), is entirely detached from the rest of the kingdom, and lies on the left bank of the Rhine. It is composed of the greater part of the French department of Mont Tonnerre and small portions of those of the Lower Rhine and the Saar, which were taken from France in 1814, and assigned by the Congress of Vienna to Austria, which made the country over to Bavaria. It is bounded on the north-west by Rhenish Prussia, on the north by Rhenish Hesse, on the east by Baden, from which it is separated by the Rhine, and on the south by France Rhenish Prussia, Coburg, and Hesse Homburg; the area within these limits, according to the 'Military Topographical Atlas' (as Hassel, 1819, states), is 140 German or 2940 English square miles. But Schlieben (1831), Hörschelmann (1834), and Cannabich (1836), all agree in making it 100 German or 2100 English square miles. The 'Weimar Almanach' of 1840 follows Hassel. The circle is very mountainous, being traversed by branches of the Wasgau (the Vosges); but there are some beautiful valleys and plains, and the country is very fertile and well cultivated. The mountains are for the most part covered with forests; very few are quite bare; the south sides, at least, being everywhere covered with vines. The principal river is the Rhine. All the other streams are tributaries to the Rhine; the chief of these are the Lauter, which forms the boundary towards France; the Queich, the Speyerbach, and the Nahe. Agriculture is carried to a high degree of perfection, and the products are corn of all kinds, pulse, flax, hemp, tobacco, madder, and hops. Fruit is very extensively cultivated, and the inhabitants derive very large profits from the walnuts and chestnuts. The best wines are produced on the Rhine; some sorts are in good repute; the greater part is consumed in the country. Though agriculture is the chief occupation of the inhabitants, there are flourishing manufactures of wool, cotton, and hardware. The population is 565,345, of whom the majority are Roman Catholics; the remainder are Protestants. [Deux Ponts; Landau; Speyer.]

RHINELLA. Fitzinger's name for a genus of Frogs, *Oxyrhynchus* of Spix. [FROGS, vol. x., pp. 494-496.]

RHINO'CEROS (the Greek *ῥινοκέρως*), the name of a genus of pachydermatous quadrupeds, placed by Linnæus in his order *Bruta;* and by Illiger in his order *Multungula*, family *Nasicornia*. It has been a question whether one of the species, *Rhinoceros unicornis*. Linn. (*Rhinoceros Indicus*, Cuv. and Desm.) is not the ראם (*Reem*) or רים (*Rem*) of Scripture (*Numb.* xxiii. 22, xxiv. 8; *Deut.*, xxxiii. 17; *Job*, xxxix. 9, 10; *Psalms*, xxii. 21; xxix. 6; xcii. 10; *Isaiah*, xxxiv. 7).

In the Septuagint the word is translated *μονοκέρως* (*Monoceros*, or *Unicorn*), except in Isaiah, where it is rendered *ἁδροὶ* (*Hadri*, or *the mighty or powerful ones*).

In the Tigurine and Vulgate versions the word is rendered (*Numb.*, xxiii. 22; *Job*, xxxix. 9, 15) *Rhinoceros*, with a note to the former, that others read *Monoceros;* and in Scheuchzer's *Physica Sacra* we have (tab. 313) *Numb.*, xxiii. 22, illustrated by a somewhat extravagant and exaggerated figure of a one-horned Rhinoceros, with 'Reem: *Rhinoceros*' below the plate.

In the Bible 'Imprinted at London by Robert Barker, Printer to the King's most excellent Maiestie' ('Breeches' Bible) the word used is 'Unicorne,' and 'Unicorn' is the expression in the version now in use in our churches.

Some are of opinion that the *Reem* or *Reïm* of Scripture were savage animals of the Bovine genus, and others that the word signified the *Oryx*, observing that *Reem* is the Arabian name for a species of wild goat or gazelle. These allege that the *Reem* was two-horned (*Deut.*, xxxiii. 17; *Psalms*, xxii. 21.) The better opinion seems to be that the animal or animals intended to be designated in most of the passages quoted, if not in all, was or were the *Rhinoceros Unicornis*, or *Great Asiatic one-horned Rhinoceros*. M. Lesson expresses a decided opinion to this effect; and indeed the description in *Job* (chap. xxxix.) would almost forbid the conclusion that any animal was in the writer's mind except one of surpassing bulk and indomitable strength.

The impotence of man is finely contrasted with the might of the Rhinoceros in this description, which would be overcharged if applied to the less powerful animals above alluded to.

It has also been doubted whether accounts of the Indian *ὄνοι ἄγριοι* (Wild Asses) given by Ctesias (*Indic.*, ed. Bähr) were not highly coloured and exaggerated descriptions of animals of this genus, and whether the *ὄνος Ἰνδικός* (Indian Ass) of Aristotle was not a Rhinoceros.

The account of Ctesias is evidently tinged with fable; but there are parts of it which suit well with the habits of a Rhinoceros. He describes his *Wild Asses* as being as large as horses, and larger, with white bodies, red heads (*πορφυροῖ*), and blue eyes (*κυανέους*), having a horn on the forehead a cubit long, which for the extent of two palms (*παλαιστάς*) from the forehead is entirely white; above it is pointed and red (*φοινικοῦν ἐρυθρὸν πάνυ*), and black in the middle. Of this horn drinking-cups are formed, and those who use them are said not to be subject to spasm (*σπασμῷ*) nor epilepsy (*ἱερᾷ νόσῳ*), nor to the effects of poison, provided, either before or after taking the poison, they drink out of them wine or water or any other liquid. Other asses, whether wild or domesticated, have no astragalus, neither have the other wild solipedes (*μώνυχα*); but these have an astragalus and a gall-bladder? (*χολὴ ἐπὶ τοῦ ἥπατος*). 'Their astragalus,' adds Ctesias, 'which I have seen, is very beautifully formed (*κάλλιστον*), in figure and size like that of an ox, heavy as lead, and red throughout like cinnabar. This animal is very swift and very strong. Neither a horse nor any other pursuer can overtake it. It begins its progress slowly, increasing in speed as it goes on, and runs quicker and faster. They are not naturally ferocious, but when they first lead forth their little young ones to graze, and are surrounded by many horsemen, they are unwilling to fly and leave their young, but fight with horns and heels (*λακτίσμασι*) and teeth (*δήγμασι*), killing many horses and men. They are also destroyed by arrows and javelins, for they are not to be taken alive. The flesh is not eatable by reason of its bitterness, but the animals are hunted for the sake of the horns and astragali.'

It is not at all improbable that these parts, so much sought after on account of supposed virtues, underwent some process by which they were artificially coloured in the manner above described.

Aristotle, who (lib. viii., c. 28) speaks of Ctesias as not being worthy of credit, notices (lib. ii., c. 1) the *Ἰνδικὸς ὄνος* (Indian Ass). He observes that he has never seen a one-horned solidungulous animal: but there are a few which are monoceratous and solidungulous, such as the one-horned Indian ass (*Ἰνδικὸς ὄνος μονόκερως*), and that it is the only one of the solidungulous animals which has an astragalus.

Agatharchides describes the one-horned Rhinoceros by name, and speaks of its ripping up the belly of the Elephant. (*Phot. Bibl.*, ccl.) This is probably the earliest occurrence of the name *Rhinoceros*.

The rhinoceros which figured in the celebrated pompa of Ptolemy Philadelphus was an Ethiopian, and seems to have marched last in the procession of wild animals, probably on account of its superior rarity, immediately after the camelopard, and before the wain carrying Bacchus fleeing to the altar of Rhea from the persecution of Juno. (Athenæus, *Deipn.*, v., c. xxxii.)

Dion Cassius (lib. li.) speaks of the rhinoceros killed in the circus with a hippopotamus in the show given by Augustus to celebrate his victory over Cleopatra; and says that the hippopotamus and this animal were then first seen and killed at Rome. If the rhinoceros was one-horned, as it appears to have been from his description, he was certainly wrong as to the sight at least; for Pliny (*Hist. Nat.*, viii. 19), alluding to the games of Pompey the Great, remarks, 'iisdem ludis et rhinoceros unius in nare cornu, qualis sæpe visus;' and probably equally wrong as to the killing, for upon great occasions few animals left the arena alive, and Pompey was not likely to have risked his popularity by baulking the Roman appetite for blood. It is not improbable that the rhinoceros slain upon the occasion of the victory of Augustus with the hippopotamus was African, and two-horned. If so, Dion would be right: for it does not appear that a two-horned rhinoceros had ever been either seen or slain previously.

The rhinoceros so clearly described by Strabo (lib. xvi., p. 774) as seen by him, was one-horned. The folds of the skin are distinctly alluded to: that noticed by Pausanias (lib. ix., c. 12) as 'the bull of Ethiopia' was two-horned, and he describes the relative position of the horns.

Mr. Wood (*Zoography*) gives an engraving of the coin of Domitian (small Roman brass) on the reverse of which is the distinct form of a two-horned rhinoceros: that coin which, with the epigram of Martial, has so puzzled antiquaries, and led some of them astray, when a very little knowledge of natural history would have kept them in the right road.

'The exhibition of the two-horned Rhinoceros to the Roman people, probably of the very same animal represented on the coin,' says Mr. Wood, 'is particularly described in one of the epigrams attributed to Martial' ('De Spectaculis Libellus,' *Ep.* xxii.), 'who lived in the reigns of Titus and Domitian.'

The following are the lines:—

Sollicitant pavidi dum rhinocerota magistri,
  Sæpe diu magnæ colligit ira feræ.
Desperabantur promissi prælia Martis:
  Sed tamen is rediit cognitus ante furor.
Namque gravem *gemino cornu* sic extulit ursum,
  Jactat ut impositus taurus in astra pilas.

'By this description it appears that a combat between a rhinoceros and a bear was intended, but that it was very difficult to irritate the more unwieldy animal, so as to make him display his usual ferocity; at length however he tossed the bear from his double horn, with as much facility as a bull tosses to the sky the bundles placed for the purpose of enraging him. Thus far the coin and the epigram perfectly agree as to the existence of the double horn; but unfortunately commentators and antiquaries would not be convinced that a rhinoceros could have more than one horn, and have at once displayed their sagacity and incredulity in their explanations on the subject. Hence we find a similar coin engraved in the second volume of Cooke's "Medallic History of Rome," where the animal is misrepresented, and particularly the horns, which appear like tusks, bending in different directions. After quoting the lines of Martial, Mr. Cooke observes, that it is the opinion of Bochart that the disputed line should be read thus:—

Namque gravi geminum cornu sic extulit ursum.

By which alteration we should have two bears instead of one;* but Mr. Cooke proposes to omit only one letter, the *s* in the word ursum, by which means he turns the bear into a wild bull; and as it is perfectly natural that the wild bull, or urus, should have two horns, he translates the line thus:—

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* And also a piece of bad Latin.

Struck with amazement, we beheld upborne
The buffal dreadful with his double horn.

If Cooke had seen the coin himself, or had consulted that book so useful to a medallist, the "Catalogue of Dr. Mead's Coins," he would not have deprived the epigram of its original and curious information.'

Two at least of these two-horned rhinoceroses were shown at Rome in the reign of Domitian.

The emperors Antoninus, Heliogabalus, and Gordian also exhibited Rhinoceroses, and Captain W. H. Smyth, R.N., noticing a coin of the emperor Philip (large brass), speaks of a noble lion on the reverse as representing one of the *Leones Mansueti* mentioned by Capitolinus. 'It seems,' says Captain Smyth, speaking of the *Sæculares Augustorum* (the legend on the reverse), 'that there were provided no fewer than 32 elephants, 10 tigers, 10 elks, 60 lions, 30 leopards, 1 hippopotamus, 1 rhinoceros, 40 wild horses, 20 wild asses, and 10 camelopards, with a vast quantity of deer, goats, antelopes, and other beasts. And still further to increase the public *hilarity*, 2000 gladiators were matched in mortal affray.' (*Descriptive Catalogue of a Cabinet of Roman Imperial large Brass Medals.*)

Cosmas speaks expressly of the Ethiopian Rhinoceros as having two horns and of its power of moving them.

The first Rhinoceros seen by modern Europeans appears to have been a *Rhinoceros unicornis*, Linn., sent from India to Emmanuel, king of Portugal, in 1513. Emmanuel sent it as a present to the pope, but the animal in an access of fury sunk the vessel on its passage. A sketch of the animal was sent from Lisbon to Nürnberg for Albert Dürer, who engraved the extravagant figure from which those of Gesner, Aldrovandi, Jonston, and Scheuchzer were taken. Among other monstrosities, the animal, which is represented as if it were clad in offensive and defensive armour, has a second small horn projecting from the top of the shoulders. A reduced copy of the same figure is given in the early edition of Petiver. In 1656 we find in the *Catalogue of the Musæum Tradescantianum* (sect. ii., '*Four-footed* Beasts, *with some Hides, Hornes, Hoofs*')—

'The Rhinoceros . $\left\{\begin{array}{l}\text{horn.}\\ \text{jaw-bone.}\\ \text{back-bone.'}\end{array}\right.$

In 1685 one was brought alive to England; another was shown throughout a great part of Europe in 1739; and a fourth, a female, in 1741. The Rhinoceros of 1739 was described and figured by Parsons (*Phil Trans.*, xlii.), and he also mentions that of 1741, which animal Cuvier believes to be the same that was shown at Paris in 1749, painted by Oudri, and afterwards engraved by Edwards (*Gleanings*), and that figured by Albinus. It was certainly that described by Daubenton, and the subject of the observations of Meckel. The Rhinoceros whose osteology is described by Cuvier was the fifth that had come to Europe. It arrived at Versailles in 1771, being then very young, and Buffon notices it in his supplement. This animal died in 1793, at the age of 25 or 26. In 1790 a Rhinoceros was brought from the East Indies to this country as a present to Mr. Dundas, who gave the animal away. It was afterwards purchased by Pidcock for 700*l*., and was exhibited at Exeter Change and about the country. A seventh, very young, destined, it is said, for the menagerie of the emperor of Germany, arrived from the Indies in 1800, and died in London soon after its arrival: this animal was dissected by Mr. Thomas, who published his observations in the *Philosophical Transactions*. An eighth, which afterwards went to Germany, was seen at Paris not many years ago. All these were one-horned. Of late years several of the same species (*R. Indicus*) have arrived in London: one of these, a very fine healthy animal, was bought by the Zoological Society of London, and is now (January, 1841) alive in their gardens in the Regent's Park.

No two-horned Rhinoceros seems to have been brought alive to Europe in modern times. Indeed, up to a comparatively late period, this form was known only by the horns which were preserved in museums, nor did voyagers give any sufficient details to impart any clear idea of the form of the animal. The rude figure given by Aldrovandi (to whom it was communicated by Camerarius), in his chapter *De Asinis Cornutis* (published in 1639), leaves no doubt that, wretched as it is, it must have been taken from a two-horned Rhinoceros. This is copied by Jonston (pl. xi.), who has given the animal the head of an ass or mule garnished with a couple of horns, and a flowing tail in order to make it more asinine. The collar, too, is made much more smart. These are the two earliest modern figures of a two-horned Rhinoceros known to us. Dr Parsons endeavoured to show that the one-horned Rhinoceros always belonged to Asia, and the two-horned Rhinoceros to Africa: but, as we shall presently see, there are two-horned Rhinoceroses in Asia as well as in Africa. Flacourt, in his *History of Madagascar*, states that he saw one in the Bay of Soldagne, near the Cape of Good Hope, at a distance. Kolbe and others always considered the Rhinoceros of the Cape as two-horned: but Colonel Gordon seems to be the first who entirely described the species with any exactness, and his description was given by Allamand in the supplement of the Dutch edition of Buffon. Sparrman gave a very detailed description of the Cape Rhinoceros in the *Transactions of the Swedish Academy* (1778), and in his *Voyage*. The description, to which we shall hereafter refer, is accompanied by sufficiently accurate figures, though that of the animal is stiff and ill-designed. At this period it was well known that the Cape species was not only distinguished by having two horns from the Indian Rhinoceros then known, but also by the absence of the folds of the skin so remarkable in the latter. Camper, in his treatise on the two-horned Rhinoceros, not only confirmed Sparrman as to the point o. the Rhinoceros of the Cape having 28 molar teeth, but also the statement of Dr. Parsons and Daubenton, that the Indian species has the incisors separated from the molars by a wide space.

Miller (Pennant, *Quadrup.*) had already noticed a Sumatran Rhinoceros, when Mr. W. Bell published, in the 'Philosophical Transactions' (1793), his account of a Rhinoceros of Sumatra apparently intermediate between that of the Cape and the Indian species already known; for whilst this species has two horns, and the skin but little folded, resembling in these points the Rhinoceros of the Cape, an interval intervenes between its incisors and molars, as in the Indian one-horned Rhinoceros; and it also has the small intermediate incisors below.

The observations of MM. Diard and Duvaucel confirmed the strong suspicion entertained by Cuvier, that the one-horned Rhinoceros, or *Badak* of Java, is a different species from the one-horned Indian species so long and so well known.

It now becomes necessary to notice the carelessness, to call it by the mildest name, of Bruce, who gave to the world a representation of a two-horned Rhinoceros from Abyssinia, with a strongly-folded skin. The truth appears to be, that the body of the animal figured by Bruce was copied from that of the One-horned Rhinoceros given by Buffon, to which Bruce added a second horn. Salt proves that the Abyssinian Rhinoceros is two-horned, and that it resembles that of the Cape. Mr. Burchell (1817) published a good and faithful account of a second species of African Rhinoceros, under the name of *Rhinoceros simus*; and Dr Andrew Smith has added a third, to which he assigns the specific name of *Keitloa*.

ORGANIZATION.

Skeleton.—The bony framework of the animal of this genus approximates to that of the *Hyrax*, the Tapirs, and the Horse among living genera. Though a general resemblance pervades the entire skeleton of the animals of this genus, there are certain differences, in the skull especially, which render it adviseable to notice certain of the species separately with regard to their osseous structure. All the species have seven molar teeth on each side, both in the upper and under jaw; but the species differ as to the incisors.

Rhinoceros Indicus. (*Rhin. Unicornis*, Linn.)

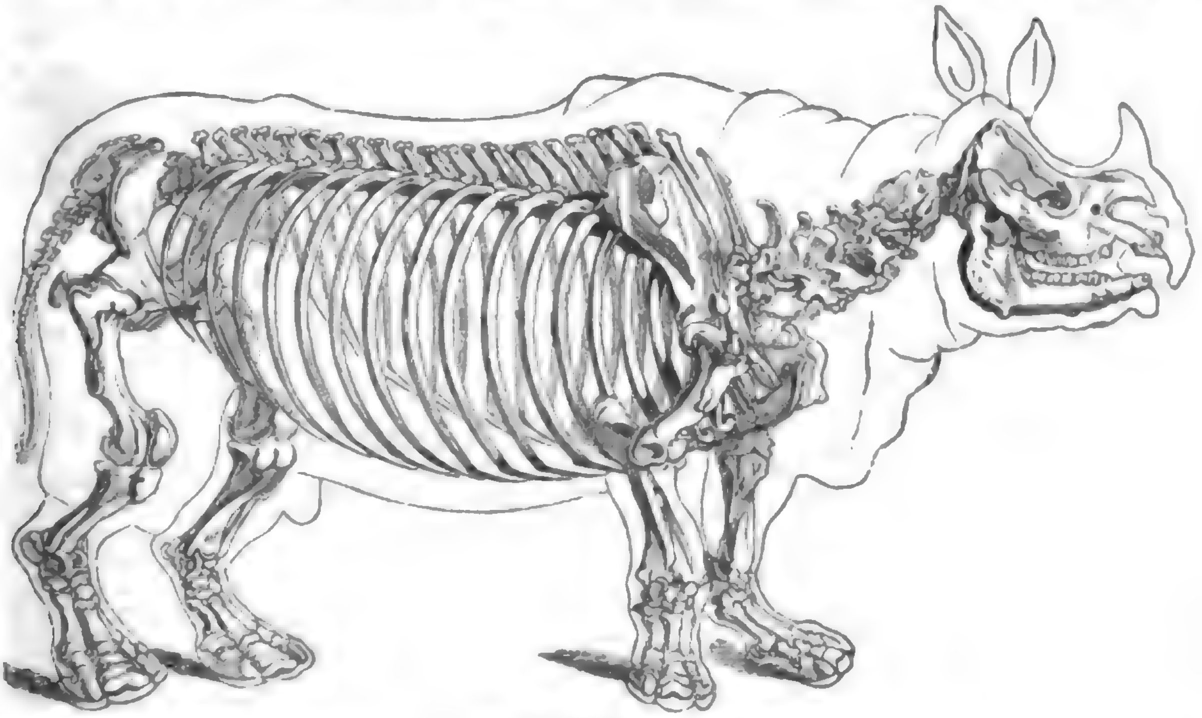
Dental Formula:—Incisors $\frac{4}{4}$; Canines 0; Molars $\frac{7-7}{7\quad 7}$, $= 36$.

Skull.—The pyramidal elevation of the cranium is the first point that strikes the observer on viewing the skull of the *Rhinoceros Indicus*. The next remarkable parts are the *ossa nasi*, which are of a size and thickness without example among quadrupeds: these form an arch or vault, which overhangs what may be termed the incisive bones, and gives support to the horn, forming, with the parts of the maxillary bones which carry the incisives, the great nasal notch which distinguishes the skull of these animals. Hence three pairs of bones, the nasal, the incisive, and the maxillary, contribute in the Rhinoceros to form the contour of the external apertures of the nostrils; whilst, with the exception of the Tapir, the two first only are employed for this purpose in the other quadrupeds. The form of the molar teeth varies but little from that which characterises those of other species. The upper incisors are very much compressed, and placed obliquely at a very considerable angle: the lower incisors are large, pyramidal, and pointed, and between them are two very little incisors, which are supposed never, or hardly ever, to cut the gum. There are also two little incisors on each side of the two upper great ones; but these are, on the contrary, on the outside of the large incisor teeth. The form of the lower incisor teeth reminds the observer of the instrument generally used by husbandmen for extracting *Docks* (*Rumex*) from their pastures, and they appear to be calculated for uprooting plants, as well as tearing or stripping up branches or stems of shrubs or trees. In the case of uprooting, the nipper-like operation of the two great upper incisors, as opposed to the lower ones, would materially assist the extraction.

The number of molar teeth on each side often varies in different individuals, though there are never more than twenty-eight. The reason of this is well explained by Cuvier.

'All herbivorous animals,' says Cuvier, 'beginning with the horse, wear their teeth to the root; because in proportion as the crown diminishes by trituration, the alveolus is filled, and pushes the root out. When this tooth is composed of two branches, as in the Rhinoceros, and the body of the tooth is entirely used, there remain two stumps of root: these stumps are shed one after the other, being constantly diminished by the trituration, and pushed out by the growth of bone in the interior of the socket. In time the sockets themselves disappear. This is what happened to our Rhinoceros' (the Paris skeleton of *Rhinoceros Indicus*); 'he had already lost his first molar on each side, and the alveoli of it were nearly effaced; he had worn the next molar to the root, and had on one side lost even one of the stumps of the root, whilst both the stumps of the other side remained. But if this Rhinoceros had lost molars by age, he had not gained incisors: that happens not to the Rhinoceros more than to other animals who grow old. The two small intermediate incisors of the lower jaw exist from the period of youth, as may be seen in the head given to the cabinet by M. Adrian Camper; and still better by the end of the lower jaw of a very young subject, designed by his father, in the "Acta Petropolitana" for 1777, and given here after nature: but they always remain hidden under the gum, and this is the reason why Meckel did not see them in the living animal, whilst they are manifest in the skeleton. Mr. Thomas, a surgeon of London, who has published some anatomical observations on the One-horned Rhinoceros, also found these small teeth in the skeleton of an individual four years old. But what no one, to my knowledge, has yet published, is that the Rhinoceros has, at a certain period of its life, two similar incisors on the upper jaw; only they are on the outside of the large ones, whilst in the lower jaw they are between the large ones. This might have been inferred from the figure of the intermaxillary bone of a very young Rhinoceros, given by Camper (the father) in the "Acta Petropolitana," vol. i., pl. ix., fig 3, and which I reproduce more complete, pl. v., fig. 3. I even thought once that this character necessarily indicated another species; but in examining the drawings of the anatomy of our Rhinoceros, made with the greatest care by Maréchal, under the inspection of Vicq. d'Azyr and Mertrud, I discovered the figure of a very small tooth outside the great incisor of the right side; and I saw in the explanation which accompanies the drawing, and which is written by Vicq. d'Azyr with his own hand, that there was, in fact, a small tooth on this side which was wanting on the other; I ran to the skeleton, and there found the remains of the alveolus on one side; but the tooth, already too much loosened (déracinée), was lost during the maceration; on the other side the alveolus itself was effaced.' (*Ossemens Fossiles.*)

There are 56 *vertebræ* in all—7 cervical, 19 dorsal, 3 lumbar, 5 sacral, and 22 coccygian. The transverse apophyses of the atlas are very great and very wide, and without obliquity, so that their contour is nearly rectangular, which distinguishes them from those of the Hippopotamus; their extreme size distinguishes the atlas of the Rhinoceros from that of the Elephant still more clearly. The spinous process is only a large tubercle, and below the body of the vertebra is a small longitudinal crest. There are nineteen pairs of ribs, seven of which are true: they are easily recognised by their proportional thickness and the great arch formed by their curvature. The first pair are soldered together below. The sternum in the adult is composed of four bones; the first is compressed into a ploughshare-shape, and projects in a point in front of the first rib



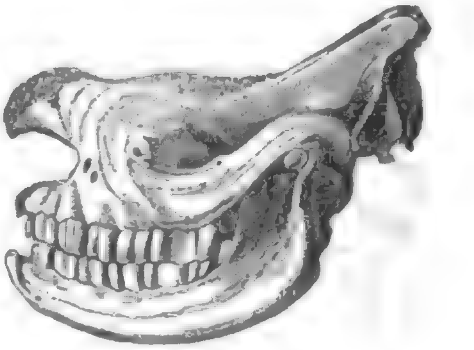
Skeleton of Rhinoceros Indicus.

Of the *anterior extremities* the following parts are remarkable. The *scapula* is oblong; its greatest width is at its upper fourth; its posterior border is elevated and thickened at this point. The crest has a very projecting apophysis at its upper third, directed a little backwards; this crest terminates at the lower fourth of the scapula, and consequently there is no acromion; a tuberosity occupies the place of a coracoid process, and the glenoïd cavity is nearly round. This configuration distinguishes the scapula or blade bone of the Rhinoceros from that of other great quadrupeds; that of the Elephant, for example, forms a nearly equilateral triangle, and the spine a great recurrent apophysis. The widely crested *humerus* is very remarkable, and distinguishable from that of every other quadruped of the same size, but the carpus is formed after the same model as that of the Tapir and the Horse; though the Rhinoceros and the Tapir resemble each other more than they respectively resemble the horse in this part of the skeleton. The anterior face of the semilunar bone is square, and not pointed above, as in the Hippopotamus. None of the bones of the anterior extremities are liable to be confounded with those of animals of the same size, and though their greatest resemblance is to those of the Tapir, the smallness of those of the latter makes a sufficient distinction.

The *posterior extremities* present the following remarkable parts. The *pelvis* is extremely wide, and that of the Elephant alone among living quadrupeds resembles it; but the pelvis of the Rhinoceros is at once distinguished by its forked spine. The angle of the *os ilium*, which reaches the sacrum, is besides more elevated, and its neck much longer and narrower. The external edge of this bone is nearly as great as the internal, whilst in the Elephant it is much smaller. The crest of the *pubis* commences from the top of the ossa ilii. The *oval holes* are wider than they are long. The tuberosity of the *ischium* is very large above, and in the form of a hook. The *femur* is, if anything, more remarkable than the *humerus;* its upper part is extremely flattened from before backwards; the eminence which Cuvier calls the third trochanter, projects extremely, and forms a hook, which ascends to touch a hook descending from the ordinary grand trochanter, so that there is an oval hole between these two eminences. The *tibia, fibula, tarsus*, and the upper part of the *metatarsus* are constructed upon the plan of those of the horse; but the pulley of the *astragalus* is wider, more oblique, less deep, and its posterior internal angle is obliquely truncated; the astragalus touches the *cuboïd bone* by a rather wide surface; the *scaphoïd* and the third *cuneiform bones* are less flattened; the second *cuneiform* and the *cuboïd* larger. In these points the Rhinoceros resembles the Tapir more than the Horse, and indeed were it not for size would be hardly distinguishable from the former; but it differs from both in having a larger and stouter *calcaneum*. Its anterior or astragalian surface is triangular. The *astragalus* has two large facets; that of the inside is prolonged into a tail-like process all along the lower edge of this surface, as in the Tapir. In the Horse the third facet towards the external angle is distinct. The facet, which touches the cuboïd bone, is very small. The *cuboïd bone* has a long and large protuberance behind, which does not exist in the Horse. On the inside of the foot is a similar one, produced by a supernumerary bone attached to the scaphoid, the internal cuneiform and the internal metatarsial bones, which represents at once the first cuneiform and the thumb in its entirety. This bone exists only in the Tapir and in the Horse; but in the latter it is promptly soldered to the second cuneiform bone. The scaphoïd bone then has three articular facets on its inferior or rather metatarsial face; the third cuneiform or internal bone is much smaller than the other. The *phalanges* are all wider than they are long; the second phalanx of the middle toe is especially short. The last are channelled like those of the hoof of a horse. (Cuv.)

In comparing the osteology of the Two-horned Rhinoceros (*Rhinoceros Africanus*) of Africa and *Rhinoceros simus* with that of the One-horned Rhinoceros of Java and that of the One-horned Rhinoceros of India, and the relations of the osseous parts of those species to each other, we commence with

The Two-horned Rhinoceros of the Cape.—The following differences appear on examining the skull:—I. On its upper surface the horizontal contour of the bones of the nose is rounded in the Cape species, and almost extravagantly so in *Rhinoceros simus*, whilst in the one-horned species it is pointed. A deep furrow marks their suture in the first. The space between the post-orbital apophyses is convex in *Rhinoceros Africanus*, or *Bicornis*, transversely concave in *Rhinoceros Indicus*. From this point up to the occipital crest the skull of *Rhin. Africanus* appears longer, because this crest is directed obliquely backwards, whilst it is vertical in *Rhin. Indicus*. The temporal fossæ are less approximated in *Rhin. Africanus*, which leaves the upper and truncated part of the occipital crest wider. The zygomatic arches are less separated backwards in *Rhin. Africanus*, whilst in *Rhin. Indicus* they form a salient angle, which, joined to the difference of the bones of the nose, makes the general horizontal contour of the skull of *Rhin. Indicus* triangular, whilst that of *Rhin. Africanus* and *Rhin. simus* is oblong. The skull of the latter agrees generally with that of *Rhin. Africanus*, but the bones of the nose are prodigiously wide and flattened in front. II. The principal differences in the profile relate to the form of the incisive bones, which in *Rhin. Indicus* advance as far as the bones of the nose, and have above a particular apophysis: in *Rhin. Africanus* and *Rhin. simus* the incisive bones are each reduced to a small oblong piece. Again, a principal difference exists in the convexity of the suborbital space of the skull of *Rhin. Africanus* and *Rhin. simus*, already noticed with regard to the upper surface; and also in the elevation of the occipital crest of *Rhin. Indicus*, and its low position in *Rhin. Africanus* and *Rhin. simus*, whence it results that at an equal distance between the occipital condyles and the muzzle, *Rhin. Indicus* has the upper part of the skull much shorter than *Rhin. Africanus* and *Rhin. simus*. III. On the lower surface, besides the differences which result from the form of the zygomatic arches, the direction of the occipital crest, and that which the difference of the incisive bones produces on the front of the palate, it may be observed that the series of molars is longer in *Rhin. Africanus* and *Rhin. simus*, and that it converges anteriorly with that of the opposite side. In *Rhin. Indicus* the two rows of molars are parallel or nearly so: the palatine notch is pointed anteriorly in *Rhin. Africanus*, and rounded in *Rhin. Indicus;* in both it advances to the penultimate molar: the basilary region is longer in *Rhin. Africanus*, so that it gains in length behind what it had lost before. IV. The posterior surface; which is demi-elliptical, and higher than it is wide in *Rhin. Indicus*, and rather wider than it is high in *Rhin. Africanus* and *Rhin. simus*, in which last the occipital foramen is wider than it is high; whilst in *Rhin Indicus* those proportions are reversed. The principal differences of the lower jaws are (besides the length which precedes the molars, which is much less in *Rhin. Africanus* and *Rhin. simus* than in *Rhin. Indicus*), 1st, that the series of molars is longer in the African species; 2nd, that the rising branches are much less high; 3rd, that the coronoid apophyses are much shorter, less pointed, and less directed forwards; 4th, that the dental branches are much more convex externally. The upper molars of the African species taken separately are much larger than those of the two one-horned species, and may be distinguished because their posterior border being less elevated, the notch of this border does not change into a fosset, as in the two one-horned species, but remains a true notch, at least till the tooth is worn to a certain extent. There are also other differences in the bones of the anterior and posterior extremities of *Rhin. Africanus*, which our limits will not permit us to detail, but which are pointed out by Cuvier,[*] who has noticed the other differences above alluded to, excepting those relating to *Rhin. simus*, and which will be obvious on an inspection of the skeleton.

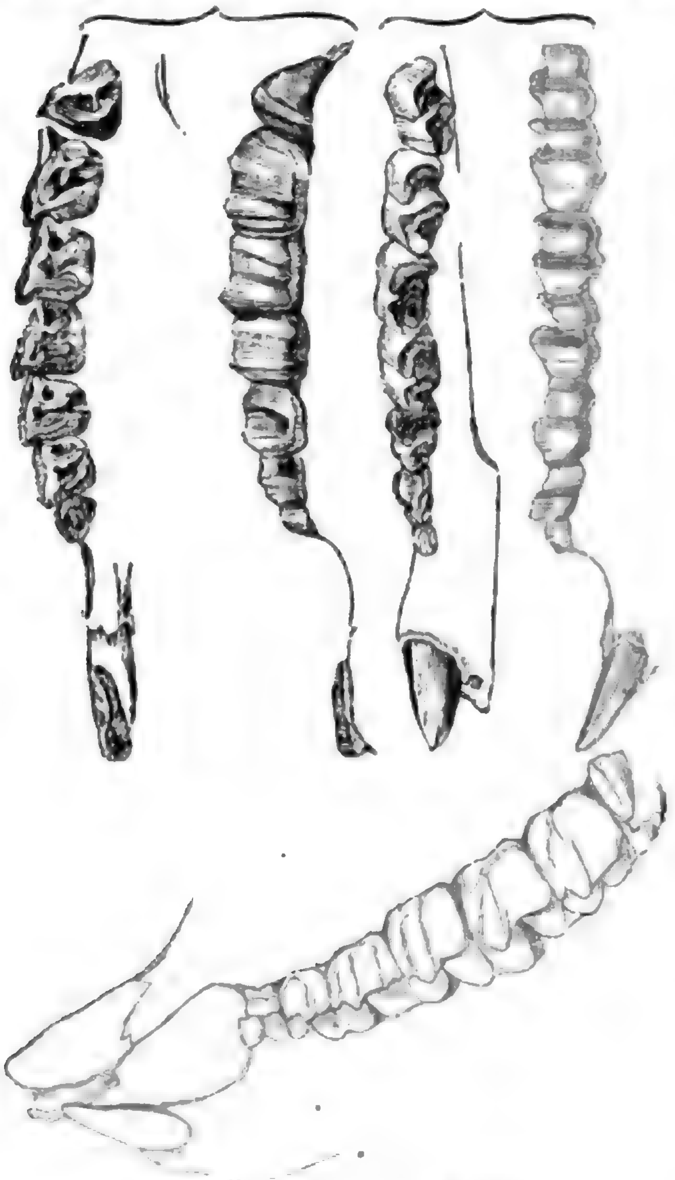


Skull of Rhinoceros bicornis.

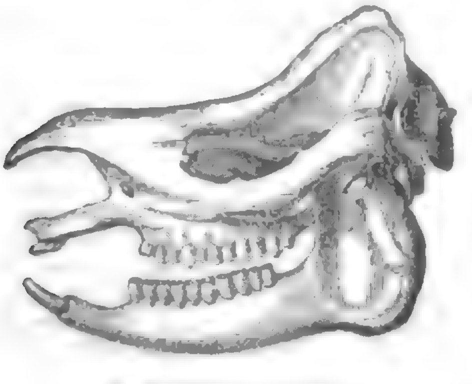
The One-horned Rhinoceros of Java (*Rhinoceros Javanus*) resembles less, in the bones of the extremities, the *Rhinoceros Indicus*, than does the *Rhinoceros Africanus;* which, as Cuvier observes, is remarkable. But in the skull the resemblance to that of *Rhinoceros Indicus* is striking, though there are still remarkable differences. The whole cranium, for instance, is less, and the zygomatic arches, the orbits, and the nasal bones, which terminate in a sharp point, are less developed. The post-orbital apophysis can hardly be traced. The occipital crest is less elevated; there is no apophysis on the superior edge of the incisive bones; the orbit has a more forward position; the posterior base of the zygomatic arch is less approximated to the occiput; the region of the external opening of the ear is wider; the descending part of the occipital arch, which is trenchant in *Rhinoceros Indicus*, is here stout and obtuse. The posterior

[*] But Cuvier observes that these differences (with the exception of those of the head and teeth) are of such little importance that he would not affirm of one of them that it might not exist as well between two individuals of *Rhin. Indicus* as between *Rhin. Indicus* and *Rhin. Africanus;* nor would he venture to found a specific character on one of them taken by itself

surface of the skull of *Rhinoceors Javanus* is wider than it is high: in *Rhinoceros Indicus* it is just the reverse; and the same difference exists in the dimensions of the occipital hole. Cuvier further observes that the upper contour of the occipital crest is notched in the cranium of the skull of *Rhinoceros Javanus* in the Paris collection, and convex in that of *Rhinoceros Indicus*. On examination of the lower surface, the incisive bones of the Javanese skeleton were found by Cuvier to be narrower. The posterior notch of the palate was less deep, and advanced nearly opposite to the antepenultimate molar; the vomer was more visible externally in the internal nasal fossa; the pterygoid processes were less approximated at their base; the basilary region was shorter and wider, &c.; the ascending *rami* of the lower jaw and the coronoïd apophysis were much less, but in other respects the structure resembled that of *Rhinoceros Indicus*. Cuvier thought at first that the small external upper incisors did not exist, but the observations of MM. Diard and Duvaucel satisfied him that they did.



Teeth of Rhinoceros Javanus. (F. Cuv.)



Skull of Rhinoceros Javanus.

Cuvier found the great upper incisors more delicate, so to speak, and situated more in parallel with each other than those of *Rhinoceros Indicus*; the lower incisors were in the form of a triangular pyramid, terminated forwards in a sharp point, with their lower edge rounded, and their upper surface worn by the friction of the upper incisors. Cuvier justly supposes that the difference between these great lower incisors, which were sharp and pyramidal, as he has well described them, in the Javanese species, and the truncated great lower incisor teeth of *Rhinoceros Indicus*, was the consequence of age only. The small intermediate incisors in the Javanese species were like those in *Rhinoceros Indicus*. There is not much difference between either the upper or the lower molar teeth of the two one-horned Asiatic species; but the scapula of the Javanese Rhinoceros is very different from that of *Rhinoceros Indicus*; for it is wider in the middle; it has the anterior edge rounded into a more convex arch; the salient angle of the spine has a much higher position, it is wider and, especially, longer, directed backwards on the plane of the bone, and so that its point answers to the posterior border. It is also much lower below, and the coracoïd tubercle is much larger than that of *Rhin. Indicus*. Cuvier further remarks that the *humerus* of *Rhin. Javanus* is distinguishable at the first glance by its bicipital obliquely hollowed canal, and other differences; the *ulna* is narrower below, and the olecranon is more elongated and directed more according to the axis of the bone: the *radius* exhibits but little difference. The bones of the *carpus* were found to resemble those of *Rhin. Indicus* more than those of *Rhin. Africanus*; with the exception of the unciform bone, which is higher in proportion. Cuvier found that the pelvis of *Rhin. Javanus* differed from that of the other species principally in having the external spine not forked. There is a slight difference in the femur, principally in what Cuvier terms the third trochanter, which is placed on the middle of its external side, is wide, curved forwards, but not ascending towards the great trochanter, which has no point to meet it. The notch or space formed by the two is not closed, in consequence, externally; but it is as large as in *Rhin. Indicus*. The lower head of the bone is widened backwards. Cuvier found the principal difference of the *tibia* to consist in its greater length and the depth of the anterior canal of the upper head of the bone. But the tarsal bones were found by Cuvier to exhibit very marked specific differences: the *astragalus*, below its anterior pulley, has an oval deep fossa which is wanting in the other species. The internal edge of the pulley is also shorter, and descends more obliquely forwards. The lower apophysis of the calcaneum is less stout in proportion. The cuboid bone is less elevated, and all the bones of the metatarsus are shorter, wider, and more flat; so that, as Cuvier remarks, the feet of this species must be shorter and wider in proportion than the others.

Before we close our short notice of the osteology of this genus, we must refer the reader to the *Catalogue of the Contents of the Museum of the Royal College of Surgeons in London*, part iii.; and to the Museum itself for a fine collection of the osseous parts and horns of these animals, Nos. 813 to 839 inclusive. Among them will be found a skeleton of the Sumatran Two-horned Rhinoceros (Sir Stamford Raffles), and the very skulls of that species which were figured by Bell (*Phil. Trans.*, vol. lxxxiii., pl. 2, 3, 4 (No. 1815). There are also good examples of *Rhin. Indicus* and a very fine skull of *Rhin. simus* from the collection of Mr. Delafons.

Digestive Organs.—The stomach of these animals is simple, their intestines very long and the cæcum very large. Sparrman, who dissected a Cape Two-horned Rhinoceros as well as his position and his Hottentot assistants would permit, remarks that the viscera most resemble those of a horse; though the stomach did not in the least resemble that of a horse, but rather that of a man or a hog. It was four feet in length and two feet in diameter; and to this viscus was annexed an intestinal tube twenty-eight feet in length and six inches in diameter: at three feet and a half from the bottom was a large cæcum, 'if,' says Sparrman, 'I may so call a viscus, which at its upper end was of the same width as the stomach, viz. two feet, and above twice the length, that is, eight feet and a half, and lay on the spine of the back, being attached to it at both ends, after which it was contracted into a rectum six inches in width and eighteen in length.' The liver was three feet and a half in breadth, but in depth (taken as if the animal were in a standing position) two feet and a half. It consisted of three larger and perfectly distinct globes, almost equal in size, and of a small lobe besides, which projected to about a foot from the concave side of the liver, at the middle of its upper edge. There was no gall-bladder nor any trace of it. In this the structure of the Rhinoceros resembled that of the horse; though some have considered the large hepatic duct of the horse as a gall-bladder. The contents of the stomach, which was very much distended, were entirely without offensive smell, and perfectly fresh and sweet, consisting of masticated roots and small branches of trees, some of them as big as the end of a man's finger. There was evidence that the animal had also eaten a great quantity of succulent plants, among which Sparrman thought he recognised two or three which were harsh and prickly. 'The whole of this mass,' says he, 'diffused around a very strong and not disagreeable aromatic odour, which in a great measure took off the stench of the putrid viscera. Might it not be some peculiar herb, or, perhaps, the root only of an herb, with which I was entirely unacquainted, that produced the greatest part of the aromatic flavour? In the excrements of this animal, which were four inches in diameter, and in other respects resemble those of a horse, though they are of a much drier nature, there is usually seen a quantity of bark and fibres of trees, a circumstance that the hunters pay attention to; and by that means are able to distinguish it from the dung of the Hippopotamus, an animal that feeds only on grass. I thrust my hand into this creature's mouth, which was half open, and found the tongue perfectly soft, which is in direct contradiction to the common notion, viz. *quod lambendo trucidat.* I was likewise not a little astonished to find no fore-teeth in any of these carcasses of the Rhinoceros, although one of the three beasts seemed to be old; and, in fact, this animal has little room for fore-teeth, as the mouth goes off so sharp at the fore-part, that in that place it is only an inch and a half broad. Besides, it has no occasion for any teeth there, as the lips, like the skin, are of that extreme hardness, that it is able to clip off the tops of plants and shrubs with them, and that with so much the greater ease, as the under jaw goes within the upper; so that this species of Rhinoceros is probably capable of laying hold of its food with its lips and conveying it into the mouth, with the same ease and dexterity as Dr. Parsons observed in the common Rhinoceros on a similar occasion.' The spleen was hardly a foot broad, but full four feet long.

Circulating and Respiratory Organs.—The heart was a foot and a half in length and the breadth was not much less. The right lobe of the lungs had an incision in it (probably made by the Hottentots who exenterated the animal, or by the shot, which passed through the great blood-vessels of the lungs, and mortally wounded the animal), but was in other respects undivided and entire: it was two feet in length. The left lung was subdivided into two lobes, the smaller of which was next to the base of the heart.

Urinary System.—The kidneys were a foot and a half in diameter.

There are, we believe, in the museum of the Royal College of Surgeons many preparations of the soft parts of a *Rhinoceros Indicus* which belonged to Mr. Wombwell, and died at Canterbury in the beginning of the year 1838. We had been in hopes that this dissection, which was made by Professor Owen, would have been given to the scientific world as a pendant to the admirable 'Memoir on the Pearly Nautilus,' and in a similar shape.

Integuments and Horns.—The hide of the rhinoceros is perhaps as thick as, if not thicker than, that of any other pachydermatous animal. The horns, solid as they are apparently, consist actually of congregated parallel horny fibres. Fine examples of these horns, and of their gradual increase, will be found in the Museum of the College of Surgeons.

ASIATIC RHINOCEROSES.

Rhinoceros Indicus (*Rhinoceros Unicornis*, Linn.).

Specific Character and Description.—Dental Formula: see above. A single horn on the nose. Skin naked, very thick, of a dull deep purplish grey, marked with sub-elevated, rounded, and other inequalities, and remarkable for the deep folds which it forms behind and across the shoulders, and before and across the thighs, &c. There are a few stout, stiff, horny, and smooth hairs on the tail and on the ears.

We have seen that a one-horned rhinoceros, this species probably, was shown at Rome by Pompey: that it was well known in the time of Domitian appears from the following epigram (Martial, 'De Spectaculis Libellus,' *Ep.* ix.):*

> 'Præstitit exhibitus tota tibi, Cæsar, arena,
> Quæ non promisit prælia rhinoceros.
> O quam terribiles exarsit pronus in iras!
> Quantus erat cornu, cui pila taurus erat.'

The best early figure of *Rhinoceros Indicus* known to us is that of Bontius, which, though somewhat exaggerated by the draughtsman about the lip, and furnished with little claws instead of broad nails, gives in general a correct idea of the animal. Bontius states that he has seen the animal a thousand times, both in confinement and in its native wilds, and he states that he gives the figure to correct the error of those painters who have depicted the animal as 'scutatum et squamis obsitum.' He states the following anecdote of its fury when provoked:—A party on horseback had proceeded to a wood, when in a marshy place they came upon a rhinoceros and her young one. The mother, on seeing them, arose and drove her young one towards the wood, and when it stopped as if in sport, pushed it forward with her snout. One of the company, out of a bravado, rode up, and drawing his Japanese sword, cut at the hinder parts of the old one, but the blows did not penetrate, on account of the hide, and some whitish marks only appeared. The mother bore all patiently till her young one was safely hidden in the bushes and brushwood. Then the scene was changed. The irritated beast turned suddenly on her persecutor, whose life was saved by his frightened horse, which galloped back to the party followed by the infuriated rhinoceros overturning trees and everything in her way.

As soon as she saw the rest of the company, she attacked them, and they avoided her by getting behind two great trees, scarcely two feet apart, between which the rhinoceros in the blindness of her rage rushed, making them tremble like reeds. Whilst she was thus entangled, they used their fire-arms with fatal effect, and slew her. The rash man who attacked her by himself had a very narrow escape; for she turned short upon him with a horrible roar 'cum immani grunnitu et stridore,' and seized him by the boot, which fortunately for him was made of light stuff, and gave way. Had it not been for its tearing, 'actum de eo fuisset,' as Bontius says, in plain English it would have been all over with him. The same author, though so anxious to dissipate error, states, in a previous part of this chapter, *De Abada sive Rhinocerote*, that when the animal has prostrated a man, it kills him by licking him with his rough tongue, and tears off both skin and flesh, even to the bones; 'hinc etiam,' he adds, 'spinis ac vepribus libentissimè vescitur, and he quotes the lines,—

> 'Lingua virum occidit lambendo rhinocerotis,
> Aulica falsidici sic quoque lingua necat.'

It is to this most probably that Sparrman alludes above.

Pennant, who is decidedly of opinion that this species is the Unicorn of holy writ, and the Indian ass of Aristotle (p. 463), says that it loves shady forests, the neighbourhood of rivers, and marshy places; that it brings forth one young at a time, and is very solicitous about it; that it is quiet and inoffensive, but when provoked, furious, very swift, and very dangerous. 'I know a gentleman,' he continues, 'who had his belly ripped up by one, but survived the wound.' Pennant gives the name of this person.†

The rhinoceros described by Dr. Parsons came to London in 1739 from Bengal. It is stated that though but two years old, the expenses of his food and his voyage amounted to near 1000*l.* sterling. He had daily seven pounds of rice mixed with three pounds of sugar: this was divided into three portions. Hay and green herbs were also given to him, but he preferred the latter. He drank largely of water, taking a great quantity at a time, was peaceable when no hungry or provoked, and allowed himself to be handled. When however he wanted to eat, or was irritated by any person, he became unruly, and in both cases he was only to be appeased by food. When he was enraged, he sprang forward, reared himself up, and pushed violently with his head against the walls. Dr. Parsons observed these movements produced by rage or impatience, especially in the morning before his rice and sugar were brought to him. The vivacity and promptitude of these actions led the doctor to think that the animal was altogether unconquerable, and that he could easily overtake any man who should offend him. Dr. Parsons also observed that this rhinoceros hearkened with a sort of continual attention to any noise; so that even if he was drowsy, employed in eating, or in satisfying other urgent wants, he started instantly, and gave attention till the noise had ceased. The *Rhinoceros Indicus* now in the Zoological Society's garden at the Regent's Park has been observed to listen with attention; and, when out, to be thrown into great excitement by the noise of the roller upon the contiguous gravel walk, charging down towards it, and rearing himself up against the fence with great violence.

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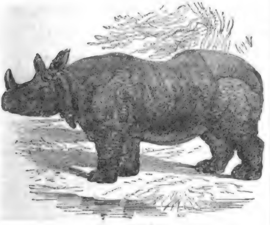
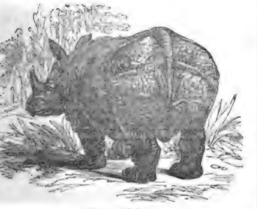
* See also lib. i., *Ep.* 4, xiv., p. 52, 53, &c.

† Charles Pigot, Esq., of Peploe, Shropshire, at that time in the India service.

The rhinoceros brought to this country in 1790 is the subject of an interesting account by Mr. Bingley, in his 'Animal Biography.' When it arrived it was about five years old, was tolerably tractable, would walk about at its keeper's command, and allowed the visitors to pat his back and sides. He was allowed twenty-eight pounds of clover, about the same quantity of ship-biscuit, and a great quantity of greens daily. Twice or thrice a-day five pails of water were given to him. The vessel out of which he drank contained about three pails, and each time as the animal drank the vessel was filled up. He never ceased his draught till the vessel was exhausted. He was fond of sweet wines, and it is stated that he would drink three or four bottles in a few hours. If he saw any person with fruit or any favourite food, he appeared anxious for it, and then uttered a sound something like the bleating of a calf. This animal died of inflammation arising from slipping the joint of one of his fore-legs. It is recorded that the incisions made through his skin, on the first attempts to relieve him, were invariably found to be healed in twenty-four hours. His death happened near Portsmouth, and the stench was so great that the mayor ordered the body to be immediately buried, which was done on Southsea Common. There it lay for about a fortnight, when it was dug up again to preserve the skin and the most valuable of the bones; but the persons employed were nearly overpowered by the effluvia.



Rhinoceros Indicus.



Rhinoceros Indicus.

The renowned combats between the Elephant and Rhinoceros handed down to us from the antients are generally considered to be tinged with fable, but there is no doubt that contentions do occur between them in a state of nature. Soon after the arrival of the Rhinoceros now in the Regent's Park, he contrived to get into the apartment of the old Elephant, but there was no proof of any actual hostility. At present they are the best friends in the world, and it is amusing to see how quiet the Rhinoceros will stand whilst his great friend scrubs his back with his trunk, and occasionally gratifies himself by a sly pull at his tail to make the Rhinoceros turn his head, if his attention is taken off by visitors.

Locality, Food, &c.—This species inhabits the East Indies, especially beyond the Ganges. It is recorded as having been found in Bengal, Siam, and Cochin-China. Shady forests, the neighbourhood of rivers, and marshy places are favourite localities. Their ordinary food consists of herbage and the branches of trees. The flesh is said to be not unpalatable. Our figure is taken from the living animal in the garden of the Zoological Society, but the horn is taken from a perfect specimen; for the animal, though a fine one, and in excellent general health, has ever since its arrival, and from the first growth of the horn, constantly employed itself in rubbing it down, so as to prevent its proper increase.

Rhinoceros Javanus, Cuv.

Specific Character.—One-horned; folds of the neck obsolete; scutules of the skin angled at the margin, concave in the middle, and furnished with a few short bristles margin of the ears and under side of the tail hairy.

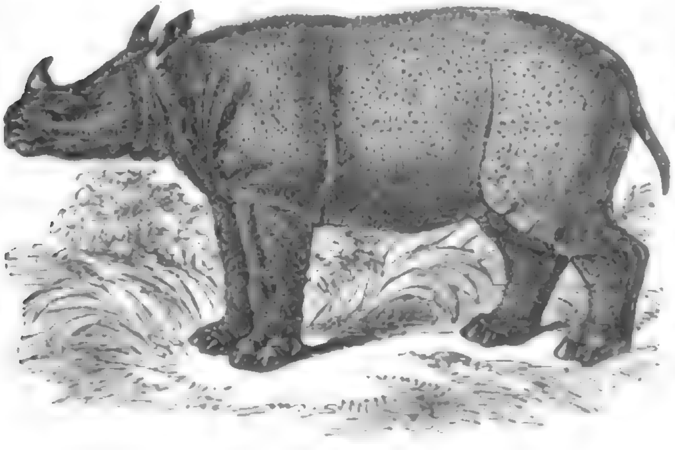
Description.—Dr. Horsfield, who had an opportunity during his residence at Surakarta, the capital of the Javanese empire, to examine an individual taken during infancy and kept in confinement, or rather in a state of domestication, gives a good figure of it, observing that the drawing from which the plate is taken, though deficient in some points that the skilful pencil of Mr. Daniell would have supplied from the living animal, exhibits, with scrupulous accuracy, its form and proportions. In 1817 this individual measured nine feet in length, and was four feet three inches high at the rump; and Dr. Horsfield remarks, that the Rhinoceros figured by M. F. Cuvier (of which a reduced copy is given below), brought to Europe from the British possessions in India, was higher in proportion to its length, and its form was more unwieldy, the entire length being seven feet, and the height four feet ten inches. The head of the animal seen by Dr. Horsfield was strongly attenuated to the muzzle, and had a triangular form; the flexible lip was considerably lengthened, and the sides of the head were marked with protuberances or scutula, resembling those on the body, but no great roughnesses or folds were apparent. The marks of distinction afforded by the folds of the external covering were less evident than those afforded by the form of the body and the attenuated head; but the folds on the whole appeared less rough or prominent than in *Rhinoceros Indicus;* those of the neck were comparatively smaller; and the posterior fold, which had an oblique direction towards the spine, was less extended. The thick covering of Dr. Horsfield's animal was divided on the surface into small tubercles or polygonous scutula; and a few short bristly hairs rose from a slight depression in the centre. The ears were bordered with a series of long stiff bristles, closely arranged; and a similar series of bristles also extended along the tail, underneath, through its whole length.

Locality, Habits, Manners, &c.—Gregarious in many parts. Dr. Horsfield states that it is not limited to a particular region or climate, but that its range extends from the level of the ocean to the summit of the mountains of considerable elevation. Dr. Horsfield noticed it at Tangung, near the confines of the Southern Ocean, in the districts of the native princes, and on the summit of the high peaks of the Priangan regencies, but it prefers high situations. 'It is not,' adds Dr. Horsfield, 'generally distributed, but is tolerably numerous in circumscribed spots distant from the dwellings of man and covered with a profuse vegetation. On the whole it is more abundant in the western than in the eastern districts of the island. Its retreats are discovered by deeply excavated passages which it forms along the declivities of mountains and hills. I found these occasionally of great depth and extent. In its manners the Rhinoceros of Java is comparatively mild.

It is not unfrequently met in the wilds by Europeans and by natives. No instance of its showing a disposition to make an attack has come to my knowledge. Being the largest animal in Java, its passions are not roused, as in many parts of India, by contentions with the elephant. It is rarely seen in a domestic state, but is occasionally decoyed into pits and destroyed. Our animal rambles chiefly at night, and often occasions serious injury to the plantations of coffee and pepper, which are laid out in the fertile districts selected for its retreats. The horns and skin are employed for medicinal purposes by the natives.'

The domesticated individual above alluded to by Dr. Horsfield was taken while very young, in the forests of the province of Keddu, and was conveyed to the residency at Magellan, in the year 1815 or 1816. By kind treatment it soon became domesticated to such a degree, that it permitted itself to be carried, in a large vehicle resembling a cart, to the capital of Surakarta. 'I saw it,' says the Doctor, 'during its conveyance, and found it perfectly mild and tractable. At Surakarta it was confined in the large area or square which bounds the entrance to the royal residence. A deep ditch, about three feet wide, limited its range, and for several years it never attempted to pass it. It was perfectly reconciled to its confinement, and never exhibited any symptoms of uneasiness or rage, although, on its first arrival, harassed in various ways by a large proportion of the inhabitants of a populous capital, whose curiosity induced them to inspect the stranger of the forest. Branches of trees, shrubs, and various twining plants were abundantly provided for its food; of these the species of *Cissus* and the small twigs of a native fig-tree were preferred. But plantains were the most favourite food, and the abundant manner in which it was supplied with these by the numerous visitors tended greatly to make the animal mild and sociable. It allowed itself to be examined and handled freely, and the more daring of the visitors sometimes mounted on its back. It required copious supplies of water, and, when not taking food, or intentionally roused by the natives, it generally placed itself in the large excavations which its movements soon caused in the soft earth that covered the allotted space. Having considerably increased in size, the ditch of three feet in breadth was insufficient for confining it, but, leaving the inclosure, it frequently passed to the dwellings of the natives, destroying the plantations of fruit-trees and culinary vegetables which always surround them. It likewise terrified those natives that accidentally met with it, and who were unacquainted with its appearance and habits. But it showed no ill-natured disposition, and readily allowed itself to be driven back to the inclosure, like a Buffalo. The excessive excavations which it made by continually wallowing in the mire, and the accumulation of putrefying vegetable matter, in process of time became offensive at the entrance of the palace, and its removal was ordered by the emperor to a small village near the confines of the capital, where, in the year 1821, it was accidentally drowned in a rivulet.' (*Zoological Researches in Java.*)

This species is the *Warak* of the Javanese, and *Badak* of the Malays and of the inhabitants of the western parts of Java. (Horsfield, *Ibid.*)



Rhinoceros Javanus. (F. Cuvier.)

Marsden, in his 'History of Sumatra,' states that the Rhinoceros, *Badak*, both that with a single horn and that with a double horn, are natives of the woods (quære tamen). He adds that he does 'not know anything to warrant the stories told of the mutual antipathy and the desperate encounters of these two enormous beasts.' The horn, he adds, is esteemed an antidote against poison, and on that account formed into drinking-cups.

The animal from which the figure was taken was a female. The horn had been worn down by use, and the deficiency is supplied, in the cut, from Dr. Horsfield's figure. M. F. Cuvier says that the upper incisors are four in the young, two in each intermaxillary, very much approximated to each other; they are then small and nearly cylindrical; they soon fall, and are not replaced in adults except by two teeth, 'longues d'arrière en avant, minces de dehors en dedans, sortant à peine des gencives, dont le tranchant est mousse et arrondi, et qui sont opposées à la partie antérieure des longues incisives inférieures.'

Rhinoceros Sumatrensis, Cuv. (*Rhinoceros Sumatranus*, Raffles).

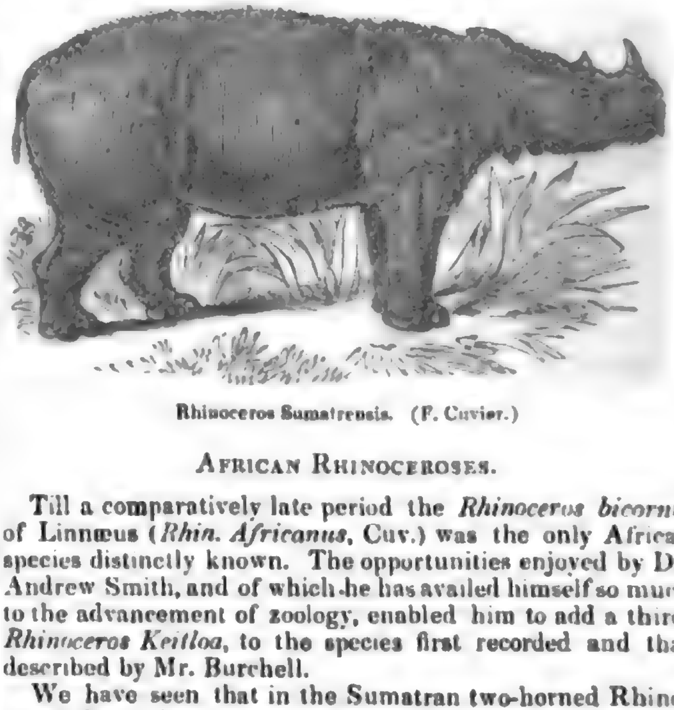
Specific Character.—Four great incisors, as in the two preceding species, but hardly any folds on the skin, which is hairy; a second horn behind the ordinary one.

The first satisfactory indication of the existence of this species occurs in Pennant, who imagined that the two-horned species of Sumatra was identical with *Rhinoceros bicornis*, the only African species then known. He quotes the following remark of Mr. Charles Miller, who was long resident in Sumatra:—'I never saw but two of the two-horned Rhinoceros; but I believe they are not uncommon in the island, but are very shy, which is the reason they are but seldom seen. I was once within twenty yards of one. It had not any appearance of folds or plaits on the skin; and had a similar horn resembling the greater, and, like that, a little turned inward. The figure given by Dr. Sparrman is a faithful resemblance of that I saw.'

Description.—Hide rugose, covered with scattered stiff brown hairs; folds on the shoulders and croup but slightly marked; the skin generally rather delicate and nearly without folds; head rather elongated: eyes small and brown; upper lip pointed and curved downwards; ears small and pointed, fringed with black short hairs; first horn bent backwards, second smooth and pyramidal, placed a little in front of the eyes.

The first figure was published by Mr. William Bell in 1793.

Locality, Sumatra.



Rhinoceros Sumatrensis. (F. Cuvier.)

African Rhinoceroses.

Till a comparatively late period the *Rhinoceros bicornis* of Linnæus (*Rhin. Africanus*, Cuv.) was the only African species distinctly known. The opportunities enjoyed by Dr. Andrew Smith, and of which he has availed himself so much to the advancement of zoology, enabled him to add a third, *Rhinoceros Keitloa*, to the species first recorded and that described by Mr. Burchell.

We have seen that in the Sumatran two-horned Rhinoceros the folds of the skin are hardly perceptible; in the African Rhinoceros there are none on the body; so that the presence of two horns in this genus seems to be a condition of the form coexistent with a smooth hide comparatively without folds. Taking into consideration the differences of the dentition, which are striking as far as the incisors are concerned, the two horns, and the smoothness of the hide; we think that this genus might be conveniently divided into two groups or subgenera: 1, the one-horned; and 2, the two-horned.

Rhinoceros Africanus, Cuv. (*Rhinoceros bicornis*, Linn.).

Specific Character.—Pale yellow brown; horns unequal in length neck surrounded with a furrow at the setting on of the head; eyes brown. Length 10 feet 11 inches. (Smith.)

Description.—Pale yellowish-brown, with tints of purple upon the sides of the head and muzzle; the groins flesh-coloured; eyes dark brown; the horns livid-brown clouded with green; the hairs on the tip of the tail and the margins of the ears deep black.

Head rather deep in proportion to its length, which gives it an appearance of clumsiness beyond either of the other South-African species; the anterior horn directly over the extremity of the nose, the first half nearly perpendicular, the last half slightly curved backwards; the posterior horn conical, and often exhibiting an appearance as if the point of a smaller sized cone had been fixed upon the section of a larger one, which observation to a certain extent might also be applied to the front horn; towards the bases both are rough, and more or less distinctly fibrous; towards the points hard, smooth, and finely polished. Eyes small, the skin surrounding them, as well as that in front of the ears and on the muzzle and the upper and lower lips, deeply cut by narrow wrinkles; the extremity of the upper lip is scarcely produced. The neck is thick, short, and at its junction with the head encircled by a deep furrow formed in the skin; the shoulder with a rudimentary hunch; the body round and heavy, limbs rather shorter in proportion than in *Rhin. Keitloa.* Tail flattened towards the extremity, elsewhere somewhat cylindrical: the upper and lower edges near the tip fringed with thick wiry hair. The surface of the skin rather rougher than in *Rhin. Keitloa*, owing to its being intersected by a great number of wrinkles. The relative lengths of the horns vary a little in different individuals, but the hindermost one in both sexes is invariably much the shortest, and in young specimens it is scarcely visible when the other is several inches in length. In *Rhin. Keitloa* the young have both horns of equal length. (Smith.)

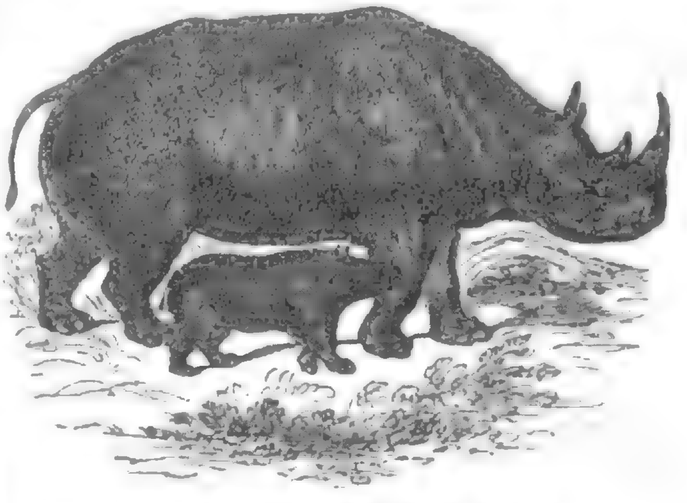
Locality, Habits, Food, Chace, &c.—Sparrman, in his description, exposes the errors of Buffon regarding both this species and *Rhin. Indicus;* especially the opinion that the copulation of the latter takes place *croupe à croupe.* His poetical fancies too touching the impenetrable nature of the skin are freely and justly dealt with by the same learned Swede, who ordered one of his Hottentots to make a trial of this with his hassagai on one of those which had been shot. Though this weapon was far from being in good order, and had no other sharpness than that it had received from the forge, the Hottentot, at the distance of five or six paces, not only pierced with it the thick hide of the animal, but buried it half a foot deep in its body.

Dr. Smith remarks that the present species, under the name of *Rhinoster*, has been familiarly known to the colonists of the Cape of Good Hope ever since 1652. In that year, when the Dutch first formed their settlement on the shores of Table Bay, this animal, he observes, was a regular inhabitant of the thickets which clothed the lower slopes of Table Mountain. 'The abandonment of those spots by this animal as a measure of safety,' says Dr. Smith in continuation, 'probably constituted the commencement of a forced migration, which has continued to extend ever since, and which has led not only to the disappearance of the species from the districts within the present colonial limits, but also in a great measure to its removal from countries beyond those limits, as far as hunters sufficiently armed are accustomed to resort. If a system such as has hitherto prevailed continues to exist, and the larger animals persevere in flying to avoid the effects of fire-arms, the time may arrive when the various species which formerly may have been scattered, each in a peculiar locality of a large continent, will be huddled together; and indeed an advance towards that period is in progress, as may be inferred from the concentration which is at present taking place in the interior of South Africa.

'Though many of the individuals which inhabited the countries where now not a single Rhinoceros is to be seen, were doubtless destroyed, yet it is equally certain that many others escaped, and thereby assisted in adding to the accumulation which is in progress in other localities. Until lately the present was the only species of the genus which was known to be receding from its native country, but of late another has been led to a like course; and the *Rhinoceros simus*, which but a few years ago was common in the neighbourhood of Latakoo, has, since the more general introduction of fire-arms into that country, almost entirely ceased to approach within a hundred miles of it. From a consideration of the various facts which we have collected in relation to the species now under consideration, and which we shall detail more at length elsewhere, we feel disposed to regard it to a certain extent as a prisoner in the country it now inhabits, and are inclined to believe the southern extremity of the continent and the country along the western coast towards Benguela to have once formed its favourite residence.'

Sparrman's account of the contents of the stomach of the individual which he dissected indicates the food on which the animal had lived. Dr. Smith states that, like the *Keitloa*, this species feeds upon brushwood and the smaller branches of dwarf trees, from which circumstance it is invariably found frequenting wooded districts, and in those situations its course may often be traced by the mutilations of the bushes. 'As it feeds but slowly,' says Dr. Smith, 'and besides passes much of its time in idleness, it must be regarded as a very moderate eater, and considering that it appears to be fastidious in the choice of its food, it is fortunate for its comfort that it does not require more nourishment. Of the many shrubs which exist in the locality in which it resides, few comparatively appear formed for its choice, as it is to be seen approaching many and leaving them again without either injuring a branch or plucking a leaf. This evident nicety in the selection of its aliment makes it difficult to imagine how so many large animals as are sometimes congregated together within a very limited space can find sufficient for their consumption. Even admitting that the reproduction of the parts which the rhinoceros may devour takes place with uncommon rapidity in the climates they inhabit, and consequently the shrubs are comparatively soon in a condition to supply another meal; yet, nevertheless, if these animals consumed in proportion to their bulk, they would of necessity be forced to be less particular in the choice of their food.'

Sparrman tells us that the Hottentot or Caffre hunters were accustomed to steal both upon the elephant and the rhinoceros while they were asleep, and wound them in different places at the same time. After this they followed the traces of the animal for one or more days, till it dropped down with weakness, or died of its wounds. Generally however, according to their own account, they poisoned one or two of their darts immediately before they attacked an animal of this size; in which case they had no occasion to wait so many days as they otherwise would, before their prey fell into their hands. A farmer told Sparrman that he had seen an elephant in this manner wounded and dead within twenty-four hours.



Rhinoceros Bicornis, Female and Young. (Smith.)

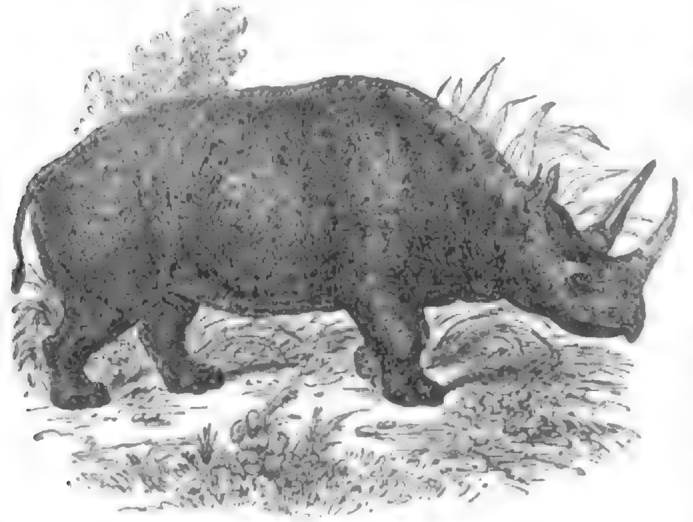
Rhinoceros Keitloa (Smith).

Specific Character.—Pale brownish yellow; the two horns subequal in length, the anterior one cylindrical, the posterior one compressed; anterior part of the upper lip produced and acuminate. Length, body and head, 11 feet and 1½ inches. Height, 5 feet.

Description.—Pale brownish yellow, the brown most distinct upon the head; the inner sides of the extremities towards the body and the groins somewhat flesh-coloured; the inner sides of the knee joint, and the hinder part of the thighs immediately above the joints pale livid black. Eyes dark brown. Horns dark greenish brown.

Figure nearly that of *Rhinoceros bicornis.* Skin destitute of hair, rough and slightly irregular, the surface exhibiting a reticulated appearance, arising from the number of waved or angular fissures by which it is everywhere impressed, but more particularly upon the shoulders and outer surfaces of the hinder extremities. The lower portion of the neck is marked by several wide vertical furrows which admit of the head being turned to either side with greater facility; several of a much smaller size also occur towards the extremity of the muzzle and around the eyes, so as to admit of the upper lip and the eyelids being moved with greater freedom. Head moderately slender; the eyes very small, and sunk in their orbits; the nostrils situated near to the extremity of the muzzle, somewhat oval and rather opaque in relation to the axis of the head. Anterior horn nearly cylindrical, the basal half directed forwards, the distal half slightly curved backwards; the posterior horn towards its base nearly cylindrical, with the distal two-thirds naturally compressed, and having the hindermost edge thinnest. Ears somewhat acuminated, edged with short hairs towards their tips. Legs rather short, knee-joints very large; scarcely any hunch on the shoulders; the neck rather long. Tail cylindrical till within a few inches of the extremity, then naturally compressed and margined above and below by strong short and wiry hair. (Smith.)

Dr. Smith remarks that the only species yet known with which the present could be confounded is the *Rhinoceros bicornis* of authors. There are however, he observes, many and marked differences between them, of which the following are a few of the external and more palpable ones. In *Rhinoceros Keitloa* the two horns are of equal or nearly equal length; in *Rhinoceros Africanus* the posterior in neither sex is ever much beyond a third of the length of the anterior horn; the length of the head in proportion to the depth is very different in the two. The neck of *Rhinoceros Keitloa* is much longer than that of the other, and the position and character of the cuticular furrows destined to facilitate the lateral motions of the head are very different. Besides these, Dr. Smith states that many other diagnostic characters might be instanced; such as the black mark on the inside of the thigh of the *Keitloa*, the distinctly produced tip of the upper lip; and the comparatively few wrinkles on the snout and parts around the eyes.



Rhinoceros Keitloa, Male. (Smith.)

Locality, Habits, &c.—Dr. Smith thinks that it may with propriety be inferred that the *Keitloa* has not, for many years at least, been in the habit of generally extending its range higher than about 25° S. lat. He remarks that we have sufficient evidence that individuals of this species have approached Latakoo, or rather the country some sixty miles to the north of it, in the fact that Mr. Burchell, 'whose merits as a traveller can be best appreciated by those who follow him in the same field, is at present in possession of the horns of an individual which was killed by his hunters.' Dr. Smith further states that the natives at and around Latakoo are only acquainted with two species, viz. *Borili* (*Rhinoceros bicornis* of authors) and *Mohoohoo* (*Rhinoceros simus*, Burch.); and those who were in the employ of the expedition declared, when they first saw the *Keitloa*, that it was not an animal of their country; and at once enlarged upon the points in which it differed from *Borili*. During the discussion an intelligent Moharotsi, who was well acquainted with the animal, approached, called it by its name, and referred Dr. Smith to districts where specimens were found in abundance. As he stated it happened, though everywhere the species appeared rare when compared with the others; and after several months' wanderings it was remarked that only sixty-eight individuals had been seen, eight of which, in one herd (two of them not more than half grown), were disturbed, when feeding near to the banks of a river which the party were descending, by Dr. Smith himself. According to the evidence of the natives given to Dr. Smith, the *Keitloa* is of a very savage disposition, on which account it is more feared than *Borili*, which is also deemed ferocious.

The food of this species consists of small shrubs, or the more delicate branches of brushwood, in collecting which, Dr. Smith observes, the prolongation of the anterior extremity of the upper lip proves a useful assistant.

Rhinoceros simus, Burch.

Specific Character.—Pale grey brown, tinged with yellow brown; margins of the ears towards the tips, and tail both above and below at the extremity clothed with stiff black hairs; mouth ox-like; two horns, the anterior one much the longest; eyes yellowish brown. Length, body and head, 12 feet one inch. Height, at the shoulder, 5 feet 7 inches.

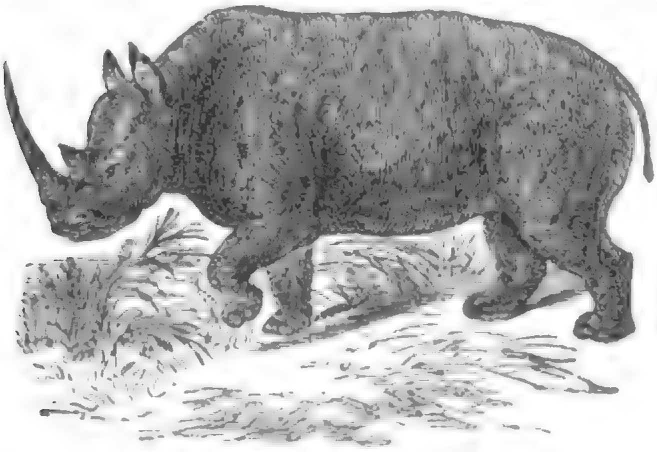
Description.—Pale broccoli-brown, shoulders, buttocks, and belly shaded with brownish purple; hair edging the ears and tip of the tail inferiorly and superiorly black; eyes yellowish brown; horns and hoofs intermediate between broccoli and wood brown; the hoofs darkest.

Figure massive. Head longer, but more delicate in proportion, than in the other African species; face concave; forehead prominent and gibbous. Ears rather long, ovate and pointed, their edges towards the tips margined with rigid hair. Neck longer in proportion than in the other African species, with three well-marked wrinkles on the nape, two of which continue visible almost to the throat. Shoulders elevated into a convex massive hunch; line of the back slightly undulated. Legs stout, and the joints strongly developed and clumsy. Tail vertically compressed at the point, and above and below fringed with short wiry bristles. Horns situated close to the anterior extremity of the head, the foremost directly over the point of the nose, and the second immediately behind it; the first very long, tapered to a point, and slightly curved, the concavity backwards; the second is short, conical, and obtuse at the point. Nose truncated, and mouth shaped like that of an ox, the upper lip perfectly square, and without the least indication of a rudimentary proboscis. Nostrils rather small, opening laterally.

Female, coloured like the male: horns, though less powerful, generally longer than his, except the anterior one (Smith.)

'Mohoohoo, the name of this species among the Bechuanas,' says Dr. Smith, 'is considered by them to be one of the original animals of their country, and to have issued from the same cave out of which their own forefathers proceeded: in this respect they make a difference between it and *Keitloa*, with whose origin they do not profess to be acquainted. Too much attention cannot be paid to the traditions of savages: what in them often appears calculated only to excite ridicule, may, properly considered, be often made to furnish the most valuable information. Thus, for instance, by attending to what has been termed a useless tradition, we get to know, not merely that the Bechuanas believe the founders of their own nation and the animals of their country originally escaped from a large cave, but also facts of interest touching the geographical distribution of animals, inasmuch as we may rest satisfied, after being aware of the prevalence of the tradition referred to, that all the animals we find in their country, to whose progenitors the afore-mentioned birth-place is not assigned, have immigrated thither since the tradition became current. Every portion however of such traditions must not be literally received, else we shall find travellers who may hereafter visit South Africa propagating errors not less detrimental to the progress of true science than those which were circulated by Kolben, one of the first Cape historians, whose indiscreet credulity led him to relate most extraordinary fictions, *inter alias* one relative to the powers the Rhinoceros exercised over his horns, powers which, had he ever examined into the manner in which these bodies were connected with the parts around and below them, would have been too clearly imaginary to have warranted even the greatest lover of the marvellous in believing him.'

Locality, Food, Habits.—Mr. Burchell, who added to much to our knowledge of the zoology of Africa, found, when he was in Latakoo, this species common there; and the natives told Dr. Smith that it was not unfrequently found even farther to the southward. The last-named author however tells us that it has almost ceased to exist, even in the situations where its discoverer met it; and the Doctor observes that this is accounted for by the danger to which it is exposed being now much increased from the general introduction of fire-arms among the Bechuanas. He also remarks that the form of the mouth at once suggests the kind of food upon which the animal probably subsists; and an examination of the contents of the stomach, principally grass, confirmed the inference. 'Localities abounding in grass are therefore the haunts of the Mohoohoo, and to enjoy them throughout the year, he is necessitated to lead a more wandering life than the two species already figured.'



Rhinoceros simus. (Smith.)

We have here collected, we believe, all the species of this interesting genus actually known. But the same author from whom we have so largely quoted, and to whom those interested in African zoology are so largely indebted, indicates others.

'While in the neighbourhood of the tropic,' writes Dr. Smith, 'we heard of two other species of the genus, which exist still farther to the northward; but, unfortunately, could not obtain any very circumstantial evidence concerning them, as the persons who had seen them were only on a visit in the country they inhabit. One of them was stated to approximate to the *Keitloa;* the other was described as very different to any species previously seen by them, and to have only one long horn towards the forehead. Now, though descriptions of objects by such persons are often inaccurate, from the circumstance of their not having been favourably situated for making correct observations, as well as from a deficiency of language calculated to convey the information they actually possess, I have always remarked that even a hasty examination seemed to supply the savage with more accurate notions of the general characters of animals than it did the civilised man, and therefore I do not despair of species such as they mentioned being yet discovered. It is in regard to the species with the single horn that we experience the greatest hesitation in receiving their evidence as credible; and therefore it is agreeable to have it corroborated by the testimony of a man from a very different part of the country, as obtained and published by a missionary of great research who resided a long time in Madagascar.' Dr. Smith then quotes the following passage, previously observing that the individual who furnished Mr. Freeman with the account of the Ndzoo-dzoo was a native of the country northward of the Mozambique; and that if we admit certain portions of the descriptions to be tainted with errors, we can recognise in the remainder the genuine habits of a Rhinoceros, and probably one of the species with which Dr. Smith's informants were slightly acquainted.

'It appears,' observes Mr. Freeman, 'that the Ndzoo-dzoo is by *no means rare* in Makoos. It is about the *size of a horse*, extremely *fleet* and *strong*. It has *one single horn* projecting from its forehead, from twenty-four to thirty inches in length. This is flexible when the animal is asleep; it can be curled like the trunk of the elephant, but becomes perfectly firm and hard when the animal is excited, and especially when pursuing an enemy. Its disposition is extremely *fierce*, and it universally *attacks* man if it sees him. The usual method of escape adopted by the natives is to climb up a dense and high tree, so as to avoid, if possible, being seen. If the animal misses his sight of the fugitive, he immediately gallops off to his haunt, from whence it may be inferred that he is not endowed with the power of a keen scent. Should he however espy his object in the tree, woe to the unfortunate native; he begins to *butt with his horns*, strikes and penetrates the tree, and continues piercing it till it falls, when his victim seldom escapes being gored to death. Unless the tree is of a large girth, he never fails in breaking it down. Having killed his victim, he leaves him without devouring the carcass. The male only is provided with the horn. The female has not anything of the kind.' (*South African Christian Recorder*, vol. i.) This is sufficiently romantic for Sinbad himself; but still, if we strip the description of its fabulous fringes, we see no reason for objecting to Dr. Smith's opinion as to the animal really meant.

With respect to the other Rhinoceros which was said to exhibit a resemblance to the *Keitloa*, Dr. Smith thinks that it may probably be found to belong to a species which has its principal habitat in Northern Africa, a conclusion to which he was led from an examination of a pair of horns in the Museum of the College of Surgeons obtained in Abyssinia by Mr. Salt. These horns differ considerably from those of *Rhinoceros bicornis;* and, in form, approach those of *Rhinoceros Keitloa*. Dr. Smith further observes that another pair of horns, probably of the same species, is preserved, according to Sparrman,* in the cabinet of the Royal Academy of Sciences, the foremost of which is twenty-two inches in length, and the hindmost sixteen: the distance between them is barely two inches. Different again from these and from all Rhinoceroses Dr. Smith had seen, are two contained in the British Museum, and obtained by Major Denham during his journey in North Africa; and Dr. Smith is of opinion that if they do not prove to have belonged to young individuals of *Rhinoceros simus*, they must be referred to a species not yet characterised: they are of a lighter colour than any horns which Dr. Smith had had an opportunity of examining, and, along with a peculiarly corneous aspect, they have a considerable degree of semi-transparency. The horns of *Rhinoceros simus* possess more of this character than any others yet known, which circumstance, together with the fact of which Dr. Smith had been informed by Professsor Owen, namely, that clubs of Rhinoceros horn about three feet in length had been obtained from Western Africa (kingdom of Dahomy), would, in Dr. Smith's opinion, lead to a supposition that either the species discovered by Burchell, or one with certain of its characters, inhabits North Africa.†

'Now,' says Dr. Smith in conclusion, 'though I am not prepared to maintain that the horns of each individual of the same species of Rhinoceros are found to be uniform, as regards size and form, or even that the relative lengths of the first and second horns are constant in different animals, yet from what I have observed in the South African species, I do not think we are justified in believing the horns of the same species to be subject to any great variations in respect to relative length. When the Rhinoceros of Abyssinia shall have been minutely examined, it will probably be found to be distinct from the *Rhinoceros bicornis*, Linn., and be identical with the animal stated, by the natives who communicated with us near the tropic of Capricorn, to be like the *Keitloa*. The other species of which they spoke will possibly be identical with the Ndzoo-dzoo and a nondescript: while the one, from which were obtained the horns referred to as in the British Museum, may prove either a *Rhinoceros simus*, or a third undescribed species.' (*Illustrations of the Zoology of South Africa*.)

There are in the British Museum stuffed specimens of the three African species above recorded: they were purchased at the sale of the African Museum.

In Captain Harris's *Wild Sports of Southern Africa*, the reader will find lively descriptions of the chace and habits of these animals. Their flesh is not unpleasant food. Sparrman had a piece of one of the animals shot by his party broiled immediately: it tasted in a great measure like pork, but, in his opinion, was much coarser.

FOSSIL RHINOCEROSES.

The Fossil Rhinoceroses hitherto discovered may be divided into three groups—1, those with a true or bony *sep-*

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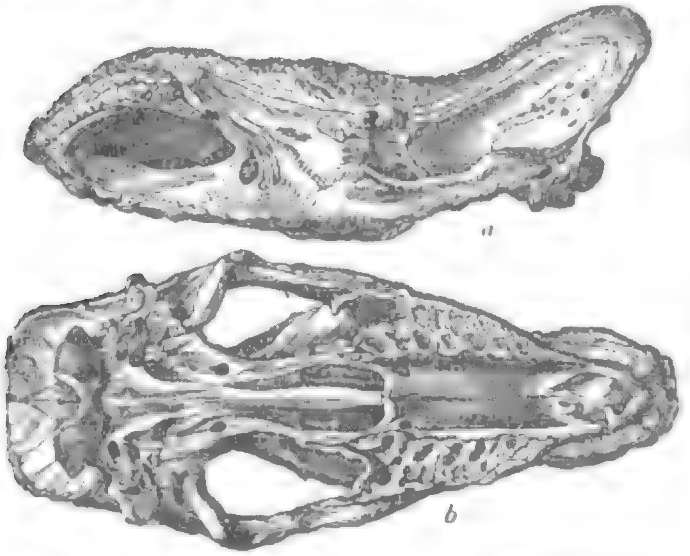
* 'Voyage to the Cape of Good Hope,' 4to., vol. ii., p. 100.

† A Rhinoceros horn wrought for a walking-staff, and so as to make it appear like the horn of 'a *real* unicorn,' was sent to this country by the king of Dahomy: it was, we believe, gorgeously fitted up and sent back to the king.

tum narium; 2, those without a bony septum; and 3, those with incisor teeth.

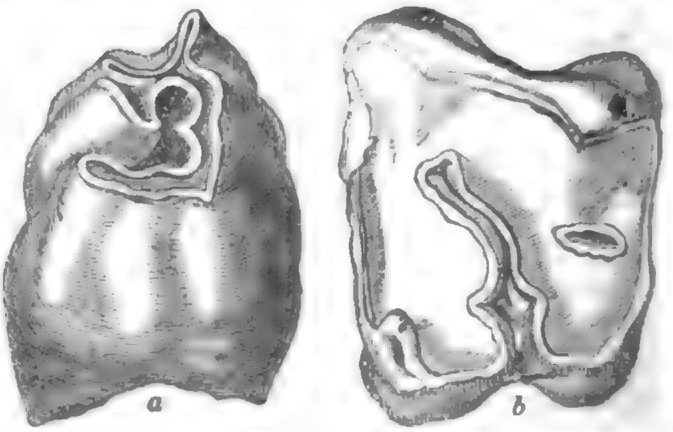
The greater portion of remains found in Northern and Central Europe and Asia belong to the first group; those found in Italy belong to the second.

The skulls of the Rhinoceroses belonging to the first group exhibit an essential difference when compared with those of the living species. Those of the former are longer and narrower in proportion; the width between the orbits is less; the bones of the nose are more elongated; the disk on which the anterior horn was seated is an oblong ellipse, whilst in *Rhinoceros bicornis* it is a demisphere. An analogous elongation exists in the place where the second horn was situated, whence Cuvier concludes that the horns of the Rhinoceros with a bony *septum narium* were very much compressed laterally. The same great zoologist remarks that in *Rhinoceros bicornis* or *Africanus* (Cape Rhinoceros) the occipital crest is nearly over the occipital condyles, and the posterior surface of the occiput is nearly perpendicular to the axis of the head. In *Rhinoceros Javanus* this surface is inclined forwards, which renders the distance from the nose to the crest shorter than that from the nose to the condyle in a proportion of 19 to 25; and it is much the same in *Rhinoceros Sumatrensis*. In *Rhinoceros Indicus* this forward inclination is still more remarkable, although the difference of the two lines is less in the proportion of 21 to 25, on account of the extreme height of this occipital surface. In all the fossil skulls, on the contrary, the occipital surface is strongly inclined backwards, and the distance from the nose to the crest much longer than that from the nose to the condyles. It would seem, says Cuvier in continuation, that in some fossil individuals the two horns did not touch each other; but in one from the neighbourhood of Rugby, which Cuvier saw in the Radcliffe Library at Oxford, and of which Mrs. Buckland made a drawing for his work, he is of opinion that the horns touched, for the disks on which they were seated are confounded together in one rugose surface.



Skull of Fossil Rhinoceros. (Cuv.*) *a*, profile: *b*, seen from below.

But, besides the difference of form of the disks, there is, observes Cuvier, on the middle of the anterior one a longitudinal projecting ridge, whilst in *Rhinoceros bicornis* there is a furrow which becomes very deep forwards. Far, too, from having the anterior apophysis of the superior maxillary bone short, and the intermaxillary bones very small, as in *Rhin. bicornis*, the fossil two-horned rhinoceros with the bony septum has those parts extremely long and strong, longer even than in any of the other rhinoceroses; which renders the length of its nasal notch more considerable; in fact, a fourth of the whole length. In the young *Rhin. bicornis* it only makes a sixth, and in the adult a seventh; in the two-horned Sumatran species and the one-horned Javanese species, it is less than a fourth; and in the *Rhinoceros Indicus* rather less than a fifth. This same fossil, remarks Cuvier in continuation, has at the upper border of the incisive bone a prominence, which neither exists in *Rhinoceros bicornis*, nor in *Rhin. Sumatrensis*, nor in *Rhin. Javanus*. It exists only in *Rhin. Indicus*, which differs so much in all other respects from the fossil. But the most important character of the fossil rhinoceros is the form of the nasal bones and their junction with the incisive bones; and it is in this part distinguished not only from the other rhinoceroses, but from al other known animals. The point of the nasal bones, instead of terminating in the air at a certain distance above the incisive bones, descends without thinning off in front of the nasal notches, and, after being divided into three projecting tubercles, is joined by a rather more delicate portion to the spot where the incisive bones unite, and themselves form two other tubercles. All four of these bones are so well soldered together, that only one suture is perceptible, even at an advanced age. The suture which distinguishes the intermaxillary from the maxillary bone is not visible. This solid construction was, observes Cuvier, no doubt destined for the support of the horn, and affords evidence that this fossil rhinoceros had larger and stronger ones than those of the present day, and a consequently increased power of using them. Behind this junction of nasal bones with the incisive bones commences a bony septum, which separates the two nostrils, and which is directed backwards in order to its junction with the *vomer*. In youth this septum appears to have been only cartilaginous; but as the animal advanced in age it became bony, and at last was soldered to the vomer, thus forming one bony continuation. No living rhinoceros yet discovered has this bony septum, the result of which is that the incisive holes are separated from each other, whilst in the living species they are confounded into one vast opening. The length of the nasal notch seems to have been the cause of the backward position of the eye, which had a more posterior situation in this rhinoceros than in the others. The notch of the posterior nostrils is much wider: it does not terminate in a point forwards, but is there nearly squared. The palate is narrower and more elongated in proportion.



a, Crown of a sixth molar, but little worn, of a fossil Rhinoceros. *b*, Molar of a fossil Rhinoceros, much worn, seen from above.

The skulls of the group of fossil rhinoceroses which have no bony *septum narium* much resemble that of *Rhinoceros bicornis*. As compared with the cranium of the ordinary fossil rhinoceros which has the bony septum, the cerebral part of the skull is less prolonged and less thrown backwards; the orbit is placed above the fifth molar; the nasal bones terminate in a free point, and are not attached to the intermaxillary bones by a vertical septum; the intermaxillaries are much less prolonged and of a different conformation, offering none of the characters which render the other fossil skulls of this genus so remarkable. But though the skulls without the bony septum approach more to that of the *Rhin. bicornis* than of any other living species, there are notwithstanding several differences. The bones of the nose in the last-mentioned fossils are delicate, straight, and pointed; whilst those of *Rhin. bicornis* are very thick and convex; the intermaxillaries of the fossil are much larger than those of *R. bicornis*, and the zygomatic arch is shorter and more convex towards the top; moreover there is a deeper depression between the part which supports the second horn and that which elevates itself to form the occipital crest.

The lower jaws of the fossil rhinoceroses do not offer less differences between each other than those of the skulls of the respective species. Those of Siberia are remarkable for the narrowed prominence of their anterior part in front of the first molars: at the extremity of this prominence Pallas thought that he detected the remains of the alveoli of incisors. In this character these jaws resemble the one-horned rhinoceros, where the part before the molars is only a little wider. On the contrary, the most common of the Tuscan lower jaws have their molars brought very near to their point, which is short and not prolonged into a prominence; in which respect they entirely approach *Rhin. bicornis.* They also approached it in all the parts which Cuvier was able to compare, as in the roundness of the lower parts of the branches, the position and size of the holes, and the obliquity of the coronoid apophysis, more than the one-horned rhinoceroses. Differences which our limits forbid us to point out in detail, and which the student will find well followed in the *Ossemens Fossiles*, exist in the rest of the skeletons of the fossil species as compared with the living ones, and even with each other.

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* From a skull from Siberia, given by Dr Buckland to the Paris Museum. (Cuv.)

The fossil rhinoceroses furnished with incisor teeth were much smaller than any known species, living or fossil.

The following fossil species have been recorded:—*Rhinoceros tichorinus*, Cuv.; *Rhinoceros incisivus*, Cuv.; *Rhinoceros leptorhinus*, Cuv.; *Rhinoceros minutus*, Cuv.; *Rhinoceros elatus*, Croiz. and Job.; *Rhinoceros pachyrhinus*, Cuv.; *Rhinoceros hypselorhinus*, Kaup.; *Rhinoceros Goldfussii*, Kaup.; *Rhinoceros leptodon*, Kaup.*

Geological Position.—Remains of this genus occur in the tertiary series of beds (Miocene and Pliocene periods of Lyell; in the strata of the last-named period they are most abundant). They are extensively found in the gravel, the bone caverns, and osseous breccia. In 'Reliquiæ Diluvianæ,' Dr. Buckland states that the facts developed in the cave at Kirkdale demonstrate that there was a long succession of years in which the Elephant, Rhinoceros, and Hippopotamus had been the prey of Hyænas, which, like themselves, inhabited England in the period immediately preceding the formation of the diluvial gravel. 'If they inhabited this country,' says Dr. Buckland, in continuation, 'it follows as a corollary, that they also inhabited all those other regions of the northern hemisphere in which similar bones have been found under precisely the same circumstances, not mineralized, but simply in the state of grave bones imbedded in loam, or clay, or gravel, over great part of northern Europe, as well as North America and Siberia.' The entire Rhinoceros found in the frozen soil at Wiluji, or Vilhoui, in Siberia, recorded by Pallas, was a most striking discovery, and, followed as it was by the detection of an Elephant in a mass of ice on the shores of the North Sea [ELEPHANT, vol. ix., p. 353], aroused the minds of men to a consideration of the causes which might have produced such effects. Dr. Buckland thus comments on the state of the climate in which these extinct species may have lived:—'It is the opinion of Cuvier, on the one hand, that as some of the fossil animals differ from existing species of the genera to which they belong, it is probable that they had a constitution adapted to endure the rigours of a northern winter; and this opinion derives support from the Siberian elephant's carcass, discovered with all its flesh entire, in the ice of Tungusia, and its skin partially covered by long hair and wool; and from the hairy Rhinoceros found in 1771, in the same country, in the frozen gravel of Vilhoui, having its flesh and skin still perfect, and of which the head and feet are now preserved at St. Petersburgh, together with the skeleton of the elephant above alluded to, and a large quantity of its wool; to which Cuvier adds the further fact, that there are genera of existing animals, *e. g.* the fox tribe, which have species adapted to the extreme both of polar and tropical climates. On the other hand it is contended that the abundant occurrence of fossil crocodiles and tortoises, and of vegetables and shells (*e. g.* the *Nautilus*) nearly allied in structure and character to those which are now peculiar to hot climates in the secondary strata, as well as in the diluvium of high northern latitudes, renders it more probable that the climate was warm in which these animals lived and died, than that any change of constitution and habit should have taken place in so many animal and vegetable genera, the existing members of which are rarely found, except in the warmer regions of the present earth. To this argument I would add a still greater objection, arising from the difficulty of maintaining such animals as those we are considering amid the rigours of a polar winter; and this difficulty cannot be solved by supposing them to have migrated periodically, like the Musk-Ox and Rein-Deer of Melville Island; for in the case of Crocodiles and Tortoises extensive emigration is almost impossible, and not less so to such an unwieldy animal as the Hippopotamus when out of the water. It is equally difficult to imagine that they could have passed their winters in lakes and rivers frozen up with ice; and though the Elephant and Rhinoceros, if clothed in wool, may have fed themselves on branches of trees and brushwood during the extreme severities of winter, still I see not how even these were to be obtained in the frozen regions of Siberia, which at present produce little more than moss and lichens, which during great part of the year are buried under impenetrable ice and snow; yet it is in these regions of extreme cold, on the utmost verge of the now habitable world, that the bones of elephants are found occasionally crowded in heaps along the shores of the icy sea from Archangel to Behring's Straits, forming whole islands composed of bones and mud at the mouth of the Lena, and encased in icebergs, from which they are melted out by the solar heat of their short summer, along the coast of Tungusia, in sufficient numbers to form an important article of commerce.' Dr. Buckland then observes that he is, in the work quoted ('Reliquiæ Diluvianæ') concerned only to establish two important facts;—first, that there has been a recent and general* inundation of the globe; and, secondly, that the animals whose remains are found interred in the wreck of that inundation were natives of high north latitudes, and not drifted to their present place from equatorial regions by the waters that caused their destruction. 'One thing however is nearly certain,' adds Dr. Buckland, 'viz. that if any change of climate has taken place, it took place suddenly; for how otherwise could the elephant's carcass found entire in ice at the mouth of the Lena have been preserved from putrefaction till it was frozen up with the waters of the then existing ocean? Nor is it less probable that this change was contemporaneous with and produced by the same cause which brought on the inundation. What this cause was, whether a change in the earth's axis, or the near approach of a comet, or any other cause or combination of causes purely astronomical, is a question the discussion of which is foreign to the object of this memoir.'

The distribution over the earth's surface of the remains of this genus is very wide. Almost every bone-cavern in England, Germany, and France contained them. They occur in the Epplesheim sand, in the bone breccia at Nice, and at Gibraltar. Mr. Crawfurd collected them on the left bank of the Irawadi, 250 miles below Ava; and Captain Cautley found them in great abundance in the Sewalik mountains, at the southern foot of the Himalayas. [ELEPHANT, vol. ix., p. 354.]

RHINOCU'RUS. [FORAMINIFERA, vol. x., p. 348.]

RHINOLOPHI'NA. [CHEIROPTERA, vol. vii., p. 23.]

RHINO'LOPHUS. [CHEIROPTERA, vol. vii., p. 23.]

RHI'NOPHIS, Wagler's name for a genus of Serpents with a pointed conical muzzle, the tip of the tail enveloped in an oval horny shield, and the eyes hidden. Mr. Swainson arranges it as a subgenus of *Typhlops*, in the family *Amphisbænidæ*.

RHINOPI'RUS, Merrem's name for a genus of Serpents, *Erpeton* of Lacépède. [ERPETON.]

RHIO is a Dutch colony, established in 1817, on the island of Bintang, which lies opposite Cape Romania, one of the promontories with which the Malay peninsula terminates on the south. The island of Bintang is a little larger than that of Singapore, and contains about 300 square miles. It is however more fertile, and produces much terra japonica; above 4000 tons are annually exported. Much pepper is also grown. After Java, Malacca, and the other Dutch colonies had been restored to the Dutch, the Dutch government intended to make themselves masters of the commerce of the Indian Archipelago, and with that view took possession of the town of Rhio, where they built a fortress; but the foundation of the town of Singapore and the rapid growth of that British colony has frustrated their design: yet Rhio is a thriving place. It is visited by the Bughis and other Malay vessels from the adjacent islands, and by the Siamese, though they prefer going to Singapore, where their commodities fetch a better price and are more easily saleable. The town and fortress of Rhio are built at the entrance of a wide inlet, called the bay of Tanjong Pinang. The harbour is good and safe, but at its entrance there are many small rocky islands, which render the navigation difficult and dangerous. Rhio is in 50′ N. lat. and 104° 28′ E. long.

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* The *Calodonta* of Bronn is a fossil rhinoceros, in all probability *Rhinoceros tichorinus.*

* See the works of Lyell, Phillips, and other geologists, and the article on GEOLOGY in this work, vol. xi., p. 120.

(Crawford's *Journal of an Embassy to the Courts of Siam and Cochin China;* Moor's *Notices on the Indian Archipelago*. Singapore, 1837.)

RHIPIDU'RA. [MUSCICAPIDÆ, vol. xvii., p. 13.]

RHIZANTHS. [RAFFLESIA.]

RHIZOMORPHA, a singular genus of fungi, having altogether the appearance of the root of a tree. The species are found in damp cellars, old walls, mines, and other subterranean places, where they sometimes acquire a phosphorescent state, which renders them exceedingly curious objects. Nothing is at present known of their mode of reproduction or origin; but it is thought that they spring out of decaying wood buried in the ground. The genus Rhizomorpha is not included in Hooker's 'English Flora,' but it is mentioned by Mr. Berkley, who wrote the mycological department of that work, as a fungous production, originating in tan-pits. Several species are mentioned by authors, of which R. medullaris is the most common. This is so like the root of a tree divided into numerous fibres, that it is probably often mistaken for it. Independently however of its cellular organization, so different from that of wood, it may always be known by its musty smell.

RHIZO'PHORA, a genus of plants which gives its name to the natural family of Rhizophoreæ, or the Mangrove tribe, the plants of which are remarkable for their seeds germinating even while attached to the branches, and also for the numerous adventitious root-like projections which serve as supports for the stem. The common Mangrove and also others of the genus are found all along the shores of the tropics, both in the new and old world, rooting in the mud, and forming dense forests even at the verge of the ocean, and below high-water mark; hence, on the retiring of the tide, the stems may often be seen covered with oysters and other shell-fish. The genus may be briefly characterised as having—a four-parted adherent calyx. Petals four, the margins each with a long row of double hairs. Stamens twice as many as the petals. Ovary 2-celled, with 2 ovules in each cell. Style short. Stigma 2-toothed. Fruit oblong, crowned with the persistent segments of the calyx, at length perforated at the apex by the radicle of the germinating embryo. Trees with entire leaves. Inflorescence axillary. The wood of several species is hard and durable, and the bark astringent.

R. Mangle, the common or black Mangrove, is found abundant on the shores of the ocean, and within the delta of the Ganges, where it grows to a considerable size. The seed of this species, which is from one to two feet long, very quickly gives rise to a young tree, and, as mentioned by Browne, in his 'History of Jamaica,' if the apex from whence the root issues be stuck only a little way in the mud, the leaves quickly unfold at the opposite end. The wood is dark-red, hard, and durable, and the bark is used for tanning leather.

R. Candel, Red Mangrove, or *Paletuvier.*—The branches of this species, though they bend downwards, do not take root in the ground. The wood is heavy, of a deep-red, and takes a fine polish. The bark is used in dyeing red, is astringent, and used in the West Indies for the cure of fevers, as well as of the bites of venomous insects.

R. gymnorhiza grows to a considerable size where the spring-tides rise over it, as in the delta of the Ganges. The wood is yellow, hard, and durable; has a sulphurous smell, and burns with a vivid light; is chiefly used by the natives for fire-wood and for making posts for constructing their houses. The pith of the wood, boiled in palm wine or with fish is used as food.

RHIZOPHY'SA. [PHYSOGRADA, vol. xviii., p. 137.]

RHIZO'STOMA. [PULMOGRADA, vol. xix., p. 124.]

RHIZOSTO'MIDÆ. [PULMOGRADA, vol. xix., p. 121.]

RHODE ISLAND (Island). [RHODE ISLAND (State).]

RHODE ISLAND, one of the United States of North America, is bounded on the north and east by Massachusetts, on the west by Connecticut, and on the south by the Atlantic. It extends from 41° 18′ to 42° N. lat. and from 71° 6′ to 71° 58′ W. long., Block Island not included. The largest part of the state lies to the west and north-west of Narraganset Bay, and comprehends about 900 square miles; a small portion lies to the east of Narraganset Bay; and the rest is composed of the islands of Rhode Island, Connecticut Island, Prudence Island, Patience Island, Hope Island, Hog Island, Dyer's Island, and Block Island, all of which are in Narraganset Bay, except the last, which is in the Atlantic. The whole area of the state is estimated at 1350 square miles, which is about the area of the English county of Shropshire. It is the smallest state in the Union, though there are others which have a less number of inhabitants. The population, in 1790, was 69,110; in 1800, 69,122; in 1810, 77,031; in 1820, 83,059; and in 1830, 97,199, which is 72 to a square mile, being in density of population inferior only to Massachusetts, which by the same census has 81 to a square mile. The number of slaves included in the population was 952 in 1790; 831 in 1800; 103 in 1810; 48 in 1820; and 17 in 1830.

The island of Rhode Island, which gives name to the state, is the largest of the islands which belong to it. The central part of it is in 41° 32′ N. lat. and 71° 15′ W. long. Its length is about 15 miles from north to south, with an average breadth of about 3½ miles. This island is the most fertile part of the state; the soil is suitable either for tillage or grazing, and is well cultivated; and the climate is so temperate and wholesome, that the island is a place of resort for the inhabitants of the southern and central states in the summer months, and for invalids at all seasons.

Narraganset Bay, which intersects a large portion of the state, is about 28 miles long from Point Judith, on the south, to Bullock's Point, 5 miles below Providence, on the north. The entrance extends from Point Judith on the west to Seekonnet Rocks on the east. The average breadth of the bay is about 10 miles. It forms a safe road during the north-west storms, is navigable in all seasons, contains several excellent harbours, and has many points suitable for defence, which have been strongly fortified.

The surface of the continental part of Rhode Island is generally level, but is hilly and rocky in some parts, chiefly to the north-west. The principal rivers are the Seekonk, the Pawtucket, the Pawtuxet, and the Pawcatuck, all which have a short course. The soil is generally thin, and for the most part better fitted for pasturage than for the plough. Cattle and sheep are raised in great numbers on the islands and on the coasts of Narraganset Bay. Wheat, oats, barley, and rye, and also many kinds of fruit, are cultivated to a considerable extent, and the rivers and bay supply plenty of fish. There are mines which afford abundance of iron-ore, and small quantities of copper-ore are obtained. Limestone is abundant, and there is a mine of anthracite coal in the northern part of the island of Rhode Island.

The exports of Rhode Island consist principally of cattle, horses, poultry, fish, beef, cheese, butter, lumber, and flax-seed, cotton and linen manufactures, and iron manufactures. The manufactures are in a very flourishing condition, and are rapidly increasing. Providence is the chief point of manufacturing and commercial industry. The imports consist for the most part of the produce of the West Indies and the manufactures of Europe. The exports in the year ending September 30, 1839, were of the value of 185,234 dollars, of which 175,808 were for domestic produce, and 9426 for foreign produce. The imports were of the value of 612,057 dollars, of which 610,431 were in American vessels, and 1626 in foreign vessels. The shipping, on the 30th of September, 1839, was estimated at 44,572 tons.

There is a railroad from Providence to Stonington, the length of which is 47 miles. The total length of canals in Rhode Island is 38 miles.

The General Assembly of Rhode Island meets four times a-year. The senate is composed of a governor, lieutenant-governor, and ten senators. The governor is elected half-yearly, and has a salary of 400 dollars. The lieutenant-governor, also elected half-yearly, has a salary of 200 dollars. The House of Representatives consists of 72 members, elected half-yearly, in April and August.

There is a supreme court, and there is also a court of common pleas for each of the five counties into which the state is divided. The supreme court consists of a chief-justice, with a salary of 650 dollars, and two associate justices, with salaries of 550 dollars each. All the judges are appointed annually by the General Assembly. The district court meets in February and August at Providence, and in May and October at Newport. The circuit court is held at Providence in November, and at Newport in June

Rhode Island has no state debt. In December, 1839 there were 62 banks, with a capital of 9,880,500 dollars specie to the amount of 537 895 dollars, and a circulation of 1,719,230 dollars.

The state pays 10,000 dollars a year for the support of free schools, which is divided among the different towns according to their population. Brown University is the only one in the state, but there are ten or twelve academies, and about 300 elementary schools not supported by the state. In 1834 there were 16 newspapers published in the state—9 at Providence, 3 weekly at Newport, 1 weekly at Bristol, 1 weekly at Warren, 1 weekly at Pawtucket, and 1 weekly at Woonsocket Falls.

Of the religious denominations, which are said to amount to about 100, the Baptists are the most numerous; then follow the Methodists, Congregationalists, Unitarians, Sabbatarians, Six-Principle Baptists, Quakers, &c.

Rhode Island has two capitals, Providence and Newport.

Providence is a corporate city, and considerably the largest and most flourishing town in the state, in 41° 51′ N. lat. and 71° 26′ W. long. It is situated at the head of Narraganset Bay, at the top of an inlet which is called Providence River, but which is only an arm of the bay reaching to the mouth of the Seekonk river. The town is built on both sides of the Providence River, and the two parts are connected by bridges, the longest of which is 90 feet. Vessels of 900 tons burthen can come up to the wharfs. Most of the houses are of wood, and painted white, but there are several of granite and brick. The inhabitants amount to upwards of 20,000. The chief public buildings are—the State House, of brick; the Arcade, which is a magnificent building of Doric architecture, the body of stone, and the two fronts and the columns of granite; the two halls of Brown University, of brick; the Dexter Asylum, of brick, for the poor of Providence; the Friends' Boarding-school, of brick, with a basement of granite; and some of the churches are handsome buildings. Brown University, originally founded at Warren in 1764, but removed to Providence in 1770, is chiefly under the direction of the Baptists. It has 9 instructors, 1390 alumni, 474 ministers, 177 students, and a library of 14,000 volumes. There are several public schools, and three or four libraries belonging to literary institutions. In 1834 there were 9 newspapers published at Providence, 3 daily, 2 semiweekly, and 4 weekly; 1 literary journal, weekly; and 4 monthly periodicals.

Providence is a place of great manufacturing industry. There are large cotton manufactories, worked both by steam and by water-power; extensive bleaching establishments; dye-houses; iron-foundries; manufactories for making cotton-machinery; steam-engines and steam-boilers; brass-foundries; establishments for working in tin, sheet-iron, copper, brass, &c.; numerous jewellers' and goldsmiths' shops; a large glass-house; besides hat, soap, and several smaller manufactories.

In 1831 the imports into Providence amounted to 457,717 dollars; the exports to 329,634 dollars. The shipping on the 31st of December, 1832, was estimated at 19,136 tons. There were 4 insurance companies and 15 banks, besides a branch of the United States Bank; and also a savings' bank. The Blackstone canal, which extends from Providence to Worcester in Massachusetts, was completed in 1828. It is 45 miles long, and is navigated by about 30 boats of from 25 to 30 tons each. Providence is 190 miles north-east from New York, 40 miles south-south-west from Boston, 30 north from Newport. Passengers from New York are brought by steam-boats to Providence on their way to Boston.

Newport, the town next in importance to Providence, is situated at the south end of the island of Rhode Island, in 41° 29′ N. lat. and 71° 21′ E. long. It has between 8000 and 9000 inhabitants. The situation is very beautiful, and it has a fine harbour.

The other towns of most importance are:—Scituate, with 6850 inhabitants; Warwick, with 5500; Smithfield, with 4000; Coventry, with 3850; New Providence, with 3500; South Kingston, with 3700; North Kingston, with 3000; and Bristol, with 3000. Pawtucket, a large village not far from Providence, and connected with that city by one of the finest roads in the United States, has some considerable cotton manufactures.

The circumstances under which Rhode Island was founded, as connected with the opinions and conduct of its founder, Roger Williams, are sufficiently curious and interesting to merit a short detail.

Roger Williams was a native of Wales, and born in 1598. He was educated at the university of Oxford, and admitted to orders in the church of England, but having embraced the opinions of the Puritans, the severity of the laws against non-conformists occasioned him to embark for North America, where he arrived, with his wife, on the 5th of February 1631. The principles which Williams began to preach at Boston were those of unlimited religious toleration, extended not merely to every sect of Christians, but to Jews, Mohammedans, heathens, and infidels. This extent of toleration was not approved by the New England churches, and Williams having been chosen by the people of Salem as assistant-teacher, the court of Boston 'marvelled' at their precipitancy, and they were required to 'forbear.' They did forbear, and Williams withdrew to Plymouth, where he was also engaged as assistant-teacher, and remained two years. In 1633 he returned to Salem. He had written an essay in which he contended that the patent of the king of England could not rightfully dispose of the lands of the natives without their consent. For this he was summoned on the 24th of January, 1634, before the court of Massachusetts, when, having explained the purport of the offensive manuscript, and consented that it should be burnt, the court declared that 'the matters were not so evil as at first they seemed.'

The magistrates of Massachusetts required every man to attend public worship. Williams reprobated the law (35 Eliz., c. 1) by which they enforced it, and this was another ground of offence to the magistrates. The English government had become extremely jealous of the proceedings in Massachusetts, and with the view of preparing for resistance, the Freeman's Oath, which required every freeman to swear allegiance not to King Charles but to Massachusetts, was administered by the magistrates. Williams denied the right of a cumpulsory imposition of an oath; and when summoned before the court, March 30, 1635, he maintained his opinion, and 'the government was forced to desist from that proceeding.'

Soon afterwards the church of Salem chose him for their teacher, and Williams having asserted that 'the civil magistrate might not intermeddle to stop a church even from apostacy and heresy,' the magistrates blamed the people of Salem for their choice of a teacher, and as a punishment withheld from them a tract of land to which they had a claim. Williams now, in conjunction with his church, wrote 'letters of admonition unto all the churches whereof any of the magistrates were members, that they might admonish the magistrates of their injustice.' This was held to be little less than treason, and the next general court disfranchised Salem till an apology for the letter should be made. The town and the church submitted. In October, 1635, he was summoned before the general court, and required to renounce the offensive opinions; but he maintained 'the rocky strength of his grounds.' The general court then pronounced a sentence of banishment against him, but as the winter was near, he obtained permission to remain till spring. And now the people of Salem could no longer be restrained; they thronged to his house to hear him; and as many were 'much taken with the apprehension of his godliness,' and there was evident danger of the infection of his opinions spreading very widely, it was resolved to send him to England in a ship then ready to sail. A warrant was sent requiring him to come to Boston to embark. He refused to come. A pinnace was sent to bring him, but he had fled. It was the depth of winter (January, 1636). 'For fourteen weeks he was sorely tossed in a bitter season, not knowing what bread or bed did mean.' He wandered towards Narraganset Bay, and was welcomed by the Indians, whose language he had learned. In June, 1636, with five companions, he founded his little settlement at the mouth of the Seekonk river. He named the place 'Providence.' 'I desired,' he said, 'it might be for a shelter for persons distressed for conscience.' On the 24th of March, 1638, the chiefs of the Narragansetts, to whom the territory belonged, presented him with an Indian deed, which made him the entire owner of a large domain; but he reserved none of it for himself; 'he gave away his lands and other estate to them that he thought were most in want, till he gave away all.'

This was the foundation of the state of Rhode Island, which was then called *Providence Plantations*. A sect of violent Antinomian Calvinists had sprung up in Massachusetts, who became offensive to the government, and its leaders were sentenced to banishment. They were welcomed by Roger Williams, and through his influence and that of Sir Henry Vane, who was then residing in Massachusetts, they obtained from the Narragansetts (March 24, 1638) the island of Rhode Island; and the colony of *Rhode Island* was thus founded.

The people of Providence Plantations and Rhode Island, excluded from the colonial union, had no chance of maintaining a separate existence without the powerful protection of the mother country; and, in 1643, Roger Williams was chosen to conduct a mission to England for the purpose of obtaining a charter. The affairs of the American colonies were at this time under the control of the earl of Warwick as governor-in-chief, assisted by a council of five peers and twelve commoners. Sir Henry Vane was one of these commoners; and chiefly through his influence a charter was granted, dated March 14, 1644, by which the two colonies were incorporated under the title of *Rhode Island*. When Williams reached Seekonk on his return, the river was covered with canoes to welcome him. But the danger was not over. In April, 1651, a commission was granted to Coddington for governing the islands of Narraganset Bay, and the two small colonies were again exposed to the risk of being dismembered and parcelled out between the adjacent governments. Williams, in conjunction with John Clarke, again returned to England: and in Oct., 1652, Coddington's commission was vacated, and the charter of Rhode Island confirmed. Williams returned in 1654; but Clarke remained, and obtained another charter in 1663, which still continues to be the constitution of Rhode Island. Williams died in April, 1683, at Providence. He is the author of 'A Key into the Language of New England,' London, 1643, 8vo. His other writings were chiefly controversial, in reply to Cotton and George Fox. In answer to a work of the latter, he published his 'George Foxe digged out of his Burrowes.'

(Bancroft's *History of the United States*, vol. i.; *Encyclopædia Americana*; *American Almanac*, 1835, 1837, 1841.)

RHODES, an island off the coast of Caria in Asia Minor, opposite to Cape Volpe, between the gulfs of Syme and Macri. The harbour of the city of Rhodes is in 28° 12′ E. long. and 36° 26′ N. lat., according to Niebuhr. Rhodes was inhabited in very early times, and the Greek poets have shown more than their usual ingenuity in inventing fables to account for the origin of its first settlers. Rhodes was called Ophiúsa, Æthræa, Trinacria, and by other names, which are enumerated by Pliny (v. 31). Pindar, in one of the most beautiful of the Olympian odes, records the myth that it was raised by Apollo from the waves, like Delos. The earliest of its inhabitants were called Telchines, under which name it is probable that the Phœnicians, as the first introducers of civilization, are alluded to. It was successively occupied by the Heliadæ, Danaides, and other mythological personages.

Passing from these traditions, we recognise something of historical truth in the story of Tlepolemus, the son of Hercules, who is said to have colonised Rhodes after his father's death. He is named in Homer among those who led forces to the Trojan war from Rhodes. The poet, in the same passage, makes mention of the three antient towns of Rhodes, Lindus, Camirus, and Ialysus; and of a triple division of the island into districts attached to them.

A second migration from Greece to Rhodes, led by the Argive Althaemenes, took place about the same time as the great movement of the Ionians in the same direction, the date of which is fixed by Clinton (*Fasti Hellenici*) to 988 B.C. The three towns already mentioned, with the neighbouring continental cities, Cos, Halicarnassus, and Cnidus, formed a confederacy, which, after the exclusion of Halicarnassus, was called the Doric Pentapolis. Between this period and the first Olympiad, 776 B.C., the Rhodians had already shown that love of commercial and maritime enterprise for which they were afterwards distinguished, and had made voyages to distant countries. They founded the colonies of Rhode in Iberia, Gela in Sicily, Parthenope among the Osci in Italy; and nearer home, Corydalla and Phaselis in Lycia, and Soli in Cilicia.

About 660 B.C., the antient kingly form of government which prevailed in the island, as in other Dorian states, was abolished, and magistrates, called prytanes, probably substituted. Such offices were filled by the family of the Eratidæ at Ialysus, who were originally kings of that city. In the seventh Olympian ode, Pindar celebrates the Olympic victories of Diagoras, one of this race, speaks of the influence of his kinsmen in Ialysus, and cautions the citizens of that place against innovations. This was about 464 B.C., when it is probable that the Athenians, who were extending their sway over the Archipelago, had already interfered with the internal government of the island.

During the Persian and Peloponnesian wars there is very little mention of Rhodes. It must have declined, like Miletus and various maritime powers on the coast of Asia Minor, and most likely from the same causes. In the course of the latter war, the alternate subjection of the Rhodians to the Athenians and Lacedæmonians produced a corresponding change in the constitutions of their cities from oligarchy by turns to democracy; and this led to internal disorders, and to the expulsion of the two representatives of the Eratidæ. One of them however, Dorieus, who was recalled by Spartan influence, succeeded in replacing the government in the hands of the nobles. In 408 B.C., the city of Rhodes was founded, by collecting into one spot the inhabitants of Lindus, Ialysus, and Camirus; and from this time the history of the city is identical with the history of the island.

In 357 Rhodes reverted for a short time to the dominion of Athens, against which state it soon after formed a league with Cos, Chios, and Byzantium. The Social War ensued, and was terminated in 355, on the condition of the future independence of the Rhodians. No sooner had they succeeded in shaking off their distant enemy, than they experienced the dangerous influence of a near neighbour, Mausolus, king of Caria, who, in consequence of the assistance which he had afforded them in their war with Athens, obtained great power in the island, and joined with the oligarchy in oppressing the rest of the citizens. After his death, his wife Artemisia, having by a stratagem obtained possession of the Rhodian fleet, deprived Rhodes for a time of its liberty. A Carian garrison was placed in the Acropolis, and it is probable that to this period may be referred the excesses of Hegesilochus and his companions, who are described in a fragment of Theopompus quoted by Athenæus (lib. x., p. 444, Casaub.) as the establishers of a corrupt and debauched oligarchy.

These internal disorders led to a mixed form of government, in which, as far as we can gather from writers of antiquity, the elements of democracy and aristocracy were balanced.

Two chief magistrates, called prytanes, vested with great powers, and taking precedence of each other by turns for the space of six months, were appointed every year. There was a senate, all the members of which had a vote in the public assembly, and sat in alternate months in the senate and among the people. In the public assemblies the people voted by show of hands. According to Strabo, great care was taken of the poor; they were provided with corn, and maintained at the expense of the rich, who were subject to leiturgiæ for that purpose. The superintendence of the marine and other matters was managed on oligarchical principles: the good effects of a constitution so modified were shown by the cessation of internal disorders in the city from this time.

After the death of Artemisia, we find the Rhodians, in alliance with Athens, sending assistance to Byzantium against Philip of Macedon. Idrieus, king of Caria, seems to have claimed some sort of supremacy over them.

They submitted, like the rest of Greece, to Alexander the Great, but expelled his troops from their city after his death. At this period they attached themselves very strongly to Ptolemy Soter, and received great benefits from Egyptian commerce. When they refused to assist Antigonus in his war against that prince, his son Demetrius, surnamed Poliorcetes, was sent against them; and the first of the memorable sieges to which Rhodes has at various times been subject commenced. The courage of the defenders was only equalled by the ingenuity with which the assailants applied every engine of assault which the mechanical knowledge of that age could suggest.

After many struggles the Rhodians succeeded in repulsing this formidable enemy (B.C. 303), and made peace on the condition that they should be the allies of Demetrius against every one but Ptolemy. From this epoch we may trace the rapid ascendency of Rhodes. The old maritime powers of Greece having fallen to decay, the supremacy of the seas fell to the share of this island, and great commercial success and refinement in the culture of art were the immediate results. The celebrated colossal figure of the sun was made at this time from the sum raised by the sale of the war-engines employed against the city in the siege, and generously presented by Demetrius, after peace was made, as a tribute to Rhodian valour. This statue, of which Pliny (lib. 34, c. 7) has left an account, was begun by Chares, a pupil of Lysippus, and completed by Laches, both of Lindus. It was made of brass; the height is said to have been 70 cubits; the thumb was so large that few men could span it; twelve years were employed in making it. The notion that its legs rested one on each side of the harbour at Rhodes does not seem to be supported by any good authority, and modern travellers do not agree as to its site. After it had stood for 56 years, it was thrown down by an earthquake by which the buildings of the city suffered very much. Such was the commercial importance of Rhodes, that on this occasion the great princes of the day vied with each other in the munificence of their presents to repair its losses. Hiero king of Sicily, Ptolemy Euergetes, Antigonus Doson king of Macedon, Seleucus II , and the various inferior powers of Asia Minor came forward with ready zeal to serve a city whose fleets protected the seas against pirates and extended mercantile communication. The Rhodians (219 B.C.), assisted by Prusias, king of Bithynia, compelled the Byzantines to remit the duty which they had been in the habit of exacting from ships that passed through the Bosporus, and shortly afterwards protected Sinope against Mithridates IV., king of Pontus.

A new epoch in the history of this people is marked by the first direct mention of the interference of the Romans in their affairs. Rhodes joined Attalus, king of Pergamus, in his war against Philip III., king of Macedon. The Romans threw their weight into the scale against Philip, and entered into an alliance with the two powers that were attacking him. After his defeat at Cynoscephalæ, B.C. 197, the Rhodians joined Rome in a war with Antiochus, in which their navy was of great service. In gratitude to their new allies, the Romans gave them Caria and Lycia. From this time the prosperity of the city began to decline. Her recently-acquired continental possessions resisted her sway, and in their struggles appealing from time to time to the Roman senate, gave that body an opportunity of practising their usual policy of interference. During the war that followed with Perseus, king of Macedon, the Rhodians, in their internal factions mistaking their true interests, became the allies of that prince, but full of consternation at the news of his speedy defeat, 168 B.C., they submitted to Rome, and gave up their territory in Asia Minor. Their revenue was curtailed, and they experienced other marks of the displeasure of the senate. From this time till the Mithridatic war (84 B.C.), we hear little of them. They then gave important aid to the Romans by sea, and were in consequence attacked by the king of Pontus with a great armament, which they defeated. In requital for their fidelity, Sulla at the close of the war confirmed their liberty. During the contest between Pompey and Julius Cæsar they took the part of the former, but abandoned him after the battle of Pharsalia. They attached themselves to Cæsar from this time, and after his death, still supporting his partisans, drew down upon themselves the anger of Cassius, who seized the city, and severely punished the inhabitants, by taking away their ships and fining them heavily.

After the battle of Philippi, Rhodes was restored to freedom by Antonius, in the enjoyment of which its inhabitants remained till the time of Claudius, who, in consequence of the frequent revolts, withdrew some of their privileges, which however he afterwards restored. Finally, Vespasian incorporated this island in a Provincia Insularum, of which it was probably the seat of government. Here the antient history of Rhodes ceases.

In the brief sketch which we have here attempted, many interesting particulars have been necessarily omitted relating to the foreign policy, the commerce, the government, arts, manners, literature, and religion of the Rhodians, and characteristic at once of the Dorian race, of a maritime and trading people, and of the influence of an Asiatic climate on the physical and intellectual condition of the Greeks. The code of laws relating to their navy, adopted afterwards by other maritime states (see *Dig.*, 14, tit. 2, 'De Lege Rhodia'), the powers vested in the several branches of their executive administration, their sumptuary statutes, and regulations to protect their poor, all claim especial attention from the student of antient history. In their most flourishing age, their city, like Alexandria at the same period, was the place of resort of learned men from all countries, and a very similar style of literature sprung up in both places. We cannot indeed expect to find among the writers of these times the freshness of fancy and originality of thought of earlier Greece, but the spirit of research and critical inquiry was awakened, and great progress made in mathematics and other sciences.

Rhodes is particularly distinguished as the parent of a new style of oratory, which the antients considered of a mixed or Græco-Asiatic type. Such too was the character of their contemporary art, which seems to have delighted in executing gigantic and imposing conceptions. Besides the celebrated Colossus, three thousand other statues adorned the city, and of these 100, according to Pliny, were on such a scale that the presence of any one of them would have been sufficient to ennoble any other spot. The architecture of Rhodes was of the same stately character; the ground on which it stood sloped gradually to the sea, like the interior of an antient theatre. The plan, designed by the same architect who built the Piræus at Athens, was perfectly symmetrical, as much, Aristides remarks in his 'Rhodian Oration,' as if it had been one house. The streets were wide and of unbroken length, and the fortifications, strengthened at intervals with lofty towers, did not appear, as in other cities, detached from the buildings which they enclosed, but by their boldness and decision of outline heightened the unity and connection of the groups of architecture within. The temples were full of the finest paintings, the works of Protogenes, Zeuxis, and other artists of the school of Rhodes. The celebrated picture of Ialysus, by Protogenes, which was afterwards brought to Rome, was the object of universal admiration. The coins of Rhodes are numerous and of good workmanship. The most usual type is a radiated head of the sun, and on the reverse a flower which has been called that of the pomegranate, though on some of the coins it rather more resembles the rose, and thus may be considered as a type allusive to the name of the island, the Greek word *rhodon* (ῥόδον) signifying a rose. Spanheim in his great work on coins has given a long dissertation on the subject. Other deities that occur on the obverses on the coins of Rhodes are Jupiter, Neptune, Bacchus, and Serapis. The head of Medusa also is met with. The coins struck under the Roman emperors are given as late as the time of Commodus in Mionnet ('Description des Médailles Antiques: Rhodes'). The word TAMIA occurs on some of the *autonomous* coins: this is an interesting fact, as we have notices from other sources of the existence of such a magistrate at Rhodes.

A few scanty notices of Rhodes may be collected from the historians of the Lower Empire. After having been made by Vespasian into the head of a province, it afterwards formed part of the Thema of Cibyra, as appears from the work of Constantine Porphyrogennetus on the Themata.

In the reign of Heraclius (A.D. 616), Rhodes is mentioned among the conquests of Chosroo, king of Persia, but reverted to the dominion of the Greek emperors shortly afterwards. (Gibbon, vol. v., p. 626, Lond., ed. 1828.) In the caliphate of Othman, A.D. 651, it was taken by Moawiyah, one of his generals, and the fragments of the Colossus, which had been lying on the ground ever since its fall, were collected by the Saracens, and sold to a Jewish merchant of Edessa, who is said to have laden 900 camels with the weight of metal.

In the year 716 Theodosius III. was proclaimed emperor of the Greeks, in consequence of the revolt of troops in Rhodes against his predecessor Anastasius. The island had been probably abandoned by the Saracens before this date. We find it again forming a part of the Greek empire at the taking of Constantinople by the Latins, A.D. 1204, and in the general partition which then followed it was seized by some adventurer, whose name Nicetas Choniata, speaking of the circumstance, does not give.

Rhodes was not long after restored to the dominion of the Greeks, by John Ducas. At the commencement of the fourteenth century it seems to have been occupied by revolted Greeks and Mussulman corsairs, when (A.D. 1310) Fulke de Villaret, grand-master of the knights of St. John, carried into execution the design of his brother and predecessor Guillaume de Villaret, and made himself master of the island, which became from that time the place of residence of the Order, till their final expulsion in the sixteenth century. Five years after their settlement they sustained a formidable siege from Othman, the Turkish sultan, and, notwithstanding the unprepared state of their fortifications, succeeded in repulsing him, and a few years afterwards his son Orkan. From this period they continued to resist the constantly increasing power of the Turks, for about 200 years, adding to the advantages of a position naturally very strong the most skilfully designed fortifications that could be devised in the fourteenth and fifteenth centuries, and making the numerical superiority of the infidels of little avail, by their better organization in the field, more efficient weapons and armour, and incredible valour. In 1344, in the grand-mastership of Helcon de Villeneuve, they attacked and took Smyrna, which they maintained as an outpost. Three years afterwards they came in contact with a new enemy, the Sultan of Egypt, against whom they defended the king of Armenia. The project of removing the knights to Syria or the Morea having been abandoned at length by Innocent VI., they continued their enterprises against the sultan of Egypt, and making a sudden descent, plundered Alexandria, A.D. 1365, but did not make any permanent conquest in that country. At the close of this century the Order engaged in a league to check the increasing power of Bajazet, and sustained a severe loss at the fatal battle of Nicopolis. In 1401 Tamerlane deprived them of Smyrna. During the grand-mastership of John de Lastic, they carried on a war with the sultan of Egypt, which was terminated by a siege of Rhodes, lasting 40 days, in which the Saracens were repulsed with great slaughter. The Turkish empire having somewhat recovered from the effects of the invasion of Tamerlane, Mahomet II. laid siege to Rhodes in 1480, and, notwithstanding the immense force of artillery employed against it, could not take the place. The last and most memorable siege of Rhodes was June, 1522, by the Turks, conducted by their sultan Solyman II. The princes of Christendom, thinking probably that it was hopeless to attempt the defence of so distant an outpost, abandoned Rhodes to its fate, and its gallant inhabitants held out till they were nearly buried in the ruins of their fortifications. Their grand-master, Villiers de Lisle Adam, entered into a capitulation in December the same year, and evacuated Rhodes on honourable terms. The history of the Order from this time belongs to that of Malta. [MALTA.] The island has ever since remained a province of the Turkish empire.

The greatest length of Rhodes, from north to south, is about twelve leagues, according to Sonnini (*Voyage en Grèce et Turquie*), its breadth six leagues, and its circuit is commonly estimated at forty-four leagues. Strabo makes the circuit 920 stadia. On the western coast is the site of the antient Camirus. On the eastern, at the northern extremity of the island, is the city of Rhodes, to the south of which is Lindus, and a small river, the Camdura, below which is Cape Tranquillo, the southernmost point of the island. The whole of this side of the coast is indented by deep bays formed by projecting headlands, and capable of affording protection for shipping. Towards the centre of the island is the mountain Artemira, the Atabyris of Strabo, which commands a magnificent view of the Archipelago, the woodland scenery of the island forming a rich foreground sloping down to the coast, and the distance being bounded, on the Asiatic side, by the picturesque outline of the Lycian hills.

The air is mild and healthy, and fragrant from the number of orange and citron groves and of aromatic herbs. The statement of Pliny, that scarcely a day in the year passes without sunshine, is confirmed by the present inhabitants. The winds are chiefly north or north-west during almost every month; sometimes they blow with great violence. The soil is fertile, and there are numerous springs. The fig-tree and the vine still flourish, and corn is grown, though only enough for the consumption of the inhabitants. Antiently many articles of commerce were exported, which were in much esteem among the Greeks and Romans. Pliny and other authors mention glue, pitch, honey, and saffron ointment; but Turkish misrule here, as in the rest of the Levant, has counteracted the natural advantages of situation, climate, and products.

The population has been somewhat differently estimated. Savary, whose 'Lettres sur la Grèce' were published in 1788, reckons it at 37,500; in Fuller's 'Turkey,' a later work, it is put down at about 40,000; and in Turner's 'Journal of a Tour in the Levant,' 1820, it is thus stated:—14,000 Greeks, 5000 Turks, and 1000 Jews. There are, according to this last writer, forty-two Greek villages, and the rest are Turkish.

The inhabitants are governed by a bey, who holds his office for life, a circumstance which is favourable to the inhabitants, who are less oppressed than in other Turkish governments, where there is a more frequent change of masters. The bey farms the revenues and pays an annual sum of half a million of piastres every year to the Porte, besides fitting out a frigate every two or three years. Shipbuilding is the chief employment of the Rhodians.

At Lindo, or Lindus, there are ruins on an eminence near the sea, which Savary supposes to be those of the temple of Athena Lindia, the work, according to Strabo (p. 655. Casaub.), of the Danaides. The harbour is frequented by small craft, and the inhabitants carry on some trade. No remains of Camirus or Ialysus have been discovered.

Of the town of Rhodes there are no remains earlier than the time of the knights, but all their works are interesting specimens of the military architecture of the middle ages. On entering Rhodes from the sea, two harbours, separated by a narrow quay, present themselves; the larger, to the north, is called Mandraici, and the smaller is named the Port; the narrow quay which separates them forms a curve, having on its extremity next the sea a round tower, and farther inland a square one of great strength and crowned with turrets of observation at the four corners. According to Thévenot, this tower was built by the Turks, on the site of the tower of the same name so often mentioned in the sieges of Rhodes in the time of the knights. Attached to it is a curtain, which connects it with the fortification of the town within. From the other side of the smaller port a narrow quay juts out, on which is another round tower. The Turks have suffered the entrance to Mandraici to be so much obstructed as to impede the navigation.

The castle of the Order in the town, containing the cells of the knights in one street, the cathedral, with curiously carved wooden doors, and with the arms of England and France on its walls, was still in a very perfect state when Dr. Clarke visited the island in 1801, and it retained its portcullises and drawbridges.

This traveller speaks of it with great admiration, and Fuller ('Turkey') recognises the same style of architecture as that which he saw in the fortifications of the knights at Malta. There are remains of several other churches in Rhodes. The inhabitants of the higher classes live in the suburbs, which are very extensive and full of beautiful gardens; the Christians live in a quarter by themselves, called Villagio Novo.

For the antient history of this island, the dissertation of Meursius, which contains most of the passages in the classical writers relating to Rhodes, Müller's 'Dorians,' and a dissertation in Latin on the Macedonian period, by Paulsen, printed at Göttingen, may be consulted. For the modern history, see Vertot's 'Chevaliers de St. Jean,' Coronelli, 'Isola de Roda,' and other authorities which may be found in Meusel's 'Bibliotheca Historica.' A very curious work, by Gulielmus Caoursin, vice-chancellor of the Order, gives a history of its siege in 1480, with wood-cuts of the harbour and operations of the siege, printed at Ulm, by John Reger, 1490.

Other views of Rhodes may be seen in Dapper's 'History of the Archipelago,' translated into French from the Flemish, and in Lebrun's 'Travels.'

RHODEZ, or RODEZ, a city of France, capital of the department of Aveyron, 312 miles in a direct line, almost due south of Paris, or 356 miles by the road through Nevers, Moulins, Clermont, and St. Flour; in 44° 20′ N. lat. and 2° 33′ E. long.

This town is mentioned by Ptolemy under the name of (Σεγόδουνον) Segodunum, as capital of the Ruteni ('Ρουτανοί) a Celtic people, included in the enlarged province of Aquitania by Augustus. It subsequently took the name of Ruteni, from which have been derived both the modern name of the town, Rhodez, and that of the county of Rouergue, of which, in the middle ages, it was the capital. [ROUERGUE.] Rhodez had also counts of its own, whose dominions came into the hands of the counts of Armagnac, and were not finally united to the crown until the accession of Henri IV., who had inherited them.

The town stands on a considerable eminence on the northern bank of the Aveyron, 2173 feet above the level of the sea, and nearly 500 feet above the bed of the river. It is surrounded by antient walls, now converted into a terraced walk or garden. The streets, from the rapid slope of the hill on which the town is built, are steep; they are also narrow, crooked, dark, and dirty, lined with ill-built wooden houses with projecting upper stories, which are however being gradually displaced by others of better architecture. There are four 'places' or squares, two of them of tolerably regular form. The cathedral is for the most part Gothic, of the earlier part of the fifteenth century, but with some incongruous additions. The size of the nave, the boldness of the vaulted roof, the beauty of the stained-glass windows, and the height of the bell-tower (to which some writers assign an elevation of above 265 English feet) render it a striking edifice. The office of the prefect is a modern building; the other chief public buildings are, the college, built by the Jesuits, and the seminary for the priesthood.

The population of the commune of Rhodez, in 1826, was 7747; in 1831, 8249 (of whom 7879 were in the town); and in 1836, 9685. The inhabitants manufacture woollen yarn, coarse woollen cloths, serges and other woollen stuffs, hats, wax and other candles, and playing-cards. There are tanyards and dye-houses. The trade of the place is in the manufactured articles, in the wool grown in the neighbourhood and the grey cloth made from it, and in cheese. There are four yearly fairs. Silk-worms are reared, and mules for the Spanish market bred round the town.

Rhodez is the seat of a bishopric, the diocese of which comprehends the department, and the bishop of which is a suffragan of the archbishop of Alby: it has several judicial and fiscal government offices, an exchange, a chamber of manufactures, an agricultural society, a departmental nursery-ground, and a public stud, an hospital, cabinets of natural history and of natural philosophy, a public library of 15,000 volumes, a deaf and dumb school, a school for outline drawing, a theatre, and public baths.

The arrondissement of Rhodez contains 183 communes: it is divided into eleven cantons or districts, each under a justice of the peace. The population, in 1831, was 94,568.

RHO'DIUM, a metal discovered by the late Dr. Wollaston, and named from *rhodon* (ῥόδον, a rose), on account of the colour of one of its solutions. This metal exists in combination with platinum. According to the analysis of Berzelius, the ore of Colombia contains nearly three and a half per cent., and that of Siberia only 1·15 per cent. of rhodium. When the greater part of the platinum and palladium have been separated from the solution of the native grains, a plate of iron is to be immersed in the residual solution, and by this the rhodium, with small quantities of platinum, copper, and lead, is thrown down in the metallic state. In order to render the rhodium pure, it is first digested in dilute nitric acid, which dissolves the copper and lead, and the rhodium and platinum are then to be dissolved in nascent chlorine (aqua regia) mixed with some common salt, and the solution is to be evaporated to dryness. By this operation there are obtained the double chloride of platinum and sodium, and rhodium and sodium. The former is to be dissolved in alcohol, and the latter afterwards in water, and a plate of zinc immersed in the solution precipitates the rhodium in the metallic state. The metal thus procured is in the state of a black powder, and requires the strongest heat of a wind-furnace for fusion.

The properties of rhodium are, that it is white, has a metallic lustre, is brittle, extremely hard, and its specific gravity is about 11. It is not dissolved by any acid or by nascent chlorine (aqua regia), except when it is alloyed by other metals; and this circumstance accounts for its being dissolved, when alloyed with platinum, in the native grains of this metal. It suffers no change by exposure to air, either dry or moist.

Oxygen and Rhodium.—These cannot be made to combine by direct action, and it is probable that the protoxide has not been insulated. When finely-divided rhodium, mixed with potash and a little nitre, is heated to redness in a silver crucible, the metal is oxidized, and becomes of a brown colour, and is mixed with potash; the mass is to be washed with water, and then treated with hydrochloric acid, by which hydrated peroxide of rhodium is left, of a greenish grey colour. It consists of about—

One and a half equivalent of oxygen .	12
One equivalent of rhodium . . .	52
Equivalent . .	64

When this peroxide is heated, it becomes black, and is then probably converted into protoxide, composed of—

One equivalent of oxygen . . .	8
One equivalent of rhodium . .	52
Equivalent . .	60

Chlorine and Rhodium probably unite in two proportions, but the perchloride only has been hitherto obtained in a separate state. It was procured by Berzelius by adding silico-hydrofluoric acid to a solution of the chloride of potassium and rhodium, as long as the double fluoride of potassium and silicium was generated, after which the filtered liquor was evaporated to dryness, and the residue redissolved in water. The remaining perchloride thus obtained has a dark brown colour, and when heated to redness, chlorine is evolved and metallic rhodium obtained. The aqueous solution of this salt is a fine rose-red colour, whence the name of the metal which it contains.

It is a sesquichloride, composed of—

One and a half equivalent of chlorine .	54
One equivalent of rhodium . .	52
Equivalent . .	106

This salt forms double compounds, called rhodio-chlorides, with the chloride of potassium and of sodium; they consist of one equivalent of each.

Sulphur and Rhodium may be made to combine by heating them together, the metal being in a state of minute division; it fuses at a white heat without decomposition, has a bluish-grey colour, a metallic lustre, and by the action of nitric acid is converted into sulphate of rhodium. Sulphuret of rhodium may also be formed by heating the amonio-chloride of the metal with sulphur, or by heating its solution with sulphuret of potassium.

Alloys of Rhodium.—When combined with steel to the amount of only two per cent., it gives the steel great hardness without occasioning it to crack under the hammer. Dr. Wollaston has examined several of its alloys, and, on account of its hardness, he suggested its employment for the nibs of metallic pens; to which purpose it has been applied successfully. It has not been combined with mercury.

Salts of Rhodium.—The salts of the peroxide only have been formed. Their general properties are but little known.

Nitrate of Rhodium is obtained by dissolving the peroxide in the acid: it is of a deep red colour, and uncrystallizable.

Sulphate of Rhodium is procured, as already mentioned, by acting upon the sulphuret with nitric acid. The solution is of a deep red colour, and does not yield crystals. When the caustic alkalis are added to the solution of this salt, a precipitate of the hydrated sesqui-oxide of a greenish-yellow colour is obtained after some time; the alkaline carbonates produce no effect, nor does sulphurous acid, nor the ferrocyanide of potassium. Hydrosulphuric acid throws down sulphuret of rhodium; but the hydrosulphates of ammonia and potash produce no immediate precipitate.

RHODOCRINI'TES. [ENCRINITES, vol. ix., p. 393.]

RHODODENDRON, a genus of evergreen shrubs, very common in gardens, is one which differs from Azalea [AZALEA] principally in the stamens being 10 instead of 5, in the corolla being campanulate, not tubular, and in the foliage being hard and evergreen. The species are nearly related to each other, and occur both in the new and old worlds. Of the numerous varieties to be seen everywhere in flower in this country, in the months of May and June, the greater part belong to R. ponticum, a species found wild on the coasts of the Black Sea from the range of Caucasus through Armenia and Georgia to the western frontier of Persia, or to R. catawbiense, an American species, or to hybrids between these. R. ponticum was at one time supposed to be the plant which rendered the honey of Asia Minor poisonous; but it has been ascertained that the effect is really produced by Azalea pontica. In the warmer parts of India there occurs the tree Rhododendron, with crimson or white or pink flowers, one of the most beautiful of all trees, too tender to bear the open air in England, but a noble object in a conservatory; there are also some mountain species on the Himalayas, one of which, R. campanulatum, is strikingly handsome, and quite hardy. By means of crossing the crimson tree Rhododendron with some of the hardy species, a race of hybrids has arisen, which are much cultivated as hardy greenhouse plants, and in Ireland and some of the milder parts of England they will endure the open air without protection. They are perhaps more beautiful than any of their parents. The most curious of these hybrids is a yellow one recently obtained by Mr. Smith, a nurseryman near London, by crossing a Rhododendron with the yellow Chinese Azalea; this is perhaps one of the finest artificial productions yet obtained by florists The Alpine Rhododendrons, hirsutum and ferrugineum, with small campanulate crimson flowers, are handsome dwarf shrubs in elevated situations, but they dislike the low grounds near London. The leaves of *R.* chrysanthum, a species with yellow flowers from Siberia, have a great reputation as a remedy for chronic rheumatism; its effects are those of a powerful narcotic.

RHODOMANNUS, LAURENTIUS, was born in 1546, at Sassawerft, on the estates of the counts of Stolberg. His parents were poor, and as the boy early displayed great talents, count Stolberg sent him at his own expense to the gymnasium at Ilfeld. Greek literature, which was then reviving in Germany, had most attractions for him, and he made it his principal study at the university of Rostock. After the completion of his studies, he held several offices as teacher, but was afterwards invited to the professorship of Greek literature in the university of Jena, and subsequently to that of history at Wittemberg, where he died on the 8th of January, 1606.

Rhodomannus is said to have been extremely ugly, but his learning and amiable qualities soon effaced the unfavourable impression created by his appearance. His greatest merits consist in his efforts to diffuse a taste for Greek poetry, and he endeavoured to attain this object by making Greek verses himself, in which he is said to have been very successful. We still possess a number of works by Rhodomannus, in Greek verse with Latin translations, viz.: 'Vita Lutheri, Græco carmine descripta et Latine reddita,' Ursel, 1579; 'Descriptio historiæ ecclesiæ, &c., Græco carmine cum versione Latina, e regione textus Græci,' Frankfurt, 1581; 'Poesis Christiana, id est, Palæstina, seu Historiæ Sacræ, Græco-Latinæ, libri ix.,' Marpurg, 1589; 'Theologiæ Christianæ Tyrocinia, carmine heroico Græco-Latino, libri v.,' Lipsiæ, 1597, &c. Rhodomannus also made some Latin translations of Greek authors, as of Diodorus Siculus, which is printed in the edition of H. Stephens (1604); of the 'Posthomerica' of Quintus Calaber; he also made a translation of extracts from 'Photii Bibliotheca' and Diodorus Siculus, under the title of 'Memnonis Historia de Republica Heracleensium et Rebus Ponticis Eclogæ,' Helmstadii, 1591, and reprinted at Geneva in 1593. Rhodomannus edited the following collection of Greek poems:—'Anonymi Poetæ Græci: Argonautica, Thebaica, Troica, Ilias parva, Arion, Narratio de Bello Trojano e Constantini Manassis Annal.,' &c., Lips., 1588. His Life has been written in Latin, by Ch. H. Lang, Lübeck, 1741.

RHODOPHY'SA. [PHYSOGRADA, vol. xviii., p. 138.]

RHOEMETALCES. [THRACE.]

RHOMB, RHOMBUS, RHOMBOID. These terms have been used in various significations by different writers, and the second and third have been sometimes distinguished from each other in meaning. It is not worth while to do more than state, that when either of them is now used, it signifies an equilateral oblique parallelogram. The Latin dictionaries define rhomboides to be a parallelogram, and rhombus an equilateral parallelogram.

RHOMBOI'DES (Conchology), De Blainville's name for a genus described as bearing a resemblance to *Byssomya* in its shell, but as differing in the soft parts. *Mytilus rugosus*, Gmel.; *Hypogæa barbata*, Poli.

RHOMBUS (Conchology), De Montfort's name for a genus of *Cones*, of which *Conus nocturnus* may be regarded as the type. [CONUS, vol. vii., p. 485.]

RHOMBUS MA'XIMUS. [PLEURONECTIDÆ.]

RHÔNE, River. [FRANCE.]

RHÔNE, a department of France, the smallest except the metropolitan department of Seine, bounded on the north by the department of Saône et Loire, on the east by that of Ain, on the south-east by that of Isère, and on the south and west by that of Loire. Its form approximates to an oval, having its greatest length from north to south, from the neighbourhood of Aigue Perse in the Charolais mountains to Condrieu on the Rhône, 60 miles; and its greatest breadth at right angles to the length, from the neighbourhood of Lyon to near Panissière in the department of Loire, 28 miles. Its area is only 1080 square miles, being less than half the average area of the French departments, and about equal to the area of the English county of Durham. The population, in 1826, was 416,575; in 1831, it was 434,429; and in 1836, 482,024, showing an increase in the last five years of 47,595, or nearly 11 per cent., and giving more than 446 inhabitants to a square mile. In amount of population it exceeds the average of the departments in the proportion of nearly 4 to 3; and in density of population, in the proportion of nearly 3 to 1; in amount of population it exceeds every English county except Yorkshire, Middlesex, Lancashire, Devonshire, and Surrey; and in density of population, every one except Middlesex, Lancashire, and Surrey. Lyon is the chief town. [LYON.]

The western side of the department is mountainous; the Lyonnais, Beaujolais, and Charolais heights, which form the prolongation northward of the Cévennes, extend through it on this side from south to north. From a point in the north of the department near the town of Beaujeu, these heights send off two offsets, one (the Mâconnais heights) to the north-north-east, which are separated from the principal range by the valley of the Grône, a feeder of the Saône; and another to the south-south-east, which are separated from the principal range by the valley of the Azergue, another feeder of the Saône. In the south of the department another offset branches off from the main range, from which it is separated by the valley of the Brevanne, and extends north-east to the banks of the Saône, north of Lyon; its extremity is known as Mont d'Or, a name which is sometimes given to the whole branch. The extremity of another branch running to the north-east and separated from the main range by the valley of the Gier, just extends into the southern part of the department. Some of the peaks are of considerable height; the mountain of Tarare is on the north side about 2600 feet, in the centre nearly 3000 feet, and on the south nearly 4500 feet. The Mâconnais heights have in some places an elevation of above 3000 feet. The principal pass over these mountains is that of Tarare, where the road from Paris by Moulins to Lyon crosses the ridge. Southward of this are the passes through which run the roads from Lyon to Feurs and to St. Etienne; northward of it the only pass in the department is that through which runs the road from Beaujeu to Charlieu. The road from Lyon along the western bank of the Rhône runs in several places through a narrow pass between the lower yet rapid slopes of the mountains and the river.

The principal mass of the mountains is composed of granitic or other primary rocks. In the valley of the Gier are found the lower secondary formations; while the valley of the Rhône is occupied, in the north, by the secondary formations, and in the south by the super-cretaceous or tertiary formations.

The mineral wealth of the department, though of various kinds, is not of any great value. There was only one coal-mine worked in 1834 (one had been given up); it produced 7577 tons of coal, valued at 3881*l.*: the quantity of coal produced in the department in 1835 was 7463 tons. Three mines produced lead in 1836, but the quantity was only 6 tons, valued at 98*l.*: two produced a small quantity of copper. The copper-mines are at St. Bel near Arbresle on the Brevanne, and at Chessy on the Azergue: they were worked by the Romans. Rock crystal, porphyry, granite, fine marble of various colours, sandstone, gypsum, potters' and fullers' earth, manganese, and excellent freestone are found. Some particles of gold are brought down by the Rhône. There are some chalybeate waters at Charbonnières near Lyon, but not of much importance.

The principal range of the mountains which we have described separates the basin of the Rhône from that of the Loire; the eastern slope being in the former, the western in the latter. As the ridge is not far within the western boundary, almost all the department is included in the basin of the Rhône, only a small part of the western side being in that of the Loire. The Saône touches the eastern boundary of the department, about 10 miles below Mâcon: this river or the Rhône forms the eastern boundary to Condrieu adjacent to the southern extremity of the department, except just in the neighbourhood of Lyon, where the department extends across so as to comprehend a portion of the eastern bank of both rivers. The affluents of the Saône are, the Grône, of which only the source and just the upper part of the course are in this department, the Ardière, and the Azergue. The Azergue receives the united streams of the Brevenne or Brevanne and its feeder the Tardine. The feeders of the Rhône are the Izeron, the Garon, and the Gier, of which last only the lower part belongs to the department. Of the feeders of the Loire, the Sornin, the Trambouze, the Loise, and the Coize have their sources in this department. None of these rivers are navigable except the Saône and the Rhône.

The only canal is that of Givors, which extends along the valley of the Gier from Rive de Gier to Givors. The length of water communication is given in the official statements as follows:—

Saône	38 miles.
Rhône	32 „
Rivers	70 miles.
Canal of Givors	6 „
Total	76 miles.

There are six government roads, having an aggregate length (1 January, 1837) of 146 miles, viz. 111 miles in repair, 12 miles out of repair, and 23 unfinished. The principal roads are those from Paris to Lyon. The road by Auxerre and Châlons (with which the road by Dijon unites) enters the department on the north side, and follows the valley of the Saône through Villefranche and Anse. The road by Moulins enters the department on the west side, and runs by Tarare and Arbresle. From Lyon two roads run, one across the Alps to Chamberi and Turin; the other along the valley of the Rhône (by the east or left bank) to Avignon, and thence to Aix, Marseille, Toulon, and Genoa; but only a very small portion of these two roads is in the department. Roads also lead from Lyon by Grezieux, Izeron, and Rivoire to Feurs in the department of Loire, and thence to Clermont-Ferrand; by St. Genis-Laval and Brignais to Rive de Gier and St. Etienne, in the department of Loire; and along the valley of the Rhône, branching off from the St. Etienne road at Brignais, and passing through Millery, Givors, and Condrieu to Le Pont St. Esprit, Nîmes, and Montpellier. The departmental roads had an aggregate length of 169 miles, viz. 105 in repair, 18 out of repair, and 46 unfinished. The bye roads and paths had an aggregate length of above 1500 miles. There is a railroad from Lyon to St. Etienne, and one from St. Etienne to the Rhône at Givors, a branch (we presume) of the other.

The climate is healthy, but the temperature is various, owing to the varying elevation of the surface. This inequality is unfavourable to cultivation upon a large scale. The surface may be estimated in round numbers at 700,000 acres; of which about 360,000 acres, or more than half, are under the plough. The banks of the Saône are remarkably fertile, and much wheat is grown there. The grain harvest is abundant, but, from the density of the population, altogether insufficient to supply the wants of the inhabitants. Pulse, colza, madder, millet, saffron, flax, and hemp are also cultivated. The meadows comprehend 90,000 acres; the heaths and open pastures, about 30,000. Neither horses nor oxen are numerous, or of a good breed; the number of cows is very great, approaching 60,000. Sheep are numerous. Asses are both numerous and good; and on Mont d'Or a number of goats are fed, from whose milk good cheese is made. The vineyards occupy above 75,000 acres; some of the finest wines in France are produced here, especially the Côte Rôtie, Romanèche, Ste. Foy, and Condrieux. The fruits both of northern and southern France are grown, except the orange and the olive; and the chesnuts are sent to Paris and sold under the name of Lyon chesnuts. The mountains are for the most part covered with wood: Mont Pilat in particular is covered with fine firs: the woodlands occupy about 85,000 acres.

The waters furnish a good supply of fish. The pike, the eel (some of great size), the barbel, excellent trout and perch, and other fish, are taken in the streams; and the shad, the lamprey, and the sturgeon ascend the Rhône. The eel-pouts of the Saône are excellent.

The department is divided into two arrondissements, as follows.—

Name.	Situation.	Area in sq. m.	Cantons.	Communes.	Population.	
					1831.	1836.
Lyon .	S.	500	16	126	292,370	330,044
Villefranche	N.	580	9	127	142,059	151,980
		1080	25	253	434,429	482,024

In the arrondissement of Lyon are—LYON; St. Genis-Laval; Millery, population 1500 for the town, 1525 for the whole commune; Givors, population 4385 for the town, or 4884 for the whole commune; Ste. Colombe; and Condrieu, or Condrieux, population 3090 for the town, 3864 for the whole commune, are all on or near the Rhône. St. Andéol is near the Gier, Riverie and Mornant between the Gier and the Garon, Brignais on the Garon, Izeron on the Izeron, Grezieux on the road from Lyon to Clermont, Arbresle near the junction of the Tardine and the Brevenne, St. Laurent and St. Bel near the Brevenne, Montrotier near a feeder of the Brevenne, and Chessenay or Chasselan and Neuville on the Saône; all these are in the basin of the Rhône, east of the Lyonais mountains. On the west side of the ridge, in the basin of the Loire, are St. Simphorian and Rivoire. St. Genis-Laval is a handsome little town, with a 'place,' or square, planted with trees. The townsmen manufacture paper-hangings, paper-stainers' colours, printers' ink, writing ink, buttons, carpets, banners, and paintings for churches. Considerable trade is carried on in wine, of which some very good is grown in the neighbourhood. There are five cattle-fairs in the year. Considerable trade in wine is also carried on at Millery. Givors, standing at the junction of the canal of Givors with the Rhône, and at the terminus of the railroad from St. Etienne, is a busy town, in a fertile and pleasant district. The townsmen manufacture window-glass, glass bottles, and drinking-glasses, and dye silk. There are three yearly fairs for nails, glass, and cattle. At Condrieu, or Condrieux, the townsmen carry on manufactures of silk and leather, dye silk, and refine salt: they carry on trade in corn, and in the much esteemed white wines of the neighbourhood. There is a good weekly cattle-market, and there are six yearly fairs. A considerable number of the inhabitants are boatmen on the Rhône, and many boats are built here. At Mornant coarse woollen cloth and hats are manufactured; there are four yearly fairs. Brignais has the ruins of an aqueduct, supposed to be of Roman construction, and several handsome country-houses belonging to the inhabitants of Lyon. Some trade in cattle is carried on, and a good deal of wine is grown round the town. Near Izeron, sometimes written Yzeron, fine granite is found. An antient Gothic castle of picturesque and imposing appearance distinguishes Arbresle. The town itself is modern, having been rebuilt after a destructive inundation in 1715. Some cottons are manufactured at St. Laurent, and there are copper-mines at St. Bel, but so unprofitable that it has been proposed to give up working them. At Neuville, distinguished as Neuville l'Archevêque, cotton-yarn is spun, silk thrown, linen bleached, and paper and sheet-lead made. There are seven yearly fairs.

In the arrondissement of Villefranche are—Villefranche, population in 1831, 6460; in 1836, 7553; Belleville; and Anse; all near the Saône; Chamelet, Yoingt, Bois d'Yoingt, Chessy, Châtillon, and Chazay, on or near the Azergue; Tarare, population 5990 for the town, 6833 for the whole commune; Beaujeu, population 1520 for the town, or 1596 for the commune, on the Ardière; and Jullie, near the northern boundary of the department: all these are in the basin of the Rhône. West of the Lyonais and Beaujolais mountains, in the basin of the Loire are the towns of Amplepius, population 4873, and Thizy, on feeders of the Trambouze; and Aigueperse near the northern frontier. Villefranche was founded, near the end of the eleventh century, by Humbert, Sire de Beaujeu. The town consists of one very wide and handsome street, extending for above a mile along the road from Paris to Lyon, and of some smaller streets branching from it. The houses are well-built. The inhabitants manufacture cotton yarn, cotton goods, and leather. There are three yearly fairs, and a considerable weekly market for cattle, chiefly for the supply of Lyon, hemp, flax, cotton yarn, and cotton and hempen cloth. Considerable trade is carried on in hides and wine. There are some subordinate government offices, judicial and fiscal; a high school, and hospitals. There were formerly lead-mines near the town, which were worked by the Romans. Belleville, distinguished as Belleville sur Saône, has a manufacture of muslins and other cottons, also of linens: trade is carried on in wine. The town lies just out of the road from Paris by Mâcon to Lyon. Anse is agreeably situated in one of the richest plains in France, at the foot of a hill covered with vineyards. Linen-bleaching is carried on at Chamelet. Yoingt has the ruins of an antient castle, the chapel of which now serves as a parish church. Chessay has important copper-mines, and works for smelting and rolling the copper. Tarare, in a narrow valley at the foot of Mount Tarare, over which the road from Paris by Moulins to Lyon has been carried with great labour, is a tolerably well-built and very busy town. It is the centre of a manufacture of muslin and embroidery, which employs 50,000 workmen scattered over the neighbouring country: it has print-works, bleach-grounds, tan-yards, and potteries: there are two yearly fairs. The neighbouring mountain contains lead-ore, but the mines have been given up; marble is quarried. The town has at times suffered considerably from the swelling of the little river Tardine, on which it stands. Beaujeu, the antient capital of Beaujolais, is a neat town, at the foot of a mountain crowned with the ruins of the old castle of the Sires de Beaujeu. There are cooperages, paper-mills, and tan-yards. A considerable trade is carried on in grain, wines, and iron, and in the cottons and linens manufactured in the district round. It has six yearly fairs. At Amplepius and Thizy linens and cottons are manufactured; and at Cours, a large village near Thizy, a mixed fabric of cotton and flax is woven. There are twelve fairs at Thizy, which is the mart for the surrounding country.

The department constitutes, with the adjacent department of Loire, the archiepiscopal diocese of Lyon and Vienne: it is in the jurisdiction of the Cour Royale of Lyon, and the authority of the Académie Universitaire of that city. It is in the nineteenth military division, the head-quarters of which are at Lyon. It sends five members to the Chamber of Deputies. In respect of education it is above the average of France; of the young men enrolled in the military census of 1828-29, 45 in every 100 could read and write; the average of the departments being under 40.

The district now included in the department was antiently part of the territory of the Segusiani (Σαιγοσιανοὶ and Σεγοσιανοί, Strabo), a people dependent on the Aedui, and perhaps of the Insubres (Ἰνσουβροι, Strab.), who appear to have been either dependents of the Aedui or a part of their nation. It is probable that the bank of the Saône above Anse belonged to the Ambarri, also dependents of the Aedui; the neighbourhood of Beaujeu appears to have been comprehended in the territory of the Aedui (Αἴδουοι and Ἑδοῦοι, Strabo; Αἰδουοι, Ptol.) themselves; and the bank of the Rhône south of Givors belonged to the Allobroges (Ἀλλόβρογες, Strabo; Ἀλλόβρυγες, Ptol.). These nations all belonged to the great Celtic stock. This part of Gaul was the seat of contest in Cæsar's war with the Helvetii, in the first year of his command in Gaul. The Rhône and the Saône were known to the antients by the names of Rhodanus (Ῥοδανὸς, Strabo) and Arar (Ἄραρ, Strabo).

In the Roman division of Gaul, this territory was included in the province of Lugdunensis, afterwards of Lugdunensis Prima; except the portion which belonged to the Allobroges, which was included in Narbonensis, the 'provincia nostra' of Cæsar, and upon the subdivision of that province, in Viennensis. A few towns, Roman or Celtic, were included in its limits. Lugdunum (Λούγδουνον, Strabo and Ptolemy), now Lyon, the most important, is noticed elsewhere. [Lyon.] The Mediolanum of the Peutinger or Theodosian Table is fixed by D'Anville at Meys, a village near the western boundary of the department, between Lyon and Feurs; the Assa or Asa Paulini of the Antonine Itinerary may be fixed at Anse; and the Lunna of the same authority was somewhere upon or near the northern boundary of the department, between Lyon and Mâcon.

On the overthrow of the Roman empire it passed into the hands of the Burgundians and Franks. In the middle ages it constituted part of the counties or provinces of Lyonais in the south, and Beaujolais in the north, so called from their chief towns Lyon and Beaujeu; and both subdivisions of the province, to which, in a more extended sense, the name of Lyonais was given. [Beaujolais; Lyonais.] When France was first divided into departments by the National Assembly, A.D. 1790, this department, with the adjacent one of Loire, formed one department under the name of Rhône et Loire. The separation was afterwards made by the National Convention.

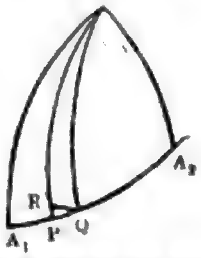
RHUBARB. [Rheum.]

RHUMB or RUMB. Vitalis (*Lex. Math.*) calls this a Portuguese word, and no doubt it might have been introduced into navigation by the Portuguese, but we suspect it to be the Latin 'rhombus': he says it signified originally the meridian, or the principal meridian of a map; perhaps it came to signify this from such meridian being usually ornamented by a distinctive rhombus, such as is added to the north direction on a compass-card. However this may be, a rumb certainly came to mean any vertical circle, meridian or not, and hence any point of the compass; so that, in modern phraseology, a rumb is one of the thirty-two principal compass directions, and to sail on any rumb is to sail continually on one course. Hence a rumb-line is a line drawn in the sphere, such as would be described by a moving point which always keeps one course; it is therefore the spiral described in Mercator's Projection, and is that which is also called the loxodromic spiral.

The mathematical properties of the rumb-line may be easily deduced. Let r be the radius of the earth, λ_1 and l_1 the longitude and latitude of A_1, and λ_2 and l_2 those of A_2, λ and l being those of any intermediate point P: and let s be the length of A_1P. If then we increase s by the infinitely small arc ds, increasing λ and l at the same time by $d\lambda$ and dl, we have the differential triangle PQR, in which $PQ = ds$, $PR = rd\lambda$, $RQ = rdl . \cos \lambda$, while the angle RPQ, which is the same throughout the curve, may be called ρ. We have then $ds . \cos \rho = rd\lambda$, or $s . \cos \rho = r(\lambda - \lambda_1)$ integrating from A_1 to P. Again, $ds . \sin \rho = rdl . \cos \lambda$, so that the two equations give

$$\frac{d\lambda}{\cos \lambda} = dl \cot \rho, \quad \text{or} \log \cot \left(\frac{\pi}{4} - \frac{\lambda}{2}\right) = l \cot \rho + C;$$

the logarithm being Naperian, and the angles being measured as in Angle, vol. ii., p. 23. If L be the length of the arc of a degree of longitude at the equator, and if we now use degrees, and extend the preceding integration from A^1 to A_2, we have—



$$r \log \frac{\cot (45° - \frac{1}{2} \lambda_2)}{\cot (45° - \frac{1}{2} \lambda_1)} = (l_2 - l_1) \text{L} \cot \rho;$$

an equation from which ρ can be found for any two places, that is, the angle which the course in sailing from one place to the other makes with the meridian. And instead of $r : \text{L}$ may be put its value 57·29578. The distance from one place to the other on the rumb-line sailed over may be found from $s \cos \rho = r(\lambda_2 - \lambda_1)$, which, when λ_2 and λ_1 are measured in degrees, becomes $s \cos \rho = (\lambda_2 - \lambda_1) \text{L}$, neglecting the small correction for the earth's excentricity.

The first of these processes can be done by Mercator's chart, the principle of which, mathematically described (with which the popular description given in Mercator's Projection agrees), is as follows:—Let equal arcs of longitude remain equal throughout the map, but as increments of latitude are to their corresponding increments of longitude as 1 to the cosines of the latitudes, let the differential triangle PQR be similar in the chart to that on the sphere, which gives $ad\lambda : \cos \lambda$, for the representation of $d\lambda$ on the chart, provided a represent the length of the degree of longitude on the chart. Hence $a \cot (45° - \frac{1}{2}\lambda)$ is the length of λ degrees of latitude measured from the equator; and a table of values of $\cot (45° - \frac{1}{2}\lambda)$ is called a table of *meridional parts.*

In such a chart all rumb-lines are projected into straight lines; but equal parts on any such straight line do not represent equal distances on the earth: and the distance sailed must be found by the formula in terms of the extreme latitudes and the angle of the course.

RHUS (Sumach, in Greek ῥοῦς), the name of a genus of plants. One of the species, *R. cotinus*, appears to have been known to Pliny, who refers to its dyeing properties, and its place of growth, the Apennines, under the name of Cotinus. (Plin., *Hist. Nat.*, xvi. 18.) This genus has an extensive geographical range, from the south of Europe to the Cape of Good Hope. It is also found in Asia and North and South America. It belongs to the natural order Anacardiaceæ, and to the tribe Sumachineæ. Most of the species are poisonous, but they are much cultivated as ornamental shrubs, especially on account of the beautiful red colour of their leaves in autumn. Many of them are used also for the purposes of dyeing and tanning; as an astringent principle, to which is frequently added an acid, is common to the whole genus.

The genus *Rhus* has the following characters:—Flowers bisexual, or polygamous; calyx small, persistent, five-partite; petals five, inserted under the margin of the disk, imbricate in æstivation; stamens five, hypogynous; ovary one-celled, sessile; fruit, a dry drupe; seeds solitary, exalbuminous; radicle opposite the hilum, and bent downwards along the edge of the cotyledons. Leaves alternate, simple, or compound; panicles axillary or terminal.

De Candolle enumerates about ninety species, to which other writers have made additions, but there is reason to believe that many of the new species are merely varieties. We shall here enumerate only a few of those which have interest on account of being cultivated, or their uses in medicine and the arts.

Rhus cotinus, Venus Sumach, or Wild Olive. Flowers hermaphrodite, arranged in loose panicles of a greenish yellow colour; leaves simple, entire. This is a very ornamental shrub, and is one of the European species, growing wild in various districts of the south of Europe. It is made use of, like many other of the species, for tanning, in Italy, and is called *Scotino*. The wood is used by the modern Greeks for dyeing wool, which is said to be of a beautiful rich yellow. It is frequently cultivated on account of its beauty. It requires a dry loam, and is best propagated by pegging down the branches flat to the ground and strewing earth over them, by which means the young shoots, when they grow up, may be removed in the following autumn.

Rhus typhina, Fever Rhus, or Stag's-Horn Sumach. Leaves with eight to ten pair of leaflets and an odd one, lanceolate, acuminate, serrated, pilose beneath. There are two forms of this plant: the one, *arborescens*, in the form of a tree, from ten to twenty-five feet in height; the other, *frutescens*, shrubby, and only from two to ten feet high. The young shoots are covered with down, which, with their somewhat crooked and stunted branches, give them the appearance of young stags' horns; hence their name. The flowers are in dense spikes, at the ends of the branches, the pistilliferous ones developing themselves into woolly drupes, which are very conspicuous when ripe. It is found in every part of North America, and its dark red leaves add much to the beauties of an American autumn. The fruit of this plant is exceedingly sour, and on this account it is frequently called *vinegar plant*, and is even used in some parts as a substitute for vinegar.

Rhus glabra (Smooth-leaved Sumach).—Leaf like the last, but broader and glabrous. Branches also glabrous. Fruit red, covered with silky hairs. Three forms of it are distinguished by De Candolle: *hermaphrodita*, with hermaphrodite greenish flowers; *dioica*, with diœcious green flowers; and *coccinea*, with diœcious red flowers. This last form is the *Rhus elegans* of the nurseries and gardens. This species, as well as another named *R. viridifolia*, is considered by some botanists as only a variety of *R. typhina*. Like the last, this species is abundant in North America, overrunning sometimes a whole district, and forming a troublesome weed. Its fruit is very sour, but may be eaten with impunity. Bees are very fond of the blossoms.

Rhus vernicifera (Varnish-bearing Sumach, or Japan Varnish-tree).—Leaf with 5-6 pairs of leaflets, all ovate, long, acuminate, entire, glabrous above, velvety beneath. It is a native of Japan and Nepaul. Its leaves are very large and beautiful, rendering it one of the handsomest of shrubs. According to Thunberg, this is the plant which yields the celebrated Japan varnish. The varnish is obtained from those branches of the plant which are about two or three years old, by cutting into them, when it oozes out. It is at first white, and of the consistence of cream, but it gets black in colour and much thicker after a little exposure. It is exceedingly transparent, and when used a dark surface of finely powdered charcoal or other substance is placed underneath it. It is very hard, cracking and flying like glass. The Japanese use this varnish very extensively, applying it to their door-posts, windows, household furniture, and in fact to everything made of wood.

Rhus venenata (Poison Sumach, or Swamp Sumach). Leaf 6-7 pair of leaflets, almost glabrous, entire, lanceolate-acuminate, reticulated beneath. Fruit white. It is a native of North America from Canada to Carolina, and also in swampy districts in Japan. This plant is exceedingly poisonous, so virulent that it is said to affect some persons by merely smelling it. A touch will sometimes produce violent inflammation. It is a beautiful shrub, and well worthy of cultivation, but great care should be taken to prevent its being carelessly handled.

Rhus coriaria (Hide or Elm-leaved Sumach). Leaf 5-7 pairs of villous leaflets, elliptical, bluntly and coarsely toothed, petioles naked. Flowers in large loose panicles of a whitish-green. Drupes villous. This plant is a native of the south of Europe. It is extensively used for the purpose of tanning, and it is said that all the leather made in Turkey is tanned with the bark of this species of Rhus. The fruit is acid and astringent, and the seeds are often used as tonics for exciting the appetite.

Rhus copallina (Gum-Copal or Mastich-leaved Rhus).—Leaf glabrous above, slightly pilose beneath. 5-7 pairs of leaflets and an odd one, lanceolate and entire. Petiole winged and jointed. Root creeping. Flowers yellowish-green, diœcious. It is a native of North America from New Jersey to Carolina. It attains a height of four or five feet. The leaves of this or a similar plant are stated (Don, *Gard. Dict.*) to be used for smoking instead of tobacco by the Indians of the Mississippi and Missouri. It is supposed to yield the gum-copal of commerce, from which copal-varnish is made.

Rhus radicans (Rooting Poison-Oak, or Sumach).—Leaf one pair of leaflets and an odd one, odd one petiolated, glabrous, entire. A native of America from Canada to Georgia. Its climbing habit, combined with the beautiful red colour of the leaf during the decline of the year, renders it one of the most picturesque of American plants. It frequently abounds in the forests, where it may be seen covering the tops of the highest trees. It climbs up walls and rocks, and runs upon the ground with equal facility, thus covering everything withing the reach of its stems. De Candolle distinguishes three varieties: *vulgaris*, with a stem climbing by means of roots; *volubilis*, climbing without roots; and *microcarpa*, with fruit much smaller than the other two. Like the following species, it emits a juice which indelibly stains linen. It is equally poisonous with *R. venenata*. A detailed account of the effects of the poison of the genus Rhus may be seen in Professor Kalm's 'Travels in North America.'

Rhus toxicodendron (Common Poison-Tree, or Poison-Oak).—Leaf of one pair of leaflets and an odd one, with a petiole, inciso-augulate, pubescent. Flowers greenish. It is found in woods, fields, and fences, in common with the last-named species, in North America, where they are both known by the same name. Many botanists consider the two only varieties of the same plant. This species is the type of the genus Toxicodendron of Tournefort. It was introduced into England in 1640, and first grown in the bishop of London's garden at Fulham. This species is that which is most frequently used in medicine.

The less common species of this genus cultivated in Britain are *R. pumila* (Dwarf Sumach), *R. viridiflora* (Green-flowered Sumach), *R. pentaphylla* (Five-leaved Sumach), *R. suaveolens* (Sweet-scented Sumach), and *R. aromatica* (Aromatic Sumach). There are also a great number grown in hothouses, many of which may probably bear exposure to the open air.

RHUS TOXICODENDRON (Trailing Poison-Oak, or Swamp-Sumach), a north-American shrub, possessed of peculiar properties. The leaves, which are trifoliate, thin, shining when fresh, of a dark-green colour, are the only parts officinal in this country. But the leaves, branches, and flowers contain a milky juice which blackens on exposure to the air, and may be used as an indelible ink when applied to cotton or linen. Besides this very acrid milk, the plant, when not exposed to the sun's rays, by growing in the shade, or during the night, exhales a hydrocarburetted gas, which acts very potently on persons of a peculiar susceptibility, when exposed to it. In two or three days after touching or being very near the plant, the skin inflames and swells, being attended with intense burning pain. If the face be affected, the eye-lids are so tumefied as to close up the eyes; and the whole head is swelled and covered with little blisters containing serum. Occasionally the whole body is enormously swollen and covered with similar vesicles. When the inflammation and swelling have subsided, the skin desquamates, and an intolerable itching is felt for several days afterwards. These symptoms closely resemble erysipelas, and are moderated by treatment suited to that complaint. Professor Barlow states that the best application is a weak aqueous solution of bichloride of mercury. All persons however should avoid touching any sumach which has milky juice.

The leaves, or an extract of the inspissated juice of this plant, have been recommended in several diseases, particularly herpes, paralysis, and consumption. It is little used in this country, but it appears entitled to some confidence in local paralysis, such as that of the jaw. It must be given with caution, as large doses act like narcotico-acrid poisons.

The bark of Rhus glabrum is said to furnish a most effectual means of checking salivation.

RHYME. Johnson's derives this word from the Greek *rhythmus* (ῥυθμός). Others derive it from the Swedish and Danish *rim*, the Dutch *rym*, and the German *reim*. All the principal European nations use the same word to signify the same thing. Thus the French have *rime*, the Italians *rima*, and the Spaniards *rima*. The Greek and Roman poets did not use rhyme, and the word rhythmus was applied by both, in its poetical meaning, to the metrical arrangement of syllables, and not to the correspondence of sound in their terminations. Rhyme was not used either by the Celtic or by the early Scandinavian nations. Thus the Irish and Erse poems on which Macpherson founded his 'Poems of Ossian' are without rhymes, as is also the Scandinavian poem of the 'Lodbrokar Quida' (Lodbroc's Death-Song). Rhyme, as an accompaniment of verse, cannot be traced farther back among European nations than to the *rymours* of Normandy, the *troubadours* of Provence, the *minnesingers* of Germany, and the monks, who, after the fall of the Roman empire, added rhyming terminations to the Latin metres which were chanted or sung in the church service. Rhyme was early employed by the Italian poets. The 'Divina Commedia' of Dante, the oldest of the great Italian poems, is in alternate rhymes. The early Spanish ballads sometimes have rhymes, sometimes only assonances [ASSONANCE], and sometimes, as in the old Spanish romance of 'The Cid,' are without either rhyme or assonance. The early Anglo-Saxon poetry is without rhyme, but it is sometimes used in the later. All the old English poetry has rhymes, which are rude and imperfect, like the versification, but they are obviously an adjunct to the verse which could not be omitted.

Perfect rhymes arise from the identity of sound with which different words terminate—the identity, not the similarity. In monosyllables, or words which have the accent on the last syllable, to constitute a perfect rhyme it is necessary that the sound of the last accented vowel and of any letters which may follow it should be exactly the same as those of the word with which it rhymes. The sounds which precede the last accented vowel must be different in the two words. The spelling is of no consequence; the rhyme is in the sounds, not in the conventional signs by which the sounds are expressed. Thus *no* rhymes to *so*, but not to *do*, which rhymes to *too* or *two*; *great* rhymes to *hate*, but not to *heat*, which rhymes to *fleet*; and so on. If the sounds of the last vowels or of any of the following consonants differ in any degree, however small, the rhyme is so far imperfect; thus, *love* and *move* form an imperfect rhyme, the sound of the *o* in love being not only shorter than that of the *o* in move, but to a certain extent different. These monosyllable or last-syllable rhymes are called male rhymes.

Another class of rhymes is formed from words in which the accent is on the last syllable but one. In this class it is requisite that the sounds of the last vowel in the last syllable but one and of all the following letters should be the same as those with which they rhyme. Thus *desiring* and *respiring*, *descended* and *extended*, are perfect rhymes of this class. These are called female rhymes.

The principle of rhyming, once understood, the application is easy in all cases. Thus, if the accent is on the last syllable but two, the sound of the last vowel of the last syllable but two, and of all the following letters, must be the same. Thus, *sensible* and *extensible* are perfect rhymes of this class; but *dissolute* and *resolute* are imperfect rhymes, the vowels in the last syllable but two of both words having different sounds.

The same principle of rhyming applies to all the modern languages, as well as to the English. Imperfect rhymes are more or less freely used in all of them according to circumstances. The English and German languages, which abound in consonants, and have for the most part consonant terminations, are more deficient in rhymes than the Italian and Spanish, which abound in vowels, and have for the most part vowel terminations.

The English use blank verse as well as rhyme in the ten-syllable measure, but they have not been successful in the omission of rhyme in any other of their forms of verse. There have indeed been a few attempts in lyric measures, of which Collins's 'Ode to Evening' and Southey's romantic poem of 'Thalaba,' may be taken as favourable specimens. The Germans have been more successful in their unrhymed lyrics. The Italians and Spaniards have lyric measures of all kinds, both with and without rhymes. The French have been quite unsuccessful in their attempts to introduce blank verse in any of their measures.

RHYNCHÆA. [SCOLOPACIDÆ.]

RHYNCHASPIS. [DUCKS, vol. ix., p. 178.]

RHYTHM. [ORATORY.]

RHYTHM (Ῥυθμός, *measure, proportion*), in Music, is *Time*; first, in a limited sense, as in the relative proportions of notes in a single bar; and, secondly, in a more general sense, as in the relative proportion of a number of bars in any given portion of a composition, as in either half of a minuet or of a march. Rhythm is the most important constituent of music; without it inarticulate sounds are unproductive of any musical effect. [MUSIC, p. 20, col. 2.] In melody, that is, a succession of measured sounds, notes are the component parts of a bar, and bars are the component parts of a strain, or musical period, or phrase. The due relative proportion of all these is absolutely necessary in the formation of a good musical composition; without it, says one who seems to have possessed a most discriminating and refined taste in the art,—

> 'How sour sweet music is
> When time is broke, and no proportion kept !'
> *Richard II.*

Musical *Rhythm*, in its limited sense, divides a bar into 2, 4, 8, &c. or 3, 6, 12, &c. equal parts; the former is *binary* measure, the latter *ternary*. In its more general sense it divides a strain, a phrase, or by whatever name the subdivisions of a composition may be designated, into equal portions of 2 or 4, &c. or 3, 6, &c. bars, or measures; and some writers have admitted a rhythmus of five bars. An intimate acquaintance with the nature of rhythm, whether considered in its relation to music or poetry, is essential to the accomplished composer; without a full knowledge of this he is perplexed by doubts, and guilty of errors which have too often brought reproaches on the art, when they ought to have fallen on the pseudo-artist. Our limits however will not allow us to extend this article; and we refer the reader, particularly the professional one, to a learned and able disquisition on rhythm in Burney's 'Hist.,' vol. i., p. 71; to Callcott's 'Musical Grammar,' where much practical information from Riepel and other German writers is to be found; to Kollman on 'Harmony;' and more especially to Reicha's 'Traité de Mélodie,' second edition, Paris, 1832, a very luminous work, the production of a highly-informed, deep thinking, and truly scientific musician. [PHRASE; TIME.]

RIASAN, or RJASAN (sometimes written *Räsan*), is an extensive government of European Russia, which derives its name from the very antient town of Riasan, which indeed has long since fallen into ruins, but the name has been transferred to the town of Pereslawl. It is situated between 53° and 55° 40′ N. lat., and between 38° 18′ and 41° 30′ E. long., and is bounded on the north by Wladimir, on the east and south-east by Tambow, on the south-west by Tula, and on the north-west by Moskwa. The area is nearly 16,000 square miles, according to Reymann's map, which is followed by Hassel, Stein, Cannabich, and Schubert; but Hörschelmann and Köppen make it only 14,650 square miles. The population, in 1838, was 1,241,000. It is divided into twelve circles. The country is traversed by many small hills and eminences, and the banks of the rivers are high. No large rivers run through it, but there are many smaller ones. The surface is diversified with little forests and groups of trees. It is only on the banks of the Don, the Osetr, and the Prona that the elevations are rocky; the other eminences consist of beds of stone, clay, marl, and lime, and are by no means unfruitful. The soil in general is a pretty thick layer of fine black mould. The wastes are susceptible of cultivation, but they are much neglected. The principal rivers are the Oka, which flows from the government of Moscow, and the Don, which issues from lake Iwanowskoe, on the frontier, both of which rivers receive smaller streams. The greater part of the canal is in this government, which joins the Bakowa, a tributary of the Prona, which flows into the Oka, and the Lernoi, which flows into the Woronesh, a tributary of the Don, thus making a communication between the Wolga and the Don by the Oka and the Woronesh. But this canal seems to be of little use, because the above small rivers are not navigable by boats except in spring, when the water is high. There are no large lakes. In autumn, winter, and spring the weather is variable, and in summer hot. The climate is healthy.

The soil is on the whole very fertile, especially in the southern part, where it is drier than in the northern, which contains some marshes. Rye, wheat, oats, barley, millet, flax, and hemp are cultivated. There is not only sufficient corn for home consumption, including large quantities used in the distilleries, but even in moderately productive years a considerable surplus for exportation. Horticulture is very general; every peasant has his kitchen-garden, where all kinds of Russian culinary vegetables are grown, especially cabbages, which in some seasons weigh from 35 to 40 pounds. Most of the peasants grow hops, which are an article of exportation. Apples and cherries are the fruits chiefly cultivated. There is sufficient wood in the southern parts, and abundance in the northern circles. On the banks of the rivers there are meadows covered with the most nutritious grasses, and good pasturage in the forests. In the plains or wastes too there are large tracts very well suited for sheep-walks. The breeding of cattle might therefore be more extensively carried on than it is; but the farmers let their pasture-land to the cattle-dealers of the Ukraine. A farmer has generally two or three horses, three or four cows, and five to ten Circassian sheep. Few swine are kept, and no domestic poultry except the common barn-door fowl. Bees are very generally kept. Fish abound in the rivers, and great quantities are exported. There is little game of any kind, but the number of quails is remarkable; many thousands are killed in the autumn, which are salted, and sent in small barrels to all parts of the empire. The minerals are iron-stone, clay, marl, lime, a little free-stone, gypsum, vitriol, and sulphur.

There are few manufactures of any importance, and those chiefly in the towns. The country-people spin thread and worsted yarn, and manufacture coarse linen and woollen cloths, leather in considerable quantities, wooden agricultural and domestic implements and utensils, and bast shoes. The brandy distilleries are numerous. The exports of the government consist in the surplus of its natural productions, and of its manufactures, especially leather. Almost all the exports go to Moscow, from which it receives in return such articles as it has need of, except salt, which it obtains from the banks of the Wolga.

The inhabitants are all Russians, except a small number of Mordwins, who live in a few villages, and between 4000 and 5000 Tartars, who live partly in the town of Kasimow, and partly in some villages. The archbishop of Riasan and Saraisk is at the head of the Greek clergy. He has 6 monasteries and 841 parishes under him. The Mohammedan Tartars have their imams, mosques, and teachers.

Riasan, the capital of the government (formerly called *Pereslawl Riäsanski*), in 54° 58′ N. lat. and 39° 20′ E. long., is situated on the river Trubesch (a branch of the Oka) at its junction with the Lebeda. It is a well built town, not fortified, but only surrounded with palisades. It is the residence of the military governor of Riasan and Tambow, of the civil governor and the government authorities, the see of the archbishop, and has a seminary for priests, a gymnasium, 20 churches, and manufactories of woollen cloth, linen, sailcloth, leather, glass, and iron-wares and needles. There are about 9000 inhabitants.

Saraisk on the Osetr has 5000 inhabitants, 8 churches, and a great trade in cattle. Kasimow on the Oka and the Babinka, has 10,000 inhabitants, of whom 500 are Mohammedan Tartars, who carry on a great trade in furs.

RIBALTA, FRANCISCO, was born at Castellon de la Plana in the kingdom of Valencia in Spain, 1551. It is thought by some that he at first formed his style by studying the works of Juan Batista Juanes, whose works adorn many of the churches at Valencia, and some of his pictures appear to favour that position. But he subsequently visited Italy, where he resided some years, and there seems to have acquired a taste for the style of Sebastian del Piombo, of many of whose pictures, in the royal collection at Madrid, he made copies, three of which are in the convent of the Carmelites in that city. In an inscription on one of these pictures in the hospital of Monteerratte at Madrid, he calls himself the translator of Sebastian:

> 'Fra Sebatianus del Piombo invenit;
> Franciscus Ribalta Valentiæ traduxit.'

He died at Valencia in 1628, aged 77. His best works are at Valencia.

RIBALTA, JUAN, son of the above, was born at Valencia in 1597. He was the pupil of his father, and in his eighteenth year painted a picture of the Crucifixion, which is still numbered among the master-pieces of the Spanish school. He would probably have attained the highest eminence in his art, had he not been cut off in the flower of his age. He died in the same year as his father (1628), in the 31st year of his age.

RIBAND, or, according to the common orthography, **RIBBON**, signifies a long narrow web of silk worn for ornament and use. Ribbons of linen, worsted, gold, or silver thread were formerly included in the term, but it is now generally confined to those made of silk. Johnson derives the word from the French *ribande* or *ruban*, which Skinner, in his 'Etym. Ling. Angl.,' imagines to be formed from the Latin particle *re* and the Saxon *bind* or *bende*, thus meaning to double or tie back. According to others, it is derived from *roux*, red, and *bande*. Alfonso XI., king of Castile, instituted in 1332, for the younger sons of noble houses, the order of the Band, which was a *red* ribbon worn over the right shoulder and under the left arm of the knight. The word *band* is common to all the Teutonic languages; whether allied in its origin to the low Latin *bandum* (an ensign), the Cambro-britannic *bannar* (a standard), or to the Saxon *bend* (anything that binds), is disputed. Ribbon, in German, is *band;* Danish, *buand;* Swedish, *band*, Dutch, *lint;* Russian, *lenta;* Spanish, *cinta;* Portuguese, *fita di seta*, from the Latin *vitta:* Italian, *del nastro*, *fettuccia*.

Webster maintains that 'ribbon' has no connection with *band*, but that it is of Welsh origin, from *rhibin*, a row or streak; Irish, *ruibin;* Armoric, *rubanou;* French, *ruban*. Conformably with this opinion, he writes the word *ribin* in his 'Dictionary,' a mode of writing which represents the vulgar pronunciation as well as that of Sheridan—*ribbin*. Chaucer, in the fourteenth century, speaks of 'ribaninges,' meaning apparently borders.

Whether, in its origin, the name of ribbon were a *banner* or a *band*, or neither, the ribbon has served in the cause of both love and war in its subsequent history:

> 'See, in the lists they wait the trumpet's sound,
> Some love device is wrought on every sword,
> And every ribbon bears some mystic word.'—*Granville*.

The knight went forth 'to do or die,' strong in the badge of scarf or ribbon received from his ladye love, while, twined in a true-love knot, it cherished her constancy at home. The village swain buys a ribbon at the fair to adorn his sweetheart's rosy cheek; the young recruit walks proudly under the gay-coloured knot fastened to his ploughman's hat; and the veteran commander arrays himself in the ribbons of his orders. The white ribbon wedding-favour is the emblem of innocence and happiness, while a green, a blue, or an orange cockade is the herald of strife to a town, a county, or a nation.*

There can be no doubt that silk was early wrought into ribbons, and that they formed a branch of the silk manufacture during its progress from Greece to Sicily, and from thence to Italy and Spain; but the ribbon trade seems first to have assumed distinct importance in France. Louis XI. is supposed to have made the first successful attempt to produce silk in his kingdom; he planted mulberry-trees, and in 1480 settled some Italian silk workmen at Tours. Under Francis I. and Henri IV. the manufacture advanced rapidly. It was established at Lyon by the former in 1521, by means of some Milanese artisans, whom he prevailed upon to fix themselves there under his patronage; by the latter monarch it was established at Paris, and, amongst other encouragements, he promised patents of nobility to such of the manufacturers as should have persevered in it for twelve years. 'France, until this time,' observes the 'Encycl. Méthod.,' 'was an agricultural and commercial nation; since then the silk manufacture has contributed to extend both the one and the other.'

Paris, Tours, Lyon, and Avignon were the chief seats of the ribbon trade; the two last cities were rivals until the year 1723, when, partly owing to the regulations which the jealous Lyonnese had prevailed upon the government to make in their favour, and partly to a plague of two years' continuance, the trade of Avignon was ruined, and in great measure transferred to Lyon. At Paris the master ribbon-weavers were incorporated into a company, under the designation of *tissutiers rubaniers* of the town and suburbs of Paris: they were also styled, together with the makers of gold and silver ribbons and galloons, fringes, borderings, &c., *ouvriers de la petite navette* (shuttle), in contradistinction to the makers of broad stuffs of gold, silver, and silk, who were entitled *ouvriers de la grande navette*. Figured ribbons were made chiefly at Paris. The 'Encyclopédie des Sciences,' &c. states that, about the year 1680, there was a rage for ribbons *gauffrés*, or embossed, on account of their novelty. The stamping was performed by hot plates of steel, on which a pattern was engraved, being applied successively along the piece. A master-weaver named Chandelier, tired of this slow process, contrived a machine which would save his trouble. He engraved his figures on two cylinders of steel, between which, when heated, the ribbon was compressed and drawn rapidly by a simple machinery, so that a piece of ribbon was embossed in less time than his brother-workmen consumed over a single ell. 'The genius and invention of this weaver had their recompense —these ribbons *gauffrés* made his fortune.'

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* By an act 7 & 8 Geo. IV., c. 37, candidates at elections are forbidden to give ribbons or cockades or any distinctive marks to their voters, under a penalty of 10*l*.

The ribbons called *double lisse*, (double warp) which were considered the richest and best, were made at Tours. Before the revocation of the Edict of Nantes, the ribbon-looms of Tours amounted to 3000; but this measure, which banished the Protestants, banished with them their trade, and both Tours and Lyon suffered severely from its effects; the trade of Lyon afterwards revived. Savary, inspector-general of French manufactures, in his 'Dictionary,' published in 1723, says, that the trade in ribbons was much diminished in his time: he also remarks—'It may seem strange that in London, where they excel in this sort of fabric, they give the preference to the Parisian ribbons, while at Paris, as if in compensation, there is a sort of rage for the English, although those of Paris are not very inferior.' This was likewise the case at the time when the importation of ribbons was prohibited in both countries—an instructive commentary on the wisdom of such prohibitions—although, some time previous to the date of the first edition of the 'Dict.,' English ribbons were admitted on paying a duty of 4 francs per lb. In the 'Encycl. des Sciences, &c.,' published in 1765, there is the same complaint of the decline of the ribbon manufacture in France, but still the consumption was large, and large quantities were exported. In the enumeration of the different kinds of ribbon, a double satin is mentioned, that is, one alike on both sides in texture, although sometimes of different colours.

The 'Encycl. Méthodique' (1784) estimates the number of French looms employed in ribbons, galloons, &c. at 12,000, and gives the following amongst other information on the subject:—The ribbon manufacturers bought their silk already dyed. The price of the dyed Italian organzine was from 52 to 57 livres per lb. of 15 ozs.; of tram, from 30 to 40 ditto. The wages of the engine-loom weaver were from 40 and 50 sous to 3 livres per day. The kind of ribbon called *ruban Anglois* was composed of organzine warp and China shoot, both of fine quality. These ribbons, being light in texture and dressed with care, possessed a brilliancy which caused them to be much in favour. The ribbons of Paris were then esteemed the best in make, but Lyon, with its neighbours St. Etienne and St. Chamond, supplied the largest quantity. The chief markets for the best qualities were Francfort, Leipzig, Lübeck, Petersburg, and England, notwithstanding the prohibition; for the inferior, Italy and Spain. Figured ribbons were made in Flanders, the Lower Rhine, Germany, and Switzerland. Ribbons formed the principal commerce of Basel; many of the Swiss ribbons, though inferior, were sold for those of St. Etienne when the demand at that place exceeded the supply. Plain ribbons were made largely in Spain, at Saragoza, Seville, Murcia, Granada, &c., and brocaded at Valencia. In speaking of Lyon, this writer observes, 'that by the novelty, freshness, and elegance of its designs, it has long held and will long continue to hold the empire of taste. It has originated the most ingenious machines to facilitate the operations of its arts, and from thence have they been carried out over the world. The manufactures of Switzerland, Germany, Spain, and even of Petersburg, were set on foot by Lyonnese or by apprentices from them. The English alone appear to owe us nothing on this score. They have invented, copied, or imitated almost all kinds of silk goods, and if they do not always equal the French taste and delicacy, they keep up the qualities with a steadiness which results from the employment by the manufacturer always of the same material for the same purpose, and from the keeping of the workman always to the making of the same kind of fabric.'

The making of ribbons and small articles in silk long preceded in England that of broad silk. The trade was principally in the hands of women; and, like a sickly plant of foreign growth, it appears to have constantly demanded props and support. In the reign of Edward III., an act was passed to prevent artificers from using more than one trade or mystery, the silk-women and other female artificers being exempted from its operation. In the same year, 1364, an enactment was made for the regulation of apparel, by which none under the degree of esquires of 200*l.* of yearly rent, and their ladies, with some few exceptions, were permitted to wear stuff of silk, silver, ribbons, girdles, or furs. By an act of Henry VI., nearly one hundred years later, 'for the encouragement of silkwomen and throwsters,' it was forbidden to import wrought silk, ribbons, laces, &c., under a penalty of 5*l.*, the act to continue in force for five years. This was renewed in the third year of Edward IV., with a sort of apology, which, if good for anything, made the prohibition unnecessary. The act states that not only were the artificers, men and women, 'greatly impoverished, hindered of their worldly increase and daily living, by these wares and chaffres being brought in fully wrought and ready for sale by strangers, the king's enemies, and other,' but that 'the greatest part in substance was deceitful, and nothing worth in regard of any man's occupation and profit.'

The next sumptuary act forbids the wearing of silk by persons not possessing more than 40*l.* per annum. The increased consumption of silk is shown in the lowered qualification, and at the same time a striking proof is given of the shortsightedness of legislative interference on such points; with one hand the government strove to hold up the trade by shutting out foreign supply, with the other to check the home demand. By acts passed in the first and second years of Philip and Mary, the lower classes and servants, upon whom it appears the prohibition had now descended, were forbidden to wear silk on hat or bonnet, &c., under pain of imprisonment for three months and forfeiture of 10*l.*

The law against the importation of ribbons, &c. was renewed at successive intervals until the 19 Henry VII., when it was made perpetual. Foreign ribbons notwithstanding still made their way over, and we find another attempt to check the trade in an order of Charles I., which forbids any silks to be imported under the breadth of nine nails and a half. A proclamation of this king in 1630 furnishes us with another example of the blunders that legislation is apt to make in such matters:—'Seeing that the silk trade was enlarged to the enriching of the kingdom, and setting many thousand people to work, unless the deceitful handling thereof do bring the same into discredit, and thereby deprive the land of so hopeful a trade when it hath near attained the perfection thereof, and whereas it hath lately been discovered that a notable abuse hath crept in by adding to the weight of the silk in dyeing, it is commanded that no dyer should henceforth, now or at any future time, use any slip or alder-bark, or iron-filings, and no silk be dyed of any black but Spanish black, and that the gum shall be fair boiled off before dyeing.' Being however afterwards 'better informed,' and finding that taffeties, some kinds of ribbons, and other articles required to be made of hard silk, or silk dyed upon the gum, this part of the ordinance was rescinded, in a subsequent proclamation dated 1638. (Rymer's *Fœdera*.)

The silk-throwsters were incorporated by a charter obtained 5 Charles I., about ten years after the establishment of the broad-silk manufacture, in the reign of James I.: the silk-weavers were already included in the great company of weavers. Towards the end of the reign of Charles II., the silk manufacture, which had hitherto been almost confined to London, was carried into several other large towns of the kingdom by the French Protestants, who took refuge in this country, to the number, it is said, of 70,000, after the revocation of the Edict of Nantes in 1685, and amongst the rest to Coventry. Camden tells us that 'the wealth of Coventry arising in the last age from the woollen and camblet manufacture made it the only mart of this part, and more resorted to than could be expected from its midland situation.' The ribbon trade, of which it has since become the chief seat in England, was introduced early in the last century by Mr. Bird, assisted probably by some of the French emigrants: the number of French terms still used in the manufacture proves that its origin was, in part at least, foreign.

After the treaty of Utrecht, in 1713, French and Italian manufactured silks were admitted under considerable duties; but in 1765 the ribbon and other silk manufacturers procured the re-establishment of the prohibitory system, which was thenceforward maintained for sixty years, enforced by heavy penalties. With the increase of population and the greater demand for luxuries, the home market increased; but an export trade, principally to America, gradually decayed, in consequence perhaps of the heavy duties on raw and thrown silk. During this period of restriction, ribbon-weaving seems to have degenerated in this country as regards the superior branches. In a petition to parliament from the Weavers' Company, in 1713, against the commercial treaty with France, it is asserted that the English ribbons were as good as those of the French. It was stated by a Coventry manufacturer to the Commons' Committee on the Silk Trade, in 1832, that he had seen 'patterns of ribbons made from fifty to a hundred years ago in England, wider, richer, and of larger figure than were made just prior to the introduction of French ribbons in 1826.' (Question 866.) Most of the specimens adduced by the Spitalfields manufacturers who were then examined in proof of their assertion that our silk-weaving needed no instruction from French patterns, were of a like early date. On this occasion it was generally assumed that English ribbons were inferior to French. Recollecting also the observation of the French writer, at a time still farther back, 'that the Parisian ribbons were not very inferior to the English,' we are led to ask why English industry and skill have not in this instance maintained their accustomed superiority, and to suspect that they have been repressed rather than stimulated by the system of prohibition.

In 1824 the government determined to try the effect of an approach to free trade upon the silk manufacture. As a preliminary step, the duties on raw silk were reduced from 4*d.* per lb. to 3*d.*, and afterwards to 1*d.*; and on thrown, from 14*s.* 8*d.* to 7*s.* 6*d.*, and afterwards to 3*s.* 6*d.*, 2*s.*, and 1*s.* 6*d.*, according to quality, with a drawback to the amount of the duty allowed on any manufactures of silk exported, whether they were or were not made of the foreign thrown silk which had paid the duty. Two years were allowed after the lowering of these duties to prepare for the admission of foreign manufactured silk at a duty of 30 per cent. During this interval the reduced price of silk stimulated the Coventry trade; the market was brisk; considerable capital was embarked to meet the increased demand, even in those branches which would inevitably suffer the most from French competition, and consequently an accession of hands was drawn into the manufacture. There were 5 Jacquard looms in Coventry in 1823; in 1832 the number had increased to 600. This period of two years was virtually prolonged for one or two more, by an exclusion of the goods prepared for our market in 1826, in consequence of an after regulation which required the pieces to be of the English lengths. As those differ from the French, the full force of foreign competition was not felt until 1828. A reaction then took place in Coventry as elsewhere; deep and loud were the complaints of masters and workmen, and the distress among the latter was great.

Besides the shock which the change even from a worse to a better system must occasion, unless prepared for by all parties with extraordinary prudence and foresight, and besides the vicissitudes to which all trades are subject, that of ribbons is peculiarly liable to fluctuation from the caprice of fashion. A demand suddenly arises, continues for one, two, or more seasons, and requires the employment of many new hands; it ceases as suddenly, and they are thrown out of employ. Wages are reduced, starvation threatens the workman, and it is not surprising that he should petition that his labour may again be rendered available by shutting out that of others abroad or at home.[*]

A Committee of the Commons was appointed in 1832 to inquire into the state of the silk-trade, at which such of the leading ribbon manufacturers as disapproved of the late measure, and also some of the weavers, attended. They were unanimous in demanding a total prohibition. 'Nothing short of this could enable them to make ribbons at all.' (Qu. 1844.) 'The inveterate *prejudice* in favour of French fancy ribbons made nugatory the protecting duty; it was not a matter of 'price, but of fashion.' (Qu. 2420, 2495.) Smuggling, which had not even diminished since the legalised entrance of French goods, would in all probability increase under a renewal of restriction; but 'smuggling to a certain extent was beneficial, for it furnished the manufacturers with patterns.' (Qs. 447, 737, 738, 846.) With total prohibition then was demanded a more vigilant preventive service, and severe personal penalties on smuggling, whilst the hope was still entertained that after all ribbons enough would be smuggled to furnish patterns and styles. By this expensive apparatus the capitals embarked in the fancy trade *might* be protected, provided that the public, when they could not get their favourite French article, should not give up the use of fancy ribbons altogether. The duty was allowed to be a sufficient protection against the French plain ribbons, the English being so nearly equal to them in quality; and several of the manufacturers admitted that some improvement had taken place in the fancy goods since the entrance of their foreign rivals. The partner of a London house largely concerned in the trade asserted that this improvement was very considerable, and that the stimulus of foreign competition was required. It was conceded by one of the manufacturers in his evidence, that although patterns had been obtained by smuggling before the removal of the prohibition, they had formed no idea until then of the extent of the French manufacture, nor of the style and fashion that would be introduced. (Qu. 803.)

This inquiry led to no alteration in the system which the government had adopted, and two further remonstrances made by the same parties in 1833 and 1834 had a similar result.

That France possesses some advantages over us in this peculiar fabric is undoubted. These advantages consist in the superior cultivation of taste—even the weavers may be seen arranging the flowers of a nosegay, so as to produce the most beautiful combinations—in the growth of its own silk, some of which, from the Cevennes, is the finest in the world from its peculiar brilliancy; and in the cheapness of labour, the cost of which is on an average about half that of the English. In their gauze ribbons these advantages unite with peculiar effect; the fine white silk, the exportation of which is not allowed, the greater proportion in them of labour to material, and the elegant variety of which they are susceptible, constitute them, in the words of the English weavers, 'a more natural manufacture of France, as hardware and cottons are a more natural manufacture of England.' It appears just that these advantages should exchange with each other, and it must not be forgotten that these gauzes must be paid for by British labour in some shape or other.

The English throwsters in 1817 petitioned the government to take off the duties on raw silk, in the expectation of exporting thrown silk, as this country now exports cotton yarn. Mr. Doxat gives it as his opinion that the throwster in England does his work cheaper, relatively, than in France or Italy, and has the command of a greater variety of silk. It appears from the evidence of Dr. Bowring, laid before the committee of 1832, that the French themselves expect that, from the superior capital and machinery of our throwsters, English thrown silk will soon be imported into France. He also states that the impression in France was so strong that the English silk fabrics had greatly improved since 1826, that considerable alarm was felt on the subject, and a high authority at Lyon expressed his belief that it would be better to prohibit the export of silk goods to England. English silks are not now prohibited in France, as they formerly were, and upon the whole the silk manufacture has been less 'protected' there than almost any other, and it appears to have prospered partly for this reason; all foreign silks are admitted into France at a duty of from 13 to 15 per cent. The importation of English manufactured silk into France was in 1828 to the amount of 4699*l.*; in 1830, 24,810*l.*; in 1838, 56,598*l.*

According to Dr. Bowring, in 1831, the number of ribbon manufacturers at St. Etienne and St. Chamond was 200. The number of ribbon looms in these towns and the surrounding district, which in 1812 was 9000, had increased to 23,000. Their daily produce was 350,000 ells. There are three kinds of looms in use: 1st, the old unimproved single-hand looms called *basselisse*, employed for plain satins and sarsnets; they were 18,000 in number, and are used by weavers who engage themselves in agriculture when there are 'no orders' in the town. 2nd, the single-hand loom called *hautelisse*, generally applied to produce large patterns:

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[*] Note. 'It was estimated before the admission of French goods, that the number of hands then in the trade could have produced in nine months, if fully employed, the whole of the year's sales of Coventry manufacturers, and this permanent excess of hands was aggravated to an 'awful depression' by the first brunt of French competition. During a slack time one-third or more of the single hand looms, and a very large proportion of the engine-looms, especially those in the fancy trade, always have been out of work, but in this case it is not the same looms that are unemployed during the whole slack time.'—(J. Fletcher, Esq., *Report on the Hand-loom Weavers.*)

of these there were 500, 100 having the Jacquard machinery attached. 3rd, the *à-la-bar*, or *bar loom*, 5000 in number, of which 800 were employed in sarsnets, 200 in velvets, 700 sarsnet galloons, 800 stout and light satin, 2000 Jacquard, and 500 striped gauzes. Two-thirds only of these were actually employed. The proprietor of the looms, who receives the work from the manufacturer, is called the *passementier;* he gives half the price paid for the weaving to the *ouvrier*, who is the weaver. The lowest daily earnings of the last were equal to about 1*s.*, the highest to 3*s.* 8*d.* There is a list of prices for weaving agreed upon amongst the manufacturers of St. Etienne, as there is at Coventry. Goods are not made on speculation, the trade being conducted by orders.

At Lyon a recent contrivance, by which the broad-silk loom had been made applicable to ribbon-weaving, had brought back a portion of the trade which had almost deserted it. By the introduction of 4 small shuttles instead of one, 4 pieces of ribbon were woven at once. There were 800 or 900 looms, chiefly Jacquard, and from 30 to 40 single-hand employed for the richest goods. The value of the French ribbons exported in 1831 was about 936,945*l.*, of which England took 75,147*l.*, the United States 472,678*l.* The whole annual value of the ribbons manufactured in France in 1832 was estimated by Mr. Dillon, in his evidence before the silk committee, at 1,300,000*l.*; in England, from 800,000*l.* to 1,000,000*l.*

The Swiss exchange their inferior ribbons for the superior ones of the French; their sarsnets are now superior to those of St. Etienne. They have an advantage in the manufacture, as they pay no duty on the silk, and the manufacturer is generally his own importer, throwster, and dyer. There were about 3200 looms at Basel in 1831, principally for plain goods. Switzerland is entirely free from protective duties. (Dr. Bowring.) Large quantities of Swiss ribbons came in on the opening of our trade, but they could not enter into competition with the English in quality or price, the cost of transport being considerable.

At the present time there are few if any ribbons made at Lyon; many of the looms which had been converted into ribbon-looms being now employed in weaving shawls.

The silk manufacture was established in Dublin about the same time as at Spitalfields by the French Protestants. Ribbons were made there in considerable quantities. In 1824 the number of ribbon engine-looms amounted to 996. The trade seems to have laboured under still greater inherent disadvantages than that of the English, one of which was that the price of silk was enhanced to the manufacturer by the additional charges consequent upon its transmission through London. When exposed to British competition by the withdrawal of the protecting duties which existed before the Union, and soon after to that of the French also, the trade sunk beneath the shock, and is now almost annihilated, a fact which proves that its growth was unsound and premature. The influx of the distressed Irish silk weavers to Coventry, Macclesfield, and other places increased the number of unemployed hands in those towns. The Irish manufacturers made precisely the same remonstrances against the free admission of English silks which those of England did against the importation of the French. (Commons' Committee, 1832.)

After a period of ten years the result of French competition appears to be this—an increase in the consumption of ribbons altogether owing to the beauty and taste of the French ribbons. These create the fashion and supply the highest market, while Coventry has a collateral trade among the middle and lower classes, which extends with the other. This is proved by the fact that although the importation of French ribbons has increased with the increasing acquaintance of the foreign manufacturer with the English market, the number of looms has augmented in Coventry; in 1838 more ribbons were made there than in any one year before. At the close of the last war, when an extraordinary demand for ribbons with large pearl edges had occasioned a sudden extension of the trade, the number of looms in Coventry and the surrounding parishes was 8491; in the year 1838 the number was 13,239, nearly all of which were employed. The real increase in the number is greater than at first sight appears, owing to the larger proportion of engine-looms, which make several pieces at once, to the single-hand. The quantity of silk dyed in 1827 was 339,956 lbs.; in 1837, 451,110 lbs. The fashion, which in 1832 was in favour of gauze ribbons, had exchanged them for a heavier style of goods, and many ribbons were produced in Coventry which equalled in quality their foreign rivals of the same make.* The anxiety to procure French fabrics merely as French has diminished since they became more common. A purchaser asks less often than formerly 'is it French or English?' and if the question be put, it not unfrequently happens that an article is termed either the one or the other to meet the wishes of the customer, so slight is the appreciable difference. Some of the Coventry manufacturers are also importers of French ribbons. Mr. Fletcher states, in his Report on the Handloom Weavers, 'that neither the weavers nor the master manufacturers generally mentioned prohibition as a remedy to which they now laid claim.' The masters demand chiefly better regulations concerning the levying of the duty, which, from the want of a custom-house officer acquainted with the ribbon trade, is done with great inexactness, some goods paying more than, and others scarcely half, the legal amount of duty; and that smuggling should be punished by personal penalty rather than by fine; for as smuggling is now carried on by a few large capitalists, who calculate the risk of fine in the charges, instead of by petty coasting traders, as was the case under the system of total abolition, the punishment by fine affords scarcely any protection. The cost of smuggling in 1830 was reckoned at about 20 per cent.†

Originality is at present very little attempted in patterns; they are in general mere copies of the French or recombinations from them. There are a few artists and superior weavers engaged in preparing them, but their remuneration is trifling. A drawing-class at the Mechanics' Institute, London, has had some effect in developing a taste for design among its members; and a School of Design, supported by national funds, has existed for more than two years in London, under the superintendence of government.

The ribbon manufacturers of Coventry are about 130 in number, including about 40 'first-hand journey-hands' who own their looms and work them on their own account. These employ nearly all the hands of the district. The leaders of the trade are not, as formerly, the manufacturers, but the 16 or 18 London and Manchester houses through whom the ribbons are distributed to the retailers. Their buyers attend at Coventry regularly, many of them once a week; according to the demand, they give orders or purchase from the stocks already made. To keep his best hands together the manufacturer is obliged to give out work even when trade is flat; his stock therefore continually accumulates; if of fancy goods, it must be sold whilst fashion favours the demand, or kept at the risk of heavy loss; if of plain goods, they are held with the chance of fluctuation in value as the price of silk rises or falls. A reduction in the price of weaving would depreciate the value of the stock in hand; the manufacturer has therefore so far an interest in keeping up the rate of labour. Formerly the same price was always given for the same labour, so that if from the depression of trade this was too high for the profits, the manufacturer gave out no work at all, but when the old system of trade was changed by the competition of the great warehousemen, and the excess of hands increased, numbers were glad to obtain work on any terms. This led to a general reduction of wages; the larger manufacturers and the weavers struggled ineffectually to maintain an equality of the prices of weaving by voluntary co-operation in the trade, and they attempted in 1818 to procure the extension of the Spitalfields' Act for the regulation of the silk weavers wages by the magistrates, from London and Dublin to Coventry. The evidence however adduced upon this occasion led to the repeal of the act altogether in 1824. Many efforts were subsequently made in Coventry to establish a list of prices to which all should conform, but the competition with France, with steam-power, and the interests of the trade continually caused its infraction, and since 1834 there has been no fixed regulation of prices except in the plain engine-trade.

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*The best ribbons made in France are those prepared for the English market; the home consumption is chiefly of less costly goods.

† The cost of smuggling is now (1840) rated at from 10 to 15 per cent. The proportion of French silk goods smuggled into England to those regularly entered, between the years 1827 and 1833, varies from 36½ per cent. to 58½ per cent. per annum. ('Report of the Select Committee of the Commons on the Import Duties,' August, 1840.) Since the above remarks on French competition were written, this Report has appeared, and is strongly corroborative of them. It must not be forgotten that the impolicy of prohibition shown in one branch of trade applies to all. It is not surprising that, when the manufacturer, upon every successive reduction, represents to the weaver that his wages are lowered because French ribbons are admitted, he should believe that this is the cause of the evil which oppresses him, and that he cannot see why, if he must make cheap ribbons, he may not be permitted to have cheap bread. The winter of 1839-40 was a season of considerable distress at Coventry, from a change of fashion, added to the general depression of the manufacturing interest. The ribbon manufacture of England has sufficient difficulties to encounter in its rivalship with the French, to require the aid of the only legitimate protection—an unrestricted interchange of its productions with the necessaries of life in the markets of the world.

The weaving is done on several systems. The *undertaking system* applies now only to the single-hand trade in the country districts,—Bedworth, Nuneaton, Hartshill, &c.: it is the same that the French have employed since the days of Colbert. According to this plan, the undertaker, or master-weaver, receives the silk dyed in the hank from the manufacturer, and returns it in finished ribbons to his order; all the intermediate operations being included in the price of weaving—two-thirds of this are paid to the journey-hand for his labour; three-fourths of the single-hand weavers are women, and nearly one-half of the remainder are youths under 20. Boys and girls are considered competent weavers at 16 or 17.

On the *journey-work system*, by which the great proportion of the engine-looms in Coventry and its neighbourhood are worked, the manufacturer gives the silk, already wound and warped, to the 'first-hand journeyman,' who is also the owner of the looms. The shoot silk is given in bank, for the winding of which the manufacturer allows 1*d.* per oz., besides the price for weaving, in which is included 'the filling,' or the winding of the shoot on the small revolving pins within the shuttles. About one-fourth of the hands employed on this system are women.

On the *hand-factory system* the manufacturer is the owner of the looms. The 'journey-hands' work them in the 'loom-shop' of the proprietor, who gets the winding and warping done at his own charge, leaving only the filling to the weaver, which is included in the price of his work, and is often done by very young children. This plan is adopted by many manufacturers of small capital, who, by personally superintending the work, and becoming in fact their own 'undertakers,' are enabled to economize to the utmost in the cost of production, while their hands are all reduced to the lowest condition of the weaver—the journey-hand, who supplies the labour, and has no property in the looms. A modern innovation, encouraged by the last system, is the employment of two hands to a loom, the one being occupied uninterruptedly in 'shooting down,' or passing the shuttle and making the ribbon; the other in 'picking up,' or fastening broken threads, picking out knots, &c. The perpetual 'shooting down' without the 'picking up,' which relieves the muscles, requires more than ordinary strength; besides which the weaver, being confined to the almost mechanical successive movements of his feet upon the treadles, one hand driving the shuttle, the other striking the shoot with the batten, is reduced from a skilled artisan to the mere moving-power of a machine. The weavers therefore oppose this arrangement, although it is found that in light work a man of average strength, with his wife picking up for him, will get through nearly double the work of a single weaver, and thus save the difference between the value of his own labour and the cheaper labour of his wife.

On the *steam-factory system* the manufacturer gets every preparatory process done; and by the steam-power one half of the weaving process itself—the shooting down: all that is left to the weaver being the picking up and superintendence. The profitable application of steam-power to silk-weaving was long considered to be almost impossible, so large a portion of time being consumed in the handling and trimming of the silk, in proportion to the time that the loom is in motion, and a consequent waste of power. 'I despair,' said one of the Macclesfield manufacturers in 1832, 'of ever applying power-looms to silk.' (*Commons' Committee*, 1832; Qu. 11,494.)

A small factory was built in Coventry in 1831, for the purpose of making the experiment on ribbons. It was burnt however during a disturbance relating to prices; and though the act was disclaimed by the weavers in general, the feeling amongst them was so strong against the employment of *inanimate labour* whilst their own was superabundant, that the scheme was given up. Within a few years there were numerous steam-factories at work at Congleton, Leek, Derby, and other places, which made large quantities of plain ribbons, chiefly black sarsenets. The Coventry manufacturers, alarmed for the interests of their trade, formed, in 1836, a steam company, and erected a large factory, but difficulties arose as to the apportionment of the power among the different parties, and it has never yet been fitted up for its original purpose. Another large factory was soon after built, and applied to the making of figured ribbons, but owing to the failure of the parties, the experiment was not fairly tested; the difficulties must be greater in the case of figured than of plain ribbons, because in them the unskilled labour, which the steam-power supplies, bears less proportion to the value of the article than in any other. One experiment on a smaller scale had some success. The steam factories of the north and of Derby have proved its advantage as applied to plain ribbons. At Congleton there were, in 1838, 254 power-looms engaged in the manufacture of plain black, a few black satin, and some plain coloured ribbons; at Leek there were 100 employed in the same way, and at Derby 233. In these each loom is tended by one pair of hands, which pick up and keep the machinery in order: the gain consists, not in a more rapid motion of the shuttles, the delicacy of the materials not allowing of this, but in the shooting down being seldom interrupted during the picking up, as in hand-loom weaving; in the greater regularity of the fabric, the same number of shoots to the inch being uniformly maintained; and also in the addition of from one-fifth to one-third more shuttles, for which one workman suffices, the loom being so constructed as to enable him to reach from the front over the batten to the warps behind. But when two pair of hands are required for one loom, as is the case with the Jacquard, one before the loom to tend the work, and one behind to pick up, the advantage is much lessened; the only chance of saving will be by the use of the best possible silk in order that few stoppages may occur. The goodness of the silk is plainly of much importance to the success of all steam-loom weaving. It is undoubtedly making great progress notwithstanding all disadvantages; at the present time (1840) the steam-factory at Coventry, which formerly failed, is again at work under the management of fresh parties, who are making both plain and fancy ribbons with a strong probability of ultimate success The fine factory belonging to the Steam Company, which is now occupied by broad silk steam-looms, has one ribbon-loom at work; and in one other instance, in Coventry, Jacquard steam-looms are employed in making light figured ribbons with great precision and beauty, and in this case it is found that one man is able to tend the front and another the back of two looms. There can be little doubt that the time is approaching when steam will be the chief motive-power of the ribbon as of other manufacturing districts, and that the strength of English machinery will be called forth to enter into competition with French taste.

Raw Silk is the silk in its natural state when wound from the cocoon. It varies in fineness according to the number of cocoons reeled off at once to form one thread, the filaments of which are united by their viscid property. In the process of dyeing the gum is discharged more or less, and the fibres become loose and unfit for weaving; the raw silk is therefore manufactured first into *singles*, *tram*, or *organzine*. By *singles* is signified one of the reeled threads twisted. *Tram* (from the French *trame*, or 'shoot') is formed of two or more threads twisted together, and is used in weaving ribbons for the shoot or weft. *Organzine* is formed of two or more singles twisted together in a *contrary* direction from that of its component singles. *Marabout* is silk thrown twice, and is made from fine white silk from which the gum has not been boiled; that of the French is the best. This preparation of the silk is the business of the throwster, a word formed from the word 'throw,' in the obsolete sense of 'to twist, to twine.'

Italian organzine, either thrown in Italy or in England from Italian raw (and principally the last), is used for the warp of the best English ribbons. Bengal and China organzine for inferior qualities. China, Bengal, and Brussa (a Turkish silk, produced at Bursa or Brusa, in Asia Minor) singles, all English thrown, are used largely for shoot. Bengal cannot be used for fine colours. Marabout is used for gauzes.

There are four throwing-mills in the neighbourhood of Coventry, besides several small establishments where hand-machinery is employed, in which the raw silk purchased by the manufacturers is thrown. The silk is bought through the London brokers or the Coventry silkmen, at a credit of five months.

The dyeing is carried on by four houses in Coventry When the silk is dyed *soft*, that is, when the gum is boiled off, it comes back from the dyer with a loss of four ounces out of sixteen in weight, when dyed *souple*, the gum being partly retained, it loses only one ounce and a half in sixteen. Inferior warp silk dyed black, and of dark colours, is sometimes *weighted*, notwithstanding the proclamation of King Charles, by an additional quantity of dye, or by a mixture of sugar to increase its apparent substance. The French dyeing is considered to possess little or no superiority over that of the English; their blacks are inferior.

The fineness of the silk is determined by the number of warp lengths, measuring seventy-two yards, in the ounce; fine warp silk, for instance, 'runs' about eight score threads to the ounce of that length. One ounce in twenty is allowed for waste in the manufacture of the silk into ribbons; for all over that quantity the undertaker, or journey-hand, is accountable. If the warp and shoot are delivered ready wound, a quarter of an ounce in twenty is allowed. The preparation of the silk by winding it from the hanks on bobbins, and then again winding it off from a sufficient number of these bobbins at once round a large revolving perpendicular reel, called the warping-frame, until the requisite length is obtained for the piece of silk or ribbon that is to be manufactured, and likewise the weaving process itself, are the same for the making of ribbons and for broad silk. The single-hand ribbon-loom differs in no essential respect from that used for any other fabric, except that its size and strength are proportional to the lighter material.

The *Dutch engine-loom* was introduced about seventy years ago. In this loom, instead of one piece of ribbon only, several are woven at once, four of the broadest width, or as many as twenty-four of the narrowest. Each warp has a separate shuttle. The batten extends across the whole width of the loom; the shuttles slide within grooves made in the batten; the driver is worked horizontally backwards and forwards by a handle. At each motion the shuttles are propelled by the cross bars of the driver across their proper warps in the corresponding direction. The loom is worked by the hands, and with treadles for the feet, like the single hand. The stroke of the batten (from the French *battant*) is made with more precision than in the single-hand loom, by the interposition of blocks of wood fastened to the framework in front, which resist the batten at the proper point. The impulse of this stroke pushes back the finished ribbon, which is hung with a weight attached to the end over a pulley at the top of the frame, or wound on a roller, just enough to draw forwards the warp, which is similarly hung over a pulley, in order to receive the shuttle at the same point. Each warp has a separate reed or *sleigh* attached to a horizontal roller, over which it passes on descending from the pulley. The sleigh is an instrument like a comb (called by the French weavers *le peigne*), for keeping the threads separate. There are corresponding sleighs in the batten. The cost of a plain engine-loom for sarsenets is about 8*l.*, for satins about 12*l.* The hire of one is about one shilling per week.

Steam-power is applied to the different ribbon-looms by the ordinary methods. Those worked by steam are generally larger than the hand-looms.

The *à-la-bar*, or *bar-loom*, was invented and introduced into St. Etienne by two Swiss brothers about sixty years ago. It has largely contributed to the prosperity of the place, but the brothers died in poverty and neglect. It is a hand power-loom worked by means of a long transverse handle or bar, which extends along the front of the loom, and is connected with wheels on each side, which communicate the motion. The shuttles are driven by means of a rack and pinion across the warps. The advantage of the bar-loom consists in the saving of labour by the intervention of mechanical means, instead of applying the human power direct to the usual operations of weaving. The original cost of these looms is considerable (from 80*l.* to 100*l.*), and they have been little used in Coventry. There are but about eight in the town, with the exception of several which are worked by steam in the factory above mentioned. At Battersea they are employed in weaving figured ribbons. In the bar-looms of St. Etienne from twenty-eight to thirty of the narrowest and from six to eight pieces of the broadest width are made at once: about eight ells of the former per day, and from three to four of the latter.

Several hand power-looms have been contrived and adopted, in all of which the requisite movements are performed by a combination of levers, springs, cranks, and wheels. In a factory at Kettering connected with a Coventry house, six looms are worked by one man by means of a wheel. In all these cases of course separate hands are required to superintend the weaving.

Figures on ribbons, as in other fabrics, are chiefly formed by omitting the regular crossing of the warp and shoot in such a manner that a difference of texture shall occur in the web so as to mark out any pattern. This is effected in the single-hand loom by a multiplication of treadles connected with the lisses by which the different portions of warp are alternately raised. Forty treadles have been sometimes required to form an intricate pattern. Small figures produced in this manner are called *leys*. To execute more complicated patterns, *tires* (from the French word *tirer*, to draw or pull) are used. Tires are cords hung over the top of the loom, and pulled by the hand as the figure may require; they work like the treadles, by raising the lisses, through the eyes of which are passed the threads which are to form the pattern. Small patterns are still largely made in the single-hand looms by means of treadles and tires. The French single-hand loom of this description is called *hautelisse*. This was the name of the loom used in weaving the best tapestry, in which the warp was stretched perpendicularly, and hence it came to be applied to other looms for weaving figures. The hautelisse looms of St. Etienne are now generally worked by a bar, as well as the engine-looms.

The production of a large pattern in the manner above described is difficult and tedious. Many skilful contrivances have been devised by weavers and others for facilitating the operation, and among others the draw-boy; but they were all superseded by the introduction of the Jacquard machine, said by some to have been originally invented by the Chinese: it was brought to England in 1820. By means of this most ingenious invention the lisses are raised in the required order for the formation of the pattern, by an apparatus affixed to the loom, enabling the weaver to produce with nearly the ease and rapidity of plain weaving, patterns which it would formerly have been almost impossible to execute. The 'numbers' (that is, the numbers of the needles which regulate the raising of the warp threads) of some of the machines at St. Etienne are as high as 1050, those of Coventry range from 250 to 600. The price of a Jacquard engine-loom for sarsenet figures is from 16*l.* to 20*l.*, for satin figures from 20*l.* to 24*l.* The hire of one is 1*s.* 6*d.*, and sometimes 2*s.* per week. The number of Jacquard machines in Coventry and the surrounding district in 1838 was 2228. The draughting of the patterns and stamping of the perforated cards is a separate business, which is done on the premises of the larger manufacturers. The Jacquard is capable of being applied to both the engine and single-hand looms, but as the same cards and machinery are required for one breadth in the single-hand, as for several breadths in the engine-loom, it is seldom attached to the former except for a few very rich goods.

The work is ordinarily given out in *sets of grosses*, consisting of two warps for each shuttle, each warp containing two pieces of 36 yards. The ribbons are cut out in pieces of 36 yards if they are of satin, and in half pieces of 18 yards if they are sarsenets or gauzes above the narrower widths. A set of pieces cut out of a loom is called a *length*, and a set of half pieces a *half-length*. The putting in of a fresh set of warps is a tedious operation, which requires from two or three to fourteen days, and proportionally lessens the earnings of the weaver. In the Jacquard loom two weeks out of six are lost in this preparation of the work, besides the delay which he frequently experiences in getting the fresh silk from the manufacturer. A simple change of pattern is often effected with very little loss of time. Whenever it is practicable, the ends of the new warp are fastened to those of the old before it is taken out of the loom, whereby the labour of passing them separately through the eyes or mails of the lisses is saved: this is called *twisting-in*. To *mount* a Jacquard loom, or prepare it for weaving, requires perhaps a month or more, but a change of pattern is often effected with very little loss of time.

Ribbons are made according to a fixed standard of widths designated by different numbers of pence, which once no doubt denoted the price of the article, but at present have reference only to its breadth. The French distinguish their widths by simple numbers.

All dressed ribbons, as satins, gauzes, &c., are made in the loom one-twelfth of an inch wider than sarsenets, in order to allow for the diminution of breadth which results from the lengthwise stretching which they receive in the operation of dressing. Fine gauzes require an allowance of two-twelfths.

Standard width in inches.	$\frac{1}{4}$	$\frac{7}{16}$	$\frac{5}{8}$		$\frac{13}{16}$		$1\frac{1}{16}$	1	$1\frac{7}{16}$	$1\frac{13}{16}$	$2\frac{11}{16}$	$2\frac{7}{16}$		$3\frac{1}{16}$			$3\frac{13}{16}$		$4\frac{7}{16}$				
English numbers	1*dy*	2*dy*	4*dy*		6*dy*		8*dy*	10*dy*	12*dy*	14*dy*	16*dy*	20*dy*		24*dy*			30*dy*		40*dy*				
French ditto .	¼ ¾ 1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	24	30	40	50	60

The French ribbons were made formerly in pieces of 12 ells; their length is now the same as that of the English. French fancy ribbons are generally made and sold in *garnitures*, that is, a broad and narrow piece taken together of the same pattern.

Sarsenet and lutestring ribbons are made by the simple and regular alteration of the warp and shoot, as in plain cloth, called technically *ground*. Lutestrings are sarsenets above the width of 12*d*., and in general of stouter make. Several threads of the warp pass through each *dent* or *tooth* of the sleigh, according to the fineness of the silk or intended quality of the ribbon. In a lutestring the dents are in the proportion of about 40 to the inch—the shoots about 90, varying with the quality. By *grogram* (French *gros-grains*) is meant a variation in the texture, caused by the warp-threads passing over two of the shoots at once, taking up one only: this often finishes the edge of a ribbon.

Organzine dyed *soft* is used for the warps of all ribbons except gauzes, from its greater strength and compactness of fibre; tram and singles dyed *souple* for the shoot of sarsenets and sometimes of satin.

In *satin* the glossy appearance is given by the threads of the warp being laid chiefly on the surface, each thread of the warp being crossed by the shoot only once in five times, as in 5-lisse satin, or once in eight times, as in 8-lisse or the superior satins. French satins were formerly made from 6-lisse to 10-lisse. Satins are woven with the face downwards, as it is easier to raise the harness connected with ⅕ or ⅛ of the warp each time that the shuttle passes than to raise ⅘ or ⅞. The number of dents and shoots to the inch are nearly the same for satin as for lutestring. The threads between each dent are generally put in in odd numbers, 9, 11, 13, which are supposed to fall in better, and produce a better surface. The French satins are lighter in make than the English, but they have a peculiar richness and lustre, owing to their superior silk. French ribbons in general have less weight of silk than the English.

The transparency of *gauze* is produced by the kind of silk of which it is made—the fine hard-twisted marabout, which leaves the interstices clear. One warp thread only passes between each dent of the sleigh, and these are closer together in general than lutestrings and satins. In fine gauzes 80 or more dents, and from 90 to 120 shoots to the inch. The plain gauze ribbons made at Coventry called China gauzes are chiefly those used for mourning—white, black, and lavender, with satin or ground stripes.

Floret Gauzes and Taffeties are light ribbons made of organzine warp shot with hard or marabout silk. There is considerably less labour in these than in other gauzes; they are largely manufactured at Bedworth.

Loves are inferior gauzes made of organzine, and singles dyed *hard*, or upon the gum.

Petershams or *Pads* (derived perhaps from the French *padou*, a coarse ribbon used by tailors, made of linen and silk, often stiffened by gum), are stout thick ribbons used for the waist.

The sleighs employed for making plain ribbons (*taffetas*) in France, have about 51 dents to the inch, for satin 54, for gauze 72·78·84, for velvet 36-42.

These ribbons all belong to the plain trade. The fancy trade comprises the manufacture of the same fabrics figured, under the heads of figured sarsenets, satins, gauzes, and pads.

The figures are frequently produced in a different colour from the ground by the mixture of colours in the warp; the colours being warped separately. In the intervals of the figures the coloured threads are carried along the under side of the ribbon; it is said to have a double or treble figure, according to the number of colours passing through each dent. In some ribbons, gauzes in particular, these threads are cut away by the scissors after the ribbon is made. This is called clipping. A change of colour in the shoot is effected by the use of different shuttles; in brocades the figure is made by small additional shuttles, thrown in partially across the ribbon as the pattern may require; the connecting threads of shoot being clipped off. By damask is meant the laying of the warp over the shoot to form the figure in the manner of satin. The patterns are sometimes geometrical, but more frequently combinations of leaves, sprigs, or flowers. In the superior French ribbons groups and wreaths of flowers are executed with the richness and variety of hand-embroidery. The French are continually introducing novelties in colouring and in texture. In one of recent appearance the ribbon is laid over with a slight covering like crape, by means of a warp of hard-silk woven in loosely over the other: in another the ribbon is made by stamping to assume the appearance of lace.

Some fancy ribbons are of plain texture but varied in colouring; they are shot or woven in shades, stripes, bars, or cheques, called in the trade plaids; these last, which require the shuttle to be changed very frequently, are still made in the single-hand loom. In shot ribbons the warp and the shoot are of different colours. A pearl-edge is frequently given to all kinds of ribbon except the narrower widths of sarsenet. This is formed by the shoot passing over horse-hairs placed outside the warp parallel with it, and raised in like manner by the lisses; as the hairs are drawn out, the silk is left in loops at the edge. Many varieties of ornamental edges, as scollops, fringes, &c., are produced by *drawing in*. The shoot in this case stops short of the edge of the ribbon, catching in an additional thread of silk, sometimes of a different colour, which it draws in in its place, and which is delivered from a bobbin at the back of the loom, and is in a manner darned into the ground of the ribbon.

Clouding is a peculiar management in the dyeing, by which a change of hue is produced in the same thread of silk. The silk, already warped, is tied up and wound closely round with packthread at regular intervals of more or less than an inch, so that the intermediate spaces only are penetrated by the dye.

In one species of fancy ribbon, called *Chiné*, the figures are printed or painted on the warp after it is prepared for the loom, and afterwards woven in by the shuttle; others are embossed after the mode of the Parisian Chandelier.

Ribbons are watered by passing two pieces together between two cylinders, one of which has a heater within it. The irregular pressure of the inequalities of the two surfaces of silk against each other produces a wavy appearance.

Satins are soft and flossy when taken out of the loom; to smooth and stiffen them, they are calendered, or pressed between heated steel cylinders, and afterwards dressed, or passed over a small cylinder covered with flannel, which is moistened with a size made from buffalo hides, and then over a large one of heated steel. Gauzes also are dressed, and sometimes even lutestrings. The French goods are in general better dressed than the English.

The *blocking* of the finished ribbons, or the winding them on cylindrical pieces of wood, is generally done at the warehouse of the manufacturer.

Galloons and *doubles* are strong thick ribbons, principally black, used for bindings, shoe-strings, &c. The narrow widths are called galloons; the broader, doubles. Italian silk is used in making the best qualities only, Bengal for the commoner. They are manufactured at Spitalfields, at Reading, in Devonshire, in the power-looms of Manchester, at Derby, and other places. There is a considerable exportation of these goods, as there is likewise of the produce of the steam ribbon-looms.

Ferrets are coarse narrow ribbons shot with cotton, used for similar purposes.

Ribbon velvets are manufactured in Spitalfields and at St. Etienne: they are also made at Crefeld in Rhenish Prussia, which has long been a principal seat of the velvet manufacture. The following were the prices paid in 1832, by a principal firm of that place, for the weaving of ribbon velvets:—

No.	Pieces		s.	d.	
No. 12	8	pieces in one loom	1	1	for 36 yards.
24	6	"	1	7½	"
30	6	"	1	9½	"
50	5	"	2	3	"
100	3	"	4	3	"
150	3	"	6	9	"

One man makes thirty-six yards in two weeks on an average. The ribbon-weavers live in the country, and those who make the narrow numbers are miserably poor, though they make 288 yards in a fortnight. Italian silk only is used. (*Commons' Committee*, 1832.)

In *gold* and *silver* ribbons a silk thread of similar colour is wound round by a flattened wire of the metal, and afterwards woven. Lyon was particularly celebrated for its fabrics of this kind.

The following table and lists are extracted from the valuable Report of J. Fletcher, Esq., on the Hand-loom Weavers, from which very considerable assistance has been derived in the details of the Coventry trade.

Approximate Statement of Coventry Weavers' Earnings when in full work, at different periods.

Artisans earning the Wages below stated.	1795	1805	1813	1818	1823	1831	1838	Observations.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	
Undertakers in the single-hand trade, supposing each to have on the average 7 looms, and to receive from each one-half a journeyman's wages . .	about 15 9	about 15 9	35 0	19 3	19 3	19 3	18 6	The proportion of deduction for fire and light, to which the earnings of the journey-hands have been subjected, multiplied, allows for the current shop expenses of the undertaker; and his apprentice looms compensate for any deficiency of profit out of looms worked by women.
Journeymen weavers in the single-hand trade	probably 4 6	probably 4 6	10 0	5 6	5 6	5 6	5 0	These earnings are the groundwork of the preceding statement.
Half-pay apprentices in the single-hand trade	about 3 0	about 3 0	about 7 6	about 4 0	about [illegible] 0	about 4 0	about 3 9	Half of the warehouse prices paid to these learners is one-fourth less than the journey-hand pay, which is two thirds.
'First-hand journeymen' in the plain engine-loom, owning their looms, as they now commonly do, after deducting every expense, but without making any deduction for loom-hire since the commencement of the journey-work system	..	..	..	..	..	11 10	11 6	These earnings doubled, for the 2 looms which are on the average worked by each family, ought properly, in estimating the journeyman's condition, to supersede those placed next below them, since they would then contain the profit which the journeyman of late years derives from being proprietor of his own looms, with the addition of rent paid him for other looms; and therefore show his present income, as compared with the prices below, which show his former income.
Journeymen weavers in the plain engine-loom (deducting loom-rent since they have been owners of their looms, as being profit, and not wages) . .	8s. to 12s.	17 0	20 0	10 0	17 0	10 10	10 6	These earnings, and those of the single-hand journeymen, are the proper comparative tests as to the price of mere labour, in contrasting one period with another, and looking at prices generally.
'Journeymen's journeymen' in the plain engine-loom, in the same position under the 'first-hand' journeymen that the latter formerly held under an undertaker, and consequently the first that are thrown out of work at a slack time	..	..	..	..	..	9 10	9 6	These are the earnings of a class approaching in position the journey-hands under the undertakers in the single hand trade, and, like them, among the first thrown out of work at a slack time.
'First-hand journeymen' in the Jacquard engine loom, owning their looms, as in the plain engine-trade . .	..	..	..	..	..	16 6	15 6	These earnings properly take the place of those formerly obtained in the plain engine-loom, in a comparison of earnings at successive periods; the plain engine-loom being formerly as much the sole superior class of work over the single-hand loom, as this is now over the plain engine-loom.
Journeymen weavers in the Jacquard engine-loom (deducting a loom-rent, which they have to pay when not proprietors of their looms) . . .	..	..	..	..	..	15 0	14 0	These figures are inserted to compare with previous mere wages in the plain engine-loom, which are hence seen to have declined from their money-rate in the steady times of trade of 1805 and 1823, although the money income of the workman differs much less.
'Journeymen's journeymen' in the Jacquard looms, if at two thirds pay .	..	..	..	..	..	..	about 10 6	These are the hands first thrown out of work at a slack time.
Factory journeymen in the Jacquard engine-loom, in the highest paying factories	..	..	..	..	..	.	13 0	The difficulty of obtaining approximate estimates of these, and of all earnings in the figure-branch, is exceedingly great.
Factory journeymen in the Jacquard engine-loom in the Bedworth and in the Coventry lower-paying factories .	..	..	..	..	..	..	9s. to 12s.	
Factory journeymen in the Jacquard engine-loom in the Nuneaton factories.	..	..	..	..	..	..	8s. to 9s.	
Half-pay apprentices in the engine trade	..	..	..	..	..	..	say 5s. 6d.	These are chiefly in the figure-trade.
Winders (women and children)	..	..	..	..	..	..	5s. to 11s.	Averaging 7s. or 6s. 6d.
Warpers (chiefly women and children)	..	..	..	..	..	..	3s. to 18s.	Averaging 10s.

Coventry Plain Engine List of 1835, *by which the Trade is still governed.**

Description of Work.	Width of Work.	Per Piece. s.	d.	Description of Work.	Width of Work.	Per Piece. s.	d.
Plain Sarsenets	1	0	6	Satins (8-lisse)	1	0	10
..	2	0	7	..	2	1	0
..	4	0	9	..	4	1	3
..	6	1	0	..	6	1	6
..	8	1	3	..	8	1	11
..	10	1	6	..	12	2	6
..	12	1	10	..	16	3	0

Description of Word.	Width of Work.	Per Piece. s.	d.	Description of Work.	Width of Work.	Per Piece. s.	d.
..	14	2	1	..	20	3	6
..	16	2	4				
..	20	3	0				
..	24	3	8				
Loves and Satins	1	0	8	Satin Loves	.	0	9
(5-lisse)	2	0	10	(8-lisse)	2	0	11
..	4	1	1	.	4	1	2
..	6	1	3		6	1	4
..	8	1	7	..	8	1	8
..	10	1	10	..	10	2	2
..	12	2	3	..	12	2	[illegible]
..	14	2	8	..	14	2	10
.	16	2	10	..	16	3	0
..	20	3	6		20	3	8

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* The late and continued (1840) depression of trade has caused great departure from this list; a considerable reduction has been made in the price of weaving sarsenets; on satins it amounts to 20 per cent. It is feared at Coventry that the increasing preference for French satins will extinguish this branch of the trade.

Shading 6*d.* per gross extra. 5-lisse satins are now seldom made in Coventry. The list of prices refers to the width of the ribbons, not to the quality. The labour is nearly the same for the richer as for the inferior goods, the difference consisting principally in the silk of which they are made. Cheap ribbons are generally made by reducing the warp silk, which is the most expensive, and making up the bulk of the ribbon with a larger proportion of the cheaper shoot. When extra labour is required, it is paid for extra. The average cost of the labour of all the processes of weaving is about 25 per cent. of the price of the goods; in gauzes and figured articles the proportion is higher.

List Price of Power-Engine-Loom-Weaving of plain Sarsenet Ribbons at Derby, 1838.

Widths.	Shuttles in each Loom.	Prices Per Length. *s.*	*d.*	Lengths made per week.
2	30 (and 36)	10	10	1½
4	28 (24, 26, and 30)	12	6	1½
6	24 (22 and 26)	14	0	1½
8	24 (20 and 22)	18	0	1½*
10	18 (20)	16	6	1
12	16 (18)	17	6	1
14	16 (18)	18	2	1
16	12 (14, 16, 20)	18	6	1
18	12 (14 and 16)	20	4	1
20	12 (8)	22	6	1
24	10 (8)	22	6	1
30	8	24	0	1

It is the universal custom to pay for weaving by the piece; in one instance only, that of the steam-factory, the men receive weekly wages. The *truck* system is unknown, all payments being made in money. It appears that the money amount of the earnings of the ribbon-weavers is not less than it was nearly fifty years ago. The purchasing power of their wages is however greater, and there has been an increase in their domestic comforts, although not in the same ratio as in those of other classes, for in common with the rest of the hand-loom weavers their condition is depressed below that of other artisans. They are less given than formerly to out-of-door amusements and robust exercises, and they have degenerated in physical constitution. Marriages are made much earlier; anxiety of mind produced by family cares in the midst of a fluctuating employment, confinement to the loom, and, among the lower and reckless, the enjoyments of the public-house and gin-shop, induce a great susceptibility to lingering and nervous disorders: they are less liable to acute diseases. Insanity is frequent among them. This inferiority of physical strength presents an obstacle to a change of occupation in bad times, no less than the long exclusive apprenticeship of seven years, the evil of which is peculiarly manifest in this uncertain trade. A want of domestic economy and management results from the employment of women in the trade from their earliest years, but the city weavers, generally speaking, are moral, industrious, attached to their homes and families, and many of them highly intelligent. The condition of the rural weaving population is far worse, and is one of great depression, rudeness, and ignorance.

The number of persons employed in ribbon-making in Coventry, including winders and warpers, was estimated, in 1838, at 6000 or 7000; and in the rural parishes, at 10,000 or 11,000.

RIBBLE, River. [LANCASHIRE.]

RIBCHESTER. [LANCASHIRE.]

RIBE. [JUTLAND.]

RIBEAUVILLE. [RHIN, HAUT.]

RIBE'RA, JOSE', an eminent Spanish painter, better known by the surname of 'Spagnoletto' (the little Spaniard), which the Italians gave him, was born on the 8th of January, 1588, at San Felipe de Xativa, a large town in Spain, about ten miles from Valencia. Having from his early youth shown a great inclination for painting, his parents, though in indigent circumstances, did everything in their power to promote his taste for that art. He was placed as a student under Francisco Ribalta, one of the best painters of the Valencian school, under whom he studied a few years; but before he was sixteen he left his master, and determined to visit Italy. After spending some time at Rome, where he almost lived upon charity, he arrived at Naples in 1606. Here he met with Michael Angelo Caravaggio, whose striking and vigorous style made such an impression upon him, that he never rested until he became his pupil. Under this great master, Ribera made such progress, and his productions were so much admired, that he was considered an accomplished master at the age of twenty. From Naples Ribera went to Parma, where the works of Correggio were then the object of public admiration, and afterwards he visited Rome. Whilst there he attempted to improve his style by imitating the works of Raffaello, but without much success. This circumstance, as well as the great number of excellent artists practising in that city, induced him to return to Naples, where his prospects of employment were greater, that country being then under the dominion of his countrymen the Spaniards. [NAPLES.] After a few months' residence in that capital, the count of Monterrey, the Spanish viceroy, took him under his protection, and employed him in executing considerable works for the king of Spain. In 1630 he was elected a member of the Academy of St. Luke at Rome, and made a knight of the order of Christ by the pope in 1644. Ribera died at Naples in 1656, in the seventieth year of his age. Like his master, his style was characterised by broad lights and shades. His genius naturally inclined him to gloomy or horrible subjects, which he selected both from sacred and profane history. He delighted in designing old men emaciated by mortification, such as hermits and saints, and seems to have at all times rejoiced in the picturesque display of bone, veins, and tendons. In tragic compositions, martyrdoms, executions, and torments, he was eminently successful, and he treated these appalling subjects with a correctness of design and a fidelity which might serve as a study for the anatomist. Thus the spasms of Ixion, St. Bartholomew under the butcher's knife, the torments of Sisyphus, Tantalus, and Prometheus, Laocoon and his sons attacked by serpents, were his favourite subjects. His principal pictures are in the Royal Museum at Madrid, in the Escurial, and at Naples, in which last place he painted the Martyrdom of S. Januarius, for the royal chapel; St. Jerome and S. Bruno, for the church of the Trinity; and the Taking Down from the Cross, for the Carthusians. Ribera sometimes indulged himself in engraving, and he also made six-and-twenty etchings, which were executed in a bold and free style, and with great correctness of design.

(Cean Bermudez, *Diccionario Historico de los Pintores Españoles*, Mad., 1800, vol. iv., p. 184.)

RIBES (a name formerly given to a species of rheum), is a genus of plants forming the natural order Grossulaceæ. As this genus is the only one in the order, its characters, geographical range, and affinities are described with the order. It is well-known as producing the currant and gooseberry, and also for affording many of the ornamental shrubs of our gardens.

De Candolle divides the genus Ribes into four sections, of which the following is an analysis:—

Shrubs with prickles:—	
Peduncles 1-2-3-flowered.	GROSSULARIA.
Peduncles many flowered.	BOTRYCARPUM.
Shrubs without prickles:—	
Calyx campanulate . .	RIBESIA.
Calyx tubular	SYMPHOCALYX.

* GROSSULARIA.

This section includes some handsome shrubs, as well as the species which produces the common gooseberry. Of these we shall notice a few that are most commonly found cultivated in this country.

R. Oxycanthoides, Hawthorn-leaved Gooseberry. Prickles infra-axillary, solitary. Leaves glabrous, lobes dentate. Peduncles short, bearing 1-2 greenish white flowers. It is a native of rocky districts in Canada, and bears a fruit very much resembling that of the common gooseberry both in appearance and taste. Like many other described species of large genera, it has been supposed to be referrible to a more common form, the *R. grossularia.*

R. niveum, Snowy-flowered Gooseberry. Prickles solitary, in pairs or threes. Leaves glabrous, roundish, entire at the base. Flowers two together in peduncles. Sepals reflexed. Stamens longer than the style. It grows to the height of 4 or 5 feet. It was found on the north-west coast of America by Mr. Douglas, who sent the seeds to England in 1826. The fruit is about the size of the black currant, of deep red-purple colour. It is said to be of a superior flavour to the common gooseberry. 'It has a rich subacid rather perfumed flavour, which is extremely agreeable. The fruit is rather too acid to be eaten raw; but when ripe it makes delicious tarts, and would probably afford an excellent means of improving the common gooseberry by hybridising.' (Lindley, *Bot. Reg.*, Aug., 1834.) The white flowers give it a handsome appearance when it blossoms, making it a valuable addition to our ornamental shrubs.

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* Sometimes less.

R. Cynosbati, Dog-bramble Gooseberry. Infra-axillary prickles 1-2. Leaves 3-4, lobed, pubescent. Calyx campanulate, cylindrical. Petals shorter than stigma and stamens. Berry prickly. This plant is found in Canada, according to Pursh, and was discovered in India by Royle, and in Japan by Thunberg. It differs little from another well-known species, *R. divaricatum*, which has the tube of the corolla somewhat narrower and the stamens longer. Two varieties of this plant are recorded: one with smooth fruit, a native of Hudson's Bay; the other with prickly branches and fruit, shorter peduncles, pubescent purplish flowers, from Lake Huron.

R. grossularia, Common Gooseberry. This plant is too well known to require any description here, and is probably the parent of many of the other recorded species of Ribes. It is found wild in almost every part of England and Scotland, growing on old walls, in hedges and woods, although a question might be raised as to its being aboriginal in this island. It seems to be truly indigenous in France, Germany, and Switzerland; and, according to Dr. Royle, is found in the Himalaya and on the banks of the Ganges. It has also been seen growing in North America, on rocks near the Falls of Niagara.

This plant does not appear to have been known to the antients; and the earliest author who mentions it is Matthiolus, an Italian botanist. It was recorded as existing in England by Turner, Parkinson, and Gerard; but Ray is the earliest writer who mentions it as a cultivated species. The Dutch were the first to cultivate the gooseberry successfully, but even up to the time of Miller it seems to have gained very little repute in England as a fruit for the table. From its extensive cultivation, it has received a great variety of names. In Cheshire and the north of England it is called *Feaberry*, in Norfolk *Feabes*, both of which names are corruptions of Fever-berry, as, according to Gerard, it was at one time considered a specific against fevers. *Grozzer* is a common name for it in Scotland, which seems to be derived from the French name *Groseille à Macquereau*, which is again derived from the Latin Grossularia, and the use of the fruit as a sauce with mackerel. Its common name, *gooseberry*, is derived from gorse-berry, because its prickles resembled those of the furze or gorse. Some derive this name from its berries being used as sauce for geese. [GOOSEBERRY.]

There are numerous varieties of this plant recorded, which chiefly vary in the extent, size, and number of their prickles, and in the shape and size of their fruit and flowers.

R. speciosum, Showy Gooseberry. Shrub prickly, infra-axillary prickles 3. Branches hurspid. Leaves glabrous, on short petioles, 3-lobed. Peduncles with 1-3 deep red flowers, longer than leaves. Stamens 4. Filaments and style red. This plant was found by Mr. Menzies on the western coast of California. Since its introduction into this country it has been a great deal cultivated on account of its beautiful crimson flowers. In its cultivation it requires some care, as the branches are so much reclined, that unless carried up against rock-work or a wall, the flowers will not be well seen. *R. Menziesii* seems to be only a variety of this species.

** BOTRYCARPUM.

This section includes four species intermediate between gooseberries and currants: they are however called by the former name. *R. orientale*, Eastern Gooseberry, with yellow green flowers, blowing in April and May. It is a native of Syria. *R. saxatile*, Rock Gooseberry, a native of Siberia, with greenish-purple flowers.

R. diacantha, Twin-prickled Gooseberry. It flowers in May and June, having yellowish flowers and cuneated leaves. It grows wild in Dauria and other parts of Siberia. *R. lacustris*, Lake-gooseberry, a native of moist places in Canada and Virginia, with flowers like a currant and prickles like a gooseberry.

*** RIBESIA.

This section includes the greater number of the currants, of which there are about forty species. The most common and useful of these is the *R. rubrum*, Common red currant. The name currant seems to be derived from the similarity of the fruit to the Corinth raisin, or small grape of Zante, which are commonly called Corinth's, or currants. This last is too well known to need a description. It is a native of Europe and Siberia, and the northern parts of North America, to the mouth of the M'Kenzie, and is found in mountainous districts in the north of England and Scotland. Like most plants that are easily disseminated and occupy varied elevation, latitude, and soil, this species is subject to many varieties. Of these seven have been recorded by De Candolle, which vary in the shape, size, and covering of their leaves, as well as the size and colour of their fruit. The writer of the article 'Ribes' in Loudon's *Arboretum et Fruticetum Britannicum*, observes, 'the common red currant is commonly treated by botanists as a distinct species, but we have no doubt whatever that *R. petræum*, *R. spicatum*, *R. alpinum*, *R. prostratum*, and several other botanical species are essentially one and the same thing. We have arrived at this conclusion from the study of the plants in the very excellent collections of this genus which are in the garden of the Horticultural Society of London and in the arboretum of the Messrs. Loddiges.'

The currant is not mentioned by Greek and Roman writers, but it is scarcely possible that its beautiful red and sweet berries should have been neglected by the people amongst whom they grew. In France they were cultivated long before the gooseberry, but were first produced in perfection by the Dutch. Gerard mentions that they were cultivated in gardens in his time. Till a recent period very few varieties were known, but several have been lately introduced, especially by the exertions of the late Andrew Knight, Esq. The following is a list of the principal varieties from Don's Miller's 'Dictionary:'—

Red Currants.

1. *Common red, groseiller rouge à petit fruit, groseiller ordinaire à fruit rouge.*
2. *Red Dutch, large red Dutch, new red Dutch, large red, large branched red, Morgan's red, red grape, groseiller rouge à gros fruit.*
3. *Knight's large red.*
4. *Knight's sweet red currant.*
5. *Knight's early red currant.*
6. *Champagne, groseiller à fruit couleur de chair.*
7. *Striped leaved currrant and variegated-leaved currant.*
8. *Large pale-red Dutch.*

White Currants.

1. *Common white currant, groseiller à fruit blanc.*
2. *White Dutch currant, new white Dutch, Morgan's white, white crystal, white Leghorn, pearl white.*
3. *Pearl white, blanc perle.*
4. *Spearey's white.*

Of these varieties those numbered 2 and 8 among the red, and that 2 of the white, are the best.

The fruit of the various species of Ribes has been used in medicine to allay thirst, and it is said to lessen the secretion of bile. The juice of the red currant is sometimes employed in making punch, and mixed with water forms the *eau de groseilles* of the French. It is also made into a jelly, and the berries are used for making tarts and puddings. When ripe the fruit makes an excellent wine, which is much used in the rural districts of England.

Cultivation.—All the sorts are hardy plants, growing freely and bearing a plentiful crop of fruit. They thrive almost as well in one situation as another, whether it be open or shady, free or confined. This permits of the ripening of the fruit throughout a long period, so that it may be obtained as early as June and as late as October. Common garden soil is suited to them, which should be tilled and recruited from time to time with fresh manure. The largest crops are produced in a strong loam or improved clay-soil. They are earlier in a light soil. Previous to planting, the soil should be dug two feet deep, and this may be done at any time from October to February or March. They are chiefly propagated by cuttings obtained early in the spring. These should consist of the previous year's shoots taken from bearing-branches, and be from ten inches to a foot in length. They should be planted 4 or 5 inches deep and may be watered in spring. In the summer all the shoots or buds should be removed except three. In the following autumn they may be transplanted. Currant bushes are best planted by themselves, and the distance between the rows should not be less than from 7 to 9 feet. They will grow freely against a wall, and when thus planted with a south or south-west aspect will produce ripe fruit three weeks earlier than standards with a north or north-east aspect: fruit may be preserved good till October, and if matted, as late as November. Grown on espalier rails the fruit is produced in the finest order.

The fruit of the currant should be gathered in dry weather, as when gathered in rain it loses its flavour.

R. nigrum, Black Currant. Flowers whitish or yellowish green. Calyx a rich brownish red or pink colour. The stamens and petals frequently present a remarkable peculiarity: the usual number of each is five; but should either the petals or stamens be increased in number, the other is diminished; thus if there are seven stamens, there will be but three petals, and if there are ten stamens, there will be no petals, and *vice versâ*. The peculiar strong smell of the leaves of this plant is very characteristic. The black currant has the same geographical range as the red, but is found more abundantly in the north than in the south of Europe. It is now common in Great Britain, but is probably not indigenous. It is found in Siberia, on the Caucasus, and in Sweden. It is indigenous in the woods of Russia as far as St. Petersburg, and in this district the fruit is found green, yellow, or even white. Species of Ribes are also found in India and South America with black fruit. There are three wild varieties: *R. bacca flavida*, with a dingy greenish-yellow fruit, supposed to be a hybrid between black and white currant; *R. bacca virida*, with green fruit; *R. foliis variegatis*, with leaves streaked with yellow. The principal garden varieties are

1. *Wild black.*
2. *Black grape, Ogden's black grape.*
3. *Black Naples, Cassis* of the French.
4. *Green-fruited black.*
5. *Russia green.*

Of these, that numbered 3 is decidedly the best for use.

The fruit of the black currant is not in so great repute as the red, and is of comparatively modern introduction. Gerard mentions it, and says that its berries are of a stinking and somewhat loathsome flavour. It is often used as a medicine. The leaves and fruit are diuretic, and are employed in the composition of the Siberian *quass*. An intoxicating spirit is distilled from the berries, and they are also used for colouring various kinds of spirits in Siberia. As a popular remedy for sore throat, they are much employed for making jelly, especially in Russia and Scotland. The leaves are frequently used by the poor to mix with black tea in order to give it the flavour of green.

R. sanguineum, Bloody or Red-flowered Currant. Leaves cordate, serrated, villous beneath. Racemes drooping, twice the length of leaves. Calyx with spreading segments. This is the most ornamental species of the genus, bearing large racemes of deep rose-coloured flowers, which are followed by berries of a bluish-black. It is a native of the north-west coast of America. This as well as the other species of currants may be propagated in the manner described for the red currant. As this plant has been extensively cultivated, a great many varieties are to be found.

R. atropurpureum, Dark Purple-flowered Currant. Stem erect. Leaves pubescent. Racemes drooping. Calyx ciliated. Berries dark purple, glabrous. It is a beautiful shrub, a native of the Altai and mountainous districts on the river Ural, but it has not yet been introduced into this country.

**** SYMPHOCALYX.

The species of this section are cultivated entirely as ornamental shrubs.

R. aureum, Golden-flowered Currant. Petiole glabrous. Leaves 3-lobed, shorter than the petioles. Calyces longer than pedicels. Petals linear, shorter than calyx. Flowers golden-yellow. Fruit yellow, and of an agreeable flavour. It is a native of the north-west of America. Of this plant there are varieties, *R. præcox*, *R. villosum*, and *R. serotinum*. They are all beautiful shrubs, and deserve a place in every collection. Of the remaining species, *R. tenuiflorum* and *R. flavum* are well worthy of cultivation.

RIBGRASS. [PLANTAGINACEÆ.]

RICARDO, DAVID, to whom the science of political economy is perhaps more indebted than to any other man of our own day, was born in London on the 19th April, 1772. His father, a native of Holland, had then been for several years a member of the Stock Exchange in London; and designing his third son, David, for the same occupation, gave him a good but plain commercial education. For this purpose he was sent, when eleven years of age, to a school in Holland, where he remained for about two years. Soon after his return to England he was taken into his father's office as a clerk, and, when of age, was associated with him in business. In 1793 he formed a matrimonial alliance displeasing to his father, by reason of his religious scruples, the elder Mr. Ricardo having been born of Jewish parents, and continuing to profess their faith until his death. This breach between the father and son, which was afterwards entirely healed, necessarily caused their separation as regarded business, and threw the subject of this notice altogether upon his own efforts, seconded however, in a manner highly honourable to all parties, by many of the leading members of the Stock Exchange. Mr. Ricardo continued to be a member of the Stock Exchange until 1818, and was eminently successful, taking for many years a leading part in its business, and realising a princely fortune by conduct which gained for him universal respect.

During the years in which Mr. Ricardo was most actively engaged in business, he continued to devote much time to study and to scientific pursuits. He was one of the original promoters of the Geological Society of London, and for some years a member of its council: he also acquired a considerable knowledge of chemistry, as well as an acquaintance with mathematics. Of late years, the powers of his mind were almost wholly devoted to the elucidation of questions connected with political economy, a study which was at once best suited to the peculiar quality of his mind and most in unison with his daily pursuits in business, and by his attainments in which he was enabled to take his place among the deepest and most original thinkers of his day.

In the beginning of 1819, Mr. Ricardo was returned to parliament by the Irish borough of Portarlington, which place he continued to represent until his death.

The reputation which Mr. Ricardo had previously acquired by his writings ensured to him the attention of the House on all occasions when he spoke, and not unfrequently induced the members present to call upon him for his opinion when the subject-matter of the debate was such as might receive light from his extensive knowledge. Although he confined himself in his parliamentary speeches almost entirely to subjects of finance, and such as fell strictly within the line of economical science, his reported speeches are numerous; and although, from the nature of the subjects which he handled, and with which the newspaper reporters could not be familiarly acquainted, it could hardly be expected that justice could be done to his reasonings, these reports yet furnish a full justification of the desire so constantly evinced by the House, and ample reason for the respectful attention which he always experienced. During each of the five sessions in which he sat in parliament, his name constantly appears as a speaker; and in the latest two years of the series (1822 and 1823) his addresses were very frequent. Although his voice was not good, and his utterance was rapid, it was yet so distinct, that he could be heard without an effort by every member present. His manner was wholly unpretending, and his argumentative style was unrelieved by any oratorical effort; he endeavoured to convince by reason, and to influence only by truth and justice. Those persons who had most narrowly watched the progress of his public career, felt justified in predicting for him a future of the highest usefulness; and had his life been spared, it is reasonable to think that their predictions would have been fulfilled. At the close of the session of 1823, he retired to his estate of Gatcomb Park in Gloucestershire, and, after a very few days' illness, died on the 11th September, of an inflammation of the brain, in the fifty-second year of his age. In private life, Mr. Ricardo was extremely amiable; his temper was mild and equable, and he enjoyed in the highest degree the respect and affection of every member of his family.

Mr. Ricardo first appeared as an author during the discussions that led to and accompanied the famous Bullion Committee in 1810. His pamphlet, which was entitled 'The High Price of Bullion a Proof of the Depreciation of Bank Notes,' speedily passed through four editions, and occasioned the publication of several replies. His next publication was entitled 'A Reply to Mr. Bosanquet's Practical Observations on the Report of the Bullion Committee;' and however much opinions may at that time have been divided upon the subject, it has long since been generally acknowledged that the victory rested with Mr. Ricardo. Although the peculiar interest which attended those discussions has long since passed away, Mr. Ricardo's pamphlet will be read with pleasure by all who delight in marking the ease with which a man of superior intellect can trace and exhibit the constant and active operation of general principles through all the intricacies of practical detail.

In 1815 Mr. Ricardo published 'An Essay on the Influence of a Low Price of Corn on the Profits of Stock,' in which he combated the justice of restrictions on the importation of corn; but the essay is chiefly remarkable for the doctrine which it propounds concerning rent. [RENT.] The following year produced 'Proposals for an Economical and Secure Currency, with Observations on the Profits of the Bank of England.' The principal recommendation put forth in this pamphlet was, that the Bank of England should be obliged to exchange its notes for gold ingots of a certain fineness, and not below a certain weight, at prices diminishing from time to time, until the price should be brought down from its then market rate to the Mint price of 77*s.* 10½*d.* per oz.

Mr. Ricardo's great work, that upon which his lasting fame as an economist must rest, 'On the Principles of Political Economy and Taxation,' was published in 1817, and was at once pronounced the most valuable contribution made to economical science since the days of Adam Smith.

In 1822 Mr. Ricardo again appeared as the author of a tract entitled 'On Protection to Agriculture,' in which he exposed certain fallacies and prejudices of the landed proprietors. The effects of legislative protection afforded to products of the soil upon wages, profits, public revenues, and non-agricultural branches of the national industry, are all discussed within the limits of eighty-seven pages, with a clearness and precision that may be said to exhaust the matter, and which prove the author to have been perfect master of the whole subject.

The only remaining work of Mr. Ricardo was found among his papers after his death, having been the latest matter of a public character that occupied his attention. This was his pamphlet in recommendation of a national bank, which was soon afterwards published by his family, in the exact state in which he left it probably only a few days before his death.

RICAUT, SIR PAUL. [RYCAUT.]

RICCI or RIZZI, SEBASTIA'NO, a painter, born at Cividal di Belluno, near Trevisano, in the Venetian state, in 1659 or 1660. He was placed early under the tuition of Frederigo Cervelli, at Venice. He accompanied his preceptor to Milan, and afterwards went to Bologna and Venice, to study the master-pieces of those two schools. He resided for some years at Florence and Rome, and ultimately made a tour of the whole of Italy, executing pictures at any price, wherever he obtained commissions, and leaving behind him a reputation almost universal. He afterwards travelled into Germany, England, and Flanders, completing his style from a careful study of the works of other artists, and especially improving in his mode of colouring. At Vienna he executed many works for the court, particularly some paintings on the walls of the imperial palace of Schönbrunn, and thence he returned to Florence, where he was employed to decorate several of the apartments in the palace of the grand-duke. Being invited to England by Queen Anne, he travelled through France, and at Paris was made a member of the Academy of Painting. The picture he executed for Chelsea Hospital, in the cupola of which he represented the Ascension, and the staircase of Montague House, now the British Museum, which he also decorated, prove him, says M. Périès, in the 'Biographie Universelle,' to be capable of great undertakings. He also painted the chapel at Bulstrode, for the duke of Portland, in the altar-piece of which, representing the Last Supper, he has introduced his own portrait in a modern habit. The hall and some of the ceilings of Burlington House, London, are also by him.

During his residence in England, which lasted ten years, he was most extensively employed, and his departure is said by Walpole to have been caused by disgust that Sir James Thornhill should have been selected to paint the dome of St. Paul's Cathedral. On quitting this country he returned to Venice, where he was constantly occupied on pictures for France, Spain, Portugal, and Sardinia. Ricci, in common with Luca Giordano, possessed the power of imitating with great exactness the style of the great masters who preceded him. Some of his pictures appear at first sight as if painted by Bassano or Paul Veronese, and one of his Madonnas, exhibited at Dresden was for some time attributed to Coreggio. This facility of imitation is said, by the writer of the Life of Mignard, in 'L'Histoire des Premiers Peintres du Roi,' p. 152, to have deceived La Fosse as to the genuineness of one of his pictures in the style of Paul Veronese, a deception which called forth the sarcastic advice that Sebastian 'should thenceforth paint nothing but Paul Veroneses and no more Riccis.'

In his historical compositions Sebastiano is rather an imitator than a plagiarist, as in the Last Supper, in the church of Santa Giustina, at Padua, which greatly resembles the cupola of S. Giovanni at Parma, by Coreggio; and his S. Gregorio, at S. Alessandro in Bergamo, recals to mind the work of Guercino at Bologna. The same may be observed of his scripture histories, painted for S. Cosmo and S. Damiano, at Venice, which are preferred to any others that he executed for that place.

Sebastiano Ricci did not early acquire an extensive knowledge of design, but he cultivated it in after-life with extreme assiduity in several academies. The forms of his figures are composed with beauty, dignity, and grace, like those of Paul Veronese: his attitudes are natural and varied, and his composition is managed with truth and judgment. His colouring is distinguished by a beautiful azure, which remains in his fresco works, but in his pictures in oil, from the badness of the grounds, that as well as the other tints has faded.

Opinions vary much concerning the merit of this painter. M. Périès, following Lanzi, speaks of him in the manner above quoted, and Lanzi is in some respects far more eulogistic. Mr. Bryan observes, that though his design is not scrupulously correct, the forms of his figures are graceful, and his colouring, though sometimes feeble and cold, is often silvery and agreeable; and that, like most painters of decorations, he consulted his imagination more than nature, and frequently discovers the repetition and the weakness of a mannerist. A careful examination of the works he executed in this country will lead us to the conclusion at which an able writer in Rees's 'Cyclopædia' has arrived, that he was one of the few, comparatively speaking, who enjoy during their lives the utmost extent of their fame. In fact he was a machinist, one who, being conversant with the rules of art and skilful in the application of the means, dazzled where he could not instruct, and deluded by ingenuity without judgment and art without expression. In many of his works he was assisted by his nephew Marco Ricci, who resided with him in England.

Sebastiano died at Venice, on the 5th of May, 1734. Amongst the most noted of his productions may be enumerated the Massacre of the Innocents, at Venice; the Rape of the Sabines, at Rome; at Bergamo, Saint Gregory supplicating the Virgin in favour of the Souls in Purgatory, before referred to; at Vienna, several ceilings of the imperial palace, and an Assumption of the Virgin, at the church of St. Charles.

(Lanzi, *Stor. Pitt.*, iii. 225; ***Biographie Universelle***; Walpole's *Anec. of Painting*, by Dallaway, iii. 281-2; Bryan's *Dict. of Painters*.)

RICCI. [JESUITS; PIUS VI.]

RICCIARELLI, DANIELE, generally called Daniele di Volterra, from the place of his nativity, was born in 1509. He appears to have first studied at Siena, under Antonio Razzi, called Il Sodoma, and afterwards under Baldassare Peruzzi. In the expectation of receiving greater encouragement at Rome, he repaired to that city, where he was first employed as an assistant to Pierino del Vaga in the Vatican, and in the Capella Massimi, in the church of the Trinità del Monte. He was chiefly indebted for the reputation which he subsequently acquired to the friendship and instruction of Michael Angelo, who gave him designs for the works which he executed in the Farnesina, and for others of his most celebrated performances. The principal monument of his fame was the series of frescoes in the church of La Trinità del Monte, representing the History of the Cross, on which he was employed seven years. Of these frescoes, the most remarkable was the famous Descent from the Cross, which was universally esteemed as one of the three finest pictures at Rome; the other two being the Transfiguration by Raphael, and the Communion of St. Jerome, by Domenichino. It has been affirmed that Michael Angelo not only assisted him by his advice, superintendance, and corrections, in the composition of this sublime performance, but that the figure of the Saviour and that of the Virgin Mary must have been the work of his master-hand. Unhappily we are unable to judge of the probability of this assertion; for the French, in their rapacious eagerness to possess so fine a work, barbarously attempted to detach the plaster from the wall, and broke it all to pieces. We have no means of judging of the grandeur of the composition but from the fine engraving of it by Dorigny. On the death of Pierino del Vaga, in 1547, he was recommended by Michael Angelo to Pope Paul III. as superintendant of the works in the Vatican, of which, and of his pension, he was deprived by Julius III.

Pope Paul IV., conceiving that the nudity of several figures in the Last Judgment was unsuitable to the sanctity of the place, had determined to destroy that great work; when Daniel undertook, and, according to a tradition which appears to be authentic, with Michael Angelo's own consent, to clothe the offensive figures. He was probably induced to do this, in order to save the picture from destruction, for which however he was ever afterwards called in ridicule Braghetone. He died at Rome, 1566, at the age of 57.

RICCIO'LI, GIOVANNI BATTISTA, was born at Ferrara in 1598, and became one of the principal cultivators of astronomy in Italy during the greater part of the seventeenth century. He entered into the Society of the Jesuits in 1614, and having diligently cultivated all the different branches of learning as they were taught in that age, he was chosen teacher of philosophy, rhetoric, poetry, and theology, in the colleges of their order at Parma and Bologna; but his inclination leading him to the study of geography and astronomy, he gave up his appointments, and applied himself wholly to the prosecution of those sciences.

His first published work was the 'Almagestum novum' (1653), which constitutes a treatise on astronomy. In it he mentions the origin of the science, and gives a list of those who had cultivated it: he also describes his method of measuring a degree of the earth's surface, and a pendulum of his own invention. He computes the obliquity of the ecliptic, the length of the tropical year, and the elements of the orbits of the sun, moon, and planets; he also treats of eclipses, and gives a long list of such as had been observed from the earliest time. The work contains a treatise on parallaxes, and some ideas of the writer concerning the body of the moon.

The learned world was then divided between the followers of Aristotle and the disciples of Copernicus in their opinions respecting the system of the universe. In the 'Almagestum,' Riccioli, having explained the ideas of the last-mentioned philosopher concerning the movement of the earth, offers a long series of objections to them, which, with a brief reply to each, may be seen in Delambre (*Histoire de l'Astron. Mod.*, tom. i., p. 672, &c.). He acknowledges however that the more we examine the hypothesis of the earth's several motions, the more we must admire the genius and sagacity of Copernicus, who had been able to explain so simply the phenomena of the heavens; and he expresses his regret that the fruits of a brilliant imagination should be set forth as realities. The admiration constantly expressed for Copernicus, and even the manner in which the objections to his theory are stated, have led to a belief that this learned Jesuit was a Copernican in his heart; and, from a passage in the work, it appears that the Aristotelians and theologians of that day, in their opposition, were more afraid of the consequences of making concessions in favour of a theory which seemed to them to be at variance with the letter of the Scriptures, than inimical to the theory itself.

The 'Almagestum' contains many passages which betray the prejudices of the age. As a reason for the necessity of reforming the calendar, Riccioli asserts that the blood of St. Januarius continued to liquefy on the 19th of September, though the time of the equinoxes had been anticipated by ten days: he finds several causes for the supposed eclipse of the sun which took place at the death of Christ, and he dwells at some length upon those which, it has been imagined, will immediately precede the end of the world.

In 1661 Riccioli published a work on geography and hydrography, in which is given an account of the operations which, in conjunction with P. Grimaldi, he had carried on in order to determine the length of a degree of the terrestrial meridian. For this purpose a base-line was measured near Bologna, and a triangulation was formed between that city and Modena; the stations appear however to have been improperly chosen, for the angles between them are often less than eight degrees, and only two were observed in each triangle. The instrument employed for obtaining the terrestrial angles was similar to the parallactic rulers of Ptolemy; and, in reducing the distances between the stations to one spherical surface, Riccioli assumed the refraction as constant, and equal to thirty minutes, as it had been determined by Tycho Brahé for celestial bodies in the horizon. The latitudes of the stations were determined by the sun and certain stars, their altitudes being observed with a quadrant whose radius was eight feet; but the declinations were taken from the catalogue of the astronomer just mentioned, and consequently were liable to errors amounting to one minute or more. It appears also that Riccioli entertained an opinion that the measures of the antients were nearly correct; hence, among his observations, he made choice of such as gave results which approached the nearest to those measures, and thus his determination of the length of a degree is found to have been very erroneous. The value expressed by 64,365 paces of Bologna (= 66,772 Eng. fath.), which he obtained by one of his methods, is considered by him as possessing an evidence in its favour which nothing can resist; it however differs far more from the truth than the determination of Snell, which had been made a few years previously in France; and in fact it is too great by above 6000 fathoms. The same work contains some remarks on the variation of the magnetic needle, observations on geographical longitudes and latitudes, and several problems relating to navigation.

Lastly, in 1665, Riccioli published his 'Astronomia Reformata,' a work in which he treats of refractions and parallaxes, and describes the instruments which he used to determine the places of the stars. He also gives a collection of the observations previously made on the planets, and he compares them with the astronomical tables which had then been published. The work concludes with several tables relating to chronology, geography, and astronomy, and with a catalogue of stars.

This writer, who is considered as having been less useful to mankind by his discoveries than by the care which he took to record those of his predecessors, died in 1671, at the age of seventy-three years.

RICE. In the article ORYZA [vol. xvii., p. 45] an account has been given of the botanical character and mode of cultivation of this useful grain. In order to remove the husk, which adheres very closely, without breaking the grain itself, several ingenious machines have been recently introduced, of some of which it is proposed to give a brief notice, referring for more detailed information to Hebert's 'Engineer's and Mechanic's Encyclopædia,' article 'Rice.'

The common mode of performing this operation in India and China, is by beating the grain in a kind of rude mortar of stone or earthenware, with a conical stone attached to a lever worked by the hand or foot. Sometimes several such levers are moved by arms projecting from the axis of a water-wheel. This process being uncertain and tedious, the preference has been given of late to a kind of mill, in which the stones are placed at such a distance asunder as to detach the shell without crushing the grain; the stones being enclosed in a case which prevents the dispersion of the rice by the rapid rotation of the machine. The rice is thrown out of the case by an opening in its side, and conducted over a sieve that separates the dust; after which it is made to fall in a gentle stream exposed to a current of air, produced by revolving fanners, and thereby separated from the husk. Such a sifting and winnowing apparatus is attached to each pair of stones, and, according to the work above referred to, one pair of stones will husk from eight to ten bushels an hour. After the removal of the husk, the grain is exposed to the action of a whitening machine, which removes the inner cuticle, or red skin, remaining on the surface of the grain. The machine used for this purpose very nearly resembles that described in vol. iii., p. 467, for the preparation of barley. This process is aided by the heat generated by the rapid motion of the grains, causing them to swell and split the red skin, which flies off in dust through perforations in the revolving case. With such accuracy are these processes performed, that it is said not more than five per cent. of the grain is broken in the operation.

The method of cleansing rice just described has been practised in Ceylon with British machinery; but other plans have been followed successfully in this country, where, owing to the difference between the duties on cleaned rice and *paddy*, or grain in the rough state, and the better preservation of the flavour of the rice when brought over in the husk, several large rice-cleaning establishments have been recently brought into operation. The process of Messrs. Lucas and Ewbank, for which patents were obtained in 1819 and 1827, consists in breaking the husk by millstones, and removing the red cuticle by beating or triturating in mortars; the latter operation being aided by mixing a quantity of the husks, well dried, with the grain, which obviates an inconvenience occasioned by the glutinous character of the red coating. The refuse matter and the broken grains are then separated by a peculiar kind of screen, and the rice is finally cleaned and polished by a machine with two concentric cylinders, the outer one remaining stationary, while the inner one, which is covered with sheepskin with the wool on, is caused to revolve with great velocity. The rice, being placed between the two cylinders, is thoroughly whitened by the friction of the wool.

In the apparatus patented by Mr. Shiel, the first operation is performed between one millstone and a piece of wood of precisely similar shape, and the subsequent removal of the dark pellicle is effected by rubbing between flat wooden surfaces covered with sheepskin, but with this distinction, that while Mr. Ewbank places the wool outwards, Mr. Shiel has it next the wood; its elasticity producing an effect very nearly resembling the rubbing of the grain between the palms of the hands.

Another ingenious contrivance, first used in the United States, consists of a long hollow cylinder of wood, with several bars projecting from its inner surface, and enclosing an axis on which are several other bars capable of revolving between those attached to the cylinder. By suitable toothed wheels the cylinder is made to revolve slowly in one direction, while the axis is turned with great rapidity in the contrary direction. The whole being placed in an inclined position, the paddy is allowed to enter the upper end of the cylinder by a hopper, and the mutual attrition of the grains, as they pass between the revolving bars, causes the separation of the husks, which are removed by a current of air as the grain falls into a bin under the lower extremity of the cylinder. The rice passes out of the cylinder by apertures capable of being enlarged or reduced at pleasure by means of sliding doors; and the action of the machine may be further regulated by varying the inclination of the cylinder, which may be placed vertically or horizontally, though an angle of about 45° is preferred.

Allusion has been made to the difference of the duty on cleaned rice and paddy, which, as may be seen from the following statement from Ellis's 'British Tariff,' 1839, discourages the importation of cleaned rice from foreign countries. The scale of duties is—

Rice, not being rough and in the husk .	15*s*. per cwt.
Rice in the husk, or paddy .	2*s*. 6*d*. per bushel.
Paddy imported from the West Coast of Africa . .	1*d*. per quarter.

If the produce of any British possessions, the duties are—

Rice, not being rough and in the husk .	1*s*. per cwt.
Rice in the husk, or paddy . .	1*d*. per quarter.

A drawback is allowed on the exportation of foreign rice that has been cleaned in this country; such drawback amounting to 10*s*. per cwt., which is equal to the duty paid on four bushels of paddy at 2*s*. 6*d*. per bushel.

RICE GLUE. [CEMENT, vol. vi., p. 412.

RICE PAPER, the name commonly, but erroneously, applied to a delicate vegetable film brought from China in small square pieces, tinged with various colours, and used as a substitute for drawing paper in the representation of richly coloured insects or flowers, and also in the manufacture of artificial flowers and other fancy articles.

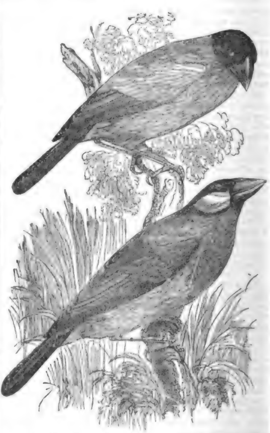
This substance, which is said to be a membrane of the bread-fruit tree (*artocarpus incisa*), is minutely described in a paper by Dr. Brewster, in the second volume of the 'Edinburgh Journal of Science,' from which it appears that though much resembling an artificial production, its vegetable organization is easily seen by the aid of a microscope, which shows 'that the rice-paper consists of long hexagonal cells, whose length is parallel to the surface of the film; that these cells are *filled with air* when the film is in its usual state; and that from this circumstance it derives that peculiar softness which renders it so well adapted for the purposes to which it is applied.'

RICE BIRD, one of the names of the *Paddy Bird*, *Paddee Bird*, or *Java Sparrow* (*Loxia oryzivora* of Linnæus).

This well-known bird, whose plumage is well described by Buffon as being so well arranged that no one feather passes another, whilst all appear to be covered with that kind of bloom which is visible on plums, giving them a beautiful tint, has the bill very much developed; indeed, with the exception of *Pyrenestes* and, perhaps, *Coccothraustes*, this finch is the most remarkable of the race for the size and power of that organ.

Description.—Bloomy lead-coloured, head and tail black, bill red, belly obscurely rosy, cheeks in the male snowy, legs flesh-coloured.

Locality, Habits, &c.—In Java, where it is called *Glate*, and the other parts of Asia where it is found, it has a very bad reputation on account of the ravages which it commits in the rice-fields with its powerful and sharp bill. In Sumatra the name of the bird is *Boorong Peepee*. It is often brought alive to this country, and confined in aviaries for the sake of its elegant shape and graceful colouring: its song, which is short and monotonous, does not much recommend it. This species must not be confounded with the *Rice Bird* of America, *Emberiza oryzivora* Linn. [BOB-O-LINK.]



Loxia oryzivora, Linn. Fringilla oryzivora of Swainson and authors. Upper figure, female; lower figure, male. (Swainson.)

RICH, CLAUDIUS JAMES, was born on the 28th of March, 1787, near Dijon in Burgundy, and, while yet an infant, was carried to Bristol, where he spent the earlier years of his life. He received a good education, and was early distinguished by his extraordinary powers in the acquisition of languages. At the age of eight or nine he happened to see some Arabic manuscripts in the library of a gentleman at Bristol, and was seized with a strong desire to acquire that language. This accidental circumstance led him to study the Oriental languages, in which he made such proficiency as to be able to read with considerable facility the Arabic, Hebrew, Syriac, Persian, and Turkish languages by the time he had attained his fifteenth year. His extraordinary acquirements in Oriental literature induced a friend to obtain for him, in 1803, the appointment to a cadetcy in the East India Company's service; and he was shortly after presented with a writership in the Bombay establishment by Mr. Parry, the chairman of the board of directors, in consequence of the strong recommendation of Sir Charles Wilkins. To enable him to perfect himself in the Arabic and Turkish languages, he was attached as secretary to Mr. Lock, who was at that time proceeding to Egypt as consul-general; and after the death of Mr. Lock, which happened before Mr. Rich joined him, he was allowed by the court of directors to prosecute such a course of travel as it was supposed might be most conducive to the object which he had in view. He accordingly went to Constantinople and Smyrna to study the Turkish language, and thence proceeded to Egypt to perfect himself in the Arabic and its various dialects. After leaving Egypt, he travelled over a great part of Palestine and Syria in the disguise of a Mameluke, and, confiding in his knowledge of the Turkish language and manners, ventured to visit the grand mosque at Damascus, while the great body of pilgrims was assembled at that city on their way to Mecca. From Syria he proceeded by Mardin and Bagdad to Bussora, whence he sailed for Bombay, which he reached in September, 1807.

On his arrival at Bombay, he resided at the house of Sir J. Mackintosh, to whom he had been introduced by the Rev. Robert Hall previous to his departure from England. In the following year he married the eldest daughter of Sir J. Mackintosh, and was shortly afterwards appointed the East India Company's resident at Bagdad, where he remained for about six years. During this time he prosecuted with the greatest diligence his favourite studies. He formed a rich collection of Oriental manuscripts, and also of medals and coins, and of the gems and engraved stones found at Babylon, Nineveh, Ctesiphon, and Bagdad. He made an excursion to Babylon in 1811 for the purpose of examining the ruins of that city, and afterwards published at Vienna, in the 'Mines de l'Orient,' a 'Memoir on the Ruins of Babylon,' which was subsequently reprinted in this country. In consequence of a paper published by Major Rennell, in the 'Archæologia,' containing 'Remarks on the Topography of Ancient Babylon, suggested by the recent Observations and Discoveries of C. J. Rich, Esq.,' in which he questioned some of his conclusions, Mr. Rich undertook another journey to Babylon, and in 1818 published, in London, a 'Second Memoir on Babylon,' in which he endeavoured to confirm the correctness of his first account; to this memoir he also added a valuable appendix on Babylonian antiques, illustrated by engravings, which represent fac-similes of many cuneiform inscriptions found upon bricks at Babylon. A second edition of these Memoirs, with the narrative of Mr. Rich's journey to Babylon in 1811, and to Persepolis in 1821, was published by his widow in 1839.

In 1813 Mr. Rich, being compelled by bad health to leave Bagdad for a time, travelled to Constantinople, and subsequently to Paris. He returned to Bagdad in 1815, where he resumed his former pursuits, and made large additions to his collection of MSS. and antiques. During this time he made the second excursion to Babylon already referred to; and in 1820 he made a tour into Koordistan. He went as far east as Sinna, and visited Sulimania, Mosul, and the ruins of Nineveh, and returned from Mosul to Bagdad down the Tigris. The journal which he kept on this occasion was published in 1836 by his widow, under the title of 'Narrative of a Residence in Koordistan,' and was accompanied by a valuable map of the country between Sinna, Arbil, and Mosul, which was drawn up from Mr. Rich's survey and astronomical observations. On his return to Bagdad, he intended to proceed to Bombay, where he had been appointed to an important office by the Hon. Mountstuart Elphinstone, who was then governor; but in consequence of an attack made upon the residency by the orders or with the connivance of the pasha, he retired to Bussora. While waiting for instructions from his own government, he employed his time in a tour to Shirauz, whence he visited the ruins of Persepolis and other remains of antiquity in that neighbourhood. While at Shirauz, he was attacked by the cholera morbus, and died of that disease on the 5th of October, 1821.

Mr. Rich's death was a great loss to his private friends and to Oriental literature. His disposition was amiable and kind, and his knowledge of many Oriental languages such as few Europeans have ever possessed. The Memoirs on Babylon were the only writings which he published in his lifetime, with the exception of a few articles in the 'Mines de l'Orient;' but he left behind him a considerable number of papers on various subjects. His collection of Oriental MSS., of coins and antiquities, was purchased by parliament for the British Museum. Mr. Rich, during his second residence at Bagdad and on his various excursions, was unwearied in his astronomical observations. He has left a very complete series of eclipses of Jupiter's satellites, and numerous altitudes of stars and lunar distances, most of which are computed, and the results in latitude and longitude deduced. It is probable that a re-calculation of the observations, *correcting the errors of the Ephemerides by contemporary observations at the standard observatories*, would improve the geography of the countries through which he travelled, though with a considerable amount of computation. Unfortunately his chronometer was so indifferent that the partial results cannot be combined. The emersions of Jupiter's first satellite observed at Bagdad, when so computed, throw the longitude a little to the east of Beauchamp's and Murphy's determinations. This seems to show that, from the clearness of the atmosphere or superior quickness of eye, Mr. Rich anticipated other observers, and saw the re-appearances earlier. His zeal as an observer may be estimated from the fact that when taking the sun at Bagdad the metal of his sextant was frequently too hot to be touched without pain; and after the most fatiguing marches, and while labouring under severe indisposition, he seized every favourable opportunity of fixing his position astronomically.

(*Brief Notice of the Life of Mr. Rich* prefixed to Mr. Rich's 'Narrative of a Residence in Koordistan.')

RICHARD I. II. OF NORMANDY. [NORMANDIE.]

RICHARD I., King of England, surnamed *Cœur de Lion*, was the third son of Henry II. and his queen Eleanor, and was born at Oxford, in the king's manor-house there, afterwards the monastery of the White Friars, in September, 1157. The history of the earlier part of the life of Richard has been already detailed. [HENRY II.] By the treaty of Montmirail, concluded 6th January, 1169, between Henry and Louis VII. of France, it was stipulated that the duchy of Aquitaine should be made over to Richard, who should do homage and fealty for it to Louis, and should espouse Adelais, or Alice, that king's youngest daughter; and in 1170, Henry, being taken ill at Domfront, in Maine, made a will, by which he confirmed this arrangement. In 1173, Richard, with his younger brother, Geoffrey, and their mother, joined their eldest brother, Henry, in his first rebellion against their father; on the submission of the rebels, in September, 1174, Richard received two castles in Poitou, with half the revenue of that earldom, and, along with Geoffrey, did homage and swore fealty to their father; nevertheless Richard continued from this time to hold the government of the whole of Aquitaine, and to be usually styled, as before, duke of Aquitaine, or duke of Poitou (which were considered as the same title), although it appears that Henry now looked upon the arrangements made at the treaty of Montmirail as annulled, and that dukedom to have actually reverted to himself (Lyttleton's *Hist. of Henry II.*, vol. iii., p. 371.) In 1183 Richard refused, when commanded by his father, to do homage for Aquitaine to his elder brother Henry, on which Henry and Geoffrey invaded the duchy, and a new war ensued between them and their father assisted by Richard, which however was terminated by the death of the eldest of the three brothers, in June of that same year, when Richard became his father's heir apparent; but at an interview between King Henry and Philip Augustus of France, in November, 1188, Richard, apparently impelled by a suspicion that his father intended to leave his crown to his younger brother John, and also professing to resent Henry's conduct in withholding from him his affianced bride, the French king's sister, suddenly declared himself the liegeman of Philip for all his father's dominions in France; whence arose a new war, in which Philip and Richard speedily compelled Henry to yield to all their demands, and a treaty to that effect was about to be signed when Henry died, on the 6th of July, 1189. Richard was present at the burial of his father in the choir of the convent of Fontevraud.

Notwithstanding his apprehensions, real or affected, of his brother John, Richard made no particular haste to come over to England; but, contenting himself with ordering his mother Queen Eleanor to be liberated from confinement, and to be invested with the regency of that kingdom, he first proceeded to Rouen, where he was formally acknowledged as duke of Normandy, on the 20th of July, and it was the 13th of August before he arrived at Portsmouth (or, as others say, at Southampton). His coronation, from which the commencement of his reign is dated, took place in Westminster Abbey, on the 3rd of September. It was on occasion of that ceremony that a furious riot broke out against the Jews in London, which was in the course of the next six months renewed in most of the great towns throughout the kingdom. At York, in March, 1190, a body of five hundred Jews, with their wives and children, having taken refuge in the castle, found no other way of saving themselves from their assailants, except by first cutting the throats of the women and children and then stabbing one another.

A short time before his father's death, Richard and his then friend Philip Augustus, had, as it was expressed, taken the cross, that is to say, had publicly vowed to proceed to the Holy Land, to assist in recovering from the infidels the city and kingdom of Jerusalem, which had recently (A.D. 1187) fallen into the hands of the great Saladin. The mighty expedition in which all the principal nations of Western Christendom now joined for the accomplishment of this object is known by the name of the Third Crusade. Leaving the government of the kingdom during his absence in the hands of William Longchamp, bishop of Ely and chancellor, and Hugh Pudsey, bishop of Durham and justiciary, Richard took his departure from England on the 11th of December of this same year, 1189, and, proceeding to Normandy, united his forces with those of Philip Augustus in the plain of Vezelai, on the 1st of July, 1190. The two friends proceeded together at the head of an army of more than a hundred thousand men as far as Lyon, where they separated on the 31st; Philip taking the road to Genoa, Richard that to Marseille, where he was to meet his fleet. The fleet however not arriving so soon as was expected, Richard in his impatience hired thirty small vessels for the conveyance of himself and his suite, and, sailing for Naples, arrived there on the 28th of August. On the 8th of September he proceeded by sea to Salerno, where he remained till the 23rd, and then sailed for Messina, which port his fleet had reached about a week before, with the army, which it had taken on board at Marseille. The French king had also arrived at Messina a few days before his brother of England.

The two kings remained together at Messina till the end of March, 1191. During their stay Richard compelled Tancred, who had usurped the crown of Sicily, to relinquish the dower of his sister Joan, the widow of William, the late sovereign, and to pay him besides 40,000 ounces of gold. In return he betrothed his nephew Arthur, the son of his next brother, Geoffrey, to Tancred's infant daughter, and formed a league offensive and defensive with the Sicilian king—a connection which afterwards cost him dear, for it was the source of the enmity of the emperor Henry VI., who had married Constantia, the aunt of William, and claimed the throne of Sicily in right of his wife, who was undoubtedly the legitimate heiress of her deceased nephew. After the dispute with Tancred had been settled, the latent rivalry of Richard and Philip broke out in a quarrel about the Princess Adelais, whom her brother Philip insisted that Richard should espouse, in conformity with their betrothment, now that his father no longer lived to oppose their union. But if Richard had ever cared anything (which there is no reason to suppose he did) for the French princess, that attachment had now been obliterated by another which he had some years ago formed for Berengaria, the beautiful daughter of Sancho VI. (styled the Wise), king of Navarre; in fact, he had by this time sent his mother Eleanor to her father's court to solicit that lady in marriage, and, his proposals having been accepted, the two were now actually on their way to join him. In these circumstances, Philip found himself obliged to recede from his demand; and the matter was arranged by an agreement that Richard should pay a sum of ten thousand marks in five yearly instalments, and restore Adelais, with the places of strength that had been given along with her as her marriage portion, when he should have returned from Palestine. Adelais was in fact sent home some years after, and eventually she became the wife of William, earl of Ponthieu, by whom she had a daughter who was married to Ferdinand III., king of Castile, and was the mother of Eleanor, wife of our Edward I.

Richard, having sent his mother home to England sailed from Messina on the 7th of April, at the head of a fleet of above two hundred ships, of which fifty-three were large vessels of the sort styled galleys; his sister the queen dowager of Sicily and the Princess Berengaria accompanying him. The king of France had set sail about a week before. Several months however elapsed before Richard reached the Holy Land, having been detained by an attack which he made upon the island of Cyprus, Isaac the king or emperor of which had ill used the crews of some of the English ships that had been driven upon his coasts in a storm. Richard took Limasol, the capital, by assault; and that blow was soon followed by the complete submission of Isaac and the surrender of the whole island. Isaac was put into confinement, and remained a captive till his death in 1195. Meanwhile the island of Cyprus was made over by Richard in 1192 to Guy of Lusignan, upon his resignation of the now merely titular royalty of Jerusalem to his rival Henry of Champagne; and Guy's posterity reigned in that island till the year 1458.

Having married Berengaria at Limasol, Richard set sail from Cyprus on the 4th of June (1191), with a fleet now described as consisting of thirteen large ships called busses, fifty galleys, and a hundred transports; and on the 10th he reached the camp of the Crusaders assembled before the fortress of Acre, the siege of which had already occupied them not much less than two years, and had cost the lives, it is said, of nearly two hundred thousand of the assailants. But the presence of the English king, although he was suffering from severe illness, and had to be carried to the trenches on a litter, immediately inspired so much new vigour into the operations of the Christian army, that on the 12th of July the place surrendered, and Saladin, who had been harassing the besiegers from the neighbouring mountains, withdrew in conformity with the terms of capitulation. This great event however was immediately followed by an open rupture between Richard and king Philip, whose rivalry had already exhibited itself in a variety of ways, and more particularly in the support given by the former to the claim of Guy of Lusignan, and by the latter to that of Conrad of Montferrat, to the vacant crown of Jerusalem. Philip in fact took his departure from Palestine on the last day of July, leaving only ten thousand men under the command of the duke of Burgundy.

Richard performed prodigies of valour in the Holy Land; but, although a signal defeat of Saladin, on the 7th of September, was followed by the capture of Jaffa and some other places of less importance, Jerusalem, all along professedly the main object of the crusade, so far from being taken, was not even attacked. Jaffa however, after it had again fallen into the hands of Saladin, was recovered by the impetuous valour of the English king. At last, on the 9th of October, 1192, Richard set sail from Acre in a single vessel, his fleet, having on board his wife, his sister, and the daughter of the captive king of Cyprus, having put to sea a few days before. The three ladies got safe to Sicily; but the first land the king made was the island of Corfu, which he took about a month to reach. He left Corfu about the middle of November, in three coasting-vessels, which he hired there, but, after being a few days at sea, he was compelled by a storm to land on the coast of Istria, at a spot between the towns of Aquileia and Venice. After narrowly escaping first from falling at Gorits into the hands of Maynard, a nephew of Conrad of Montferrat (to whose murder in Palestine Richard, upon very insufficient evidence, was suspected to be an accessory), and then at Freisach from Maynard's brother, Frederic of Betesow, he was taken on the 21st of December at Erperg, near Vienna, by Leopold, duke of Austria (a brother-in-law of Isaac of Cyprus), and was by him consigned to close confinement in the castle of Tyernsteign, under the care of his vassal, baron Haldmar. In the course of a few days however, by an arrangement between Leopold and the emperor Henry VI., the captive king was transferred to the custody of the latter, who shut him up in a castle in the Tyrol, where he was bound with chains and guarded by a band of men who surrounded him day and night with drawn swords. In this state he remained about three months. Meanwhile intelligence of his having fallen into the hands of the emperor had reached England, and excited the strongest sensation among all ranks of the people. A sketch of the course of events there during his absence has been given in the article on JOHN. It is sufficient to mention that a struggle for supremacy had for some time been carrying on with various success between the king's brother John and Longchamp, the chancellor, who had acquired the entire regency, and had also been appointed Papal legate for England and Scotland; and that this had issued, in October, 1191, in the deposition of Longchamp by a council of the nobility held in St. Paul's churchyard, London; after which he left the country, and although he soon ventured to return, ultimately deemed it most prudent to retire to Normandy. The supreme authority was thus left for a time in the hands of John, who, as soon as he learned the news of his brother's captivity, openly repaired to Paris, and did homage to the French king for the English dominions on the Continent. On his return to England, John raised an army to support his pretensions, and his confederate Philip took up arms in his behalf in France, and, entering Normandy, overran a great part of that duchy, although Rouen, the capital, was preserved principally by the exertions of the earl of Essex, lately one of Richard's companions in the Holy Land. In England also John met with a general opposition to his usurpation of the regal authority, which soon compelled him to conclude an armistice with a council of regency that had been appointed by the prelates and barons. This was the position of affairs when Longchamp, having discovered Richard's place of confinement, after much solicitation prevailed upon the emperor to allow the royal prisoner to be brought before the diet at Hagenau, where accordingly he made his appearance on the 13th of April, 1193, and defended himself with so much eloquence against the several charges made against him in regard to Tancred and the kingdom of Sicily, to his conquest of Cyprus, and to the murder of Conrad of Montferrat, that Henry found himself compelled by the general sentiment of the diet to order his chains to be immediately struck off, and to agree to enter upon negociations for his ransom. Longchamp was immediately dispatched to England with a letter to the council of regency, and the result was, that, notwithstanding the insidious efforts both of John and his friend Philip of France to prevent the conclusion of the treaty, Richard was at last liberated, on the 4th of February, 1194, after 70,000 marks had been actually paid to the emperor, and hostages given for the payment of 30,000 more. The English king had also engaged to release both Isaac of Cyprus and his daughter, and he had besides, at the persuasion, it is said, of his mother Eleanor, the more effectually to conciliate Henry, formally resigned his crown into the hands of the emperor, who immediately restored it to him to be held as a fief of the empire, and burthened with a yearly feudal payment to his superior lord of five thousand pounds. This strange transaction rests on the apparently satisfactory authority of the contemporary annalist Hoveden. Richard, descending the Rhine as far as Cologne, proceeded thence across the country to Antwerp, and, embarking there on board his own fleet, landed at Sandwich on the 13th of March.

Most of John's strongholds had been wrested from his hands before his brother's return, and now the rest immediately surrendered, and he himself fled the country, and with his principal adviser, Hugh, bishop of Coventry, having been charged with high treason, and not appearing to plead after forty days, was outlawed and divested of all his possessions.

Meanwhile it was thought necessary, perhaps on account of the formal resignation of his crown which he had been induced to make to the emperor, that Richard should be crowned again; and that ceremony was accordingly performed at Winchester, by Hubert, archbishop of Canterbury, on the 17th of April. Then, leaving Hubert guardian of England and grand-justiciary, on the 2nd of May following, having, with his characteristic activity, employed almost every moment since his arrival in raising an army and procuring funds for its maintenance by all sorts of exactions and the most unscrupulous use of every means in his power, he again set sail from Portsmouth, his whole soul bent on chastising the king of France. Owing to adverse winds, he was a fortnight in reaching Barfleur in Normandy, where, as soon as he landed, he was met by his brother John, who professed contrition and implored his pardon. On the intercession of his mother Eleanor, he consented to receive the submission of the repentant traitor, and to grant him his life, although he refused to restore him his lands. He now marched against Philip, and several engagements took place between them, in most of which the English king was successful. But the war, though it lasted for some years, was distinguished by few remarkable events. A truce for one year was agreed to on the 23rd of July; and, although hostilities were resumed some time before the expiration of that term, a peace was again concluded in the end of the following year, which lasted till the beginning of 1197.

All this time Hubert, assisted by Longchamp, who had been restored to his office of chancellor, is said to have presided over the government at home with great ability. Hubert had been educated under the famous Glanvil, and he seems, in the spirit of his master, to have exerted himself in re-establishing and maintaining the authority of the law, by which alone, even if he did no more, he must have materially contributed to the revival of industry. The large sums however which he was obliged to raise by taxation to meet the expenses of the war, in the exhausted state to which the country had been reduced, provoked much popular dissatisfaction; and the third year of the king's absence in particular was distinguished by the remarkable commotion excited by William Fitz-Osbert, styled Longbeard, a citizen of London, who is admitted to have possessed both eloquence and learning, and whose whole character and proceedings might not improbably, if he had had his own historian, have assumed a very different complexion from what has been given to them. Longbeard, who acquired the names of the Advocate and King of the Poor, is affirmed to have had above fifty thousand of the lower orders associated with him by oaths which bound them to follow whithersoever he led. When an attempt was made to apprehend him by two of the wealthier citizens, he drew his knife and stabbed one of them, named Geoffrey, to the heart, and then took refuge in the church of St. Mary-le-Bow in Cheapside, the tower of which he and his followers fortified, and held for three days, when they were at last, 7th of April, 1196, dislodged by fire being set to the building. Fitz-Osbert was first dragged at a horse's tail to the Tower, and then to the Elms in West Smithfield, where he was hanged, with nine of his followers. The people however long continued to regard him as a martyr. He appears to have been accustomed to appeal to the religious feelings of the populace in his attempts to rouse them against the government; even at that comparatively late day too he raised the old cry of Saxon against Norman, professing to wear his beard unshorn, it is said, out of affection for that custom of the more antient inhabitants of the land.

The war between Richard and Philip broke out again in 1197, and in the course of this campaign Richard had the gratification of capturing the bishop of Beauvais, a personage whom he had reason to regard as a main instigator of the severities and indignities which he had sustained at the hands of the emperor. The bishop was taken armed cap-à-pie and fighting, and when Pope Celestine recommended him to the clemency of Richard as his son, the English king sent his holiness the bishop's coat of mail, with the following verse of scripture attached to it:—'This have we found: know now whether it be thy son's coat or no.' This same year too finished the career of the emperor Henry, who in his last moments is said to have expressed the extremest remorse for the manner in which he had treated the great champion of the Cross. Richard's other enemy, Leopold, duke of Austria, had been killed by a fall from his horse two years before.

A truce, as usual, at the end of the year, again suspended hostilities for a space. The war was renewed on its termination, and in this campaign (of the year 1198) Richard gained one of his greatest victories, near Gisors, when Philip in his flight fell into the river Epte, and was nearly drowned. After this, by the intervention of the pope's legate, a truce was concluded between the two kings for five years, and they never met again in fight; although they probably would, notwithstanding the truce, if both had lived. But on the 26th of March in the following year, 1199, as Richard was engaged in reducing the castle of Chalus, the stronghold of one of his Aquitanian vassals, Vidomar, viscount of Limoges, who it seems had refused to surrender a treasure found on his estate, to which the king laid claim in right of his feudal superiority, Cœur de Lion was struck in the left shoulder by an arrow, aimed, it is said, at the royal person, from the rampart of the castle, by a youth named Bertrand de Gurdun. The wound would not have been dangerous, but for the mismanagement of the surgeon in his attempts to extract the arrow-head, which had broken off in the flesh. As it was, Richard lived only till Tuesday, the 16th of April. The shot was a fatal one in every way; in the fury into which the wound of the king threw the besieging army, the castle was taken by storm, and all the persons found in it were immediately hanged, with the exception only of Gardun. He was brought into the presence of his dying victim, when Richard, under the impulse of generosity or compunction, gave him his liberty, with a hundred shillings to take him home; but after the king's death he was flayed alive, by order of Marchadee, the leader of the Brabantine mercenaries serving in Richard's army.

Richard I. had no issue by his wife Berengaria, but he is said to have had one or two natural children. He was succeeded on the throne by his youngest brother, John, to the exclusion of Arthur of Bretagne, the legitimate heir, as being the son of his next brother, Geoffrey. [John.]

The character of Richard is one of course not to be judged without reference to the general manners of the age in which he lived. He is charged by writers of his own or near his own time with crimes of all sorts, and it is probable enough that there was hardly an excess, either of violence or licentiousness, into which his impetuous temperament did not occasionally precipitate him; but, besides the sanction or indulgence for all this accorded by public opinion and the universal example, it is also to be said for Richard that, with all his passion and recklessness, he seems to have had nothing base or malignant in his composition; and that he was as capable of acts of extraordinary generosity and disinterestedness as of excesses of brutal fury or profligacy. Of the courage and strength of will proper to his race, he had his full share, with more than his share of their strength of thew and sinew; and his intellectual powers, both natural and acquired, were also of a high order. He was renowned in his own day, not only as beyond all dispute the stoutest and most gallant of living heroes, but as likewise occupying a place in the foremost rank of those who excelled in wit, in eloquence, and in song. Walpole indeed, in his 'Royal and Noble Authors,' tells us that Hoveden, the monkish annalist, 'says positively that Richard, to raise himself a name, bought and begged verses and flattering rhymes, and drew over singers and jesters from France to chant panegyrics on him about the streets, and it was everywhere said that the world contained nothing like him.' But in fact Hoveden says that this was done not by Richard, but by Longchamp, his chancellor. A few of Richard's poetical compositions have been preserved, and may be found in the following works:—'La Tour Ténébreuse,' 1705, which contains a love-song in Norman-French, and another chanson in mixed Romance and Provençal, said to be the joint composition of Richard and his favourite minstrel Blondel de Nesle, and to be that by which Blondel, according to the well-known story, now generally believed to be a fiction, discovered his master's prison; Walpole's 'Royal and Noble Authors,' which contains a poem of about forty lines in Provençal, from a MS. in the Laurentine Library at Florence, another version of which in Norman French (by some supposed to be the original), is given by Sismondi, 'Litérature du Midi de l'Europe,' vol. i., p. 149, and of which there are two English versions, one published in Burney's 'History of Music,' another by the late George Ellis, in Park's edition of Walpole's work; Raynouard's 'Choix des Poésies des Troubadours,' vol. iv., containing the Provençal version of the same poem; and the 'Parnasse Occitanien,' Toulouse, 1819, in which another poem of Richard's is given. Richard is also a distinguished character in romance; on which subject it may be sufficient to refer the reader to Ellis's 'Specimens of Early English Romances,' vol. ii., p. 175-290 (edit. of 1811).

The claim of Richard I. to the authorship of the antient maritime code called the Laws of Oleron, has been shown to be unfounded in another article [vol. xvi., p. 426]. Almost the only improvement in the laws or institutions of England which is attributed to him is some reform of the institution of justices itinerant introduced by his father; but it is not very clear in what this consisted; and, whatever it was, the merit of it appears to belong not to Richard, but to his viceroy Hubert. He is also said to have abolished some of the most cruel penalties of the forest laws, although he enforced that code generally with great exactness. What is called the time of legal memory, or the term requisite to establish immemorial usage, dates from the commencement of the reign of this king; though some recent acts of parliament have altered the law in this respect by shortening the time of prescription. [Prescription.]

(The chief contemporary authorities for the history of the reign and exploits of Richard I. are, William of Newbridge or Newburgh, Gervas of Canterbury, Roger de Hoveden, Ralph de Diceto, Benedictus Abbas, Josephus Iscarius, Richard of the Devizes, Greg. Alpharagius, Geoffrey de Vinesauf, and the Arabic historian Bohadin.)

RICHARD II. (surnamed of Bordeaux), King of England, was the second but only surviving son of Edward, styled the Black Prince, eldest son of King Edward III., by his wife Joanna of Kent [Edward III.], and was born at Bordeaux on the 3rd of April, 1366. He was consequently ten years and two months old when he lost his father, and not quite eleven years and three months when he succeeded to the throne on the death of his grandfather. His reign is reckoned to have commenced on the day following that event, the 22nd of June, 1377. His coronation did not take place till the 16th of July.

On the accession of a king who was thus still a minor, the powers of government were, by an assembly of the prelates and barons, vested in twelve counsellors, who were appointed to assist, in other words to direct and control, the chancellor and treasurer. From this council the king's three uncles, John of Gaunt, duke of Lancaster, Edmund of Langley, then earl of Cambridge, afterwards duke of York, and Thomas of Woodstock, then earl of Buckingham, afterwards duke of Gloucester, were all excluded; but this arrangement appears to have been collusive, and intended merely to lull the popular dislike and suspicion of Lancaster, in whose interest most of the counsellors are said to have been; and who, although he at first retired to his castle of Kenilworth, was the next year appointed to the command of a fleet fitted out to act against France. In the course of that year, 1378, great honour was obtained by John Philpot, a citizen of London, who, having equipped a small naval armament at his own expense, set sail with it against the Scottish privateer Mercer, who had recently carried off all the ships in the port of Scarborough, and succeeded in capturing him with all his prizes. During the next three years the war with France was prosecuted in Brittany under the conduct of the earl of Buckingham; but the death of Charles V., in September, 1380, having been speedily followed by a peace between the duke of Brittany and the new French regency, Buckingham, now finding an enemy in his former ally, was glad to return home with his army, in April, 1381.

Meanwhile in England the heavy pecuniary exactions called for by the war were hastening on a crisis which other causes had been long contributing to bring about. Three contending forces may be distinctly perceived at work in the ferment which now broke forth. First, there was the crown, or, rather, its natural ally the antient aristocracy, in whose hands the young king on the present occasion was, and of which he may be considered as the mere representative or instrument, striving to protect from encroachment the almost exclusive control of the national affairs which it had possessed at least from the æra of the Conquest. Secondly, there was the recently established House of Commons, the representative of the minor gentry and the middle classes, pressing forward to secure a share in the government, and, with the instinct of a growing power, eagerly seizing hold of every opportunity of forwarding its object, its chief means being the right of taxation, of which it was already in the undisputed enjoyment, and which it had learned to apply with considerable skill as a screw for compressing the crown, and extorting from it new concessions and privileges. It may be remarked that the present state of affairs, with the king a boy and a cipher, and the government in the hands of a regency, was peculiarly favourable for such attempts on the part of the House of Commons. Lastly, there was the great body of the population, forming the labouring class, of which by far the larger portion was yet engaged in agriculture, and in a state of villeinage or servitude, bound to the soil, and so confounded in some sort with the cattle and chattels of the landlord, counted, or at least treated, as *things* not as *persons*, at any rate in so far as all rights of a political character were concerned. But the example of what had recently taken place in other countries, in France and in Flanders, and the progress that the development of society had made among ourselves, had inspired even this the lowest class with a general desire of acquiring a new position in the commonwealth—of being raised from bondage to freedom and citizenship. Of course, both on the part of the House of Commons (or middle classes) and still more on that of the villeins, what was reasonable and right in this ambition may have been mixed with much that was ill-considered, extravagant, and impracticable; their efforts may have been, in some respects, ill-directed, both in regard to ends and means; but in the main, what took place must have happened if society was to advance at all, or even if it was to retain any principle of life. The explosion of these various elements was provoked by the state of pecuniary necessity to which the crown was reduced in the years 1379 and 1380. First, to induce the commons to grant the money that was wanted, it was found necessary, after a short struggle, to submit to their demands, of not only being allowed to inspect the accounts of the royal treasury, but even of appointing the king's ministers. Then, in December, 1380, the famous capitation tax was imposed, which gave rise to the rebellion of Wat Tyler in the summer of the year following. This formidable movement began at Fobbings, near Brentwood in Essex, on the 30th May, 1381, when the people rose against Thomas de Bampton, one of the commissioners who had been appointed to superintend the collection and enforce the payment of the tax. It thence spread over Essex, Kent, Suffolk, Norfolk and other counties along the eastern and southern coasts: the most noted among the popular leaders being two priests called Jack Straw and John Ball; Watt, the Tyler (or tiler) of Dartford, who headed the Kent men, and seems to have been by far the most determined and ferocious of the rebel captains; and two persons of the names of Lister and Westbroom, who were called kings of the commons in Norfolk and Suffolk. In the earlier part of the month of June, Tyler and his followers, having marched upon London, perpetrated a series of frightful devastations: they sacked the archbishop's palace at Lambeth, demolished the Marshalsea and King's Bench prisons, and the duke of Lancaster's palace of the Savoy, set loose the prisoners in Newgate and the Fleet, and destroyed the former building; set fire to the Temple, and to the Priory of the Knights Hospitallers at Clerkenwell; and massacred great numbers of the wealthier classes, among others the two first officers of the kingdom, the archbishop of Canterbury, who was chancellor, and Sir Robert Hales, the treasurer. At last, on the 15th, the career of the demagogue was suddenly terminated by the bold hand of Sir William Walworth, the lord mayor, who, when Tyler, coming forth from his men, rode up to the king stationed in front of the abbey of St. Bartholomew in West Smithfield, plunged a dagger into his throat, on which he was speedily dispatched by one or two other persons in the royal suite. Richard himself on this occasion, young as he was, showed great firmness and presence of mind. The insurgents, deprived of their leader, were easily induced to lay down their arms, and in a few weeks the rising of the commons was completely suppressed in all parts of the kingdom. The victory obtained by the king and the government was followed by the shedding of torrents of blood on the scaffold: it is said that the persons executed amounted in all to about 1500; Straw, Ball, and the other leaders being among the number. All the promises also that had been made to the congregated multitudes while they had still arms in their hands, were broken. The Essex men had only asked for the abolition of slavery, the fixing of a maximum for the rent of land, the universal liberty of buying and selling in fairs and markets, and a general pardon; and before they broke up and retired to their homes, they had actually received a written grant of these demands under the king's hand. Even Wat Tyler and the men of Kent, when they came to specify their terms, had insisted upon nothing more extravagant than that the forest law should be repealed, and all warrens, waters, parks, and woods thrown open, so that the killing of fish, fowl, and game of all kinds should be everywhere free to every man.

On the 14th of January, 1382, Richard was married to Anne of Bohemia, daughter of Charles IV., the late emperor of Germany. The next two years were filled up with a war against the French in Flanders, conducted by Henry Spenser, the young and fighting bishop of Norwich, who in the late commotions had distinguished himself by his decisive style of dealing with the rebels; first, as Froissart tells us, meeting them in the field, and then, when he had routed them, exchanging his sword and armour for a crucifix and sacerdotal robes, and, thus arrayed, confessing and absolving his prisoners as he hurried them to the gibbet; and who now went over to the Continent to assist the burghers of Ghent in their contest with the count of Flanders and the French king, and in support of the cause of Urban VI., in the general European war excited by the struggle between that pope and his rival Clement VII. The bishop in his first campaign defeated the count of Flanders, and took the town of Gravelines, but in the end he was obliged, in the spring of 1384, to make his way back with much precipitation to England, where he was arraigned by the parliament for the failure of the expedition, and his temporalities confiscated till the king should be repaid the money it had cost. In 1385 the war with France was transferred to Scotland; and in the summer of that year Richard, for the first time, appeared at the head of his army, which penetrated as far as Aberdeen, having on its way reduced Edinburgh, Dunfermline, Perth, and Dundee to ashes, without having however, during its whole progress, seen the face of the enemy. An expedition of John of Gaunt to Spain, to assert his claims to the throne of Castile and Leon, grounded on his marriage with Constance, the eldest daughter of the late king Peter the Cruel, after occupying him for about three years, terminated, in 1388, in the marriage of the duke's daughter Catherine to Henry prince of Asturias, the heir of the reigning Castilian king John I., an alliance which seated the descendants of the English duke for many generations upon the throne to which he aspired.

Meanwhile, during the absence of the duke, the ascendancy at home had been assumed by his younger brother Thomas, now duke of Gloucester; and in the latter part of the year 1387, an ill-conceived and worse-directed attempt of Richard to take the management of affairs into his own hands had resulted in the complete defeat of that design by Gloucester, the execution of Richard's two principal counsellors, the chief-justice Tresilian and Sir Nicholas Brember the lord mayor of London, and the expulsion of the archbishop of York, and of the royal minions De Vere, duke of Ireland, and De la Pole, earl of Suffolk, from the kingdom. The 'wonderful parliament,' as it was called, which met on the 3rd of February, 1388, after ratifying the proceedings of the victorious party, also sent Sir Simon Burley and three other knights to the scaffold, banished four more of the judges to Ireland, and in short completely put down the king's faction. On the 15th of August this year was fought the famous battle of Otterbourne, or Chevy Chase, in which the Scots lost their commander, Earl Douglas, but the English were finally driven from the field, after both their leader Lord Harry Percy (popularly designated Hotspur) and his brother Lord Ralph had fallen into the hands of the enemy.

Richard remained in the state of subjection to which he had been reduced by the 'wonderful parliament' for more than a year. At last, at a great council held in May, 1389, he unexpectedly intimated that, being now in his twenty-second year, he intended to take the management of affairs into his own hands; and the suddenness of the movement secured its success for the moment. Gloucester found it necessary to retire into the country. But, in fact, although no further attempt was made for the present formally to set him aside, his own indolence and indisposition to business very soon threw the government into the hands of his uncle Edmund, duke of York, and Lancaster's son, Henry of Bolingbroke, earl of Derby. John of Gaunt also now returned from the Continent, and had influence enough to force a seeming reconciliation between his royal nephew and Gloucester, and to bring back that duke and his party to court. After this some years passed without any changes or other events of importance. The country was still professedly at war both with France and Scotland; but after the suspension of hostilities had been long kept up by a succession of short amnesties, a truce for four years was concluded with both countries in 1394. His queen, who was called 'the good Queen Anne,' having died on Whitsunday in that year, Richard soon after solicited the hand of Isabella, the beautiful but still infant daughter of Charles VI.; after many delays, the treaty of marriage was finally arranged in October, 1396; and at the same time a further peace and alliance was concluded between the two countries for the space of twenty-eight years.

This French marriage is believed to have materially contributed to the domestic revolution that soon after followed. It was opposed before it was contracted, and reprobated afterwards, by Gloucester and the popular party; and on the other hand Richard is supposed to have counted upon the assistance of his father-in-law the French king, to enable him to rid himself of and avenge himself on his uncle. In the beginning of July, 1397, first the Earl of Warwick, and two days after the Earl of Arundel, the most intimate friends and confederates of Gloucester, were suddenly arrested by the orders of the king, who carried his project into effect with profound dissimulation and treachery; and a few days after Gloucester himself was seized in his castle of Plashy, in Essex, and immediately conducted a prisoner to Calais. A parliament was then called, which met on the 17th of September, and which, awed by the display of military force made by the king, and led by the example of the dukes of Lancaster and York and the Earl of Bolingbroke, all of whom Richard had previously seduced or forced into a public approval of the arrests, ratified all that had been done, and impeached the three peers, and also Arundel's brother, the archbishop of Canterbury, of high treason. The archbishop and Warwick were banished for life; Arundel was beheaded on Tower-hill; and when an order was sent to the governor of Calais Castle to bring up his prisoner Gloucester, the answer returned was that he had died, and few doubted that he had been made away with by the king's orders. It was immediately after this affair that Bolingbroke was raised to the dignity of duke of Hereford; Richard's half-brother, Sir John Holland (the son of his mother by her second husband), being at the same time made duke of Exeter. The subservient parliament, before it separated, devolved the whole power of government and legislation upon a commission of twelve peers and six commoners, all devoted to the king; and having also obtained from them the grant of a revenue for life, Richard might now be considered as almost an absolute sovereign.

This state of things however did not last long. Intoxicated by the success of his schemes, Richard now set no bounds to his exactions and extravagance; and, instead of being satisfied with the discomfiture and destruction of so many of the persons whose opposition he had had the most reason to fear, he seems to have been only thereby incited to the devising of means for ridding himself of others whom he still apprehended to be dangerous. Of those who had supported him in the prosecution of the late Duke of Gloucester and his friends, the two most powerful were the Duke of Hereford, and Mowbray, earl of Nottingham, now duke of Norfolk. While Hereford was riding from Windsor to London in December of this same year, he was overtaken by Norfolk, who, according to the account given by Hereford, more than hinted to him that he had reason to suspect the king was watching for an opportunity of destroying them both; his words were carried to Richard, probably by Bolingbroke himself; that nobleman, at any rate, when called upon in parliament to state what had passed, charged Mowbray with having given utterance to the treasonable expressions; and the result was, that after Mowbray had denied the charge, and the two had in compliance with the award of a court of chivalry, presented themselves on the 16th of September, 1398, at Coventry, to decide the matter by wager of battle, Richard suddenly interposed, forbade the combat to proceed, and pronounced sentence of banishment for ten years upon Hereford, and for life upon Norfolk. The issue of the duel, whatever it might have been, would probably have only delivered him from one of his enemies; this method removed both. But one of them doubtless resolved, while professing for the moment to submit to the sentence, that he would not be long in returning. Henry of Bolingbroke had been for some time sedulously and successfully attracting to himself the popular favour which his cousin Richard was fast losing or throwing away; and probably no other subject whom the king might have banished from England could have carried the affections and hopes of so many of his countrymen along with him. This he himself well knew. Accordingly, when in the beginning of February, 1399, about three months after his departure, his father died, and the estates which had now become his inheritance were seized by the crown, he did not hesitate as to the course he should take. Richard had set sail from Milford Haven on the 31st of May, at the head of a fleet of two hundred transports, to quell an outbreak of some of the native tribes of the south of Ireland: Bolingbroke, now calling himself duke of Lancaster, landed at Ravenspur in Yorkshire, on the 4th of July. The returned exile brought with him only forty followers; but by the time he had reached St. Alban's, on his unimpeded march to the capital, his army had increased to sixty thousand men. The Duke of York, in whose charge the government had been left, withdrew towards Bristol, to which place the Earl of Wiltshire, Bussy, Green, and others of the king's friends and servants had previously fled. Bolingbroke merely showed himself to the citizens of London, and, having received their plaudits and addresses of congratulation, set out for the west. York and he met in Berkeley Castle, where the regent after a short conference yielded to all his demands. They marched together to Bristol, where, having taken possession of the castle, Bolingbroke directed Wiltshire, Bussy, and Green to be executed, and then set out for Chester, and established himself in that city. Meanwhile Richard, long detained by tempestuous weather, had at last landed at Milford Haven on the 5th of August. He brought with him the greater part of the army he had carried over to Ireland two months before; but the men nearly all deserted the first night they found themselves again upon English ground. Richard then disguised himself as a Franciscan friar, and, accompanied by the Duke of Exeter and some others of his friends, fled to Conway, where it was understood that the Earl of Salisbury was in command of a numerous royalist force; but upon his arrival he found that that too had broken up some days before. On the 18th the Earl of Northumberland came to him from Bolingbroke, and induced him to accompany him to Flint Castle, where, on the following day, Bolingbroke presented himself at the head of about 80,000 men. The unhappy king proceeded to Chester in the train of his conqueror, and thence in a few days he was carried to London, where he was forthwith lodged in the Tower. Here, on the 29th of September, he consented to read a renunciation of the crown before a deputation of prelates, barons, knights, and lawyers, and to declare that, if he had the right of naming his successor, the man he would fix upon should be his cousin Lancaster. Such at least is the account inserted by Henry's order in the rolls of parliament. On the next day the two houses of parliament met together in Westminster Hall, and voted his deposition, immediately after which the Duke of Lancaster rose and claimed the crown, and was unanimously recognised as king. [HENRY IV.]

Richard did not long survive his dethronement. On the 23rd of October the house of peers, in a new parliament, on being consulted, by king Henry's order, as to what should be done with him, recommended that he should be closely confined in some castle, the knowledge of which should be kept secret from the people; and in conformity with their advice, he was a few days after privately conveyed away from London. All that is further known is, that in the following February rumours were everywhere spread that he was dead, and that in the beginning of March his body, or what was declared to be such, was brought with funeral pomp from Pontefract Castle to London, and there exhibited openly to the people. Afterwards it was reported, by some that he had starved himself to death, by others that he had been starved by his keepers, according to a third version of the story, that he had been violently made away with by Sir Piers Exton, assisted by seven other assassins. For many years also rumours continued to arise from time to time that he had made his escape, and was still alive in Scotland; and an attempt has lately been made to establish the probability of this strange story; but the supposed new evidence brought forward in support of it has been satisfactorily shown to be quite inconclusive.

Of the alterations made in the statute law during the reign of Richard II., the most important was the extension of the former Acts against provisors, or persons obtaining papal presentations to benefices before they were vacant, by a series of new Acts, and especially by the 16 Ric. II., c. 5, commonly called the Statute of Præmunire. [PRÆMUNIRE.]

In 1382 a statute was passed for apprehending and punishing the followers of the religious reformer Wycliffe, who are described as malevolent persons going about from county to county, and from town to town, in peculiar habits, with pretence of great sanctity, and without licence of the pope or the ordinary, preaching daily in the churches, churchyards, markets, fairs, and other open places where the people were assembled in greatest numbers, discourses full of heresies and notorious errors, to the great injury of the faith, and destruction of the laws and estate of holy church, &c. But this Act was repealed the same year, on the representation of the Commons that it had been passed without their assent. Just before its enactment twenty-four opinions, attributed to Wycliffe, had been condemned as heretical and dangerous by a synod of churchmen; the reformer appealed against the decree, but was ultimately induced to submit, and he remained in quiet at his rectory of Lutterworth, till his death, about two years after. His opinions however had already made great progress among the people; and the spirit which he had awakened by his preaching and writings continued to live and spread after his death, and no doubt materially contributed to prepare the way for the overthrow of the old religion, which was effected a hundred and fifty years later.

In the preceding year (1381), after the suppression of Tyler's rebellion, the offence of treason was extended to the act of beginning a riot, rout, or rumour, by the 5 Ric. II., st. i., c. 7; but this severe enactment was repealed in the reign of Edward VI. This is one of the antient statutes constituting the offence called *Scandalum Magnatum*. To the reign of Richard II. have been assigned the complete establishment of the court of the high admiral, and the enlargement of the jurisdiction of the Court of Chancery by the first issuing of writs of subpœna. [Equity; Pleading in Equity; Subpœna, Writ of.] Finally, the right of impeachment and prosecution by the Commons in parliament, which had been first asserted in the latter years of Edward III., was finally established in this reign by the impeachment of the earl of Suffolk, the late chancellor, in 1386.

Richard II. had no issue by either of his wives (his second indeed was only a child of ten years of age at the time of his death); nor are any natural children assigned to him by the genealogists. Queen Isabel returned to France in 1401, and became the wife of her cousin Charles, duke of Orleans, after bearing a daughter to whom, she died, at the age of twenty, in 1409.

The transactions of this reign must be principally sought from public documents. Of the contemporary historical accounts the principal are, besides the graphic narrative of military transactions by Froissart, a work by a monk of Evesham, published by Hearne, in 1729; Knyghton's 'History of the Deposition of Richard II.,' in Twysden's 'Decem Scriptores;' and an alliterative poem in English on the deposition, and another, in Latin, by Richard Maydiston, a Carmelite friar, entitled 'De Concordia inter Ric. II. et Civitatem London.,' lately published together by the Camden Society. There is also in the Harleian Library (MS. 1319) a very curious history of the close of the reign, embracing both the deposition and the preceding expedition to Ireland, written in French verse by a person who professes to have belonged to the king's suite, and adorned with many illuminations of remarkable beauty and delicacy of execution. This interesting composition has been printed in the twentieth volume of the 'Archæologia,' with a translation and ample annotations by the Rev. J. Webb, and with engravings of all the drawings.

RICHARD III., king of England, was the youngest son of Richard, duke of York, whose descent is given in the article on Edward IV. Richard was born 2nd October, 1452, at Fotheringay Castle in Northamptonshire. On the defeat and death of the duke of York at Wakefield Green, 31st December, 1460, where the duke's second surviving son Edmund, styled earl of Rutland, was also killed, Richard and his elder brother George, afterwards duke of Clarence, were sent by their mother to Utrecht, where they remained under the protection of Philip, duke of Burgundy, till the crown of England was acquired (about two months after) by their eldest brother Edward. Soon after this event Richard was created duke of Gloucester, made a knight of the Garter, and appointed to the office of lord high admiral, though as yet only in his tenth year. In 1469 he was made one of the wardens of the Scottish marches: in 1470 he fled with the king, his brother, to Flanders on the sudden restoration of Henry VI. by the earl of Warwick: in 1471 he commanded the foreward of his brother's army at the battle of Barnet; and he also assisted in gaining for Edward his next and crowning victory of Tewksbury. He and his brother Clarence are asserted to have been the actual murderers of Henry's son Prince Edward, after the battle. [Edward IV.] To Gloucester also was popularly ascribed at the time the murder of Henry himself in the Tower a few weeks after. [Henry VI.] The following year the Lady Anne Nevil, daughter of the earl of Warwick, and widow of Prince Edward, was prevailed upon to give him her hand.

In 1478 Gloucester took a foremost part in the attainder and destruction of his brother Clarence, whose removal placed him next after the king's issue in the order of succession to the throne. In 1482 he commanded an expedition against Scotland, in the course of which he took the town of Berwick and penetrated as far as Edinburgh. He had only recently returned from this expedition, and was still in command of his army on the borders, when the death of his brother took place, in the beginning of April, 1483.

On the receipt of this intelligence, Richard immediately prepared to set out for London, stopping however on his way at York, where he summoned the gentlemen of the county to swear allegiance to Edward V., taking the oath first himself. At Northampton he was met on the 29th of April by the duke of Buckingham, and it is believed that the measures, probably in part arranged previously by letter, were then finally concerted, by which Richard should be elevated to the throne. On the next day Edward's uncle, Earl Rivers, and his half brother, Lord Grey, who were at Stony Stratford with the king, were both arrested by Gloucester's orders; and possession was also taken of the royal person.

From his arrival in London to the disappearance of the young king and his brother towards the end of June [Edward V.], Gloucester, who now called himself Lord Protector, kept his residence at Crosby Place in the City, where he held frequent conferences with his confidants. On the 13th of June, Lord Hastings was arrested by his orders in the council-room at the Tower, and immediately led to execution; and two days after, the Lord Grey, Sir Thomas Vaughan, and Sir Richard Hawes underwent the same fate before the gate of Pontefract Castle. The public were informed by proclamation that these persons had been put to death as having, with the queen and her adherents, 'intended to murder and destroy the Protector and his cousin the duke of Buckingham, and the old royal blood of the realm.' Lord Stanley, the archbishop of York, and the bishop of Ely were also arrested.

On Sunday the 22nd of June, Dr. Shaw preached his famous sermon at Paul's Cross, in which he denounced both the present and the late king as bastards; and on the Tuesday following the duke of Buckingham harangued the citizens to the same effect from the hustings in Guildhall. The next day, Buckingham, accompanied by other lords, by Shaw the lord mayor (brother of the preacher), and by a number of other citizens, proceeded to Baynard's Castle, the residence of the duchess of York, where Richard then was, and in a long address offered him the crown and royal dignity in the name of the three estates of the land. Richard, after some affected hesitation, replied that he felt it to be his duty to obey the voice of his people, and that he would from that day take upon himself the royal estate of the two noble realms of England and France. On the following day, the 26th, he proceeded to Westminster Hall, and there formally declared himself king. The commencement of his reign is counted from that day, though he was not crowned till the 6th of July

Whether it was the fear inspired by the known determination and unscrupulousness of Richard's character, and the executions at London and Pontefract, that operated upon the public mind, or that any considerable part of the nation really preferred his claims to those of his nephew and the rest of his late brother's children, it must be admitted that his accession, so far from having been opposed in the first instance from any quarter, appears to have been everywhere hailed with all the evidences of popular approbation and rejoicing. Part of this favour, if it was not a mere show, he may have owed to the clemency and condescension which he affected as soon as he found himself fairly seated on the throne, and to the expectations of a mild or lax government which the very doubtfulness of his title would excite. But the story, in truth, has been so imperfectly transmitted to us, that it is difficult to weave any consistent or satisfactory theory out of the unconnected details that have been preserved. All we know is, that Richard, having immediately after his coronation set out with his queen on a tour through the northern parts of the kingdom, and having been everywhere received with apparently the most cordial gratulations by all classes, was suddenly surprised, while sojourning at York, by intelligence of a formidable confederacy which had been formed against him by the friends of his two nephews in the southern and south-western counties, with his own chief adviser the duke of Buckingham at its head. It appears that a rising would have taken place immediately throughout Kent, Essex, Sussex, Berkshire, Hampshire, Wiltshire, and Devonshire, had it not been prevented for the moment by its being ascertained that the two royal children were dead. This intelligence however only changed the plan of the conspirators. By the advice of the bishop of Ely, the crown was offered to Henry, earl of Richmond, on condition that he should marry Edward IV.'s daughter the Princess Elizabeth; and as soon as his acceptance of the proposal was received from beyond seas, his partizans called their followers to arms on the same day, the 18th of October, in all the parts of the country where they had influence. But this insurrection was quelled almost as soon as it broke out. Richmond, after having reached the coast of Devon, did not venture to disembark; Buckingham was deserted by a force of Welshmen that he had raised at Brecon, and, falling into the king's hands, had his head immediately struck off in the market-place of Salisbury; of his associates the most fortunate escaped beyond seas; and by the end of the month not an enemy of Richard's remained in arms in England.

A parliament was now summoned, which, having met on the 23rd of January, 1484, immediately passed an Act declaring Richard to be undoubted king of the realm of England 'as well by right of consanguinity and inheritance, as by lawful election, consecration, and coronation,' and bastardizing the issue of the late king Edward IV. by Elizabeth Rivers, whom it designated as the late wife of Sir John Gray, and denied to have any rightful title to the dignity of queen-dowager. This Act is known by the name of the *Titulus Regius*, and is the earliest of what are called the Private Acts, none of which are given in any of the printed collections of the statutes. The *Titulus Regius* however has been printed by Sir Robert Cotton, in his 'Abridgment of the Rolls of Parliament.' This Act was followed by others (also classed as private Acts), attainting and confiscating the property of all the principal persons engaged in the late revolt. But various Acts of public utility were also passed by this parliament; among others, one authorising every justice of the peace to admit a prisoner to bail, and directing that no officer should seize the goods of a prisoner till after his conviction; one regulating the impannelling of juries; one declaring and amending the law respecting the levying of fines; and several relating to commercial affairs, which, if they were not in all points grounded on the most enlightened principles, were at least in accordance with the opinions of the time, and must be regarded as evidences of a considerable interest taken by this parliament in the economical welfare of the country.

Soon after this however Richard deemed it expedient to adopt a new policy. The queen dowager, whom the parliament had just declared to have been only the late king's mistress, he now, in alarm at the projected alliance between her eldest daughter and the earl of Richmond, affected to court as his near and honoured kinswoman; he proposed marrying the princess Elizabeth to his own son Edward; and when that prince died (in April, 1484), and his queen, Anne, who had borne him no other children, soon after suddenly fell sick, he offered to marry Elizabeth himself. And strange as it appears, both mother and daughter went eagerly into this scheme; the princess in particular showed the utmost impatience for the marriage with her uncle, protesting that he was 'her joy and maker in this world, and that she was his in heart and thought,' and fretfully expressing her fears that queen Anne 'would never die.' And at this time she was living as a companion with the poor sick queen! But when Anne at last did die (on the 16th of March, 1485), not without suspicion of poison, his two confidants, Radcliffe and Catesby, succeeded in dissuading Richard from venturing upon this incestuous marriage, which they assured him would excite the popular indignation from one end of the kingdom to the other; and he then took great pains to proclaim that nothing of the kind had ever been contemplated.

He had the preceding year disembarrassed himself of one considerable source of annoyance and distraction by concluding a peace with Scotland for three years; and affiancing his niece, the lady Anne de la Pole, daughter of his sister the duchess of Suffolk, to James III.'s eldest son, the duke of Rothsay, afterwards James IV. (a transaction however which did not issue in an actual marriage). But at home the aspect of things was now becoming more unsatisfactory every hour. He durst not venture in the state of the public mind to call a parliament, and he found himself at once without money and nearly without an adherent upon whose fidelity he could depend. One after another the most eminent of those who had hitherto stood by him fled to France to join the earl of Richmond. At last, on the 7th of August, Henry landed at Milford Haven; and on the 21st of the same month the result of the battle of Bosworth deprived Richard at once of his crown and his life. [HENRY VII.; BOSWORTH.]

Richard left at least one natural son, known by the name of John of Gloucester, who, although yet a minor at his father's death, had been already appointed governor of Calais. There is also a romantic story told of a Richard Plantagenet, who died in the parish of Eastwell in Kent, in 1550, an old man of eighty-two, after a life spent as a working bricklayer, and who asserted that he was present at Bosworth Field, where Richard informed him he was his son; but this legend rests on the slightest authority. A natural daughter, named Katherine, is assigned to Richard, who was to have been married to the earl of Huntingdon, but who died in 1484, before she had reached the age agreed upon. The duchess of York, the mother of Edward IV. and Richard III., we may here notice, survived all these events, not dying till 1495.

Both the character of Richard III. and many of the events of his reign have been subjects of dispute among modern writers, some of whom have gone the length of attempting to make out that all the crimes imputed to him are the mere fabrications of his enemies. Much to this effect that Horace Walpole has advanced in his famous 'Historic Doubts,' had been anticipated by Sir George Buck, in his 'Life and Reign of Richard III.,' published so long ago as the middle of the seventeenth century. Buck's work however also contains a considerable quantity of matter not elsewhere preserved, at least in a printed form. The chief original historian of this reign is Sir Thomas More, in his unfinished tract, entitled 'A History of the Pitiful Life and Unfortunate Death of Edward V. and the Duke of York his brother; with the Troublesome and Tyrannical Government of the Usurpation of Richard III., and his miserable End.' There are the Latin annalists, John Rouss, or Rosse, and the continuator of the History of Croyland.

RICHARD PLANTAGENET, Earl of Cornwall, and titular King of the Romans and Emperor of Germany, was the second son of John, king of England, and was born January 5, 1208. He was created earl of Cornwall by his brother Henry III. in 1226; and he figures as one of the leading personages throughout that turbulent and distracted reign, showing generally much moderation and good sense in his endeavours to assuage the stormy contentions between the king and the barons, with whom he occasionally sided against the more outrageous excesses of the royal authority, although, as might be expected, without any participation in the design of abridging the antient prerogatives of the crown, and not without a natural regard in other respects to the interests created by his position. Although he showed some military talent on more than one occasion, his abilities on the whole seem to have been, like his politics, moderate, and of a middle character; he had no pretensions to a brilliant or commanding intellect, but he was at least as far removed from the weak-mindedness of the king his brother, generally evincing in his public conduct at least good sense and discretion, as well as a calm and conciliatory temper. It was a consequence of this moral and intellectual constitution however that, if he had no great vices, he should also be without great virtues; and that the reigning principle of his character should be a cold selfishness, which, though it might shrink from any course of violent aggression upon the rights of others, would yet be active in seeking all safe advantages; and, in that pursuit, would be in danger of sometimes tripping or overreaching itself, notwithstanding all its clear-sightedness and habitual caution. Richard, moreover, if he had no lofty or daring ambition, seems to have had a considerable share of vanity, which also would be apt to assist in betraying him in certain circumstances. If we take these considerations along with us, it will be easy to understand his career. After having first joined the barons who attempted to check the royal despotism, and afterwards more than once interposed successfully as a mediator between them and the king, we find him entirely separating himself from their latter and more decided proceedings; and, in the final struggle with De Montfort and his associates, which put in jeopardy even the possession of the crown by his family, resisting the insurgents as keenly as Prince Edward himself. The most remarkable incident however in Richard's history is his election as King of the Romans in 1256. This honour he is believed to have owed entirely to his great wealth, which enabled him to bribe several of the electors; but it is matter of dispute whether, after all, the majority of votes was really given to him, or, at another election a few weeks after, to his competitor, Alphonso, king of Castile. Richard is commonly reckoned among the German emperors next after William, count of Holland, the successor of Conrad IV.; but some historians distinguish the whole period from the death of Conrad in 1254, to the accession of Rodolph I. in 1273, by the name of the Grand Interregnum. Richard was crowned at Aix-la-Chapelle, and occasionally exercised such of the imperial rights as could be exercised by a stroke of the pen or the expenditure of a little sealing-wax; but he never enjoyed any real authority in Germany, nor indeed did he show himself much in that country. He was taken prisoner by De Montfort, along with the king his brother, at the battle of Lewes, in May, 1264, and was confined in Kenilworth Castle for more than a year. He died in his house at Berkhampstead, on the 2nd of April, 1272.

Richard was thrice married: first, in 1230, to Isabel, daughter of the great earl of Pembroke, and widow of the earl of Gloucester, who died in 1240; secondly, in 1243, to Sanchia of Provence, a sister of his brother's wife, Queen Eleanor, who died in 1261; thirdly, in 1267, to a German lady, Beatrice, daughter of Theodoric de Falkmoute, and niece of Conrad, archbishop of Cologne, who survived him. Of five children which he had by his first wife, and two by his second, all died without issue. His second, and then eldest, son Henry, was assassinated in the church of St. Lawrence at Viterbo in Italy, by Simon and Guy, the two sons of De Montford, on the 3rd of March, 1271. The earls of Berkeley claim to be descended from a natural daughter of Richard, earl of Cornwall, Isabel, who married Maurice de Berkeley, the father of the first Baron Berkeley.

RICHARD DE BURY was born in 1287, upon the estate of his father, Sir Richard Angerville, or in Bury St. Edmunds, but it is probable that the predilection which occasioned his taking the name of that place arose from his having received the first rudiments of scholastic education there, from his uncle John de Willoughby, a clergyman. When sufficiently qualified, he was sent to Oxford, where he continued to study till he received the appointment of tutor to Prince Edward (afterwards Edward III.), with the office of receiver of his revenues in Wales. This situation enabled him to afford assistance to his royal pupil in the hour of adversity, for when Edward fled with his mother to Paris, and was distressed for want of money, De Bury secretly hastened to succour him, taking with him a large sum in gold, which he had collected while in office; but his flight being discovered, he was pursued by the king's lieutenant, with a band of twenty-four horsemen, even to Paris, where he narrowly escaped detection by being concealed during seven days in the belfry of the convent of Friars Minors. When Edward came to the throne, the fidelity of his tutor was rewarded by a rapid advancement to dignities both in church and state. He was first made cofferer to the king, then treasurer of the wardrobe and clerk of the privy seal; he also visited Rome twice, as legate to Pope John XXII., and on both occasions was treated with great honour and distinction, being made one of the pope's principal chaplains, and presented with a bull nominating him to the first see that should become vacant in England. His expenses upon the second of these journeys amounted to 500 marks. They could not well be less, considering the splendour of his retinue; for when he went into the presence of the pope and his cardinals, he was uniformly attended by 26 clerks and 36 esquires, all attired in the most sumptuous manner. Whence the means were derived, may be seen in the list of his appointments, which, besides the above-named, were, during the first six years of Edward's reign, two rectories, six prebendal stalls, the archdeaconries of Salisbury and Northampton, the canonry of Weston, and the deanery of Wells.

While at Paris, on his return from Rome, he received intelligence that the bishopric of Durham was vacant, and that the king had written to the pope requesting his presentation to that see. It happened that the right of election was vested in the prior and chapter of Durham, who, notwithstanding they had also a letter from the king, proceeded to elect Robert de Graystanes, a monk and subprior of Durham, who was confirmed and consecrated by the archbishop of York, as Bishop Godwin says, with more haste than good speed, for the temporalities were at the king's disposal, and he withheld them till he received the pope's answer, which happened to be dated one day prior to the election of Graystanes, and confirmatory of the appointment of De Bury. Upon this Graystanes was deposed, and De Bury consecrated by the archbishop of Canterbury, on the 19th of December, 1333.

The ready submission to this infringement of the right of appointment by all the parties concerned, has been severely remarked upon by those who were not interested in it. In 1334 De Bury was made chancellor and high treasurer of England. Within the three following years he was thrice at Paris as ambassador to the king of France, upon the subject of Edward's claim to the crown of that kingdom, and in the same character he visited Antwerp and Brabant. He had been installed at Durham by proxy, and had once visited the see, but in 1337 he did homage to the archbishop of York. It does not appear when he resigned any of his political appointments, but he probably did not pass much of his time in his diocese till after 1338. When he had leisure, we find him deeply involved in pursuits far more congenial to his taste than politics. Accident made him a statesman, but he was a scholar from habit and natural inclination. In early youth he delighted in the society of learned men but of books 'in which wisdom is contained' he was an enthusiastic lover and the most distinguished collector of his age. Fortunately for him the king encouraged this disposition, and allowed him to use the influence of office in the promotion of his views. He purchased freely in his travels and at home, where he made himself acquainted with every collection, public and private. Moreover, he says, when it became commonly reported that books, especially old ones, were more precious in his estimation than money, or such new-year's gifts and other presents as it was customary to make in his time, they flowed in abundantly from all quarters. His researches saved many books that would have perished from neglect; and these he caused to be repaired. Such as he could borrow, if they were not for sale, he caused to be copied, for which purpose he had an establishment of book-binders, stationers, and illuminators in his palace. It is said that he finally became possessed of more books than all the other bishops of England put together; but it is a just tribute to his memory to state that his exertions were intended for the public good, and not merely for the gratification of a taste by no means unbecoming, though it was remarked upon as almost peculiar to himself at the time. In a sketch of his will, made shortly before his death, he says he bequeaths all his books to a company of scholars residing in a hall at Oxford, as a perpetual alms-deed for his own soul and for the souls of his parents, and of King Edward and his consort. The books went to Oxford, but Bishop Godwin could not find that he made a foundation there, as it has been stated. The hall in which they were deposited was on the site upon which his successor Hatfield founded Durham (now Trinity) College.

De Bury was not only a very learned man, but a liberal patron of learning, and it is evident that what he calls his extatic love for books was identified with the love of literature, and an ardent desire for promoting the same feeling in others, whom he amply supplied with the means of acquiring knowledge. He regretted the general ignorance of the Greek and Hebrew languages, and took care to provide grammars of both. In searching for elementary books generally, even the village schools did not escape his scrutiny. There is no doubt that De Bury was acquainted with Greek, and he probably learned it at Oxford. Grosseteste, who died in 1258, learned Greek and Hebrew at Oxford, from which it appears that these languages were taught there before De Bury's time. That Greek was taught in England still earlier than Grosseteste's time is also certain. [ROBERT OF LINCOLN.]

The best account of his researches and of his life will be found in the 'Philobiblon,' a small treatise written for the purpose of explaining his objects, of giving directions about books generally, and particularly about his own collections, and even of justifying his conduct, for there were many who derided his pursuits, and thought them altogether extravagant. This tract was first printed at Cologne, in 1473; afterwards at Spires, in 1483; Paris, 1500; Oxford, 1599, and in the collections of Goldast and Schmid: a limited impression of an English translation was published in London, 1832. There is no other known work by him extant, though one is mentioned under the title of 'Orationes ad Principes,' and some letters are spoken of. He certainly had an extensive correspondence with the most distinguished literary men of his time. Petrarch, with whom he conversed, calls him a man of an ardent and enthusiastic turn. He bears an excellent character generally; his wealth was freely bestowed upon the deserving but needy scholar, and he was equally munificent in distributing alms to the poor. His book evinces a benevolent disposition, though we must except against his refusing the use of books to the laity, but his precautions against the abuse of them are worthy of all commendation. He died at Aukland, on the 14th of April, 1345, aged fifty-eight, and was buried with due honours in the southern angle of the cathedral of Durham.

RICHARD OF CIRENCESTER, or *Ricardus Corinensis* (sometimes called the Monk of Westminster), a monkish historian of the fourteenth century, so named from his being a native of Cirencester in Gloucestershire. No traces of his family or connections have been discovered, nor has the exact time of his birth been ascertained, although the superior education which he received has led to the supposition that his family was of the higher ranks. He entered the Benedictine monastery of St. Peter, Westminster, in 1350: his name occurs in various documents in 1387, 1397, 1399, and he is registered in one of the chamberlain's lists preserved among the abbey records, by the name of Circestre. He composed several elaborate works on Saxon and British history, and to increase his knowledge he visited most of the libraries in this country for reference to original manuscripts. He obtained a licence to visit Rome from his abbot in 1391, the original of which is still in existence. It is supposed that he undertook this journey between 1391 and 1397, for he appears to have been confined in the abbey infirmary in 1401, and to have died in that or the following year. His work entitled 'Historia ab Hengista ad ann. 1348,' is in two parts. The first part is from the arrival of the Saxons to the death of Harold. His theological works were, 'Tractatus super Symbolum Majus et Minus,' and 'Liber de Officiis Ecclesiasticis.' But he is chiefly known from his celebrated treatise entitled 'De Situ Britanniæ,' which lay hid in manuscript till 1747, when it was first discovered by Charles Julius Bertram, professor of the English language at the Royal Marine Academy at Copenhagen, who sent a transcript of the whole to Dr. Stukeley, with a copy of the MS. In 1757 Dr. Stukeley published an analysis of the work, with the 'Itinerary;' and other particulars may be seen in the second volume of Dr. Stukeley's 'Itinerarium Curiosum,' and in Whitaker's 'Manchester.' In the same year the original was published at Copenhagen by Professor Bertram, with the remains of Gildas and Nennius, under the title 'Britannicarum Gentium Historiæ Antiquæ scriptores tres Ricardus Corinensis, Gildas Badonicus, Nennius Banchorensis,' &c., 8vo., but this work became scarce. In 1809 an edition was published in London, entitled 'The Description of Britain, translated from Ricardus of Cirencester, with the original treatise De Situ Britanniæ,' with the map and a fac-simile of the manuscript, as well as a commentary on the Itinerary. The discovery of this treatise may be regarded as an æra in the study of British and Roman-British antiquities. The Itinerary contains eighteen journeys which Richard says he compiled from certain fragments written by a Roman general and from Ptolemy and other authors; he mentions a hundred and seventy-six stations (while Antoninus has only 113), some of them a considerable distance north of the wall of Severus, besides which there are numerous chasms which show that many names have been lost or obliterated. The credit and fidelity of Richard have been attacked, but with little success; for wherever the subject has admitted of local investigation, the result has added to the estimation of his authenticity. Gibbon says of him that 'he shows a genuine knowledge of antiquity very extraordinary for a monk of the fourteenth century.' He is frequently quoted by his Latin name Ric. Corin., *i.e.* Ricardus Corinensis.

RICHA'RDIA, the name of a genus of plants belonging to the natural order Araceæ, of which only one species is known, the *R. Æthiopica*. It was introduced into this country from the Cape, under the name of *Calla Æthiopica*, in 1731. It is also found wild at St. Helena. It is one of the most beautiful of Aroideous plants. Its large spathe is pure white, surrounding a spadix which is coloured deeply yellow by its antheriferous flowers. Richardia is a hardy plant, bearing well our mildest winters, and growing in great vigour and beauty in the ordinary apartments of a house. It may be made to blossom all the year round.

RICHARDSON, JONATHAN, a portrait-painter, was born about the year 1665. His father dying when he was only five years old, his mother's second husband articled him to a scrivener; but as his master died in the sixth year of his clerkship, he followed the bent of his inclination, and at the age of twenty became a pupil of John Riley. After leaving this instructor, with whom he studied four years, and whose niece he married, Richardson commenced the practice of portrait-painting, in which, even during the lives of Kneller and Dahl, he obtained great employment, and upon their decease he was considered as the head of his profession in England. The profits of his business enabled him to retire from practice many years before his death, which happened suddenly at his house in Queen-square, Westminster, on the 28th of May, 1745. Hudson, the preceptor of Sir Joshua Reynolds, was his pupil and son-in-law. As an artist, Richardson was one of the best painters of a head that this country had at that time produced, but there his merit ended. He had strength, roundness, and boldness in his colouring; but his attitudes, draperies, and backgrounds are insipid and unmeaning, and the disposition of his subjects shows that he was wholly devoid of imagination. There are a few etchings of portraits by his hand, among which are his own, prefixed to his work on Criticism; John Milton; Alexander Pope, two plates, one of them a profile; and Dr. Mead.

It is however as a writer on art that the fame of Richardson must depend. In 1719 he published two discourses, entitled 'An Essay on the whole Art of Criticism as it relates to Painting, and an Argument in behalf of the Science of a Connoisseur,' in one volume, octavo. This work contains the rules of painting and of pictorial criticism laid down with judgment and precision, and expressed in language both forcible and just. It is truly observed of the above essay by a writer in the 'Pictorial History of England,' vol. iv., p. 733, that it 'should be in the hands of every one who seeks for knowledge of sound principles, and would learn to appreciate the divine excellences of Raffaelle.' In it he makes many admirable remarks upon the various styles of this exquisite painter: his Perugino, his Florentine, and his Roman manner. He also refers with pride to our national treasures at Hampton Court, the Cartoons of Raffaello, and pronounces as to them and the Transfiguration, that as they were the last, so they are the best productions of his hand. The Essay and the Argument with 'The Theory of Painting,' by Richardson, were published together in an octavo volume by his son in 1773. This latter composition also contains an able criticism on the style of Raffaello, acute observations on the Cartoons, and some valuable notices of the paintings by him in the Vatican. In 1722, in conjunction with his son, he published 'An Account of some of the Statues, Bas-Reliefs, Drawings, and Pictures in Italy, &c., with Remarks by Mr. Richardson, sen. and jun.;' and in 1734 they published together 'Explanatory Notes and Remarks on Milton's Paradise Lost, with a Life of the Author, and a Discourse on the Poem.' In 1776 the son published a volume of poems by his father, but they possess very little literary merit. (Walpole's *Anecdotes of Painting*, by Dallaway, iv., 23-29; Bryan's *Dictionary*.)

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THE PENNY CYCLOPÆDIA

OF

THE SOCIETY FOR THE DIFFUSION OF USEFUL KNOWLEDGE.

RICHARDSON, SAMUEL, the inventor of the modern English novel, was born in Derbyshire in 1689. His father had been a joiner in London, but had retired to the country, and fixed himself at Shrewsbury, after the execution of the duke of Monmouth, with whom it appears he had been in some way or other connected. It is stated that both his father and his mother had been born in a superior station to that in which they had come to move. At one time the joiner hoped to have been able to educate his son for the church; but a decline in his circumstances forced him to forego this ambition, and young Richardson was in his seventeenth year bound apprentice to Mr. John Wilde, a printer of London, after having had merely the education in reading and writing to be obtained at a common village school. He has informed us himself however, that long before this the peculiar talents which he afterwards displayed in his novels had begun to show themselves. He was noted while at school, he relates, for his flow of invention; his schoolfellows used to make him tell them stories, and were always most pleased with those he made out of his own head. 'All my stories,' he characteristically adds, 'carried with them, I am bold to say, a useful model.' But already, as throughout his life, his most delighted listeners, and the associates who best drew forth his powers, were of the other sex. 'As a bashful and not forward boy,' he says, 'I was an early favourite with all the young women of taste and reading in the neighbourhood Half-a-dozen of them, when met to work with their needles, used, when they got a book they liked, and thought I should, to borrow me to read to them, their mothers sometimes with them; and both mothers and daughters used to be pleased with the observations they put me upon making. I was not more than thirteen when three of these young women, unknown to each other, having a high opinion of my taciturnity, revealed to me their love secrets, in order to induce me to give them copies to write after, or correct, for answers to their lovers' letters; nor did any one of them ever know that I was the secretary to the others.' This was an employment well suited to nourish and strengthen Richardson's wonderful faculty of entering into the feelings of other hearts, and giving them true and natural expression.

He was so punctual and industrious during the seven years of his apprenticeship, that Wilde used to call him the pillar of his house; yet he did not neglect his private studies, finding time, by stealing it from the hours of rest and relaxation, both for much reading and a good deal of letter-writing. He remained five or six years as foreman in Mr. Wilde's printing-office after his apprenticeship expired, and then set up for himself in Salisbury-court, Fleet-street. Soon finding himself in possession of a good business, he married Miss Allington Wilde, his old master's daughter, whom however he lost in 1731, after she had borne him five sons and a daughter, all of whom he likewise survived. He afterwards married Miss Leake, sister of Mr. James Leake, bookseller, by whom he had five daughters and a son: of these, four daughters, with their mother survived him.

Richardson first became an author in the year 1740. He had been in the habit of occasionally furnishing prefaces and dedications for the works which he printed, at the request of the publishers; and had been often importuned by his friends Mr. Rivington and Mr. Osborne to draw up for them a small collection of familiar letters on subjects of general interest in common life; a task, they conceived, well adapted to his style and turn of mind. Many years before, he had been greatly interested by a story of real life that had been told him, the same in its general outline with that of 'Pamela;' he now thought of making it the topic of a letter or two in the proposed little volume; but when he began to reflect on the subject, its capabilities gradually unfolded themselves to him, and 'I thought,' says he, 'the story, if written in an easy and natural manner suitable to the simplicity of it, might possibly introduce a new species of writing, that might possibly turn young people into a course of reading different from the pomp and parade of romance-writing, and, dismissing the improbable and marvellous, with which novels generally abound, might tend to promote the cause of religion and virtue.' The result was the composition of the first part of 'Pamela,' the two large volumes of which were written between the 10th of November, 1739, and the 10th of January, 1740. It was published in the latter year, and became immediately so popular that five editions of it were called for within the twelvemonth. So refreshing and exciting were mere nature, truth, and simplicity, even under many disadvantages and indeed positive offensivenesses of style and manner, found to be in a species of composition fitted above all others to amuse and interest the popular fancy, but which had hitherto been cultivated in our language only in a spirit and after a mode of working with which the taste of the most numerous class of readers was the least formed to sympathise.

The first part of 'Pamela' was soon followed by the second part, which was felt at the time by most people to be a great falling off, and which it has since been generally agreed is an attempt at improving the original story that might very well have been spared. The author was led to write it by the appearance of a sequel to his book by another hand, under the title of 'Pamela in High Life,' the wretched speculation of some needy scribbler to turn to his own profit the interest and curiosity which Richardson's work had excited. It ought to be mentioned that Richardson also completed and published the 'Collection of Familiar Letters' out of the project of which his novel had arisen: Mrs. Barbauld, his biographer, speaks of this performance in high terms, describing it as 'a work usually found in the servant's drawer, but which, when so found, has not unfrequently detained the eye of the mistress, wondering all the while by what secret charm she was induced to turn over a book apparently too low for her perusal.' Another incident connected with the publication of Richardson's first novel is the circumstance of its having been the means of impelling his celebrated contemporary Fielding into the same line of writing; Fielding's first novel, properly so called, his 'Joseph Andrews,' which appeared in 1742, was an avowed burlesque of 'Pamela,' for which Richardson never forgave him.

It was not till after an interval of several years that 'Pamela' was followed by 'The History of Clarissa Harlowe.' The first four volumes of this greatest beyond all dispute of Richardson's novels appeared in 1748, and immediately raised his reputation as a master of fictitious narrative to the highest point. The admiration it excited was not confined to his own country; the work, translated into the French and German languages, soon acquired for him a European name. So strong was the hold which the story took of the imaginations of its readers, that, as if the events and characters had all been real, and the author's pen had had a power of actual creation and embodiment, many persons, during the progress of the work, wrote to him in the most urgent terms to gratify them by such a winding up of the plot as they had set their hearts upon, declaring that their own happiness depended upon the extrication of the heroine from the miseries in which he had involved her. But Richardson obeyed his own high genius, and was not to be persuaded to turn the deep and noble tragedy of unconquerable and triumphant endurance which he had so finely conceived, into a mere common-place stimulant for sentimentalism.

Richardson's next and last great work, his 'History of Sir Charles Grandison,' appeared in 1753. This is of all his works that in which he has most frequently deserted the true field of his genius, and ventured farthest upon ground on which he was not qualified to appear with advantage; and accordingly it contains much more that is tedious and uninteresting than either of his other novels; the plot too has little that excites curiosity or sympathy; and the conception of the principal personage sins against all the principles both of poetical art and of probability and the philosophy of human nature. Yet with all its faults this novel too is full of its author's most graphic and dramatic genius; the whole picture of Clementina, in particular, is perhaps surpassed by nothing in either 'Pamela' or 'Clarissa.'

The only publications of Richardson's that have not been mentioned are, a paper in the 'Rambler' (No. 97); an edition of 'Æsop's Fables, with Reflections;' a single printed sheet, entitled 'The Duties of Wives to Husbands' (a subject on which, with all his amenity of nature, he entertained somewhat strong notions); and his 'Case,' a statement of the piracy of his 'Sir Charles Grandison' by the Dublin booksellers. His works brought him a considerable harvest of profit as well as of fame; and his pen and a flourishing business together soon placed him not only in easy, but even, it may be said, in affluent circumstances. He early obtained, through the interest of Mr. Speaker Onslow, the lucrative employment of printing the Journals of the House of Commons; and in 1760 he purchased the moiety of the patent of king's printer. In 1754 he was elected to the post of master of the Stationer's Company. He continued to reside and carry on his business to the last in Salisbury-court; but he had also his country villa, first at North End, afterwards at Parson's Green. He died on the 4th July, 1761, and was buried beside his first wife, in the middle aisle of St. Bride's church.

No character could be freer from vice of every sort, or more perfectly irreproachable, than that of Richardson. In all the duties of morality and piety he was the most regular and exemplary of men. His principal weakness was a rather greater than usual share of literary vanity, not untinctured with some disposition to underrate other writers of the day, more especially those who were fortunate enough to share the public favour with him in his own walk. These were failings naturally springing from the circumstances of his life, and the somewhat effeminate constitution of his nature both intellectual and moral; and they were further nourished by the habit of seclusion in a coterie of female idolaters—a sort of platonic harem—in which he indulged in his latter days.

RICHARDSO'NIA, the name of a genus of plants in the natural order Cinchonaceæ, given by Houston in honour of Richardson, an English botanist of the sixteenth century. This genus was called Richardia by Linnæus, but that name has been given to another plant. Most of the species of Richardsonia are natives of South America. They possess emetic properties, and under the name White Ipecacuanha, &c. are used extensively as a substitute for the true Ipecacuanha (*Cephælis Ipecacuanha*).

RICHBOROUGH. [Kent.]

RICHELIEU, ARMAND JEAN DU PLESSIS, CARDINAL DE, a younger son of François du Plessis, Lord of Richelieu, was born at Paris, in 1585. He studied at the college of Navarre, and was at first intended for the military profession, but his elder brother Alphonse, bishop of Luçon, having resolved to withdraw from active life and retire into a Carthusian convent, young Armand was looked upon as his successor in his see. Accordingly he applied himself to the study of divinity, in which he took a doctor's degree at the age of twenty. The pope objected to his being consecrated bishop of Luçon on account of his youth; but Armand repaired to Rome, and succeeded in convincing the pope of his aptitude for the episcopal office, and he was consecrated in 1607. Having taken possession of his see, he applied himself sedulously to the discharge of his pastoral duties, and in preaching and converting the Calvinists. In 1614 he sat as deputy of the clergy of Poitou in the assembly of the States-General, on which occasion he harangued the young king Louis XIII., and so pleased the queen-mother Marie de' Medici, that she made him her almoner, which was the beginning of his fortune. He was soon made secretary of state, but in consequence of a quarrel between the king and his mother, Richelieu was banished to his diocese. He afterwards acted as mediator between those two personages, and acquired a permanent influence over both. In 1622 he was made a cardinal, soon after which the queen-mother obtained for him a seat in the council in 1624, when he became the chief minister of the crown, and continued such for the remaining eighteen years of his life. The history of his political career forms an important period in the history of the French monarchy. Richelieu had three great objects in view: 1, to render the power of the crown absolute, and to humble the feudal nobility; 2, to annihilate the Calvinists as a political party; 3, to reduce the power of the house of Austria, both in its German and Spanish branches, and to extend that of France. Unscrupulous about the means, he succeeded in breaking down the political influence of the nobles, many of whom he sent to the scaffold on various pretences. He put to death Marshal de Marillac, the duke of Montmorency, Cinq Mars, and De Thou, and many more in a cruel manner. Others were shut up in dungeons during the cardinal's life. His great political opponent was Gaston d'Orléans, the king's brother, who conspired against the cardinal. The conspiracy failed, and was the cause of the death of Gaston's friends. Gaston then openly revolted against the king, being assisted by the duke of Lorraine, whose sister he had married. He was not more successful in this attempt, was obliged to seek an asylum in the Spanish Netherlands, and the duke of Lorraine lost his dominions, which were seized by the French. The queen-mother, who had quarrelled with the cardinal and supported his enemies, was obliged to quit France. She retired to Cologne, where she died, in 1642, in great distress.

Richelieu accomplished the second object which he had in view, namely, the extirpation of the Calvinist party, by besieging in person and taking La Rochelle, the stronghold of the Calvinists, in 1628. But the motives of Richelieu appear to have been more political than religious: at all events he did not show himself after his victory a fanatic or a persecutor. He secured religious tolerance to the Calvinists by a royal edict in 1629; and when the faculty of theology of Montauban, which was then, as it is now, the Calvinist university of France, went to visit the cardinal, he told them courteously that he could not receive them as a body of divines, but that he should always be willing to see them as men of learning.

The third great object of Richelieu was that of humbling the House of Austria, which, since the time of Charles V., had been the preponderating power in Europe. For this purpose, setting aside all clerical scruples, he supported, first secretly and afterwards openly, the Protestants of Germany against the emperor. His almoner, a Capuchin friar named Père Joseph, was his confident and trusty agent in all his diplomatic intrigues. The history of this singular character has been published, 'Histoire du véritable Père Joseph,' and is a most curious biography. The friar repaired to Germany, to the camp of the Protestant princes and of Gustavus, and also to that of Wallenstein. After the death of the two great leaders, Gustavus and Wallenstein, the French troops carried on the war on the Rhine in concert with the Swedes against the emperor. At the same time Richelieu was assisting the Protestant Grisons against the Roman Catholic insurgents of Valtelina, who were supported by the Spaniards. He also allied himself with the States-General of the Netherlands to attack the Spanish dominions in Belgium, which he had in view to annex to France as far as Antwerp, a scheme in which however he failed. On the side of Spain the French took Roussillon, and supported the Catalonians in their revolt against Philip IV. Richelieu is also said to have meddled, by means of Père Joseph and the French ambassador in London, in the first stirring of the Covenanters and Puritans which led to the great Revolution. Charles I., ever wavering in his foreign policy, had disappointed Richelieu in his proposal of a defensive league between France and England, and seemed to lean towards a Spanish alliance. 'The king and queen of England,' said Richelieu, 'will repent the rejection of the treaty before the year is over.' (Père Orléans; D'Estrade; President Hénault; *Biographie Universelle*, art. 'Richelieu.') In 1639 arms and ammunition were sent from France to Leith for the use of the disaffected.

In Italy the French invaded Piedmont, which however they evacuated by a treaty with the princes of Savoy. The principal result of all these wars was to circumscribe the Imperial power in Germany, and to weaken the influence of Spain in the general politics of Europe.

In 1642 Richelieu fell ill, and died in December, at his house at Paris, at the age of fifty-eight. The king repaired to his bed-side shortly before his death, when the cardinal recommended to him Mazarin and others, and told his majesty that he left the kingdom at the highest pitch of glory, and protested to him that all his 'doings as a minister had been for the good of religion and of the state,' an assertion rather startling from such a man, but which he may very possibly have believed. His funeral was magnificent, but the people of Paris made bonfires in token of rejoicing. He had become unpopular of late years on account of the fresh burthens which he had laid on the people. A splendid mausoleum, by Girardon, was raised to his memory in the church of La Sorbonne. He left a considerable property, which however had not been altogether accumulated at the expense of the state, but was in great part the proceeds of his vast church preferment.

Mary de' Medici had died at Cologne a few months before Richelieu, and Louis XIII. died five months after his minister.

Richelieu established the royal printing-presses; he was the founder of the French Academy; he built the Palais Royal, which was then called Palais Cardinal, and he rebuilt La Sorbonne. He was well informed for his age, and has left several works, some on religious and controversial subjects, and others on politics. His 'Testament Politique' has been considered by some as apocryphal, but Foncemagne has defended its authenticity in the edition of 1764, by his Letters to Voltaire, and apparently upon sufficient grounds. The 'Mémoires du Cardinal de Richelieu,' written by himself, have been published in several volumes, in 1822-3, by Petitot, from a MS. corrected in the Cardinal's own hand, which existed in the archives of the department of Foreign Affairs at Paris. A Life of Richelieu, by Le Clerc, was published in two volumes, Cologne, 1696, without the author's name: it seems fairly written. Aubéry and others have also written biographies of Richelieu. His domain of Richelieu in Poitou was created a dukedom by Louis XIII., in 1631.

Cardinal Richelieu ranks among the greatest ministers of the old French monarchy; he had extended views, great perseverance and acuteness, and a lofty mind, but he was also revengeful, cruel, and unprincipled. He laboured strenuously to make the authority of the crown absolute, and by so doing he paved the way for the subsequent despotism of Louis XIV. Montesquieu says that Richelieu made his master the second man in the monarchy, but the first in Europe that he depressed the king, but ennobled his reign.'

His grand-nephew, Louis François du Plessis de Richelieu, marshal of France, figured under Louis XV., and acquired a name for his bravery in war and some ability in negociation, and also for his libertinism, court intrigue, and overbearing disposition. He died in 1788, at a very advanced age. A grandson of marshal Richelieu entered the Russian service during the French revolution, was made governor of Odessa, a town which he greatly improved, and became, after the Restoration, minister of Louis XVIII. He was known by the title of duc de Richelieu. He died in 1821, with the reputation of an honourable and loyal statesman.

RICHMOND, an antient borough, a market-town, and parish, and the capital of the extensive baronial liberty of Richmondshire, in West Gilling wapentake, the most north-western division of the North Riding of Yorkshire. The whole wapentake is in the liberty of Richmondshire, in the archdeaconry and deanery of Richmond, and in the diocese of Ripon. Richmond is 239 miles north-north-west of London, 44 miles north-west of York, and 52 miles north by west of Leeds. The municipal borough comprises only the parish of Richmond, and the corporate body consists of a mayor, four aldermen, and twelve councillors, with a commission of the peace of six magistrates besides the mayor and recorder. Richmond was deprived of its quarter-sessions by the Municipal Act, but they have since been restored. The parliamentary borough comprises the parishes of Richmond and Easby, and extends over 10,000 acres of land, and has a population of 4722. The population of Richmond alone, in 1831, was 3900. This borough returns two members to parliament, and is one of the polling-places for the North Riding.

Alan Rufus, son of Hoel, count of Bretagne, a kinsman of William the Conqueror, who accompanied him in his expedition to England, is generally stated to have been the founder of both the castle and town of Richmond. By some authorities the town is said to have been in existence prior to the Conquest. William conferred on Alan the title of earl of Richmond, and the estates of the Saxon earl Edwin, embracing nearly 200 manors and townships, and a jurisdiction over all Richmondshire, about a third of the North Riding. In the situation of his castle Earl Alan selected not only an eligible residence, but also a place of defence; its foundation was laid on an almost perpendicular rock on the left bank of the Swale, about a hundred feet above the bed of the river. The site contains about six acres, and commands an extensive view of the surrounding country. To the original buildings of the castle, additional walls, towers, and outworks were erected by the successors of the founder. The earls of Richmond enjoyed these possessions till they fell to the crown on Henry, earl of Richmond, becoming king of England by the title of Henry VII. Charles II. bestowed the title of duke of Richmond on his son Charles Lenox, in whose descendants the dignity continues. The walks round the castle present a succession of varied and romantic scenery. Swaledale is in many parts skirted with with bold rocks almost covered with trees and shrubs. From the hills on the north-west side of the town, the castle and town seem to be situated in a valley. The ruins of the castle are still majestic. The bold Norman keep is almost entire: the walls are nearly one hundred feet high and eleven feet thick. It is the property of the duke of Richmond. The dilapidations seem to be solely owing to the neglect of repairs.

A small monastery, called the Grey Friary, was founded at Richmond in 1258, the sole remains of which are a steeple, which Rickman describes as 'a remarkably elegant specimen of good perpendicular work.' The extensive remains of St. Agatha's Abbey are about a mile below Richmond: many of the arches and columns of the finely pointed windows and doors are in good preservation. These ruins are in the parish of Easby, and are surrounded by well-wooded grounds and fine scenery.

Richmond is said to have been a place of good trade for three centuries after the Conquest, but many causes contributed to its decay; among these may be mentioned the charters granted for holding markets in neighbouring towns, and the want of water-communication, which is precluded by the rocky bed of the Swale and the sudden swells to which the river is subject. The market of Richmond is held on the Saturday, and it is well supplied with corn and other provisions. Many wealthy people reside in the town, and the country for several miles round is studded with the parks and mansions of numerous landed proprietors. The races are well attended, and are held in the first week of September, on the high moor about a mile from the town, where there is a commodious grand stand. Several of the resident gentry have training-stables near the race-ground. Three fairs are held at Richmond in the course of the year, The chief manufactory is an extensive paper-mill. Gas-works were established in 1821, and waterworks in 1837. The town-hall is a convenient building, in which the public business of the town is transacted and the quarter-sessions held both for the town and Riding. It contains a spacious assembly-room.

A court of record is held once a fortnight before the mayor, recorder, and aldermen: it takes cognizance of all pleas, actions, and suits in which the debts or damages do not amount to more than 100*l.*; the recorder is the sole judge in this court. A court baron for the liberty of Richmondshire, of which the duke of Leeds is the chief bailiff, is held once in three weeks for the recovery of debts under forty shillings.

The parish church is a Gothic building, and consists of a nave, chancel, and aisles, with a tower at the west end. It has been enlarged several times, and exhibits several varieties of architecture. The rectory is in the patronage of the crown. Holy Trinity chapel stands in the market-place. The consistory court for the archdeaconry of Richmond is held in two rooms adjoining the north aisle. Some portions of this building are occupied as shops and dwellings. The upper part of the north aisle is fitted up for divine service. The other places of worship are a Catholic chapel, erected by Sir John Lawson, Bart., in 1811; an Independent chapel; and a Wesleyan chapel.

Richmond free grammar-school was founded and endowed by the burgesses, and incorporated by Queen Elizabeth, by which Act it was called 'The free grammar-school of the burgesses of the borough or town of Richmond, in the county of York, for the education and instruction of boys and youths in grammar.' The four bailiffs were to be the governors of the possessions of the school. The property now produces a yearly income of 337*l.* 7*s.* 4*d.* All natives and the sons of burgesses and other persons residing within the borough are entitled to admission as free scholars by the payment of seven shillings a year for fire, candles, and cleaning. The instruction in writing and arithmetic is also paid for.

The Corporation School is endowed with an annuity of 50*l.* from the borough funds and charities, for which fifty scholars are taught. The National School contains about one hundred boys and eighty girls. There are also an infant-school, a mechanics' library, a subscription library, and a news-room.

There are charities at Richmond for poor tradesmen and widows, for the distribution of coals, bread, and medicines, and various small bequests for education and apprentice fees. (Clarkson's *Richmond*; and Allen's *Yorkshire*.)

RICHMOND. [Surrey.]

RICHMOND. [Virginia.]

RICHTER, JEAN PAUL FRIEDRICH, commonly called Jean Paul, was born on the 21st of March, 1763, at Wunsiedel, in the neighbourhood of Baireuth, where his father held the office of tertius or under-schoolmaster and organist. Shortly after the birth of his son, he was made pastor of the village of Jodiz, whence he was transferred to Schwarzenbach on the Saale. Owing to the very limited circumstances of his parents, as well as to the want of a good schoolmaster, the boy had hitherto been educated and taught at home by his father. At Schwarzenbach however he was sent to school, and continued the study of Latin and Greek, to which Hebrew and some other branches of learning were added. His stay at this school was short, and he was sent to the gymnasium at Hof, where he continued his studies for two years, notwithstanding the death of his father, which happened shortly after his arrival there, and left his family almost in a state of destitution. The young scholar however was in some degree supported by his grandfather on his mother's side. In 1781 he went to the university of Leipzig, for his family wished that he should follow the example of his father and study theology. He hoped to obtain some support from the university, but he found the difficulties greater than he had anticipated; and he was thrown entirely on his own resources. He had to contend with extreme want, and was sometimes even unable to obtain necessary food and clothing. The circumstances of his mother likewise grew worse, and she was unable to supply him with any money. Notwithstanding this painful situation, he persevered in his studies, and he remained cheerful. Soon after his arrival at Leipzig he had given up the study of theology, which he found ill-suited to his taste, and now seeing no other possibility of satisfying his most urgent wants, he wrote a book called 'Grönländische Processe,' 2 vols., Berlin, 1783. The pittance which he received for his work, small as it was, determined him henceforth to try to support himself by writing. A second book, 'Auswahl aus des Teufels Papieren,' was soon written, but no publisher could be found, as his first work had not met with a favourable reception. After many disappointments, he quitted Leipzig in 1785, and went to Hof to reside with his mother, who with her family inhabited a house containing one apartment. All that he possessed was a number of MSS. containing extracts from the various works which he had read. At Hof his poverty rather increased than diminished, but the unconquerable vigour of his mind and the benevolence of a few friends kept him up. He engaged himself as a tutor in a family, and in 1788 he succeeded in finding a publisher for his 'Auswahl aus des Teufels Papieren.' The little income which he thus gained was however not sufficient to support him and his family. In 1793 several families of Schwarzenbach united to invite him to come and undertake the education of their children, an offer which he gladly accepted. Here he tried and developed the principles of education which he afterwards (1807) published in his 'Levana.' His circumstances now began to improve, especially after 1793, when, through the mediation of a friend, he found a publisher for a new work called 'Die Unsichtbare Loge,' 2 vols., Berlin. This work attracted the attention of the public and brought the author into notice. A fair prospect of success as a writer being thus opened to him, he left Schwarzenbach (1794) and returned to Hof, where in the course of a few years he wrote some of his most admired works: 'Hesperus,' 4 vols., Berlin, 1794; 'Quintus Fixlein,' Baireuth, 1796 (this work was the first which appeared under his full name, for in the preceding ones he had only called himself Jean Paul); 'Biographische Belustigungen unter der Gehirnschale einer Riesin,' Berlin, 1796; 'Siebenksäs, oder Blumen-Frucht-und Dornenstücken,' &c., 4 vols., Berlin, 1796-97, and 'Der Jubelsenoir,' ibid., 1797. In this year his mother died, after having for a short time enjoyed the happiness of seeing her son appreciated, and Jean Paul now returned to Leipzig. His name was now favourably known, and the most distinguished among his countrymen, such as Gleim, Herder, Schiller, Wieland, and others, esteemed the man no less than his works. In 1798, in which year his work called 'Das Campanerthal, oder die Unsterblichkeit der Seele,' was published at Erfurt, he was induced by Herder, whom he revered more than any other of his friends, to take up his abode at Weimar. It was about this time that he become acquainted with the Duke of Saxe-Hildburghausen, who afterwards honoured him with the title of councillor of Legation (Legationsrath). In 1801 he married Charlotte Maier, the daughter of a distinguished physician of Berlin. He first settled at Meiningen, which in 1803 he exchanged for Coburg; but after a short stay in this town he took up his permanent residence at Baireuth. During this period of wandering he wrote 'Briefe und Bevorstehender Lebenslauf,' Gera, 1799; 'Titan,' 4 vols., Berlin, 1800-3; 'Die Flegeljahre,' 4 vols., Tübingen, 1804-5.

At Baireuth he enjoyed the well deserved fruits of his indefatigable zeal—the esteem and admiration of the most illustrious and best among his countrymen. In 1809 the Prince Primate, Carl von Dalberg, granted him a pension of 1000 florins per annum. In 1815 the prince was obliged to resign his secular sovereignty of Regensburg, Aschaffenburg, Frankfurt, Witzlar, &c., which he had before possessed, together with his archbishopric and primacy of Regensburg, but the pension was continued by Maximilian, king of Bavaria. In 1817 the university of Heidelberg honoured Jean Paul with the diploma of doctor of philosophy, and three years afterwards he was elected an ordinary member of the Academy of Sciences of Munich. From the time of his settlement at Baireuth, Jean Paul pursued his literary occupations as zealously as ever, and only now and then made either little excursions into the neighbouring country, or short journeys to Heidelberg, Munich, Berlin, and Dresden. Among the works which belong to this last and happiest period of his life, we shall only mention 'Vorschule der Aesthetik,' 3 vols., Hamburg, 1804; 'Katzenbergers Badereise,' 2 vols., Heidelberg, 1809; 'Des Feldprediger Schmelzle Reise nach Flätz,' Tübingen, 1809; 'Der Komet, oder Nicolaus Markgraf,' 3 vols., Berlin, 1820-22.

During the last years of his life he was attacked by a complaint in the eyes, which at the beginning of the year 1825 terminated in complete blindness. His physical powers also began to decline, and he died on the 14th of November, 1825. Some time before his death he had made preparations for a complete edition of his works. This plan was executed by his friend Dr. Otto, who edited the works of Jean Paul in 60 small 8vo. volumes, Berlin, 1826-28. Another edition in 4 vols., imp. 8vo., appeared at Paris, 1836-38, which is disfigured by numerous typographical errors.

Whether we consider Jean Paul as a man or as an author, he is one of the most wonderful phenomena that Germany has ever produced. He was simple-hearted as a child, and his kindness, benevolence, and purity of conduct were unparalleled; yet with all this he had courage enough to struggle fearlessly with a world of adversity, without losing one particle of his cheerful and humorous temper. His works, which are all written in prose, and most of which may be called humorous novels, evince the deepest and most intense feeling, a most profound knowledge of human nature, and an intimate acquaintance with almost every department of science. His earliest writings are sometimes of a satirical nature, and show that he had not yet reached the height of pure humour which appears in his later works. Some of his works, such as the 'Levana' and 'Vorschule der Aesthetik,' are not novels, but philosophical discussions full of profound thought; but even here his humour sometimes gushes forth and enlivens the abstruseness of philosophical inquiry. Notwithstanding these great qualities of Jean Paul, there are some circumstances which prevent his writings from being as popular as they deserve to be. His ideas and conceptions are too profound to be understood and appreciated by the many, and his thoughts are expressed in a language which presents considerable difficulties even to a German. His sudden transitions, his associations of ideas, the frequent distortions of his sentences, in which parenthesis is put into parenthesis, cause such difficulties to the ordinary reader, as will at first deter him from undertaking the task of searching for the sterling matter which is concealed under such a disguise. Jean Paul moreover possessed an inexhaustible stock of knowledge on all subjects, and his works abound in allusions which can only be understood by those who have made such subjects their study. The number of those who fully appreciate the merits of Jean Paul is, even in Germany, comparatively few; but these few are the best and most enlightened of the nation, and the power which his works exercise over them is greater than that of any other writer. The time when Jean Paul shall be fully appreciated is yet to come. The best key to his writings is a work called 'Wahrheit aus Jean Paul's Leben,' in 8 vols., Breslau, 1826-33, which was commenced by Jean Paul himself, and after his death continued and completed by Dr. Otto. Another very useful work in this respect is, R. O. Spazier, 'Jean Paul Friedrich Richter, ein biographischer Commentar zu seinen Werken,' 5 vols., Leipzig, 1833; H. Döring's 'Leben und Characteristik Richters,' in 2 vols., Gotha, 1826, is a very indifferent work.

English translations of some of the smaller and extracts from the larger works of Jean Paul have appeared in various magazines. But the choicest specimens, which are also most faithfully translated—are those given in *German Romance*, by T. Carlyle, who has also written some excellent essays on the life and writings of Jean Paul. (See Carlyle's *Miscellanies*, vol. i., p. 1-31; vol. ii., p. 295-377; comp. p. 403, &c.)

RICI'NULA. [Entomostomata, vol. ix., p. 457.]

RI'CINUS, the name of an apetalous genus of plants belonging to the natural order Euphorbiaceæ. This word is derived from *ricinus*, the Latin name for a species of insect which the fruit of this plant was supposed to resemble. (Plin., *Nat. Hist.*, xv. 7.) The common name of *Ricinus* is *Palma Christi*, a name applied to these plants by Brunfels, Matthiolus, and other older botanists, on account of the form of its elegant lobate leaves. It was originally a native of Asia, but is now naturalized in Africa, America, and the south of Europe. The characters of this genus are:—Flowers monœcious; calyx 3-5-parted, valvate; no petals; filaments numerous, polyadelphous; style short; stigmas three, bipartite, feathery; ovary globose, three-celled, with an ovule in each cell; fruit capsular, tricoccous; leaves alternate, stipulate, palmate, glands at apex of petiole; flowers in terminal panicles; trees, shrubs, or herbs, becoming arborescent. Of this genus the *Ricinus communis*, common Palma Christi, is best known as producing the castor-oil. It has peltate palmate leaves, with lanceolated serrated lobes; an herbaceous glaucous stem, of a purplish-red colour upwards, and flowers in long green and glaucous spikes springing from the divisions of the branches, the males from the lower part of the spike, the females from the upper. The capsules are prickly. It varies in size; in Britain it is seen seldom more than three or four feet in height, but in India it is a tree; and Clusius mentions it as measuring from two to four feet round its stem in Spain. Lindley refers several species distinguished by Willdenow to this form, viz. *R. viridis*, *R. africanus*, *R. lividus*, and *R. inermis*. (*Flora Medica*, p. 183.)

R. communis will grow freely in this country, and when sown in pots or hotbeds early in the season, and transplanted in spring, it forms a very handsome border annual.

RI'CINUS COMMU'NIS, the castor-oil plant, known from very antient times both to the Egyptians and also to the Greeks. According to Herodotus (ii. 94), the Egyptians called the oil of the *sillicyprion* (σιλλικύπριον) by the name *Kiki* (κίκι). The Greeks also called it *Croton* (κρότων), a name bestowed by modern botanists on a closely allied genus of euphorbiaceous plants, one species of which yields the purgative oil designated Croton oil, or Oleum Tiglii. [Croton.] The native country of the Ricinus communis is unknown, though it is conjectured to be originally from Barbary. Like all plants which have been long in cultivation, numerous varieties of it are met with, differing not only in colour and the peculiar pruinose condition of the stem, but in stature and duration. In warm countries it is ligneous and perennial; in cold, annual and herbaceous. The entire plant is possessed of active properties, but the oil extracted from the seeds is only employed in Europe: the antients administered the seeds entire, but their variable action, occasionally even producing fatal effects, led to their disuse, and the oil is of comparatively recent introduction. The seeds, of which three are found in each capsule, are about the size of a small bean, obtuse at both ends, surface smooth, shining, and beautifully marbled. They were formerly known in the shops as *semina Ricini*, or *Cataputiae majoris*. The skin consists of three tunics—1st, an outer brittle pellicle; 2nd, a hard testa consisting of two dissimilar layers, the external thick, dark brown, formed of transverse radiating cells; the internal thinner, paler, and formed of vertical cells; 3rd, a membrane investing the nucleus or kernel. 'The nucleus consists of oily albumen, and an embryo, the cotyledons of which are membranous or foliaceous.' The outer shell is devoid of taste; in the inner coat the acrimony or active principle resides, according to Dierbach; while others assert the embryo to be the seat of the purgative principle; and even Humboldt and Bancroft state that if this part be excised, the seeds may be eaten with impunity, or the oil thereafter expressed is as mild as olive-oil. The same statement has been made respecting the Jatropha Curcas, or *purging-nut* of the Philippine Islands. (See Bennet, in *Medical Gazette*, vol. ix., p. 7.) But this is by no means the case, as has been proved by Merat and De Lens (*Dictionnaire des Sciences Medicales*, t. xlix.) and Bennet (*l. c.*); who have shown that the active principle is diffused through the entire substance of the kernel, though it probably exists in greater intensity in the embryo. Various procedures have been adopted to extract the oil, and these have much influence on its qualities in respect of colour, acridity, and freedom from rancidity: there are also effects which result from the greater or less maturity of the seeds, the peculiar variety of the plant from which they have been obtained, and the occasionally accidental, but more frequently intentional admixture of other seeds, before the different processes of extraction have been begun. Both in India and America, whence the first supplies were brought, much heat was employed, and during the application of this agent a volatile principle was either liberated, or more probably formed, which was so irritating as to require the workmen to protect their faces by masks. Even in the present day some heat is used to obtain what is termed the *cold drawn* castor-oil, but it is quite unnecessary, and should always be avoided.

According to Sir Whitelaw Ainslie (*Materia Indica*, vol i., p. 256), the following is the plan pursued in the East Indies:—'Take five seers of the small castor-oil nuts, and soak them for one night in cold water; next morning strain this water off and throw it away, and put the nuts into a second quantity of fresh water, and boil them in it for two hours; after which strain the water off and throw it away, as in the first instance: the nuts then are to be dried in the sun on a mat for three days; at the end of which time they are to be well bruised in a mortar: add to the nuts thus bruised ten measures of water, and set the whole on the fire to boil, taking care to keep continually stirring the contents of the pot until all the oil appears at the top, when it is to be carefully strained off and bottled for use. The quantity of nuts mentioned in this formula ought to yield about one quart bottle of oil.' The processes used in the United States and the West Indies are both objectionable, from employing not only heat but water, which last promotes the rancidity of the oil. The acrid property and the rancidity are owing to different causes, the former being always in proportion to the freshness of the oil, the latter to the imperfection of the means used in extracting it, or to its age. The plan adopted in France is the best; it is as follows:—The fresh seeds are bruised, and then put into a cold press (some persons improperly heat the plates of the press). The oil expressed is allowed to stand some time to permit the albumen, mucilage, and other matters to subside, or it is filtered to separate them more rapidly. (*Journal de Pharmacie*, tom. v., pp. 207, 506.) The produce is equal to about a third of the seeds employed, and the oil possesses all its natural qualities. The American process yields only 25 per cent. of oil. In the French West Indian Islands, a peculiar variety of Ricinus, called *R. ruber*, more active, is used, which yields an oil called *carapat*, or *karahat*, but this is violent and unpleasant, and must not be confounded with or substituted for the fine oil procured in France. Both the French and Italian oils are much weaker than oil procured from tropical countries. Another mode of obtaining the oil is to macerate the bruised seeds in cold alcohol, by which six ounces of oil are procured from every pound of seeds. (*Journal de Pharmacie*, viii., 475.) The expense of this process is the objection to its general employment.

Oil of good quality is a thickish fluid, of a very pale yellow colour (the best now almost limpid), with a slightly nauseous odour, and an oily taste, mild at first, but causing a feeling in the back of the throat which is more or less intense in proportion to the freshness of the specimen. Old or badly prepared oil is rancid and disagreeable. The specific gravity is, at 55° Fahr., 0·969, according to Saussure, but according to Geiger it is only 0·954.

It can be solidified only by a very low temperature. It is distinguished among fixed oils by its complete or nearly complete solubility in pure sulphuric æther and in alcohol, thereby approaching the essential oils in its habitudes, and its easy combination with alkaline leys, and consequently its ready saponification, two properties of much importance, the one furnishing a convenient test of its purity, the other facilitating its administration in a form less repulsive than its ordinary state. Its very moderate price (in the year ending 5th of January, 1841, it ranged, according to quality, from 4*d.* to 10*d.* per lb.) renders it scarcely worth adulterating, but its purity may be tested by mixing it with an equal quantity of absolute alcohol, in which it should be entirely dissolved; the adulterating oil, if there be any, will remain undissolved. Its ultimate composition seems to be—

	Saussure.	Ure.
Carbon .	74·178	74·00
Hydrogen .	11·034	10·29
Oxygen .	14·788	15·71
	100·000	100·00

It thus appears to be one of the most highly oxygenated oils or fats, notwithstanding which, on exposure to the air, it very readily absorbs more oxygen, and quickly becomes rancid; it is however slow of drying. It is stated to consist of several proximate principles, but whether these are educts or products is uncertain. Bussy and Lecanu, who have paid great attention to the subject (*Journal de Pharmacie*, xiii. 57) incline to the latter opinion, which is the most probable. 'This oil,' they state, 'cannot be regarded as a simple immediate principle, but as a *compound organic product* resulting from the mixture of at least two different substances.' The other view is that it is a compound of *three fatty acids saturated by glycerin*, for in the process of saponification 100 parts of castor-oil yielded—

1. Fatty acids (viz. ricinic, elaïodic, and margaritic acids) . .	94
2. Glycerin	8
	102

The only analysis of the seeds is that of Geiger (*Handbuch der Pharmacie*, ii., p. 1671):—

a. Seed-coats	Tasteless resin and extractive .	1·91	23·82
	Brown gum .	1·91	
	Ligneous fibre .	20·00	
b. Nucleus of the seeds	Fatty oil .	46·19	69·09
	Gum . .	2·40	
	Caseum (albumen)	0·50	
	Ligneous fibre, with starch, &c. .	20·0	
Loss (moisture) . . .			7·09
			100·00

For further details respecting the chemistry of castor-oil, see Pereira's *Mat. Med.*, ii., p. 770.

Castor-oil is a mild aperient or laxative when pure, operating without griping or other inconvenience, and commonly very soon after its administration. It is the most proper laxative for infants, and in many inflammatory states of the abdomen or of the kidneys, bladder, &c. It is also one of the best purgatives in rheumatism, especially in lumbago, and one of the best means of relieving habitual constipation, as, unlike other purgatives, the dose may be successively reduced without its power being impaired. It is also a most eligible medicine in piles or other affections of the rectum. Alone or with turpentine it is a very efficacious means of expelling worms. The chief obstacle to its extensive use is the repulsive taste which it often possesses. Many expedients have been adopted to remove or lessen this; but no artifice can make bad or old oil good or palatable. Rancic oil may be purified by calcined magnesia; but the careful exclusion of the air, which prevents the rancidity occurring, is preferable to any process for removing it when it has affected the oil. Mixing the oil, immediately before swallowing it, with milk, coffee, or broth, is sometimes a successful means of escaping the unpleasantness. Brandy and gin are improper in many cases, owing to their heating properties. Syrup of orange and lemon are beneficial adjuncts, especially if a portion of the orange-peel be masticated immediately after swallowing the mixture. An emulsion with yolk of egg is sometimes acceptable, if made immediately before it is administered. By far the best plan however is to take advantage of the tendency to combine with alkalis, and so form a soapy emulsion, which does not destroy the purgative power, while it completely alters the appearance, and prevents any one recognising the oily object of his aversion. To effect this however requires care and skill, especially as a variable quantity of alkaline ley is needed, according to the age of the oil, very old oil requiring more ley than fresh oil. In general from fifteen to twenty drops of pure liquor potassæ will saponify half an ounce of oil, to which one ounce of distilled water, and one drachm of spirit of pimento or of nutmeg are to be added.

1. Quantity of castor-oil on which duty was paid for home consumption in the United Kingdom, showing the average annual consumption in each of the following periods of five years each, with the net revenue annually received in each period:—

	Average Annual	
Periods of Five Years.	Home Consumption.	Net Revenue.
1820-4	170,820 lbs.	£10,655
1825-9	281,061	7,678
1830-4	409,541	2,425
1835-9	708,005	538

2. Rates of duty:—

	British Possessions.	East India Company's Territories.	Foreign Countries
	s. *d.*	*s.* *d.*	*s.* *d.*
1820-4	1 3 per lb.	1 3 per lb.	1 3 per lb.
1825	0 6 ..	0 9 ..	1 0 ..
1828	0 3 ..	0 3 ..	1 0 ..
1833	2 6 per cwt.	2 6 per cwt.	1 0 ..
1836 (Aug.)	1 3 ..	1 3 ..	1 3 per cwt.

The distinction formerly made in the rate of duty between castor-oil from British possessions and foreign countries was quite unnecessary, as nine-tenths of the quantity on which duty is paid comes from countries within the limits of the East India Company's territories, and nearly the whole of the remaining tenth is from the British West Indies. About one-fourth of the quantity imported is re-exported. In 1837-8-9 the importations averaged annually 905,726 lbs., and the home consumption 686,755 lbs.

Castor-oil is extensively used in the East, France, Italy, and elsewhere, for burning.

RICKETS, or Rachitis (from ῥάχις, the spine), is a disease in which the bones being of unnatural softness, some of them bend under the weight of the superincumbent parts of the body. Bones affected with rickets present such a softness of texture that they may be cut with a knife; their walls are remarkably thin, and their interior, instead of being filled with marrow deposited in their bony cells, is occupied by a semi-fluid jelly-like substance of a reddish colour, which fills a number of rounded cavities of irregular size. The quantity of earthy matter in such bones is reduced to considerably less than its natural proportion, and they lose much of their normal weight. All the bones may be thus affected, but it is only those which have to bear the weight of the body that give evidence of it by bending; the arms, for example, never change their form, but the thighs and legs become arched forwards under the weight of the trunk; the spine assumes a variety of curves from the pressure of the head; the breast-bone becomes prominent, and the ribs flattened; the haunch-bones grow outwards, and the pelvis is sometimes seriously deformed by an approximation of its anterior and posterior boundaries.

Rickets, as far as the softness of the bones is concerned, cannot be regarded as a dangerous disease; for this condition is generally recovered from, though not without deformity of the trunk and lower limbs. But the disease of the bones is commonly only a part of a general state of disease affecting many other organs of the body. The muscles are always pale and weak, and there are all the signs of general debility; and besides these, the brain and the organs contained in the chest and abdomen are peculiarly apt to suffer, and become the seat of fatal diseases, such as hydrocephalus, phthisis, obstruction of the mesenteric glands, &c.

In all these respects there is much resemblance between rickets and scrofula; each may be regarded rather as a general disease than as a disorder of any particular organ or system of organs. The similarity extends to the remedies beneficial to each, which consist mainly of such means as will best amend the original weakness of the constitution, including a good and carefully regulated diet, pure air, warm clothing, bathing, and as much of active exercise as can be borne without fatigue. To these it is not essential in all cases that medicines should be added: where any are necessary, they are usually mild aperients and tonics, especially those of the latter class which contain iron.

When rickets affects only or chiefly the bones, an attention to the means just mentioned will, with advancing age, usually lead to a termination of the disease. The bones will gradually become hard by the addition of their natural quantity of earthy matter. They retain indeed the curves which they acquired in their condition of softness, but the want of strength which might result from this change of form is compensated by the remarkable thickness and strength which they acquire in the concavities of the curves, upon which the chief stress from the weight of the body falls.

Young persons are exclusively subject to rickets. It occurs at the age of two or three years, and from that time to puberty, and as the curvatures begin to form as soon as the weight of the body is thrown on the limbs by assuming the erect posture, it is commonly proposed to support the upper part of the body and the limbs by *irons*. Such measures however are, in a large majority of cases, full of mischief; if they can ever accomplish their intention of supporting the head and trunk, it can only be by preventing entirely that active use of the limbs which is essential to the attainment of the proper hardness of the bones. It is constantly observed that the strength and density of bones are in direct proportion to the habitual exertion of the muscles attached to them; and as the latter are made inactive by irons, the application of any such modes of restraint cannot but be injurious to those affected with rickets.

When children first begin to walk, their legs not unfrequently become a little bent. This is especially the case with those that are large and have heavy bodies to bear; but it is not to be regarded as a sign of rickets, and when the muscles of the limbs become stronger, and the bones in their natural process of development grow harder, the curvatures will gradually disappear. The distinction between this kind of bending of the legs and that dependent on rickets may be made by the condition of the general health in each; in the former it is unaffected or may even be more than usually good, in the latter it is always weak and disordered.

RICKMANSWORTH. [Hertfordshire.]

RICOCHET, a word expressing the act of rebounding, is applied to that mode of firing ordnance in which (the axis of the piece being parallel, or inclined at a small angle to the horizon) the shot or shell, having described a curve in the air, descends to the ground, and, after striking or grazing it, rises upwards; when, by the force of the impulsion, and the power of gravity, it describes a second curve of small elevation: the shot, then descending as before, again grazes the ground, from whence it experiences a second reflection. This effect frequently takes place several times before the force of impulse is destroyed.

Ricochet firing is most generally employed in the attack of fortresses in order to enfilade or rake the faces of works, whose fire might be directed upon the ground on which the approaches are to be made: for that purpose a battery of the besiegers is placed with its front perpendicular to the prolonged direction of each rampart or parapet, and three or more guns are laid either horizontally or with slight elevations or depressions, according to the position of the battery, so that their shot may pass a little above the crest of the parapet which covers the line to be enfiladed. The same mode of firing is also occasionally employed by the besieged against the batteries of the enemy. In either case the intention is to dismount the artillery by causing the shot or shells to strike it obliquely behind the parapet or epaulement, or to destroy the traverses which cover it. It is also used to compel the troops to abandon the parapets, or to destroy the palisades of the covered-way or ditches, so as to facilitate the entrance into a work when an assault is to be made by main force.

The practice of firing à-ricochet was first tried by Vauban at the sieges of Philipsburg and Mannheim, in the war of 1688; and in a letter which that engineer wrote to Louvois, he states that at the former place it had succeeded so far as to dismount six or seven pieces of cannon, and oblige the defenders to abandon a long branch of a hornwork and a face of one of the bastions in front of the ground on which the chief attack took place. The success of ricochet firing appears to have been still greater at the siege of Ath, which was conducted by Vauban during the same war.

It is a remarkable circumstance that, soon after the invention of this method of firing, the changes which were made in the trace or plan of fortifications, though attended with many and great advantages, were such as to render the works more liable than those of former times to the destructive action of the ricochet. The great saliency then given to the ravelins, and the consequent acuteness of the salient angles, allow the prolongations of the faces to be easily observed by the besiegers while at a distance from the work; and thus the guns in the ricochetting batteries are enabled to enfilade the faces in their whole length with great accuracy. The faces of the bastions were also lengthened about the same time; and in fortifications constructed on the inferior polygons, or those of few sides, there is a like facility of dismounting the artillery on those faces. The latter evil ceases to exist when the works are formed on the superior polygons, because the prolongations of the faces of the bastions may then fall upon the intermediate ravelins, and thus be invisible to the enemy; but, for the damage to which the long faces of the ravelins are exposed, no other remedy can be found than in the construction of traverses or blindages on the terrepleins, or in covering the general direction of the faces by an advanced portion of the latter, about twenty yards long, on each side of the salient angle.

The French engineers divide ricochet firing into two kinds, of which one is designated *ricochet mou*, and the other *ricochet tendu* (short and long ricochet); the former comprehending all elevations of the piece, from the greatest which the charge and the gun-carriage will permit, to that which is but little above the horizon; and the latter term being applied to all other cases, down to that in which, from the height of the battery, the gun is depressed below the horizontal plane. When the crest of the parapet which covers the rampart or the ground to be ricochetted is above the level of the battery, the coincidence of that crest with the vertex of the trajectory forms the inferior limit to the elevation of the piece; for if the shot were to pass closely over that crest with a lower elevation, it would at that place be in the ascending branch of the curve, and then the ground behind the covering parapet would not, to a considerable distance from thence, be struck. In proportion as the elevation of the piece is increased above the same limit, the vertex of the trajectory is nearer to the battery, and thus the shot is in the descending branch when it passes over the crest of the work.

When the parapet over which the shot is to pass has little elevation above the battery, it requires considerable charges to allow the vertex of the trajectory to coincide with the crest; but the charges diminish rapidly as the height of the parapet increases, or as the distance of the battery from thence diminishes: the effect of this is to produce the kind of ricochet first mentioned above, for the angle made by the descending branch with the horizontal ground being greater, the rebounds of the shot are more numerous within a given extent of ground, and between the successive grazes the curves are higher and shorter. In this case, and when the descending branch passes through the crest, the shot falls almost immediately behind the parapet, and no part of the ground to be ricochetted is free from its action: this is not always certain, when by great charges and low elevations the second kind of ricochet is used, since it may happen that the shot will pass above the objects which it should strike within the limits of the ground. In the modern system of fortification the greatest length of the faces of works which are liable to the ricochet is about 100 yards; therefore when there are no traverses on the terreplein, and it is merely required to strike an object somewhere between the crest of the covering parapet (supposed to be about 8 feet high) and the further extremity of any such face, the descending branch of the trajectory will make with the horizon an angle of about one degree, and the charge and elevation of the gun should be determined so that this condition may be fulfilled. From shot so fired a traverse near the covering parapet would entirely protect the ground, since the projectile would lodge in it, and do no harm to the defenders; and in order that the fire of shot may do execution, whether made in that manner or with an increased elevation of the piece so as to produce ricochets, it is necessary previously to destroy the traverse by shells fired as above described. For such a purpose General Millar's 8-inch howitzers will probably be found to be the most serviceable; and if the large shot subsequently fired a ricochet to dismount the artillery should not succeed in clearing an enemy's work of the troops who defend the parapet, spherical case shot fired from 24-pounder guns might be advantageously employed. One gun in a ricochet battery should be exactly in the prolongation of the crest of the parapet on the face to be enfiladed, in order that its shot may graze, with the long ricochet, the interior slope of such parapet.

Experiments in ricochet firing were carried on at Woolwich, in the months of June and October, 1821, when a work 100 yards long, and resembling the face of a bastion or ravelin, was enfiladed in that manner with iron and brass ordnance of different natures; the covering face was eight feet high, and its crest was nearly on a level with the axes of the guns in the battery. The results were, that with a range equal to 400 yards, and a charge of powder equal to $\frac{1}{31}$ of the weight of the shot, about two-thirds of the number of rounds took effect; at 600 yards, with charges varying from $\frac{1}{31}$ to $\frac{1}{16}$ of the weight, from one-third to one-half took effect; and at 800 yards, with charges from $\frac{1}{31}$ to $\frac{1}{12}$, between one-third and two-thirds took effect. It was concluded therefore that ricochet batteries ought, if possible, to be at a distance varying from 400 to 600 yards from the nearest part of the line of rampart to be enfiladed; for beyond the latter distance the effect of the fire is uncertain. The long ricochet, with high charges and small elevations or depressions of the guns, may however be advantageously employed in firing from the ramparts of a fortress on the ground in front, or against extensive lines of works when the battery is at a much greater distance.

It appears from the experiments above-mentioned that the best elevations of ordnance for enfilading a work à-ricochet with shot or shells is that in which the axis of the piece is directed at an angle varying from 6 to 9 degrees above a line drawn from the chamber of the gun or howitzer to the crest of the parapet over which the projectile is to pass. It is stated that of 170 shells filled with powder which were fired, 58 took effect, but only 33 burst in the work. Before the traverses were constructed several guns on the work were struck and rendered useless; but afterwards, though the traverses were much injured, none of the guns protected by them were disabled.

When employed against troops in the field, ricochet firing is found to be of essential service; for the shot making on the ground eight or ten grazes, it cannot fail at some of these to take effect. In 1757, the King of Prussia had several six-inch mortars mounted on travelling carriages; and from these he caused shells to be thrown à-ricochet, in an oblique direction, against the enemy's line, which it immediately put in great disorder.

Ricochet firing, when first employed in sieges, from the defenders not being prepared with means to diminish its destructive effects, produced immediately a strong impression of its power; and the opinion of its superiority to the direct mode of firing has continued to prevail from the time of Vauban to the present day, though the service of artillery is now so precise, that when the guns in an enemy's work can be seen, they can be as readily dismounted by the latter mode as by the ricochet. It ought also to be remembered that before the latter can be usefully employed, the parapets, traverses, or blindages which cover the artillery of a fortress must be ruined by other means; and it may reasonably be concluded that the rapid reduction, or the most protracted defence of a place, will always be owing to a judicious combination of the different modes in which, according to the circumstances, artillery can be used during the siege. [SIEGE.]

RIDEAU CANAL. [CANADA.]

RIDING. [YORKSHIRE.]

RIDINGER, JOHN ELIAS, was born in 1695, at Ulm in Suabia, and was instructed in drawing by his father, who was a schoolmaster, and in the rudiments of painting by Christopher Rasch. His genius led him to animal painting. 'He was,' says Fuseli, 'one of the greatest designers of animals of every denomination whom the annals of painting can produce. If he has been excelled by Rugendas in horses, and by Rubens perhaps in the ideal dignity of the lion, he far surpassed them and the rest of his predecessors and contemporaries in the wide extent of his powers over every species of brute creation.' Bryan thinks this encomium exaggerated 'by the pardonable partiality of his countryman and biographer M. Fuseli' (but Fuseli was a Swiss, not a German). His biographer in the 'Conversations Lexicon' says, 'No painter ever represented with such truth the characters of wild animals. His delineations of them are, as it were, their natural history. They take the spectator into the recesses of the forest, amidst lions, tigers, and other wild beasts, whose figures, dens, and mode of life are represented by him with the accuracy of a naturalist. His landscapes are always suited to the animals. He was less happy in the representation of the human figure, and of tame animals, for instance horses. His paintings are rare, for he painted but little, his time being almost wholly taken up by his numerous drawings, which are executed with great accuracy and taste. The largest and most choice collection of them (about 1400) are in the possession of Mr. Weigel at Leipzig. His copper-plates or etchings are very numerous, of which the following are considered as the best:—eight plates of wild animals; forty plates of observations of wild animals; fables of animals, sixteen plates; hunting of animals of the chase by dogs, twenty-eight plates; Paradise, in twelve plates. The coppers are in the possession of Schlossin, repository of arts at Augsburg. Old impressions are scarce, and pretty high in price.' Ridinger was chosen, 1757, director of the Academy of Painting at Augsburg, where he died in 1767. His sons Martin Elias and John Jacob followed their father's profession. The first, and Ridinger's son-in-law John Gottfried Seuter, had some share in the execution of his copper-plates. The latter engraved in mezzotinto.

RIDLEY, NICHOLAS, was born in the county of Northumberland, near the beginning of the sixteenth century. He was educated first at Newcastle, and afterwards at Pembroke College, Cambridge. He received further instruction in France, and having gained some reputation for learning, returned to Cambridge, took orders, and became master of his college. His knowledge and power of preaching having attracted the attention of Cranmer, he was presented with clerical preferment, became one of the king's chaplains, and in 1547 was nominated bishop of Rochester. His denunciations from the pulpit of the use of images and of holy water soon showed him the strenuous supporter of

Protestant doctrines, and his abilities caused him to be associated with the principal reformers both in their chief undertakings and discussions. He frequently disputed on transubstantiation and other doctrines: and he sat as a member of the commission appointed to examine into charges brought against Bonner, bishop of London. The commission deprived Bonner of his dignities, and, after some time had elapsed, Ridley was appointed his successor in the see of London. Soon after his appointment he commenced a visitation of his diocese, actively endeavouring to diffuse Protestant doctrines, for the better understanding of which he assisted Cranmer in framing forty-one articles, which were subsequently promulgated. He was nominated bishop of Durham, but his appointment was never completed. Three instances are mentioned, in which he attempted great ends by the force and power of his preaching: he aimed at the conversion of the Princess Mary, went to her residence at Hunsdon, and requested permission to preach before her. This permission she peremptorily refused, and so offended Ridley, who afterwards showed considerable generosity and a ready sense of forgiveness, by interceding with Edward VI. on Mary's behalf, that she should be allowed the free exercise of her religion. Secondly, he endeavoured through his preaching to direct the young king's mind to works of charity, describing three sorts of poor—such as were so by infirmity, by accident, or by idleness. Edward, deeply impressed by this sermon, ordered Grey Friars' church, with its revenues, to be a house for orphans; St. Bartholomew's, near Smithfield, to be an hospital; and gave his own house of Bridewell to be a place of correction and work for such as were wilfully idle. (Burnet.) Thirdly, at the instigation of the supporters of Lady Jane Gray, whose case he espoused, he set forth her title in a sermon at St. Paul's, warning the people of the dangers they would be in, and the ruin that would befal the Protestant cause, if the Princess Mary should come to the throne.

On Mary's accession, Ridley was immediately imprisoned. Her detestation of his opinions was aggravated both by the services he had rendered to the Protestant cause and his opposition to her accession. She committed him to the Tower, in July, 1553, and did not suffer him to be removed until complaints were made that the most learned Protestants were restrained from attending the discussions maintained by the Catholics and the Reformers on different disputed points. In April, 1554, a convocation was appointed at Oxford, at which the doctrine of the real presence was to be discussed, and since Cranmer, Ridley, and Latimer were esteemed the most learned men of their persuasion, the queen granted a warrant for removing them from the Tower to the prisons at Oxford. Each disputed in his turn amidst great disorder, shoutings, tauntings, and reproaches; all were considered to be defeated, and all were adjudged obstinate heretics. Ridley never again left Oxford. He was reconducted to prison, and after resisting many efforts to induce him to recant, was led with Latimer to the stake on the 16th of October, 1555. The place of his execution was in front of Baliol College. Gunpowder was hung to his neck, but it was long before the flames penetrated the mass of fuel, and explosion did not terminate his miserable sufferings until his extremities were consumed; he bore his tortures with undaunted courage. Burnet says that for his piety, learning, and solid judgment, he was the ablest man of all that advanced the Reformation.

(Foxe's *Acts and Monuments*; Burnet; Rapin; Lingard; Hume; and Wood's *Athenæ Oxonienses*, in which a list of his writings is given.)

RIENZI. [Papal States.]

RIES, FERDINAND, an eminent composer of the German school, was born at Bonn on the Rhine, in 1785. He was at first educated under his father, afterwards received instructions from Bernhard Romberg, and finally had a few lessons in composition from Albrechtsberger, the celebrated theorist, to whom he was recommended by Beethoven, the great composer candidly confessing that he possessed not the talent for teaching, which he considered as a 'particular gift.' But the young musician was studious and industrious, and acquired from books more knowledge than he obtained from oral communication. His first professional attempts were made at Munich; his next at Vienna, where he remained till 1805, when he was drawn as a conscript for the French army, which then occupied the capital of Austria, but, having early lost the use of one eye, he was declared disqualified for military service. He afterwards went to Paris, and composed much, but not successfully. The Beethoven school, to which he belonged, was then but little understood out of Germany. He afterwards proceeded, through Hamburg, Copenhagen, and Stockholm, to St. Petersburg, where fortune began to smile on his efforts, and was preparing to set out for Moscow, but the French army again deranged all his plans, and he finally determined to seek the English shores, where alone he could hope to pursue his peaceful art undisturbed. He arrived in London in 1813, and was immediately received by the liberal violinist Solomon, who procured his admission into the Philharmonic Society, where his symphonies were performed with great applause, and he exhibited his talents as a first-rate pianoforte player. He now was most actively engaged, both as a composer and teacher, and by his unwearied exertions amassed a handsome independence. In 1824 he returned to his native country, continuing however to exercise his talents as a composer, and, besides many works for the pianoforte, produced two German operas, and an oratorio, *David*, a work of more than ordinary merit. But his early efforts and privations, his unintermitting and exhausting labours, undermined his constitution, and to these he may be considered to have fallen a victim. He died at Frankfort in 1838.

RIESENGEBIRGE. [Germany.]

RIETI. [Spoleto, Province of.]

RIETI, the antient *Reate*, once one of the principal towns of the Sabini, and now the chief town of a province of the Papal State, which has retained the name of Sabina to our own times, but is now annexed to the delegation or administrative division of Spoleto. Rieti stands on an elevated plain about one thousand feet above the sea, which is part of the western highlands of the Apennines, a large tract which projects out of the central chain of the Abruzzo. This tract begins at the ridge east of Antrodoco, which forms the boundary between the table-land of Aquila, 2500 feet above the sea, the waters of which run by the Pescara to the Adriatic, and the basin of the Velino, or of Rieti, the waters of which run into the Tiber. This mountain-region, which belongs partly to the Papal and partly to the Neapolitan territories, was the country of the antient Sabini. Its length is about 70 miles from north to south, from the sources of the Nera at the foot of Mount Tetricus above Norcia, to the sources of the Anio above Subiaco. Its greatest breadth, from the defile east of Antrodoco, on the road from Aquila to Rieti, to the fall of the Velino near Terni, is about thirty miles on the map. The Nera forms the northern boundary of this mass of highlands, and drains the northern part of them by means of the river Corno, which rises near Leonessa, and flowing northwards through a narrow glen near Norcia, joins the Upper Nera near Cerreto. The Velino and its affluents drain the central and by far the largest part of the highland region. The Anio drains the southern part as far as the ridge which divides its waters from those which flow eastward by the Sacco into the Liris. The Anio falls by a cascade at Tivoli into the lowlands of the Campagna, and thence flows into the Tiber. The two waterfalls of the Velino and Anio are the only outlets by which the waters of the highlands of Sabina find their way westward to the Tiber.

A succession of mountain-ridges form the western boundary of the highlands of Sabina on the side of the Tiber, extending from the Anio at Tivoli to the Nera above Terni. The southern part of this range near the Anio is known by the antient name of Lucretilis, now Monte Gennaro; and the northern part, which extends to the Nera, by the name of Mount Canterius, which is seen from the valley of the Tiber towering to the eastward above the towns of Magliano, Calvi, Otricoli, and Narni. The eastern boundary of the region of the Sabini is formed by the lofty ridge of the central Apennines, consisting of the groups of Monte Sibilla, 7200 feet; Mount Terminillo, north-east of Rieti, 7000 feet; and Mount Velino, 8180 feet. Between these two ridges lies the basin of the Velino, the lower part of which forms the plain of Rieti. The Velino has its source in the central Apennines, about fifteen miles north of Antrodoco, at the foot of Mount Cenatra, not far from the sources of the Tronto, which flows on the opposite or eastern slope to the Adriatic. [Ascoli.] The Velino first flows southward through a narrow and deep glen until it reaches Antrodoco, where it turns to the west, passing by Civita Ducale and Rieti. Before it reaches the latter town, it receives the Salto or Imele from the south. The Salto rises near Tagliacozzo, not far from the lake Fucino, and flows north-west through a secluded but interesting valley called Cicolano, belonging to the Neapolitan territory. This valley has been explored of late years by Dodwell and by Keppel Craven, for the purpose of examining the remains of Cyclopian constructions which are scattered all about this district, and which are supposed to belong to the towns of the aborigines mentioned by Dionysius (i. 14) as destroyed long before his time. (Keppel Craven, *Excursions in the Abruzzi*, 1838, vol. i., chap. 7.) Others look for those towns, Palantium, Batia, Tiora, and Lista, on the banks of the Velino above Rieti, where remains of Cyclopian walls are also found. (Review of Dr. Cramer's *Description of Antient Italy*, in the 'Quarterly Journal of Education,' No. xiv.) Cutiliæ, another town mentioned by Cato and Dionysius, is supposed to have been also in the valley of the Velino near Paterno, where there is a small but deep lake, which is still called Cutilia. The ruins of Trebula Mutusca are south of Rieti, near Osteria Nuova, on the Via Salaria, and in the same direction are the remains of Cures, near the village of Correse; at the foot of Mount Lucretilis are other remains, supposed to be those of Suna and Orvinium, also mentioned by Dionysius as cities of the aborigines.

In modern times, the district of Cicolano, in the valley of the Salto, has acquired a certain historical interest on account of the tragical end of the Cenci, a Roman baronial family of the middle ages, the head of which, Francesco Cenci, was murdered in the castle of Petrella, at the instigation of his wife and daughter, who were put to death after a long trial, which has been the subject of many compositions both in prose and verse.

The Velino, after its confluence with the Salto, passes through Rieti, dividing the city from the suburb, and then turning to the north-west receives the Turano also from the south. The Turano, the antient Telonius, rises in the Neapolitan territory, not far from the Anio, in the mountains which border the basin of the Fucino to the westward, and on the opposite side of which the Liris has its source. The Turano runs in a north-west direction nearly parallel to the Salto, passes by Carseoli on the Via Tiburtina, which leads from Tivoli into the country of the Marsi, flows along the eastern base of Mount Lucretilis, and then enters the plain of Rieti, where it joins the Velino after a course of about 40 miles. In the valley of the Turano, the greater part of which lies in the Papal State, but which, like the rest of this region, is almost unknown to travellers, is the town of Rocca Sinibalda, near the site of the antient Trebula Mutusca. It was on the banks of the Telonius that the consul P. Rutilius and 8000 men were defeated and killed during the Marsian or Social war.

The plain of Rieti is one of the most delightful spots in Italy. It is covered with plantations of mulberry-trees, vines twining round elms and maple trees, fields of wheat, Indian corn, beans, flax, hemp, wood, and vegetables of every kind. It is traversed by two clear streams, which unite their waters about three miles below the town of Rieti, whose churches, steeples, and other massive buildings make a fine contrast with the brilliant verdure of the surrounding country. Farther down the river, between the right bank and the base of the Apennines, is a succession of marshes and lakes, the largest of which, called Piè di Luco, is about 10 miles in circumference; the banks are very bold and picturesque, but are considered unwholesome. The waters of the lake have an outlet into the Velino. Near this place the two ridges, eastern and western, which bound the plain of Rieti, approach near each other, leaving only a narrow gorge through which the Velino flows on a rocky bed with a rapid declivity until it reaches the edge of the terrace, where it falls into the valley of the Nera amidst clouds of mist. According to the measurement taken by the engineer Brandolini, the whole perpendicular height from the edge of the rock to the level of the Nera below is 143 mètres, or about 455 English feet. The fall however is broken into two parts, the first of which is perpendicular, after which the water forms a succession of cascades or rapids, until it meets the Nera. A pavilion called 'la Specola,' erected by Pius VI. on a projecting shelf of rock which overhangs the precipice, commands a fine view of the fall and of the valley of the Nera below. The cascade, called Della Marmora, has been considered by many as the finest in Europe, the mass of water being superior to all the Alpine cascades, and the height far superior to the fall of the Rhine at Schaffhausen. A rainbow is often seen hovering on the mist produced by the spray:

> A matchless cataract!
> Horribly beautiful! but on the verge,
> From side to side, beneath the glittering morn,
> An Iris sits, amidst the infernal surge.
> (*Childe Harold*, canto vi.)

The best view of the cascade is from the banks of the Nera below, about three miles distance from the village of Papigno, which is near Terni. (Tournon; Valery.) The name of Marmora has been given to the mountain from which the river falls, on account of the abundant incrustations, resembling marble, produced by the deposit of the waters of the Velino. The inhabitants of the neighbouring country are said to be subject to the gravel and the stone.

The valley of the Velino is said to have been in very remote times occupied by the Umbri, before that people descended from the highlands of the Apennines into the valley of the Upper Tiber, which has ever since retained the name of Umbria. [Etruria.] After the migration of the Umbri, another race of mountaineers from the central parts of the Apennines about Amiternum, near the sources of the Aternus or Pescara, became possessed of the valley of the Velinus; they were known by the name of Sabini, and they spread from thence into the country between the Nera, the Anio, and the Tiber, which they occupied almost as far as the gates of Rome. [Osci.] The Sabini were a remarkable people; their manners were simple, and their habits austere; they had a reputation for good faith and domestic virtue. They were religious, and even superstitious, and their country was famed for omens and prodigies. Prodigies, such as monstrous births, showers of stones, &c., are mentioned by Livy (xxv. 7; xxvi. 23; xxxvii. 3; lx. 11; liii. 13) as being of frequent occurrence at Reate previous to some great event or calamity. The Sabini had adopted a periodical system of emigration. As their population increased beyond the means which the country afforded, they sent out colonies in the spring of the year, and the migration was attended with religious ceremonies. The Piceni and Samnites were colonies of the Sabini, anterior to the foundation of Rome. The subsequent history of the Sabini forms part of the history of Rome.

The principal towns of the Sabini were:—Amiternum, Testrina, Reate, Cures, Nursia, Eretum, Trebula Suffena, Mutusca, and Nomentum; the last was in the lowlands of the Sabini, which extended on the side of Rome as far as the confluence of the Anio with the Tiber.

The name of Sabini has continued to be applied to the country of the antient Sabini down to our own times. Previous to Napoleon's occupation of Rome, in 1809, Sabina was one of the provinces of the Papal State. After the restoration of 1814, it was styled the Delegation of Rieti, which has been since united to that of Spoleto. [Spoleto e Rieti, Province of.]

The plain of Rieti was almost entirely covered with water, when the consul M. Curius Dentatus, 240 B.C., made a cut through the rock, deepening and widening the outlet for the waters of the Velino, and drained thereby the fields of Reate. The outlet must have existed before, for the waters of the valley above could have no other issue, but the natural channel was probably not deep enough to prevent the country being overflowed, until Dentatus deepened it. The people of Interamna, or Terni, complained of the damage occasioned to their fields by the overflowings of the Nera, in consequence of the additional stream thus poured into it. The senate sent a consul and ten legates to the spot to decide the matter, and Cicero repaired thither to plead for the people of Reate. (*Ep. ad Atticum*, iv. 15.) The result was that the cut was maintained.

Under Tiberius the question was again agitated in the senate: this time it was the people of Rome, who, alarmed at the inundations of the Tiber, ascribed them to the Velinus, the Clanis, and other affluents of the Tiber. The Reatini made a sensible defence, and the opinion of Piso, who was for maintaining things as they were, was adopted. (Tacit., *Ann.*, i. 79.) In more modern times the bed of the Velino above the fall has repeatedly become obstructed by calcareous deposits, and the river has again overflowed the plain; to remedy which Pope Paul III. made a new cut, and Clement VIII. afterwards restored the old one made by Curius. (Angelotti, *Descrizione di Rieti*.)

Reate is said to have derived its name from Rhea or Cybele, the antient patroness of the place. Like the rest of the Sabini, Reate was an early and constant ally of Rome, and is mentioned by Livy as having, together with Amiternum, furnished soldiers for Scipio's expedition to Africa. Cicero, in various places, extols the fidelity of the Sabini, and particularly of the people of Reate. (*Pro Ligario*, 11, and the third *Catilinaria*, 2.) The Flavian Gens was originally from Reate. Vespasian was born at Falacrina, in the valley of the Upper Velinus, above Reate, and he died there, and his son Titus after him. Remains of the baths built by those two emperors are still seen in the territory of Rieti. Near San Lorenzo, which is on the Via Salaria, on the summit of the ridge between the valley of the Tiber and the plain of Rieti, is a spot still called Titabalnea, with considerable remains of Roman brick-work.

In more modern times the people of Rieti were among the first to pay voluntary allegiance to the see of Rome, as their temporal sovereign, in the time of Pope Adrian I., their deputies cutting their hair and beard in token of submission. Rieti was often an asylum for the popes in the middle ages, when driven away from Rome by faction or foreign invasion. In our own times, in March, 1821, the Neapolitan constitutionalists, under General Pepe, were defeated by the Austrians near Rieti. In 1831, the people of Rieti showed their devotedness to the papal see by repulsing the insurgents from Bologna and Romagna who were advancing towards Rome.

Rieti is built partly on the slope of a hill, and partly at the foot of it; it is a bishop's see; it has a college and a clerical seminary; it has also manufactures of coarse woollens, silks, glass, and leather. The population amounts to about 9000, among whom are many wealthy landed proprietors. The town-house, or governor's palace, is a massive building, in the highest part of the town, and enjoys a splendid view of the surrounding country. The cathedral was built in the twelfth century, but has been repeatedly restored. There are several other churches and convents, as well as the episcopal palace, which are worthy of notice.

(Angelotti, *Descrizione della Città di Rieti*, 1635; Maroni, *Commentarius de Ecclesia et Episcopis Reatinis*, 1763; Galotti, *Mémorie di Tré Antiche Chiese di Rieti*, 1765; Sperandio, *Sabina, Sacra e Profana, Antica e Moderna*, 1790.)

RIFLE, or **RIFLED**, a term applied to muskets or pieces of ordnance when their bores are furrowed with spiral grooves. It is probably derived from an Anglo-Saxon word signifying to *rive* or *tear*; the grooves or channels being formed by a machine which scrapes away the substance of the barrel interiorly in parallel and serpentine directions.

It is not precisely known at what time rifled barrels were first employed in warfare, but P. Daniel states (*Hist. de la Milice Françoise*, liv. vi.) that the carabiniers of the French cavalry were furnished with such arms: he also observes that they had been invented long before the time at which he wrote, and that he had seen them used before that class of troops was formed into a regiment. This circumstance took place in 1692, and we may therefore conclude that rifled arms were known on the Continent about the middle of the seventeenth century. The historian describes the *carabines rayées*, as he calls them, as being grooved in a circular manner along the whole of the barrel; and he asserts that the range of the balls fired from them was very considerable. Rifled arms do not appear to have been introduced in the British service till the time of the American Revolutionary war.

A bullet made of lead cast in a spherical form, according to the practice till lately followed, having unavoidably some irregularities on its surface, and, from unequal expansion in cooling, a void space being formed in the interior by which the density is caused to vary in different directions from the centre, it follows that, when such bullet is discharged from a common musket, the atmosphere, pressing unequally against its front on opposite sides of the line of flight, causes it to deviate continually from the direction which, when uniformly resisted, it would take by gravity and the impulse of the fired gunpowder. It will also happen that the bullet acquires, by friction in the barrel, a rotatory motion about some diameter as an axis; and this diameter not coinciding, except by an extraordinary chance, with the proper path of the ball, the pressure of the air, which, when that coincidence does not take place, will be greater on the side of the ball where the revolving motion conspires with the direct motion, than on the opposite side where the two motions are in contrary directions, will, even if there were no irregularity of surface, produce deviation. This will evidently be various, according to the position of the axis of rotation; and since that position may change during the flight of the ball, the path of the latter may suffer several inflexions.

The intention therefore in forming spiral grooves within the barrel of a musket or piece of ordnance, is, to produce a rotatory motion of the shot about an axis which shall coincide with the line of its path, in order that the unequal pressure of the atmosphere in its front, on account of any irregularity in its form or density, may correct itself at every half-revolution of the shot on such axis; so that, on arriving at the object, the deviation may be only that which is due to some fraction of a rotation. The number of spiral channels in a rifle-musket has varied at different times; at first there were eight or sixteen, but the number was afterwards reduced to four, and at present the practice is to have but two. It has not been exactly determined what is the best form for the spiral; sometimes the curve-line makes, in the length of the barrel, 1½ revolutions about the axis of the latter, but in general one revolution in the whole length (=30 inches) is considered sufficient.

Different methods have been employed for the purpose of enabling the bullet to acquire, by means of the rifle-grooves in the barrel, the intended rotation on its axis. At first the leaden bullet was made spherical as usual, but a little larger than the bore of the musket, and being laid on the muzzle of the latter, it was forced down upon the powder by blows of a mallet applied at one end of a ramrod; thus, during the descent, the bullet being soft, there were formed on a zone of its surface projections which nearly fitted the grooves, and these projections, by moving along the grooves on the piece being fired, produced the required rotation. Some time since rifle-muskets were made so as to admit of being loaded at the opposite extremity of the barrel; a sort of chamber being formed by an enlargement of the bore at that place, the powder and bullet were introduced in it through a perforation made in the side of the barrel, and this, after the piece was loaded, was closed up by a screw which fitted it. Then, on firing the charge, the bullet, yielding to the compression in the bore, acquired projections where the grooves allowed it to expand, and thus it passed into the air with the rotatory motion on its axis. But neither of these methods is now used.

The most general practice of late has been to press the bullets (by means of the ramrod) into the barrel upon a piece of greased cloth or leather (called the *plaster*). This plaster is made of a circular form and greater in diameter than the bore, on the aperture of which it is laid with the greased side downwards: the bullet is then placed upon it, and both being forced down together, the cloth or leather which then covers the lower half of the bullet expands in the grooves, and this is found to be sufficient, when the piece is fired, to give the motion of rotation. At present rifle-bullets are made with a projecting zone which surrounds them on the circumference of what may be called a great circle, and has a breadth equal to about one-third of the diameter. The pieces are loaded at the muzzle, and the parts of the zone which are diametrically opposite to one another are those which pass along the two grooves in the barrel.

Captain Norton's rifle-bullets are nearly of a spheroidal form, and on a circumference perpendicular to the longer axis are two knobs which pass along the grooves when the bullet is pressed into or fired from the piece. The bullets are made hollow like small shells, in order to contain a small quantity of powder, and this, when the bullet strikes the object, is ignited by means of a detonating composition in a cap which covers an orifice in front of the bullet. It is proposed that these loaded bullets should be fired into an enemy's magazine or carriage conveying gunpowder, that by exploding there they may cause the destruction of the ammunition and of any objects which may be in its vicinity.

A bullet fired point-blanc from a rifle-barrel is found to strike an object at a much greater distance from the piece than when it is fired from an ordinary musket, and this was once ascribed to a superior velocity which the rifle was supposed to communicate to the ball. In fact, however, it is caused merely by the correction of the deviation, on which account the rifle-ball proceeds farther than the other in the direction of the line of aim; for Mr. Robins found by experiment that both the velocity and the range of the former were less than those of the latter, and he justly attributes the circumstance to the greater friction which the ball experiences in moving along the rifle-grooves than in passing through a simple barrel. He also ascertained that the velocity and range of a rifle-ball were greater after the piece had been long in use than they were at first, probably on account of a diminution of friction consequent upon an enlargement of the breadth of the grooves.

Mr. Robins moreover proved by experiment that a rifle-ball in its flight presents always the same side to the front, or rather, that the axis of rotation continues nearly parallel to itself; and to this circumstance he ascribes the deviation which such a ball experiences when fired with an elevation of the piece so that its trajectory becomes greatly curved, for the axis of rotation not coinciding with the direction of the path, the inequality of the air's resistance on different parts of the bullet is no longer corrected by the revolution about that axis. Mr. Robins, in order to remedy the evil, proposed that bullets should be formed like eggs, the longer axis to be placed in the direction of the axis of the piece, and the larger end to be in front; for then, the centre of gravity being thrown forward, there will be a tendency of the axis of the bullet, at least in the descending branch of the curve, to keep in the direction of the line of flight. The suggestion has not however been adopted, and probably such balls would not be found to possess any practical advantages over those which are in common use.

In the year 1774, Captain Blair proposed the formation of rifled guns of iron to be used as field artillery. Agreeably to the old practice, they were to be made hollow in the act of being cast, and in the same operation the grooves were to be formed. The balls were to be of lead with knobs on them to fit the grooves, and they were to weigh not more than two pounds. During the late war, the French attempted to introduce into their service cannon-shot of a cylindro-spherical form, the cylindrical part being in contact with the charge of powder, and a ring of lead surrounding the shot near its middle, so as to render this part rather greater than the bore of the gun. The circumference of the ring, being scraped down by the edge of the muzzle when the shot was forced into the gun, became in close contact with the surface of the bore, and thus no windage was left: by this contrivance it was expected that most of the advantages of a rifled gun would be obtained, though no rotatory motion took place in the shot. The result of the trials was thought to be favourable with respect to the direction and range of the shot, but the labour and time required to load the gun were great, and this circumstance probably prevented the invention from being adopted. No kind of rifle ordnance has ever been used in warfare, and the spherical form has always been found preferable to any other for shot.

It may be mentioned here, that bullets for common muskets, as well as for rifle-barrels, are not now cast in their actual forms, but are made from lead which has been previously cast in cylindrical rods rather greater in diameter than the intended ball. Each rod is passed between two revolving cylinders, whose convex surfaces are indented, and, by the pressure, the rod becomes a series of rudely formed beads: the rod in this state is passed between two other revolving cylinders, on whose convex surfaces are several corresponding hemispherical cavities, and the pressure then reduces the beads to a spherical form, the whole series of balls being connected together by a thin portion of lead where the hemispheres of the balls unite; this portion being afterwards removed, the bullets are complete. The cavities for rifle-bullets allow, during the pressure, a projection to form itself about each in the manner above mentioned. The great pressure to which the lead is subject when passing between the cylinders, by forcing the particles together, fills up any vacuities which may form themselves in the rods during the cooling process, and probably renders the density of the ball nearly uniform.

RIFLEMEN (called by the French *tirailleurs*) are soldiers whose duties correspond nearly to those of light-infantry troops, but their muskets being rifled or grooved, the effect of their fire, within certain limits, is more certain.

In the preceding article we have stated what is known concerning the first use of rifled barrels on the Continent; and in the article Arms it has been shown that the duty of riflemen is indicated in the 'Observations' compiled by the earl of Albemarle in 1646. The Anglo-American people are however believed to have been the first who organised corps of infantry armed with rifle-muskets, and during their struggle for independence the fire from those pieces too often took effect with fatal precision against the officers and in the ranks of the British forces. From that time the incorporation of bodies of riflemen with the armies began to take place among the nations of Europe, and it is now become a general practice. In the British service, the 60th, formerly called the Royal American regiment, is a rifle corps; and Manningham's rifle corps appears in the 'Army List' for 1801, but this became, in 1803, the 95th regiment. In 1816 it was formed into the present rifle-brigade, and placed under the command of Sir David Dundas, who had before been colonel of the 60th regiment. Subsequently to that year, a regiment of native riflemen has been raised in Ceylon, and a rifle corps of cavalry at the Cape of Good Hope.

When a company or corps of riflemen act with closed ranks and files, the manner of performing the exercises differs but little from that which is practised by other troops of infantry; the men however are instructed to be careful that the rifle do not fall to the ground, as it is easily damaged, and on service it may happen that it cannot be repaired or replaced.

If a corps of riflemen is detached from a main body of troops in order to skirmish with the enemy, one-half advances with trailed arms about 100 paces towards the front, when it extends its files so as to cover the whole body from which it was detached, while the other half advances only 50 paces, and remains at close order for the purpose of supporting the former party. On a signal for alarm being given, the skirmishers retire quickly through their respective intervals in the main body, and re-form themselves in its rear. When a body of troops retreats across a plain, the riflemen on the right and left flanks of each division remain fronted, while the main body faces to the right-about and retires; those men then extend themselves so as to cover the retreating troops, whom they follow at the distance of a few paces, keeping off the enemy's flankers at the same time by their fire.

On firing at close order, the two right-hand files of each section step three paces to the front, and the rear-rank men step to the right of their file-leaders. Each man fires as soon as he gets proper aim; then, resuming his place in the company, he reloads. When the two first files have fired, the two next advance, and so on through the whole company. Rifle-firing in extended order is performed by sound of bugle, and the regulation is, that the whole body of men should not have their pieces unloaded at the same time. For this purpose, on the signal being given, each man of the front rank selects his object and fires; then, as soon as each rear-rank man sees his file-leader put another ball in his piece, he fires through the interval between two front-rank men. Afterwards, when the rear-rank men are putting other balls into their pieces, they give notice to their file-leaders that they may fire; and this is continued, the men either standing or lying on the ground, till the signal is given to cease.

On a signal being made to fire advancing, each rear-rank man moves briskly six paces before the front rank and fires; then, after reloading, he trails his arms. When the serjeant of the front rank sees the other rank reloading, he steps forward and gives a signal with his whistle, on which the front-rank men pass six paces before the rear-rank and fire, and so on alternately. If the signal be made to fire retreating, the rank which happens to be in front fires and then goes twelve paces to the rear of the second rank; there each man faces to the front and reloads. As soon as the the sergeant on the flank of the second rank sees the first-rank men loading, he gives a signal with his whistle, on which the second rank fires and goes twelve paces to the rear of the former men; and so on. The ranks thus support one another by their fire, till the signal is made to halt.

RIFLE BIRD. [Ptiloris.]

RIGA. [Livonia.]

RIGA (in the language of Livonia, *Righa*; in that of Esthonia, *Riolin*), the capital of the government of Livonia, is situated in 56° 55′ N. lat. and 24° 12′ E. long., on the right bank of the Düna about seven miles above its entrance into the Gulf of Riga. The width of the river and the distance of the town from the sea make the port very spacious and secure, and the merchantmen come up to the quays. In summer a bridge of pontoons, loosely attached to piles, and rising and falling with the tide, is laid across the river; this bridge is 40 feet wide and 2600 feet long, and is a pleasant and fashionable promenade in the summer time. The town is surrounded with ramparts and bastions. It has a strong citadel, and is otherwise well fortified, so that it is considered one of the most important bulwarks of the Russian empire. It consists of the town itself, of one suburb within the palisades, and of two more distant suburbs on the left bank of the Düna. There are three gates towards the country and four towards the Düna. About 1000 of the 4000 houses are of stone, many of which are large and handsome, but the streets are narrow and crooked, and the town dark and gloomy. There is but one inconsiderable market-place, and a pretty spacious parade before the palace, in which the merchants erected, in 1817, a granite column, twenty-three feet high, surmounted by a bronze statue representing the goddess of Victory, nine feet high, in memory of the triumphs of the Russian arms in 1812-13. Of the 14 churches, 6 are Lutheran, 4 Greek, 1 Calvinist, 2 Livonian, and 1 Roman Catholic; of the Lutheran the most remarkable are the large and lofty cathedral, attached to which is a quadrangle surrounded with cloisters, and which contains the museum and the public library of 18,000 volumes, and St. Peter's church, which has a fine tower commanding an extensive view of the harbour. The other public buildings are, an imperial palace, with an observatory; the residence of the civil governor; an ancient palace, partly used as the residence of the military governor, partly serving for barracks; the town-house, containing the Exchange; the assembly-house of the estates of Livonia; the arsenal, the hospital of St. George, the Catherinenhof, a bomb-proof warehouse 445 feet in length, and a theatre. There are numerous literary and useful institutions, as the gymnasium, the economical society, the society for the study of the history and literature of the Baltic provinces, the cathedral school, and the commercial bank.

The town of Riga was founded about the year 1200, by Albert, the third bishop of Livonia, Christianity having been introduced in the middle of the century, by Meinhard, a monk of Bremen, who was ordained by the pope as first bishop of Livonia. The founder granted it several privileges and a considerable extent of territory. The city, which was at that time a colony of Germans, soon became rich and powerful, and in the thirteenth century joined the Hanseatic league, and its commerce was the source of such great wealth that the power of the city and the pride and luxury of the inhabitants became proverbial. At the beginning of the sixteenth century it belonged to the Teutonic knights, who were obliged to submit to Poland in 1561; but Riga, which had embraced the Reformed religion, fearing a Popish master, refused to recognise the sovereignty of the kings of Poland till 1581, when it obtained the guarantee of its antient privileges. From that time its prosperity declined. In 1621 it was besieged and taken by Gustavus Adolphus. In 1710, after a vigorous defence, it was taken by Peter the Great, when half the town was in ruins, many hundreds of the inhabitants had perished by the enemy's fire, and 20,000 had been carried off by the plague during the siege. In the siege of 1812, the suburbs, with nearly 800 large houses, besides the smaller houses and outbuildings, and four churches, were burnt, and also 200 houses in the town itself, and 1500 inhabitants perished. The suburbs have been rebuilt, and are much handsomer than before. It has likewise suffered several times by fires and inundations, to which latter it is much exposed by the banks of the river being very low. Thus at the breaking up of the ice in 1814, 400 houses were swept away with their inhabitants, immense quantities of timber, and eighty vessels laden with hemp. The loss was above thirty millions of rubles. Before the rapid rise of Odessa, Riga was the third city in point of population in the empire: it is now the fourth, the population being nearly 60,000, of whom above 30,000 are Protestants, chiefly Germans and their descendants; the remainder are mostly Livonians, the Russians being comparatively few. The numerous ships in the river, the bustle in the streets, and the well-stocked warehouses and shops, are indications of the extensive trade of which Riga is the centre; it is in fact, next to St. Petersburg, the greatest emporium of foreign commerce in the empire. The exports consist of the great staple articles of Russian produce, corn, timber, flax, hemp, linseed, tallow, Russia leather, and sail-cloth. It appears from the official accounts, that the quantity of corn exported has considerably decreased of late years; that of hemp has remained nearly stationary; on the other hand, a remarkable increase has taken place in the exports of flax, linseed, and timber.

The number of ships annually arriving at and leaving the port may be stated at between 1200 and 1300. In 1831, the arrivals were 1522, the departures 1483. Of these ships nearly one half are English. The value of the exports is about two millions sterling; that of the imports, consisting of colonial produce, manufactures of woollen, cotton, and silk, wine, &c., is not above one-third of that sum; about two-thirds of the ships arriving at the port are in ballast. It is not only the commerce of Riga that is increasing; it has now considerable manufactories of woollen, cotton, tobacco, starch, looking-glasses, and iron-wares, besides sugar-refining houses, which produce annually five million pounds of refined sugar. (Stein's *Lexicon;* Hörschelmann; Cannabich; Hassel; *Russian Official Journals.*)

RIGAUD, HYACINTHE, a portrait painter, called the Vandyck of France, was born at Perpignan on the 25th of July, 1659. He was the son of Matthias Rigaud, an artist, from whom he learned the rudiments of painting, and upon whose death he was sent by his mother to Montpellier, and placed under various masters, among whom was one Ranc, a painter of portraits in the manner of Vandyck. In 1681 he returned to Paris, and in the following year gained the chief prize given by the Academy. He intended to follow historical composition, but was advised by Charles le Brun to practise portrait, and the same artist dissuaded him from visiting Italy. In 1700 he was admitted a member of the Academy of Paris, and presented as his admission picture a portrait of the sculptor Desjardins, a performance which gained him the highest reputation. His success as an artist was now most brilliant; he frequently painted the portrait of Louis XIV., those of the royal family, the principal nobility of the court, and many of the most illustrious personages of Europe. In 1727 he was pensioned and decorated with the order of St. Michael. He was successively professor, rector, and director of the Academy. Grief for the loss of his wife, who died in 1742, coupled with his advanced age, hastened his own death, which happened on the 19th of December in the following year. He left no issue, and no pupil of note except Jean Ranc, who married his niece, and who became principal painter to the king of Spain. Works by Rigaud are contained in most of the collections of Europe. In the Louvre, besides others, are the portraits of Le Brun, Mignard, and Bossuet. His pictures have been engraved by Edelinck, the Drevets, J. Audran, and other eminent artists, and consist of two hundred historical portraits.

Rigaud is considered one of the best portrait painters of the French school; his heads are full of character and expression, his touch bold and free, yet exquisitely delicate, and his colouring, though brilliant, generally speaking free from gaudiness. In his draperies however he was too apt to express a fluttering effect wholly inconsistent with the repose of the other parts of his work, and in many instances the attitudes of his figures exhibit an unnecessary violence of action. With regard to the title given him of the French Vandyck, it seems difficult to reconcile it with truth, for the charming simplicity of that exquisite painter, one of his most prominent merits, is entirely wanting in the works of Rigaud; nor do the two less resemble each other in their style of colouring and in their management of the chiaro-'scuro. Where the tints of Rigaud are brilliant and dazzling, those of Vandyck are harmonious and chaste; and where the lights of the former are relieved by positive and forcible colour, those of the latter are brought to their proper degree of projection by the gradual depth of the accessories and backgrounds.

(*Biographie Universelle;* Pilkington's *Dictionary of Painters.*)

RIGEL. [Orion.]

RIGHI'NI, VINCENZO, a composer of great merit, whose works deserve to be better known, and will probably ere long be rescued from the ill-deserved neglect into which they have fallen, was born at Bologna, about the year 1758, and received his musical education under the celebrated Padre Martini, but completed it at Prague, where he acquired a vigour which was not then the attribute of the Italian school. Righini composed many operas for different theatres, among which his *Armida*, *Tigrane*, *Enea nel Lazio*, and *Alcido al Bivio* are well worth the notice of the true amateur. He died in his native city, in 1812.

RIGHT. It has been shown in Law [vol. xiii., p. 301] that the word *right* occurs under some form in all the Teutonic languages; and that it bears a double meaning equi valent to the significations of the Latin word *jus*, namely, *law* and *faculty*. The Anglo-Saxon word bore this double meaning, but *right*, in modern English, has lost the signification of *law*, and has retained only its other meaning.

Right, in its strict sense, means a legal claim; in other words, a claim which can be enforced by legal remedies, or a claim the infringement of which can be punished by a legal sanction. It follows from this definition that every right presupposes the existence of positive law.

The causes of rights, or the modes of acquiring them, are various, and can only be explained in a system of jurisprudence; for example, a person may acquire a right by contract, by gift, by succession, by the non-fulfilment of a condition.

Every right correlates with a legal duty, either in a determinate person or persons, or in the world at large. Thus a right arising from a contract (for example, a contract to perform a service, or to pay a sum of money) is a right against a determinate person or persons; a right of property (or dominion) in a field or house is a right to deal with the field or house, availing against the world at large. On the other hand, every legal duty does not correlate with a right; for there are certain absolute duties which do not correlate with a right in any determinate person. Such are the duties which are included in the idea of police; as the duties of cleanliness, order, quiet at certain times and places.

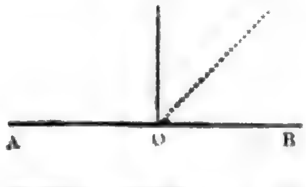
The word right is sometimes used, improperly and secondarily, to signify not legal but moral claims; that is to say, claims which are enforced merely by public opinion, and not by the legal sanction.

In this sense the right of a slave against his master, or of a subject against his sovereign, may be spoken of; although a slave has rarely any legal right against his master, and a subject never has a legal right against his sovereign. It is in the same sense that a sovereign government is sometimes said to have rights against its subjects, although in strictness a sovereign government creates rights, and does not possess them. In like manner, one sovereign government is said to have rights against another sovereign government; that is to say, moral rights, derived from the positive morality prevailing between independent nations, which is called *international law*.

We likewise sometimes hear of certain rights, styled natural rights, which are supposed to be anterior to civil government, and to be paramount to it. Hence these supposed natural rights sometimes receive also the additional epithets of indefeasible, indestructible, inalienable, and the like. This theory of natural rights is closely connected with the fiction of a social compact made between persons living in a state of nature; which theory, though recommended by the deservedly high authority of Locke, has now been abandoned by nearly all political speculators.

RIGHT. (Mathematics.) This term is applied in mathematical language to anything which is imagined to be the most simple of its kind, to distinguish it from others. Thus a right line is a STRAIGHT line; a right angle is the most simple and well known of the angles used by Euclid; a right cone is one in which the axis is at right angles to the base: and so on.

RIGHT ANGLE. When two lines, at first coincident, are made to separate so that one of them revolves about their common extremity, the revolving line will in time become the continuation of the other. This angle or opening, made by a line and its continuation, would, we might suppose, be one of the principal angles considered in geometry, and should, according to the previously defined meaning of RIGHT, be called a right angle. But in the geometry of Euclid the word angle seems to have been essentially connected with the idea of a pointed corner, and we have no means of finding out that he considered a line and its continuation as making any angle at all. Instead of this angle, made by AO and OB, or the angle of opposite directions, he introduces its half, and calls it a right angle Let AOC and COB be equal angles, that is, let OC bisect the angle AOB, and each half is called a right angle. When the angle AOB is mentioned, it is as two right angles. All that is necessary as to the magnitude of a right angle has been given under ANGLE: we propose here to point out the effects of the forced manner in which Euclid avoids the angle AOB.



It is sufficiently evident that nothing can lose its right to be considered as a magnitude by augmentation: so that the opening of AO and OB, which is double that of AO and OC, must really be a magnitude of the same kind as the angle AOC. Now the consequences of preferring AOC to AOB, as a fundamental angle of reference, are as follows:—

1. The introduction of the apparently very arbitrary axiom, that 'all right angles are equal,' instead of the more simple and natural one that 'two straight lines which coincide in any two points coincide beyond those points.' It is as evident as that 'two straight lines cannot inclose a space,' or 'two straight lines which coincide in two points, coincide *between* those points,' that the same also takes place *beyond* those points. A moment's examination will show that this axiom immediately gives as a consequence that the angle AOB in any one straight line is equal to the angle A′O′B′ in any other; or, as Euclid would express it, the doubles of all right angles are equal, whence all right angles are equal. And it is one consequence of leaving the natural route, that Euclid himself has assumed both the more complicated axiom which he has expressed, and also the more simple one by which he might have avoided it: for he nowhere shows that if OA be made to coincide with O′A′, then OB coincides with O′B′. Some of his editors have supplied the defect by making it a consequence of 'all right angles are equal,' that 'no two lines can have a common segment.'

2. The necessity of proving a particular case of a proposition which is taken as self-evident in all other cases. Thus Euclid never proves that COD and DOB are together equal to COB; while he has to spend a proposition in proving that AOD and DOB are together equal to AOB.

3. The necessity of proving a particular case after the general case has been proved. Thus to bisect a given angle is the general proposition, of which to draw a line perpendicular to a given line from a given point within it, is the particular case. The construction of the latter is precisely that of the former: but the two results are obliged to be obtained in two distinct propositions: it would be right enough to make them cases of one proposition.

4. The habituation of the student to neglect the angles greater than two right angles, by his never meeting with one *as great*. Two lines which end at the same point make two openings, one greater and the other less than two right angles; except in the intermediate case when both are equal to two right angles. Now Euclid does not positively reject the angle greater than two right angles, nor does he say that of two lines which meet, the angle which they make shall be always taken to be that which is less than two right angles. Had he had such intention, one of his propositions would have been positively false, to wit, that in any segment of a circle, the angle at the centre is double of the angle of the circumference. Had such been his intention, he would have said, 'in every segment *which contains an angle less than a right angle*, the angle at the centre is double of that at the circumference.' It is true that his proposition is, 'In a circle, the angle at the centre is double of the angle at the circumference *when they have the same circumference for a base*:' and some may think that the words in italics exclude (as in one sense they certainly do) the segment which has an angle greater than a right angle; since this angle, and its central angle, that namely which is less than two right angles, do not stand on the same circumference as a base. Let this be so, then we throw the difficulty on another proposition, the 27th. It is there shown that 'in equal circles, the angles which stand upon equal circumferences are equal whether they stand at the centre or *at the circumference*.' If no mention of angles greater than two right angles be intended in the previous proposition, then the one before us is not completely proved, but only when the angle at the circumference is less than a right angle. At the same time there seems to be, in some of the subsequent propositions, proof of a desire to avoid the angle greater than two right angles, and to subdivide proofs into particular cases in order to avoid the difficulty.

But are we not in fact to assume, without particular inspection, from the general tone of the first six books, that the angle equal to or greater than two right angles was never really meant, and that all propositions are to be taken with such limitations as the above restriction would render necessary? Let those who think so, look at the last proposition of the sixth book, in which it is shown that in equal circles angles are to one-another as their subtending arcs. Now the criterion of Proportion, as given by Euclid, requires that, in this proposition, any multiple, however great, of the angles may be taken. Now a multiple of an angle may not only be greater than two right angles, but greater than a thousand right angles: and every such multiple must not only be really included in the demonstration, but considered as a magnitude, and compared with other magnitudes of the same kind. It is impossible that the writer of the fifth book should have been unable to bear in mind that the establishment of proportion demands that every possible multiple of the quantities asserted to be proportional should be admitted and compared with every other: and thus it is certain that Euclid must have meant to consider angles not only greater than two right angles, but even greater than four, or any other number. Some commentators have supposed that Euclid meant to omit all pairs of right angles from such multiples, and all semicircumferences from the multiples of the arcs; but this would only be a use of the axiom, that if equals be taken from unequals, the remainders are unequal, which admits the greater of the quantities mentioned to be comparable magnitudes: and that Euclid does consider them as such, is all that is contended for.

RIGHT, PETITION OF. [Petition of Right.]

RIGHTS, BILL OF. [Bill of Rights.]

RILEY, JOHN, born in London, 1646, was the first Englishman that attained any excellence in portrait, unless perhaps Dobson may be considered as an exception, and in that department he remained unrivalled by any native artist until the appearance of Sir Joshua Reynolds. He was instructed in his art by Fuller and Zoust, but he adopted Vandyck as his model, and painted much in the style of Lely; his draperies were admirable. Riley was a modest and unassuming man, and excessively diffident and distrustful of his powers. 'With a quarter of Sir Godfrey's vanity,' says Walpole, 'he might have persuaded the world he was as great a master.' And the same writer observes, that his 'talents while living were obscured by the fame rather than by the merit of Kneller, and depressed since by being confounded with Lely, an honour unlucky to his reputation.'

Upon the death of Sir Peter Lely, Riley came into general notice, and obtained the patronage that he merited. He was introduced to Charles II., and painted his portrait, who said, upon seeing it, 'Is this like me? Then, odd's fish, I am an ugly fellow,' which greatly disconcerted the modest painter. He painted also the portraits of James II. and his queen, Mary of Modena; and after the Revolution in 1688, he was appointed state painter to William and Mary, whose portraits he also painted.

Riley's master-piece is reckoned the portrait of the lord-keeper North, at Wroxton; and amongst his most successful performances are mentioned also the portraits of Bishop Burnet and the celebrated Dr. Busby, master of Westminster school. Riley died in London, of the gout, 1691, in the forty-sixth year of his age. His property, which, according to Walpole, amounted to only 800*l*., came to his scholar Richardson, who had married his niece.

RI'MINI. [Forli, Province of.]

RI'MULA, the name given by Defrance to a genus of testaceous mollusks founded on a minute species of the genus *Emarginula* of authors, which has a fissure approximating to the margin, but not arriving at it. [Cervicobranchiata, vol. vi., p. 444.]

RIMULI'NA. [Foraminifera, vol. x., p. 347.]

RING. [Annulus.]

RING DOVE, one of the English names of the *Ring Pigeon, Wood Pigeon, Cushat* or *Queest*, *Columba Palumbus*, Linn.; *Ramier* of the French; *Colombaccio, Palombo, Piccione da Ghianda* of the Italians; *Ringeltaube* of the Germans; *Ysguthan* of the Antient British. The term *Ring Dove* is also applied to the *Collared Turtle, Columba risoria*, Linn.: *Tourterelle à collier* of the French; *Lachtaube* of the Germans. [Columbidæ, vol. vii., pp. 370, 373.]

RING OUZEL. [Blackbirds, vol. iv., p. 478.]

RINGENT, a form of the corolla of plants, so named from the supposed resemblance to the snout and mouth of some animal. The petals are irregular and gaping. The natural order Lamiaceæ possess this form of corolla.

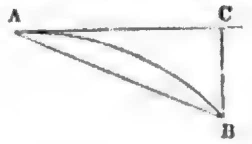
RINGTAIL, the English name of the female of the *Hen Harrier, Circus cyaneus*. [Falconidæ, vol. x., p. 183; Harrier (Ornithology).]

RINGTAILED EAGLE, a *Golden Eagle* in its youthful plumage. [Falconidæ, vol. x., p. 173.]

RINGWORM is the term applied to many cutaneous eruptions, and more particularly to those on the head. It is not now possible to determine to which of these the name was first applied; but it is probable that the species of herpes which appear in the form of rings were thus designated, especially that which nosologists call herpes circinnatus. This disease is still often called ringworm, when it appears upon the forehead or scalp; but the same name is still more generally applied to the different forms of porrigo, especially P. larvalis and P. scutulata. The descriptions of the diseases thus confounded under this name will be found in the articles Herpes and Porrigo.

RINGS, COLOURED. Sir Isaac Newton, in his 'Treatise on Optics,' first supplied a careful examination of the coloured bands which are familiarly seen in soap-bubbles of sufficient tenuity, in thin plates of mica, and generally in any transparent plate of small width, whether bounded by denser or by rarer media. In explanation of these phenomena he invented his ingenious theory of 'Fits of easy transmission and of easy reflexion of light.' The explanation given by the undulatory theory is founded on the doctrine of the interference of the luminous waves.

Newton adopted an accurate method for discovering the relation between the thickness of the medium and the colours of the bands produced. Thus, by geometry, the distance of any point B of a circular arc from a tangent AC, is equal to the square of the chord AB divided by the diameter of the circle. When the latter is great in comparison of the arc AB, we may then substitute the tangent AC for the chord. Now, if we place together a convex lens and a plane glass, the perpendicular section taken through the point of contact of this system is evidently that in our figure. The point of contact A is the centre of the coloured rings: AC, being the radius of one of them, is easily measurable, and hence BC (the thickness of the interposed stratum of air) becomes known.



From the above it is evident that a convex lens of considerable focal length (about ten feet will answer) is to be preferred, inasmuch as the diameters of the rings enlarge, for a constant value of the thickness BC, in proportion to the square of the radius of the lens; the bands, being then greatly enlarged, may be more accurately examined and measured.

Suppose white light to be incident, the point of contact A will transmit it, and consequently appear black, but the light which passes through the small interval between the glasses will be decomposed, and form coloured rings having A for centre, each band having a gradation of colours from its interior to its exterior border, in the following order, viz.:—

	First.	Second.	Third.	Fourth.
Rings.	Black	Purplish Violet	Purple	Dull Green
	Faint Blue	Blue	Blue	Pale Pink
	Bright White	Green	Bright Green	Red
	Yellow	Strong Yellow	Yellow	
	Orange	Crimson-Red	Pink	
	Red		Crimson	

In the fifth, sixth, and seventh, the colours are green and pink, with a middle white in the fifth, but they are now faint colours, and gradually become invisible.

By the calculation above explained Newton found the intervals BC between the plates in the succession of the darkest parts of the several rings to be as the numbers 0, 2, 4, 6, &c., and those corresponding to the brightest parts, as the odd numbers 1, 3, 5, &c., that corresponding to the brightest part of the first ring being only 178,000th part of an inch. Hence conversely the interval may be computed by observing the colour and the number of the band, for these intervals are constant whatever may be the curvature of the glass or glasses (if two lenses are used). The contact should be made as perfect as possible by pressure. Fringes may be similarly formed by laying a prism on a plane glass. The rings enlarge when seen obliquely, the interval for a given colour varying as the cosine of the angle of incidence. The constant co-efficient of this cosine (as compared with perpendicular incidences) is $\frac{1+106\mu}{107\mu}$, μ beng the index of refraction.

If homogeneous light of any colour be used, the rings of light then produced are all of that colour, intercepted by bands absolutely black. The colours, as given in the above table, when the light is white, being the result of superposing the different systems of rings, belong to the various homogeneous rays of the prismatic spectrum which constitute white light.

If we place the glasses between the eye and the source of light, so that the rings may be viewed by that portion of it which is transmitted, we find, as might be expected, that the colours are now complementary to those visible by reflected light. Colours are said to be complementary when their mixture produces white light.

The colours of soap or other liquid bubbles are produced in the same way, and at the same thickness as those in the case detailed above. In that case we had the rarer medium between the denser; here the denser is between the rarer. The rings commence at the top of the bubble, because there it first grows sufficiently thin.

The undulatory theory, upon admitting the loss or gain of half an undulation in the interference producing these rings, gives a satisfactory explanation of all the phenomena of coloured rings, but which contains analytical investigations of an abstruse nature.

Rings or fringes, such as those denominated Grimaldi's fringes, are also formed by the interferences attendant on the inflexion of light by the edges of opaque bodies, for which see DIFFRACTION.

RINGS, FAIRY, is a name given to certain spots which are observed amongst grass in fields, and which are characterised by being more luxuriant than the surrounding herbage. They are of two kinds: either an entire knot of grass is more luxuriant than the rest, or the luxuriant grass grows in a circle or the segment of a circle around a comparatively barren spot. The name of fairy rings was originally given to these spots because they were supposed to be the places where the little fairies held their nightly revels. Recently a better cause has been assigned for their origin. They are now known to be those portions of the surface on which a species of fungus has grown, which by dying has afforded nutriment for the grass on the spot; and as the fungus grows in this particular place on account of something favourable to its development, it continues year after year to extend itself beyond the small circular space to which it was originally confined; but as the grass in the centre loses the stimulating influence of the decayed fungus, this part becomes comparatively barren, and thus the ring of luxuriant grass keeps on extending for many years, till the earth, no longer affording the circumstances necessary to the development of the fungus, it dies. There are several species of fungus that produce this effect. It was first noticed by Dr. Withering as occurring with the *Agaricus oreades*: but the common mushroom (*A. campestris*), the gigantic puff ball (*Bovista gigantea*), and many others may be seen in the act of forming these circles. It is very probable that most of the large fungi would form these rings during their growth, provided the entire surface of the earth by which they were surrounded afforded the circumstances necessary to their growth.

RIO DE JANEIRO. [JANEIRO.]

RIOBAMBA. [ECUADOR, p. 267.]

RIOM, a town in France, capital of an arrondissement in the department of Puy de Dôme, 225 miles south-south-east of Paris, by the road through Fontainebleau, Montargis, Nevers, and Moulins, and 7 miles north of Clermont-Ferrand.

This town was antiently the chief town of the duchy of Auvergne, erected by King Jean II. in 1360, in favour of his son the duke of Berri: its prosperity dates from this epoch.

Riom stands on a small elevation in the rich plain of the Limagne of Auvergne, near the little river Ambène, which flows by the Lachau and the Morges into the Allier. The town is surrounded by a boulevard planted with trees, and lined, toward the country, with houses of modern erection, which shut out the beautiful view from the boulevard. The interior of the town consists of several streets; the two principal cross each other near the centre: these are wide and handsome, but not quite straight; the other streets are inferior all are very ill paved with lava and basalt, and some are adorned with fountains. The houses are almost universally built of lava from the quarries of Volvic, a small town three or four miles west of Riom: the dark colour of the stone gives to the place a sombre appearance. The principal public buildings are the church of Saint Amable, remarkable for its elegant dome; La Sainte Chapelle, a beautiful Gothic building; the court-house (palais), another fine Gothic building; the clock-tower, from the summit of which there is a charming prospect of the surrounding country; and the central prison or house of correction, large, lofty, secure, and well ventilated.

The population of the town in 1831 was 11,992 for the town, or 12,379 for the whole commune; in 1836 it was 11,473 for the commune, showing the serious diminution of 906 persons in five years. The trade of the place is not very considerable: the chief articles of manufacture are candles, and preserves of apricots, apples, &c. (which, together with the fruits of the neighbourhood, are sent to Paris), liver of antimony, some linens and cottons, brandy, and leather. The chief articles of trade, besides the above, are corn, hemp, coarse linens, walnut-oil, and hempseed-oil. There are four fairs in the year.

The importance of Riom is chiefly derived from its tribunals, the business of which is augmented by the propensity of the people of Auvergne to litigation. It has a Cour Royale, the jurisdiction of which extends over the departments of Allier, Cantal, Haute Loire, and Puy de Dôme; a subordinate court of justice, and a tribunal of commerce; together with some fiscal government offices. There are also a high school, with a cabinet of natural philosophy; an hospital, two almshouses, a poorhouse, and a theatre.

The arrondissement of Riom has an area of 885 square miles, and is divided into thirteen cantons, or districts, each under a justice of the peace: it comprehends 130 communes. The population in 1831 was 146,495; in 1836, 151,456.

RIOT. A riot is a misdemeanour at common law. The definition of it given by Hawkins, and which appears to have been very generally adopted without much alteration by subsequent writers, is 'a tumultuous disturbance of the peace by three persons or more, assembling together of their own authority, with an intent mutually to assist one another against any who shall oppose them in the execution of some enterprise of a private nature, and afterwards executing the same in a violent and turbulent manner, to the terror of the people, whether the act intended were of itself lawful or unlawful.' The assembling together therefore in a case where the law authorises parties to meet and use force in concert, as for the purpose of suppressing rebellion or opposing the king's enemies, or as part of the posse comitatus, will not constitute a riot. Neither will a sudden quarrel occurring among a number of persons who have met together at a fair, or on similar occasions, constitute a riot. But if on the occasion of a meeting, lawful in itself, some act of violence in disturbance of the peace is afterwards proposed, and executed in concert by those who are assembled, they will be guilty of a riot. The enterprise must be of a private nature, not necessarily relating to an individual, but still having in view some minor and special, and not a general public object. Thus it may concern the interests or disputes either of some one person or of the inhabitants of some town or district. The object may be, for instance, to redress a grievance said to be suffered by such person, or to pull down inclosures on lands where the inhabitants claim a right of common. But if the enterprise is for the purpose of redressing grievances generally throughout the kingdom, or to pull down all inclosures, the offence is not a riot, but amounts to a levying of war against the king, and the parties engaged in it are guilty of high treason.

Hawkins asserts that there must be some circumstance of violence either to the person of a man or to his possessions; but it has been otherwise decided by Sir James Mansfield, C.J. (2 *Camp.*, 368). Violence however, if not of actual force, yet in gesture or language, and of such a nature as to cause terror, is a necessary ingredient in the offence of riot. The lawfulness of the enterprise operates no further than as justifying a mitigation of the punishment. It does not in any way alter the legal character of the offence. All parties present at a riot who instigate or encourage the rioters, are themselves also to be considered as principal rioters.

Two minor offences of rout and unlawful assembly, which are similar to riot, are generally treated on under that head.

A *rout* is where parties have commenced but not accomplished an enterprise, and in such a way that if the enterprise had been executed, they would have committed a riot.

It is an *unlawful assembly* when great numbers of people meet together with such circumstances of behaviour as to raise the fears of their fellow-subjects, and to endanger the public peace. An assembly therefore of a man's friends to defend his person against violence threatened to him if he appear in a public place is unlawful, as such conduct tends to produce a breach of the peace. But an assembly in a man's own house to protect him while there, or to defend the possession of it, is not considered an unlawful assembly. At common law the sheriff and all peace officers are bound themselves to make every effort and to command all others to assist them to suppress a riot. It seems also that where the emergency is great and immediate, private persons on their own authority may act, and even use arms for the same purpose. On such occasions it has not been usual for the military to take any part except in the presence and under the direction of a civil authority. They are not however by law disqualified for any duty or relieved from any responsibility which under the same circumstances attach to other classes of their fellow-subjects.

Various acts of parliament have been passed for the purpose of giving authority to magistrates and others for the purpose of suppressing riots, and restraining, arresting, and punishing rioters. These are collected and commented upon by Hawkins (1 *P. C.*, b. i., c. 65) and Burn (5 vol., 'Riot,' &c.). The most important is 1 Geo. I., st. ii., c. 5, commonly called the Riot Act. By that statute it is provided that 'if any persons to the number of twelve or more, being unlawfully, riotously, and tumultuously assembled together to the disturbance of the public peace, shall continue so assembled for the space of an hour after a magistrate has commanded them by proclamation to disperse, they shall be considered felons.'

The form of proclamation is given in the Act, and is as follows:—'Our sovereign lady the queen chargeth and commandeth all persons, being assembled, immediately to disperse themselves, and peaceably to depart to their habitations or to their lawful business, upon the pains contained in the Act made in the first year of King George for preventing tumults and riotous assemblies.

'God save the Queen.'

This is directed to be read with a loud voice and as near as possible to the rioters; no word must be omitted. Persons who do not disperse within the hour may be seized and apprehended by any magistrate or peace-officer or any private person who has been commanded by a magistrate or an officer to assist. In case of resistance, those who are attempting to disperse or apprehend the rioters will be justified in wounding or killing them. It is felony also to oppose the reading of the proclamation; and if the reading should be prevented, those who do not disperse are still guilty of felony, if they know that the reading of the proclamation has been prevented.

A prosecution under this Act must be commenced within a year after the offence has been committed. By the 7 & 8 Geo. IV., c. 30, s. 8, rioters who demolish or begin to demolish a church or a chapel, a dwelling-house, or any other of the various buildings or machinery mentioned in that Act, are to be considered as felons. By 7 & 8 Geo. IV., c. 31, provision is made for remedies against the hundred in case of damage done by rioters.

By that Act compensation may be recovered by action against the hundred for any injury done to buildings, or furniture, &c. contained in them, to the amount of 30*l.* Where the damage done does not amount to 30*l.*, inquiry may be made on oath of the claimant, or other witnesses, before justices at a petty sessions, who are authorised to make an order for payment of damages and costs. An inhabitant of the hundred is made a competent witness for the defendants. In order to recover in either of these proceedings, it is necessary to show that a riot has been committed; and in case the building, &c. has not been demolished, to show that the rioters had *begun to demolish* it; that is, that their intent was to demolish, although from some reason that intent has not been carried into execution. Unless this intent is proved, the party is not entitled to compensation, however great damage may have been done; and if the intent did exist in the minds of the rioters, compensation is still claimable, however slight the damage. If the rioters have been interrupted in their proceedings, it will be left to the jury, or it will be for the justices to say, whether, without such interruption, a demolition would have been effected. But if the rioters have voluntarily retired without effecting a demolition, or if, though disturbed, their intent, from other circumstances, appears to have been directed towards some other object, as for instance to compel persons to illuminate, &c., the parties injured will have no remedy under the statute, as it appears that there was no intent to demolish.

The action must be commenced within three months after commission of the offence; and to entitle the party injured to bring an action, he, if he had knowledge of the circumstances, or the party in charge of the property, must, within seven days after the injury done, go before a magistrate and give on oath all the information relative to the matter which he possessed, and also be bound over to prosecute the offenders.

With respect to unlawful assemblies of a seditious character, various provisions are enacted by 39 Geo. III., c. 79, and 57 Geo. III., c. 19; and in reference to those for the purpose of training to the use of arms, by 60 Geo. III., c. 1.

(Hawkins, *P. C.*; East, *P. C.*; Burn's *Justice*, vol. 5, 'Riot,' &c.; Russell, *On Crimes*.)

RIPON, an antient borough, parish, market-town, township, and bishopric, is in the wapentake of Claro in the West Riding of the county of York. It gives its name to an extensive liberty which has its peculiar courts. It is 208 miles north-north-west of London, 27 miles north of Leeds, and 24 miles north-west by west of York.

The parliamentary borough comprises the township of Ripon and a part of the township of Aismunderby-cum-Bondgate, including a population of 5735. It returns two members to parliament. The municipal borough has the same extent: the corporate body consists of four aldermen and twelve councillors, with a commission of the peace. Till lately the liberty of Ripon contained 29 townships, parishes, and chapelries, 43,490 acres, and a population of 13,222; but by a statute of 1st Victoria, five parishes and townships situated in the North Riding, and comprising a population of 1293 and 8990 acres, were separated from this liberty. Besides extending over the liberty of Ripon, the parish is partly in the lower division of Claro wapentake, where it has 18,391 acres, and a population of 3252. The bishopric of Ripon was created, in 1836, out of the large dioceses of York and Chester; it extends over a great part of the more populous districts of the West Riding, and over the liberty of Richmondshire in the North Riding.

According to the first historical notice of Ripon, Eata, abbot of Melrose, founded a monastery here in 661. A few years after, Aldfrid, king of Northumbria, gave this monastery to Wilfred, archbishop of York. Under his auspices both the town and the church flourished, and received many marks of royal munificence. He died in the year 711, and was buried in his monastery. The town is said to have suffered much by the incursions of the Danes in the ninth century, but it was made a borough by Alfred the Great. King Athelstan granted the monastery various immunities, among which was the privilege of sanctuary, which it possessed till that privilege was wholly abolished in England. The town suffered reverses in the wars against the Northumbrian Danes, in the devastations of the Normans, and in the invasion of Robert Bruce. Henry IV. fixed his residence here when he was driven from London by the plague; and in the civil war under Charles I. the town was occupied by the parliamentarians under Sir Thomas Mauleverer, who was expelled by the royalists commanded by Sir John Mallory.

The collegiate church of Ripon, commonly called the Minster, now the Cathedral, is dedicated to St. Peter and St. Wilfred; it is parochial as well as collegiate. Rickman speaks of this edifice as 'containing various parts well worthy of attention, particularly its west front, which is a very fine specimen of bold early English, and, except the battlements and pinnacles, without alteration.' The first stone of the present building was laid in 1331, but the choir was probably not finished till 1494. It is said to be one of the best-proportioned churches in the kingdom. Its length from east to west is 266 feet 5 inches, the transept is 132 feet long, the nave and aisles 87 feet broad, and the choir and aisles 66 feet 8 inches broad. It has two uniform towers at the west end, each 110 feet high, besides the great tower, called St. Wilfred's tower; each of these towers originally supported a spire of wood covered with lead. Under the chapter-house is a vaulted charnel-house, which is much visited by tourists; it contains an immense collection of human remains in good preservation, piled in regular order round the walls.

Trinity Church was built and endowed in 1826, at a cost of 13,000*l.*, by its first incumbent, the Rev. Edward Kilvington. The other places of worship are three Methodist chapels and an Independent chapel. St. Mary Magdalene's Hospital, founded by Archbishop Thurstan in 1144, is now divided into six dwellings for poor widows, who receive a small annual stipend. A chapel is attached to this building. In the hospital of St. Anne eight poor women are similarly maintained. The hospital of St. John the Baptist is occupied by two poor women, and the chapel formerly attached to it is now a national school with 200 boys. Jepson's Hospital is for the education and maintenance of poor orphan boys; the funds have been increased by a small bequest, and now amount to nearly 180*l.* a year, which supports and educates ten boys. There are also a few minor charities. The free grammar-school was founded in 1546 by Edward V., and afterwards endowed by Philip and Mary. Its income is at present 370*l.* per annum. The property is let at low rents on leases of 21 years, renewable every seven on payment of certain fines; these fines amounted in 1811 to 1069*l.*, and in 1818 to upwards of 1200*l.* The master is allowed to take boarders, and other boys not on the foundation. The school is free, for Latin, Greek, and English grammar, to the sons of all residents; a charge is made for writing and arithmetic. There is a girls' national school, which was built by Miss Lawrence of Studley; this and the boys' national school are supported by subscriptions. The Public Rooms at Ripon comprise a Dispensary, a Mechanics' Institute, a Subscription Library, and a News-room; the edifice thus occupied was erected in 1834, at a cost of 2500*l.*, in 200 proprietary shares; an extensive pleasure-ground and garden is attached.

Ripon was once celebrated for its manufacture of spurs, which were in such high repute, that 'as true steel as Ripon rowels' became a proverbial expression to denote honesty and courage; it was also noted for its woollen manufactures, which however left the banks of the Ure for those of the Aire and Calder some centuries ago. The present manufacture is chiefly saddle-trees; it also produces linens and malt. The market-place is a spacious square, surrounded chiefly by shops and good houses; in the centre stands an obelisk 90 feet high, which is surmounted by the arms of Ripon, a bugle-horn and a spur-rowel. This obelisk was erected by William Aislaby of Studley, who represented the borough for sixty years in parliament. The fairs of Ripon are six in number, and are chiefly for leather, cattle, and cloth. On the south side of the market-place is the Town-hall, built in 1801, at the cost of Mrs. Allanson of Studley; it comprises a suite of rooms for the magistrates, assembly-rooms, and other commodious apartments. Four beautiful Ionic columns in front support a handsome pediment. The streets of Ripon are neither spacious nor regular, but they are generally clean. The Ure navigation was brought up to the town by means of a short canal in 1767. The fine domain of Studley is situated about three miles from Ripon, and includes the venerable monastic remains of Fountain's Abbey.

(Allen's *Yorkshire;* and White's *History and Gazetteer of the West Riding.*)

RIPPERDA, JOHN WILLIAM, Baron, afterwards **DUKE OF,** a descendant from an antient and honourable Spanish family, which had settled at Groningen during the period that the Low Countries were attached to Spain, was born in that district in the latter part of the seventeenth century. His father being a Roman Catholic, young Ripperda was educated in the Jesuits' college at Cologne. After greatly distinguishing himself in the course of his education, Ripperda returned to the United Provinces, and having soon after entered the Dutch army, served during the whole of the war of the Succession, and rose to the rank of colonel. He then married the heiress of very considerable property, in order to obtain which he first renounced the faith of his fathers. Aspiring to political distinction, he eagerly sought a seat in the States-General, and was returned towards the end of the war as deputy for his own province. In 1715 the States appointed him envoy extraordinary to the court of Spain, with instructions to arrange definitively a system of commercial intercourse between the two powers. On his arrival at Madrid, Ripperda immediately attached himself to Alberoni, the all-powerful minister of Philip V. [ALBERONI], whom he assisted with memorials and plans of improvement for the commerce and finance of Spain, and whose protection he secured. During his residence at Madrid, Ripperda carried on several intrigues by no means creditable to his character either as an ambassador or a man; for whilst conducting the negociations of his native country, Holland, he maintained a secret correspondence with the emperor, and was also guilty of a most disgraceful transaction towards Mr. Doddington, the English minister, in whose pay he seems to have been, whilst he secretly informed Alberoni of all his projects.

In the meantime Ripperda rose high in favour both with Philip and his minister. By his exertions fifty master-workmen from Holland were induced to settle in Spain, and to establish extensive cloth manufactures, first at Azeca, and afterwards at Guadalaxara. Having some time after applied for some recompense for his services, he was answered that the king of Spain could never employ in any high or responsible office a person attached to the Protestant faith. Accordingly, in March, 1718, Ripperda quitted the Spanish capital and returned to Holland. Having rendered a full account of his mission, of which the States expressed their approbation, he then formally resigned the office which he held, and set out once more for Madrid, and proceeded thence to Aranjuez, where, soon after his arrival, he made his abjuration, receiving as a compensation for his losses the appointment of superintendent-general of the royal manufactories at Guadalaxara, with a considerable pension and extensive grants of land. The fall of Alberoni, which was hastened by Ripperda, opened to this ambitious man the way to power, and he was accordingly entrusted, in 1725, with the formation of a secret treaty with the emperor. To reward his services in that memorable transaction, he was soon after created duke, and raised to the dignity of grandee of Spain.

On his return to Madrid, Ripperda was appointed secretary of state in the place of the marquis of Grimaldi. Having succeeded shortly after in gaining the entire confidence of Philip, he was raised to the post of prime minister. His administration however was not of long duration. Unable to fulfil the secret engagements entered into with the house of Austria, or to accomplish the vast schemes laid down by the treaty of Vienna, such as the recovery of Gibraltar by force of arms, and the seating of the Pretender on the throne of England, schemes which the exhausted state of the Spanish treasury and the menacing attitude assumed by Great Britain compelled him to relinquish, Ripperda fell into disgrace with the Spanish monarch.

On the 25th of May, 1727, he was arrested at the house of Colonel Stanhope, where he had taken refuge, and was sent to the fortress of Segovia, where he remained in close confinement, until, having eluded the vigilance of his keepers, he made his escape, and arrived safely in Lisbon, where he embarked for Cork. After spending some time in England, he set sail for his native country in 1731, and settled at the Hague. Whilst there he became acquainted with an envoy from the court of Marocco, of the name of Perez, who was a Spanish renegado, and who, perceiving the violent hatred which Ripperda bore to the Spaniards, and his love of adventure, induced him to try his fortunes upon the shores of Africa. Ripperda accordingly set sail for Tangier, and was well received by the emperor of Marocco (Muley Abdallah), who gave him the command of an army destined to repel a threatened invasion from Spain. Ripperda was however defeated before Oran, which city fell into the hands of the Spaniards in 1732.

About this time Ripperda is said to have abandoned the Roman Catholic creed, and to have embraced the Mohammedan religion, taking the name of Othmán Pashá. He lived for some time at Marocco, surrounded with all the gratifications and luxuries that wealth could supply, and then removed to Tetouan, where he remained until his death in 1737.

It is said that some time previous to his death he believed himself inspired, and endeavoured to propagate a new religion—a mixture of Christian, Jewish, and Mohammedan doctrines, which however had no followers. Shortly after the death of this extraordinary man there appeared at Amsterdam an account of his life and adventures, under this title: 'La Vie du Duc de Ripperda, par M. P. M. B.,' 8vo., Amst., 1739. The same work was translated into English, by John Campbell, and published as 'Memoirs of the Basha Duke of Ripperda,' London, 1739, 8vo. There is also a Spanish translation of it, Madrid, 1748

RIPPLE-MARK. In geology, the undulations on the surface of many rocks, which resemble the ridges and hollows left on mud and sand by the small waves of water, are thus termed.

The progress of geological induction has given an unexpected importance to the study of these undulations; for it is now certain that the right understanding of their origin is a very necessary element in reasoning on the deposition of stratified rocks and the displacements of the antient bed of the sea.

The formation of small ridges and furrows, under the influence of water which ripples or undulates in small waves, may be conveniently witnessed and studied on the shores of comparatively quiet seas, on the margins of lakes, or along the sides and shallow beds of rivers. The 'ripple-mark' thus produced is more or less permanent, according to the nature of the sediments on which it is impressed, and the circumstances which accompany and succeed the withdrawal of the water which formed it.

Loose coarse sand easily receives impressions from the superfluctuating water, which momentarily change under the varying influences of the waves: muddy sediments are less easily moulded, but the forms are less fleeting. It happens often that on the gradual retreat of the tide from broad muddy surfaces like those in the bay of Morecambe, or along the shores of the Thames, the small rippling waves of the ebbing tide leave marks sufficiently durable to allow of being indefinitely preserved, if by any gradual operation some new sediments were gently overlaid.

A very small ripple leaves its mark on the subjacent sand or mud at only very small depths: larger waves are felt to a greater depth; and apparently the depth at which ripple-marks are formed may be judged of, within moderate limits of error, by the breadths of the ripple-marks. Wherever then we find among marine stratified rocks or sediments, of whatever date, undoubted ripple-marks such as shallow waters leave, those deposits contain clear proof of their having been formed at small depths; and when, as frequently happens, these are seen to be covered by other sediments hundreds or thousands of feet in thickness, the conclusion is just that in those situations the antient sea-shore underwent a great subsidence, or the ocean-level experienced a great rise, after the formation of those now buried ripple-marks. There has been in those situations a change of the level of land or sea. Now we find ripple-marked strata among the rocks of every geological age. As examples, we mention, among strata lower than the mountain limestone, the fossiliferous rocks ('grauwacke') near Kirby Lonsdale, and near Linton in North Devon; in the sandstones of the mountain limestone group, under Penyghent in Yorkshire; in the sandstone of the coal-formation at Elland in Yorkshire; in the sandstones of the new red-sandstone formation at Storeton near Liverpool; in the sandstones of the oolitic rocks near Scarborough and near Stamford; in the Wealden deposits at Horsted.

In most cases ripple-mark is found on sandstones or indurated clays of fine grain and frequent lamination, and it is most distinct on surfaces where a change of deposit happens, as where sandstones alternate with thin clay partings. Rarely, as in the Storeton quarries, impressions of quadrupeds accompany the ripple-mark; and it is even thought that marks of rain are preserved thereon.

It is unnecessary to lengthen this notice by pointing out the obvious importance of the careful study of a phenomenon which is frequent among the stratified deposits, and on which remarkable generalizations partly, if not principally, depend. By careful attention to the evidence which is left on the surfaces of rocks, we may learn the depth and some other circumstances of the water which covered them at the time of their deposition; and come to understand how, by successive steps or gradual depression, the sea-bed was lowered, in relation to the ocean-level, hundreds, or even thousands of feet, locally or extensively, so as to allow of the successive accumulation of new sediments containing the remains of new races of marine animals and land-plants, without requiring the aggregation of laminated clays, sands, and gravels, at depths beyond the reach of littoral agitation, or the profuse abundance of mollusca and polypiaria, in regions of the sea where enormous pressure and deficient light seem to forbid their very existence.

See for a general view of the causes of ripple-mark made by water and wind, and examples of the latter circumstance, Mr. Babbage's *Ninth Bridgewater Treatise*. Further notices bearing on the subject will be found in Playfair's *Huttonian Theory*; Lyell's *Principles of Geology*, vol. iv.; and De la Beche's *Theoretical Researches*.

RI'SCULUS. [POECILOPODA, vol. xviii., p. 302.]

RISK. In the theory of PROBABILITIES the risk of loss or gain means such a fraction of the sum to be lost or gained as expresses the chance of losing or gaining it: thus an even chance of losing 40*l.* is considered as a positive loss of one-half of 40*l.*, or of 20*l.*; and 2 to 1 for gaining 60*l.* is counted as two-thirds of 60*l.*, or 40*l.* If both these risks were encountered at the same time, the whole transaction would be considered as a gain of 40*l.*−20*l.*, or 20*l.*, since this is the sum which would be netted by every such transaction in the long run, and one with another.

The following is the method of ascertaining the effect of the division of risks. Let there be an adventure in which the chance of success is p, and that of failure $1-p$. Let failure produce the loss £n and success the gain £m: then $pm-(1-p)n$ is the result of every such transaction one with another. Let this last be called M; it is required to estimate the probability that in s transactions the average effect (gain or loss, according as M is positive or negative) shall lie between $M+l$ and $M-l$. Calculate the square root of s divided by $2p(1-p)$; multiply this square root by l, and divide the result by $m+n$. Take the table in MEAN (using it as in PROBABILITY, p. 27), let the last result be A, then the corresponding B is the probability required. [WAGER; WEIGHT OF OBSERVATIONS.]

RI'SSOA, M. de Freminville's name for a genus of small testaceous trachelipods (gastropods of Cuvier), founded on some small shells observed by the well-known M. Risso of Nice, and described by M. Desmarest in 1814 in the 'Nouveau Bulletin de la Société Philomathique.'

Lamarck placed the few species known to him among the *Melaniæ*, but without distinction. Delle Chiaje made known the animal structure of a Mediterranean species in his memoirs on the *Invertebrata* of the Neapolitan Sea; and Philippi recorded its generic characters in his 'Enumeratio Molluscorum Siciliæ,' from observations made upon two other Mediterranean species.

Generic Character.—Animal with a subtriangular foot, truncated anteriorly, pointed posteriorly. Head proboscidiform, with a subulate tentacle on each side, at the external base of which the eye is placed on a little convexity; mouth prolonged into a short and truncated proboscis.

Shell elongated, turriculate, sometimes short and subglobular; aperture oval, semilunar, subcanaliculate, having the right lip thickened, and nearly always projecting forwards, and arched longitudinally; *operculum* horny, closing the aperture exactly.

M. Deshayes acknowledges the difficulty of fixing the relations of *Rissoa*; but, upon a comparison of the characters observed by Delle Chiaje and Philippi with those of *Cerithium*, he thinks it evident that *Rissoa* approaches the *Melaniæ* as closely as the *Cerithia*, and that it may be considered as intermediate between those two genera. In the last edition of Lamarck, he has placed it between *Melania* and *Melanopsis*. M. de Blainville had previously placed the genus in his family *Ellipsostomata*, between *Melania* and *Phasianella*. M. Rang arranged it between *Melania* and *Littorina*, among the *Turbinés* of De Férussac, observing that he does not think that *Rissoa* can be admitted as a genus, though it may well hold the rank of a subgenus, in which case it may take its place at the side of the *Melaniæ*, and near the genus *Paludina* of De Férussac.

M. de Blainville divides the genus into the following sections:—

A.

Turriculated and Ribbed.

Example, *Rissoa acuta.*

B.

Subturriculated and Ribbed.

Example, *Rissoa costata.*

C.

Subturriculated; perfectly smooth.

Example, *Rissoa hyalina.*

D.

Subglobular

Example, *Rissoa cancellata*.

The same divisions are adopted by M. Rang.

Seven species only appear to have been known up to the time (1830) when M. Michaud published, in his illustrated memoir, sixteen new species; and to these are to be added the thirteen described and figured by Philippi. M. Deshayes, in his Tables, gives the number of recent species as twenty-three, and of fossil (tertiary) twenty-two, of which last two, *Rissoœ lactea* and *cochlearella*, are recorded as both living and fossil (tertiary). In the last edition of Lamarck, the number of recent and fossil species published by M. Deshayes amounts to forty-four; but he states that there are other materials for this genus, and that his own collection alone contains more than eighty species, living and fossil.

M. Deshayes divides the *Rissoœ* into three groups: in the 1st he places the subglobular species which approach the *Turbines* and *Littorinœ* (*The Turbiniform*); in the 2nd, those which are elongated, and whose aperture approaches that of the *Melaniœ* (*The Melanioids*); and 3rd, those whose semilunar aperture is subtruncated at the base, and which are approximated to the *Cerithia* (*The Cerithiform*).

Localities.—The Mediterranean Sea, principally; but species are recorded from the coasts of Great Britain and France, and from the East Indian Seas and Senegal.

Mr. Th. Müller (*Synopsis*) seems to be of opinion that *Fusithea nigra*, *Turbo minutus*, and *Acteon trifidus* of Totten, belong to this genus.

Fossil Rissoæ.

M. Deshayes, in the last edition of Lamarck, observes that for a long time *Rissoœ* were found fossil in the tertiary strata only; but that Mr. James Sowerby, in his 'Mineral Conchology,' has published four species from the great oolite; whilst it is remarkable that no species of this genus have been found in the formations between the great oolite and the tertiary strata: it is to be presumed, he adds, that hereafter they will be found in those beds.

We have seen that the number of fossil *Rissoœ* (including two living species) found in the tertiary formations is given by M. Deshayes in his Tables as twenty-two. The two species recorded as both living and fossil are *Rissoœ lactea* and *cochlearella*. In the last edition of Lamarck, *R. lactea* is not noted as occurring in a fossil state; nor do we find any mention of *R. cochlearella*, excepting under the head of *Rissoa striata*, where it is stated that this species, described by MM. Quoy and Gaimard, in the *Voyage of the Astrolabe*, bears much resemblance to living individuals of *R. cochlearella*; but *Rissoœ cancellata*, *labiata*, *oblonga*, *costata*, *monodonta*, *pusilla*, *pulchella*, and *Bruguieri*, are all recorded as both living and fossil (tertiary). The number of named species which are fossil only, including the species from the oolite and *R. decussata*, in the same work, is eleven.

RITSON, JOSEPH, a poetical critic and antiquary of the eighteenth century, was born at Stockton in Durham, and some of his pieces were published there before he came to settle in London. He was by profession a conveyancer, with chambers in Gray's Inn, but being appointed deputy high bailiff of the duchy of Lancaster, he did little in his profession, living on the income which his office yielded him, and spending his time in literary pursuits. During the twenty years between 1782 and 1802, he poured the results of his studies and researches on the public in books in quick succession; yet not so rapidly that it can be said that they are carelessly executed, or that their contents are worthless. On the contrary, he appears to us to have been a most valuable member of the literary fraternity, and to have done perhaps more than any man to introduce a spirit of curiosity respecting our early poets, and of critical exactness in editing their remains.

The trifling works which he printed before he became settled in London need not be particularised; and the first work which we need to mention, and indeed the first work which brought him into any notice, was his 'Observations on the three first volumes of the History of English Poetry,' in a familiar letter to the author (Warton), 4to., 1782. This was the first serious attempt to call the attention of the public to the many inaccuracies and faults of that celebrated work; a bold and useful service, but dangerous to him who undertook it, as Warton had many and powerful friends, who could not bear to see him so roughly handled, even though they could not deny that almost every one of Ritson's strictures was just. However it must be owned that Ritson addressed himself to the work in a very unamiable spirit, and wrote like a man who was not much accustomed to the intercourse of refined society. The work has become, perhaps justly, a bye-word when men would speak of critical abuse. In the next year he published some 'Remarks on the Commentators on Shakspere,' which is to be distinguished from a larger work published by him in 1792, entitled 'Cursory Criticisms on the Edition of Shakspere published by Edmund Malone.' In 1783 he also published 'A Select Collection of English Songs, with an Historical Essay on the Origin and Progress of National Song,' of which a second edition was published by Mr. Park in 1813. In 1790 appeared his volume of 'Ancient Songs, from the time of King Henry III. to the Revolution,' reprinted in 1829. This is regarded as one of the most valuable of his works. In 1791 he published 'Pieces of Antient Popular Poetry,' from authentic manuscripts and old printed copies; in 1793, 'The English Anthology,' in three volumes; in 1794, a 'Collection of Scottish Songs,' and in 1795, the very remarkable poems of a forgotten poet, Minot, on events in the reign of Edward III., which have also been reprinted. In the same year he published his large collection of ballads on the exploits of 'Robin Hood,' with much prefatory matter, in which he cannot be said to appear to any great advantage. In 1802 he produced two works in this department of literature: the one, 'Antient English Metrical Romances,' in 3 vols. 8vo.; the other, 'Bibliographia Poetica,' a catalogue of English poets of the twelfth, thirteenth, fourteenth, fifteenth, and sixteenth centuries, with a short account of their writings, a work very imperfect, but to which succeeding writers in this department have been greatly indebted.

To enumerate however all the works produced by Mr. Ritson in his twenty years' literary career would carry out this article to an unreasonable extent. It may be sufficient to add that there are several small works of his under the denomination of Garlands, as the 'Bishopric Garland,' the 'Yorkshire Garland,' the 'Northumberland Garland,' and 'Gammer Gurton's Garland;' and also several tracts relating to his profession, and especially to the court with which he was more particularly connected. In 1802 he published 'An Essay on Abstinence from Animal Food as a Moral Duty.'

He died in September, 1803. Since his death several tracts have appeared attributed to him, and a collection of his correspondence has been published. Some account of his life was published by Mr. Hazlewood in 1824. He had through life the reputation of a surly critic, which his attack on Warton gained for him, and he was more shunned than courted by his literary contemporaries.

RITTENHOUSE, DAVID, was born on the 8th of April, 1732, near Germantown in Pennsylvania. His father, who was a farmer in that province, intended that he should follow the practice of husbandry, and being apparently in narrow circumstances, he could give him no other education than that which usually falls to the lot of persons who are engaged in such occupations.

But the elasticity of genius is often superior to the pressure of adverse fortune, and young Rittenhouse, before he was seventeen years of age, displayed a taste for mechanical and mathematical subjects; without books or instructors, he is said to have executed a wooden clock, and, similarly to what is related of Pascal, to have covered the ploughs and fences on his father's farm with geometrical figures. This exhibition of uncommon talent, joined to a conviction on the part of the elder Rittenhouse that the delicacy of his son's constitution would render him unfit for the labour of cultivating the ground, induced the father to procure for the youth the tools of a watch and mathematical instrument maker, and to dispense with his services in performing the duties of the farm. Grateful for this favour, the young man worked diligently with his hands during the day, and at night devoted a portion of the time which should have been passed in taking repose, to the prosecution of his studies. His success appears to have been extraordinarily great, for his biographers assert that, before the age of twenty, he was able to read the 'Principia,' and that he had discovered the method of fluxions, without being aware that this had been already done by Newton and Leibnitz. He also constructed two orreries exhibiting the movements of the planets and their satellites. These machines are said to be still in existence, one in the university of Pennsylvania, and the other in the college of Princeton.

In 1769, Mr. Rittenhouse was made one of a Committee appointed by the American Philosophical Society to observe the transit of Venus which was to take place in that year, and he was so fortunate as to witness the phenomenon in a temporary observatory which he built for the purpose. His observation and the calculations relating to it gained for him the approbation of the astronomers of Europe, and the title of Doctor in Laws was subsequently conferred on him. In 1779 he was named one of the commissioners for adjusting a territorial dispute between the states of Pennsylvania and Virginia; in 1786 he was employed in fixing the line which separates Pennsylvania from the state of New York, and in the following year he assisted in determining the boundary between New York and Massachusetts.

Dr. Rittenhouse was elected a member of the American Academy of Arts and Sciences at Boston, in 1782, and of the Royal Society of London, in 1795. In 1791 he succeeded Dr. Franklin as president of the American Philosophical Society, to whose 'Transactions' he contributed many papers, chiefly on astronomical subjects. In 1777 he was appointed treasurer of Pennsylvania, and this important office he held with incorruptible integrity till his resignation of it in 1789. During the American war, he is said to have fulfilled the duties of a patriot, and to have spoken and acted like a freeman; and in 1792 he received his last appointment, which was that of director of the mint of the United States. In this post his mechanical skill is said to have been highly useful; but in 1795 he was obliged to resign it from bad health, and, after a short but painful illness, he died on the 26th of June, 1796.

It is stated that, in private life, Dr. Rittenhouse exhibited every amiable virtue; that he was an excellent husband, father, and friend; and that, himself a stranger to high pretensions, he felt a strong attachment and esteem for those who cultivated and propagated science. A public eulogium was pronounced on him by Dr. Rush; and in 1813, a Memoir of his life was published by his relative, W. Barton, Esq., of Lancaster.

(*Encyclopædia Americana; Gent. Mag.*, Sept., 1796; *Monthly Mag.*, Oct., 1796.)

RITUAL (from *ritus*, in the sense of *consuetudo*), the book which directs the rites and ceremonies to be observed in celebrating divine service in any particular church.

RIVE DE GIER. [LOIRE.]

RIVER. In a legal sense rivers are divisible into fresh and salt-water rivers. Salt-water rivers are those rivers or parts of rivers in which the tide ebbs and flows. Rivers are also divisible into public or navigable rivers and private rivers.

The property in fresh-water rivers, whether public or private, is presumed to belong to the owners of the adjacent land; the owner on each side being entitled to the soil of the river and the right of fishing as far as the middle of the stream. But this presumption may be rebutted by evidence of special usage to the contrary. For instance, it may be shown that the property of the river is in one person, and of the adjacent land in another: or that one party owns the river and the soil of it, and another the free or several fishery of the river. If a fresh-water river between the lands of two owners gains on one side by insensibly shifting its course, each owner continues to retain half the river, and the insensible addition by alluvium belongs to the land to which it attaches itself; unless the lands of the proprietors on each side has been marked out by other known boundaries, such as stakes, &c. in the river. This part of the law as to the acquisition by alluvio, is stated by Bracton in the chapter 'De acquirendo rerum dominio' (fol. 9), and his statement both in substance and expression is taken from the *Digest* (41, tit. 1, s. 7), with which Gaius may be compared (ii. 70). But if the course of the river is changed suddenly and sensibly, then the boundaries of the lands will be, as they were before, in the midst of the deserted channel of the river. Special custom may also alter this general presumption of law. It is said that below Gloucester bridge the Severn is by common custom always held to be the boundary of certain manors, however suddenly or sensibly the course of it may be changed. Though fresh-water rivers are presumed to be the property of adjacent landowners, yet such owner cannot set up a ferry and demand a toll unless by prescription or by charter from the king.

In early times also the king by his prerogative might prevent all persons from fishing or fowling in any river until he had first taken his pleasure there. This was effected by directing a precept to the sheriff commanding him to cause all persons to abstain from approaching the banks. By the 16th chapter of Magna Charta the enjoyment of this prerogative was restricted to such streams as it had been exercised upon in the time of Henry I. Subsequently the custom was to name the rivers in the precept to the sheriff; among these was the Avon, at least that part which flows through Worcestershire. Eventually the prerogative fell into disuse. In those rivers which are navigable, and in which the public have a common right to passage, the king is said to have 'an interest in jurisdiction,' and this is so not only in those parts of them which are the king's property, but also where they are come to be private property; such rivers are called 'fluvii regales,' 'haut streames le roy,' 'royal rivers'; not as indicating the property of the king in the river, but because of their being dedicated to the public use, and all things of public safety and convenience being under his care and protection. Thus a common highway on land is called the king's highway, and navigable rivers are in like manner the king's highway by water. Many of the incidents belonging to a highway on land attach to such rivers. Accordingly any nuisances or obstructions upon them may be indicted even though the nuisances be in the private soil of any person; or the nuisances and obstructions may be abated by individuals without process of law. It must not however be inferred that all the incidents of a land highway attach to such rivers. Thus, if the highway of the river is obstructed, a passenger will not be justified, as he would be in the case of a land highway, in passing over the adjacent land. Though a river is a public navigable river there is not therefore any right at common law for parties to use the banks of it as a towing-path. (Ball *v.* Herbert, 3 *T. R.*, 253.)

If a river which is private in use as well as in property be made navigable by the owner, it does not therefore become a public river unless from some act it may be presumed that he has dedicated it to the public. The taking of toll is such an act. Callis says that the soil of the sea and of royal rivers belongs to the king. But the expression, if intended to apply to all parts of the rivers where the public have a right of passage, appears too comprehensive.

But there is no doubt that in some such rivers the property may be in the crown; as it was in the river Thames, the property in which, both as to the water and the soil, was conveyed by charter to the lord mayor and citizens of London. And in all rivers as far as the tide flows, the property of the soil is in the king, if no other claims it by prescription. In navigable rivers where the tide flows, the liberty of fishery is common and public to all persons. (Hale, *De Jure Maris et Brachiorum ejusdem;* Callis, *On Sewers.*)

The property in the mere running water is in no one; but the proprietor of adjoining land is entitled to the reasonable use of it as it runs by his land. 'And consequently no proprietor can have the right to use the water to the prejudice of any other proprietor. Without the consent of the other proprietors who may be affected by his operations, no proprietor can either diminish the quantity of water, which would otherwise descend to the proprietors below, or throw the water back upon the proprietors above. Every proprietor who claims a right either to throw the water back above, or to diminish the quantity of water which is to descend below, must, in order to maintain his claim, either prove an actual grant or license from the proprietors affected by his operations, or must prove an uninterrupted enjoyment of twenty years.'

(*Judgment of Sir J. Leach in* Wright *v.* Howard; Sim. Stuart, 109; Gale, *On Easements.*)

RIVER HORSE. Since the article HIPPOPOTAMUS was written, Dr. Andrew Smith has published his interesting account of the animal, in the *Illustrations of the Zoology of South Africa*, together with the most accurate figure hitherto engraved: of this we have endeavoured to give some idea below; but the reader should refer to the work itself, where, with all the advantages of size and colour, the portraits of the female hippopotamus and her young one have all the air of life.

As Dr. Smith has evidently paid very great attention to the characters and habits of this curious quadruped, we proceed to notice the result of his observations.

He describes the *Hippopotamus Capensis* of Desmoulins as having the anterior and lateral parts of the head, and the upper parts of the neck and body brownish red, the former rather lightest. The brownish red of the back passes insensibly into a light brownish purple red, which is the colour of the sides and limbs; the belly, the sides of the lips, and the eye-lids, light wood-brown, with a faint flesh-coloured blush; the hinder parts of the body and the belly freely freckled with small spots of the same hue as the ground colours, only of darker tints; hairs of tail and ears black; pencils of hairs on lips, &c., yellowish brown; eyes a clear orange-coloured brown; hoofs dark horn-colour.

The male and female, as far as colours are concerned, are, he observes, nearly alike, but in regard to size they differ materially, the male being always considerably larger than the female.

Dr. Smith, who gives a most elaborate description of the form of the animal, to which we refer the reader, remarks that previously to the establishment of the Dutch colony at the Cape of Good Hope, *Hippopotami* existed in abundance in all the larger rivers of South Africa; but no sooner did the colonists direct their attention to hunting them, than their numbers began to diminish, partly from destruction by fire-arms, and partly by migration from the scene of danger. 'At present,' continues Dr. Smith, 'scarcely one exists in any of the rivers of the Cape Colony, and even but very few in streams within a moderate distance of it. On the expedition arriving in latitudes too remote to be readily reached by hunters furnished with fire-arms, every large river was found to abound in specimens, and in those the animals appeared, as they probably did some two hundred years ago, much nearer to the southern extremity of the continent, familiar, comparatively fearless of man, and generally prepared to survey with curiosity any intrusion upon their haunts. To convey some idea of the numbers in which they were found in several of the rivers towards the tropic of Capricorn, it may suffice to state that in the course of an hour and a half a few members of the expedition party killed seven within gun-shot of their encampment. Several other individuals were in the same pool, and might also have been killed, had it been desirable. One of the survivors was observed to make his escape to an adjoining pool, and in accomplishing that he walked with considerable rapidity along the bottom of the river, and with his back covered with about a foot of water.'

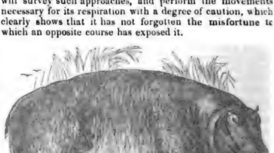
The hippopotami, according to Dr. Smith, feed chiefly on grass, resorting to situations near the banks of rivers which supply that food. 'In districts fully inhabited by man,' says Dr. Smith, 'they generally pass the day in the water, and seek their nourishment during the night; but in localities differently circumstanced, they often pass a portion of the day as well as the night upon dry land. In countries in which the night-time constitutes the only safe period for their leaving the water, they are generally to be seen effecting their escape from it immediately before dark, or are to be heard doing so soon after the day has closed, and according to the state of the surrounding country; they then either directly commence feeding, or begin a journey towards localities where food may exist. When, previous to nightfall, they may have been in pools or rivers, they are generally at once enabled to commence feeding on reaching the dry land; but when they may have passed the day in the sea, they require commonly to proceed some distance after leaving it, before they find the grass which appears congenial to their palate. It is not every description of grass that hippopotami seem to relish: they often pass over, in search of food, luxuriant green swards, which would strongly attract many other animals which feed upon grass. Besides having a peculiar relish for the grasses of certain situations, they appear to have a predilection for districts supporting brushwood; and owing to the latter peculiarity, they are often to be found wandering in localities on which but little grass exists, when they might have it in the neighbourhood in great abundance, but without the accompaniment of wood. The whole of the night is probably not more than is necessary to admit of the hippopotamus acquiring sufficient food for its wants; but if that be otherwise, it certainly prefers to pass what portion of the night may be necessary for procuring nourishment upon the dry land, rather than in the water, being generally only seen to retire to the latter upon light returning.'

Dr. Smith thinks it difficult to decide whether these animals prefer the pools of rivers or the waters of the ocean for their abode during the day. When an opportunity for choice existed, he found that some individuals selected the one, and some the other. During a journey which he made some years ago to Port Natal and the country beyond it, he had many opportunities of observing the footsteps made by them while entering and leaving the sea; and on one occasion his party opposed unsuccessfully a female with her young one on their way to the sea.

The excrement, like that of the elephant and rhinoceros, is voided, according to the same accurate observer, in immense cylindrical masses; and those which came from the hippopotamus seemed principally to consist of comminuted grass, apparently but little altered by the process which it must have undergone, but in a drier condition than that in which it could have entered the stomach.

The disposition of this huge creature is described by Dr. Smith to be peaceable and inoffensive: not that when the animal is wounded, or happens in its excursions on dry land to be accompanied by its young, it does not manifest much ferocity, instantly giving chase, if in any way interrupted in its course. The mother which his party endeavoured to intercept immediately became the assailant on discovering the object of the party, and she rushed open-mouthed on the man nearest to her. 'The display of her enormous mouth, armed with formidable teeth, caused the most advanced of the hunters to retreat, and those in the rear to pause. The flight of the hunters seemed to encourage the animal in pursuit, and though the direction they took led her, in pursuing them, to retire from the sea which she had intended to enter, she persevered in giving chase, until one of the party, who from his situation had not had occasion to fly, fired a bullet into her mouth. Immediately after the wound was inflicted she for an instant stood still, and then retreated with precipitation to the sea, in which she was afterwards shot, having, contrary to the usual custom of her kind, manifested a disinclination to retire into deep water, a disinclination no doubt arising from sensations experienced from the wound she had received.'

Dr. Smith is of opinion that the sagacity of the hippopotamus, though doubtless inferior to that of the elephant, is nevertheless very considerable, and that its memory may be considered tenacious, certainly superior to that of the rhinoceros, and possibly equal to that of the elephant. After noticing its adroitness in guarding against assailants, and in avoiding pits dug to entrap it, the Doctor remarks that when once a hippopotamus has been assailed in its watery dwelling, and has been injured from incautiously exposing itself, it will rarely be guilty of the same indiscretion a second time; and though its haunts may not again be approached by hunters till after a long period has elapsed, it will survey such approaches, and perform the movements necessary for its respiration with a degree of caution, which clearly shows that it has not forgotten the misfortune to which an opposite course has exposed it.



Female Hippopotamus and Young. (Smith.)

RIVERS. (Geology.) [VALLEY.]

RIVERS are the flowing waters, which bring to the sea, and sometimes to a lake, the waters which are collected within a certain portion of the earth's surface. The country which is thus drained by a river is called its *basin*, as the river runs in the lowest part of it, and the country rises on all sides with greater or less steepness, in the fashion of the sides of a basin. The margin of such a basin generally lies contiguous to the basin of another river, and thus constitutes the boundary-line of the two basins. From these margins the waters descend on both sides towards their respective basins, which are separated by them, and hence the whole line of these margins is called a *watershed*.

The basins of rivers vary greatly in size. A *brook* is the name commonly given to rivers of the smallest description. When such a river rises near the sea or near a large river, into one of which it flows after a short course, it consequently drains a very small surface. If the waters should be increased by those of another brook, the name of brook is changed for that of *rivulet*. The basin of a rivulet is therefore more complicated than that of a brook. One or more brooks descend from the margin of the basin, and by uniting their waters with those of the rivulet, increase its volume. When several rivulets unite and so produce a considerable volume of running water, this watercourse takes the name of *river*. But all such rivers do not reach the sea or even a lake; most of them join other rivers, and thus a large river is produced. This last-mentioned large river is called the *principal river*, and those which increase its waters are called, with respect to it, *affluents* or *tributaries*, and sometimes *feeders* or *branches*.

The first waters of a river are generally derived from a spring, which breaks out at the foot of a declivity, or on the side of some hill or mountain; and sometimes from a swamp or a lake. This is called the *source* of a river. From this source the river descends through the lowest part of its basin until it terminates its course in the sea, a lake, or another river, and this termination is called the *mouth* of the river. The cavity in which the running water flows is called the *bed* of the river, and the solid land which bounds this bed is called its *banks*.

It was formerly thought that the elevation at which a river originates must be in proportion to the length of its course, and accordingly geographers assumed that there are elevated mountain-ranges in those regions where large rivers take their rise; but modern researches have shown that this is not always the case. Thus the Volga, which is the largest river of Europe, and runs above two thousand miles, rises in a district the most elevated part of which does not exceed 1100 feet above the sea; and the Mississippi, which is still larger, originates in a tract which can hardly be called hilly, and at an elevation probably not much exceeding 1500 feet above the sea.

But still most large rivers have their origin in very elevated mountains or on high table-lands, in descending from which a great difference with respect to the rapidity of their course and the nature of the country through which they flow, is observed. Accordingly geographers divide the whole of the course of such rivers into three divisions, the *upper*, *middle*, and *lower* course.

The *upper* course of such a river lies within a mountain region, and its source is consequently at a great elevation above the sea. The waters run with greater or less velocity, according to the greater or less extent of the mountain-region, and the greater or less rapidity with which the whole region declines towards the country to which the course of the river is directed. When the elevation of the mountain-region decreases with great rapidity, the current of the river is extremely rapid, and presents a quick succession of cataracts and rapids. The force of the current is so great that pieces of rock of considerable size, which are frequently detached from the overhanging masses, cannot resist it, and are carried down by the current, until they reach a point where the rapidity of the descent begins to diminish. The mountains which constitute the banks of the river often rise several thousand feet above it, and their bases are united by slopes forming an angle, over which the water runs on bare rocks, without the least covering of earth. Thus the river does not flow in a valley, but in a cleft or ravine, which cuts deep into the mountain masses. Sometimes there is space enough for a path between the river and the mountains, but in many places this space is only obtained by artificial means, as by cutting away a projecting portion of the rock, or by making a tunnel through it. Where either of these means cannot be applied, the path is continued over the bed of the river by a wooden bridge of greater or less extent, until a place is reached which offers sufficient space for a path on the sides of the rocks. The course of the river is generally in a straight line, but sometimes it makes short and abrupt bends which form acute angles. In the last-mentioned case it is, almost without exception, observed, that the mountains which enclose the river have on one side a projection, and on the other a receding, which correspond so exactly that if it were possible to unite both mountains, the projecting would exactly fit into the receding part. This peculiarity in the formation of the ravines of mountain streams was observed by the Spaniards in the Andes of South America, who called them *quebradas*, or broken; by this term tacitly assuming that the phenomenon had been caused by a violent disruption of the mountains. This description of mountain-streams and their ravines applies particularly to those of the western Alps along their southern declivity, to those rivers which constitute the upper branches of the rivers Doria and Sesia, to the valleys of Anzasca and Vedro on the southern side of the great road of the Simplon, and to the still larger valley of Aosta, through which the road leads from Switzerland to Italy over the mountain-pass of the St. Bernard. The military road of the Romans was made through the Val d'Aosta; but in these parts it was only practicable for beasts of burden. Such deep ravines not only occur between the gigantic elevations of a high range, but likewise in the elevated table-lands. Humboldt observes that the plain of Quito, which is nearly 10,000 feet above the sea, is intersected by ravines, which in some places sink so deep that their bottoms are hardly more than 2000 feet above the sea-level; and he adds that some of them are so narrow as not to contain the smallest cultivable space. Similar ravines intersect the table-lands of Guatemala and Anahuac, where they are called *cañadas*

When the mountain-region through which the upper course of a river lies descends with less rapidity, and consequently occupies a much greater extent of country, the mountain-streams, as well as their banks, present very different features. Both the streams and the banks show that the descent of the whole mass is not by a regular slope, but is formed by an alternation of plains and declivities; in ascending such a mountain-stream, it is found that in certain places the rocky masses approach so near to the banks, as to leave hardly room enough for the river, and in these narrows the current is extremely swift, and generally a continual rapid, interrupted by falls of moderate height. These narrows however rarely extend more than a few miles. Above them the mountains recede to some distance from both sides of the river; and thus a basin is formed, in the middle of which the river flows with a comparatively slow current, not over bare rocks, but over a gravelly bed, and between low banks of earth. The bottom of the basin is level, or descends with a gentle slope, and may be cultivated or used as pasture-ground. In some of the rivers which descend from the central and eastern Alps, this alternation of narrow passes and basins occurs several times. Thus the Reuss, along which the great road runs which leads over the mountain-pass of St. Gothard, rushes with incredible velocity through the ravine of the Hospendal, and falls 1800 feet before it reaches the basin of the valley of Ursern, which is nearly eight miles long and more than half a mile wide, and in which it runs with a gentle course. At the northern extremity of the valley of Ursern the river enters the second narrow at the Urnerloch. This narrow, which extends about three miles to Geshinen, is extremely contracted, and within these limits the river descends 1074 feet, forming a succession of small cataracts. Below this is the basin of the Krachenthal, which is not so wide as that of Ursern, and about six miles long. The course of the river within this basin is rapid, but there are no cataracts. From this valley the river escapes by the third narrow, which is about four miles long, and also very contracted; it terminates at the village of Am-Stäg, where the Reuss enters the valley of Uri, in which it flows until it mingles its waters with those of the lake of Uri (Urner-see), as the southern part of the Vierwaldstädter-see is named. The same conformation is observed in the southern declivity of the Alps, where the river Ticino descends from the mountain-pass of St. Gothard. This river runs in a ravine from the Hospendal to Airolo, in which it descends about 2880 feet. It then enters the upper valley of Leventina, which is about seven miles long and half a mile wide, and in which the river is rapid, but has no cataracts. It issues from this valley by a narrow about two miles long, between Il Dazio and Faido, where a series of beautiful waterfalls occur, and the ravine is so narrow that an artificial road has been cut on the adjacent mountain called the Platifer. At Faido the Ticino enters the middle valley of Leventina, in which it flows with great rapidity to Giornico, a distance of about fifteen miles, but without forming any falls. The valley is less than half a mile wide, and often interrupted by rocks. Above Giornico the river enters a short narrow, at the outlet from which it forms cataracts, and then reaches the wide valley called the Lower Valley of Leventina, in which it flows with a comparatively gentle course to Lago Maggiore. The greater number of the rivers which originate in the Alps and Pyrenees are of this latter discription. The basins which occur in these river-valleys may at some remote period have been filled with water, and this may have been drained off by the rivers forming an outlet for the waters by the narrows which now connect their basins with one another.

In some places the elevated mountain-regions border immediately on low plains. In such cases the rivers cannot be said to have a middle course; for as soon as they reach the plain their character is changed, and the rapid torrent is converted into a gentle stream. Thus the Marañon, after issuing from the Pongo de Manseriche, and entering the great plain, flows slowly through the alluvial level; and the Ganges, after leaving the Himalaya Mountains at Hurdwar, flows with great bends through the immense plains of Hindustan. All the rivers which descend from the southern declivity of the Alps to the plain which the river Po traverses are of the same description. In most cases however the mountain-regions are not in immediate contact with the plains, but are separated from them by hilly tracts, and that portion of the course of a river which lies through such a hilly region is called the *middle* course. The rocky masses rarely approach the bed of the river which has a middle course, but retire to some distance from them, so as to form between the higher grounds a wide valley, which the inundations of the river have covered with a thick layer of alluvial soil. It is remarkable that the highest ground of these valleys occurs, without exception, on the very banks of the rivers, and that the land slopes from them towards the base of the higher grounds. Accordingly the inundations generally cover the lower tracts, which are at some distance from the river, to the depth of several feet, while the banks are still above the surface of the water. The slopes of the higher grounds, which may be considered as the outer banks of the river, because they fix a limit to its inundations, are generally gradual, and covered with vegetation. The current of the river itself is gentle. This change, when compared with that of the mountain-stream, is partly due to the more gentle descent of the hilly region, and partly to the form of its course. The bed of the river rarely lies in a straight line, but continually forms bends, which are not acute angles, as in the case of the mountain-streams, but have only a small curvature, so that the river runs through the valley in a serpentine course. This circumstance renders the course of the river much longer than it would be, if it flowed in a straight line, and consequently diminishes the fall and the rapidity of the current.

It is observed that rivers form numerous small islands and sand-banks a short distance below the place where they issue from the mountain-region. Thus the Rhine, between Basel and Kehl, opposite Strasburg, and the Amazonas below the Pongo de Manseriche, as far east as the mouth of the Yapura, and the Mississippi, between the mouth of the St. Peter river and that of the Missouri, form islands and sand-banks. This is easily to be accounted for, by observing that the river, on issuing from the mountains, retains a large quantity of earthy matter in suspension, which subsides when the current decreases in rapidity. This sediment forms islets and sand-banks. Though it rarely happens, as already observed, that the rocky masses approach close to the banks in the middle course of a river, yet this generally occurs several times, and at such places the river usually forms rapids and whirlpools. A ledge of rocks traverses the bed of the river in some places. Such ledges occur in the Danube at Passau, near Neuburg above Vienna, near Presburg in Hungary, above Pesth, and at Orshova, or Orsova, on the boundary-line between Austria and Turkey. On the Rhine they occur only between Mainz and Bonn, where the river is traversed by three ledges, at Bingen, at St. Goar, and near Andernach respectively. Such ledges are found in nearly all the large rivers of Europe. The elevations by which they are produced are sometimes connected with ranges of hills. Ledges of this description occur in many of the Atlantic rivers of the United States, as the Potomac, the James River, and others; and they mark with precision the passage of the rivers from the undulating or hilly region to the low plains along the coast. There are of course rapids where these ledges occur.

The *lower* course of rivers usually lies through a plain. In general there are no hills which constitute the outer margin of its course, and consequently there is no bottom or valley through which it runs. The banks are very little raised above the surface of the waters, and the level ground extends to a greater distance. The current is slow, the fall being very small. Thus it was observed by La Condamine, that the Amazonas from the narrow at Obydos to its mouth, a distance of 700 miles, does not fall quite twelve feet, or little more than 0·2 of an inch per mile. It can hardly be conceived that a river with so small a fall could propel its waters, and as the current of the Amazonas is considerable it can only be accounted for by supposing that the enormous volume of water which the river brings down, drives on by its pressure that which is before it until it reaches the sea. The surface of the Elbe at Hamburg, about 70 miles from the North Sea, is not more than 6 feet above the sea, and the fall per mile very little exceeds an inch. The surface of the plain through which a river runs generally consists of an alluvium, which the river has deposited during the inundations. The matter of which this alluvium consists is soft and loosely bound together, and consequently the current, slow as it is, has power enough to remove a portion of the banks from one side, and to deposit the detached matter on the other. Thus great changes are produced in the course of rivers in the lapse of time. Major Rennell surveyed a large portion of the lower course of the Ganges about fifty years ago, and his maps were very exact at the time. He also observed the changes which the river had produced in its bed. A few years ago the course of the Ganges was again surveyed, for the purpose of establishing a steam navigation, and it was found that the course of the river hardly in any place agreed with the maps of Rennell. The most remarkable circumstance however is, that a river frequently divides into a number of arms, each of which runs to the sea, though some branches re-unite and again detach themselves from one another. Thus the Danube reaches the sea by seven arms, as the Nile formerly did, according to the antient accounts, though there are now only five arms in the Nile. Our best maps represent the number of the mouths of the Ganges as amounting to ten at least. This division of a river into several arms is easily understood when the soft nature of the alluvium is considered: and if we suppose that the river, in its operation of changing its bed, finds in its way a piece of rock or other matter harder than the alluvial soil, by setting against such an obstacle the current is divided, and flows on both sides of it: the following inundation removes still more of the alluvium, and thus, in course of time, a new arm is formed.

The country which is enclosed by the arms of a river is called its *delta*, from the form of the Greek letter Δ, which the delta of the Nile, that which was best known to the antients, greatly resembles: but the term is generally appropriate, as most river deltas have that form. It is a common conjecture that the space which is now occupied by the delta of a river was once a part of the sea, which was filled up by the débris and earthy matter brought down by the river from the mountainous and hilly country through which its upper and middle course lie. This supposition is strongly supported by the nature of the soil, which evidently consists of matter brought down by rivers, and not of such as the sea leaves behind when, from any cause, it retires. It may be added, that this operation of rivers goes on during the inundations, for after the waters have subsided the surface of a delta is found to be covered with a very thin layer of mud, which soon becomes dry earth. The deltas of rivers which are annually swollen by rains, which is the case between the tropics, are generally much more extensive than those which are formed by rivers whose inundations are only produced by the melting of snow.

There is a river of first-rate magnitude which has no delta, though it seems to possess all those qualities which are supposed to be requisite to the formation of such an alluvial tract: the St. Lawrence in North America reaches the sea by a kind of bay, which extends upward of 300 miles, and gradually increases in width from three to above one hundred miles. One would suppose that the form of this bay would render it subject to be easily filled up by the earthy matter brought down by a river whose course exceeds 1800 miles; and yet we do not find that an alluvium of any extent has been formed along the banks of this wide æstuary, except on the right bank below Quebec. This single instance might throw some doubt on the opinion that deltas are formed by rivers in the way above mentioned, if the peculiar nature of the St. Lawrence did not suggest an explanation of this deviation from the common course of things, which rather confirms than refutes the established principle. The St. Lawrence is the only large river which traverses a great number of lakes. Even after having left the five great Canadian lakes, it passes through those of St. Francis, St. Louis, and St. Peter's. In each of these lakes the current ceases, and it is only perceptible where the river again issues from the lake. All the earthy matter therefore which the river collects and keeps suspended in its course from one lake to the other is deposited in these lakes. Thus this large river brings no débris and earthy matter, or very little, to its wide æstuary, which cannot therefore be changed into a delta by the accumulation of such matter.

Most large rivers, as already observed, admit of this division of their course into three parts, an upper, middle, and lower course; but the exceptions are far from being rare. It sometimes happens that the characteristic features by which the middle course is distinguished, occur in the upper course. This takes place when a river originates on an elevated table-land, and traverses a considerable part of it. Thus the Indus, the Sutlej, an affluent of the Indus, and the Sampoo, rise on the elevated table-land of Tibet, and drain a portion of it: in this part of their course they resemble the middle course of the Rhine or Danube. But where they leave the plain and enter the mountain-region of the Himalaya, they resemble the mountain-streams of the Alps, except as to the volume of water. When the Indus and the Sutlej have descended into the plains of the Panjab, they assume the character of the lower Rhine and lower Danube. The Sampoo, after leaving the mountain-region, traverses a hilly tract of great extent, the valley of Asam, before it enters the alluvial plain of Bengal. There are other rivers, in which only the characteristic features of the middle and lower course can be recognised: the number of such is considerable, and some of them are of the first magnitude. Thus the Volga and the Mississippi, neither of which rises in a mountain-region, but in a hilly tract, in the greater part of their course present the characteristics of the middle course of the Rhine and Danube, but towards their mouths they traverse a large plain. The number of rivers whose whole course lies through a hilly or undulating country is still greater, as is the case with nearly all the rivers of England and Southern Scotland, except the Humber, whose course is partly through a low plain. There are also rivers which in their whole course traverse a mountain-region, but they are all small; such are some of the rivers in North Scotland and in Sweden, and nearly all the rivers of Norway, and those on the west coast of South America.

The number of rivers which do not reach the ocean is not great, if we except those which fall into the Caspian Sea and into the lake of Aral. The other rivers without an outlet always terminate their course in a lake. It was formerly supposed that the water of some of them was absorbed by a dry soil, and that they were lost in the sand; and this opinion still prevails as to some rivers which descend from Mount Atlas southward to the Sahara. But as none of these rivers have been visited by Europeans, the point remains doubtful. Among other rivers which have no communication with the sea, some few traverse elevated table-lands, consisting of plains surrounded by continuous mountain-ranges, through which the waters cannot find an outlet, and consequently collect in the lower part of the plains, and form lakes large enough to part with all their surplus water by evaporation. Such rivers occur in the valley of Tenochtitlan in Mexico. The most remarkable is the Desaguadero, in the valley of Titicaca in Bolivia, which runs about 300 miles, and is lost in a lake or in swamps. The Hyarkan or Yerkan, in Chinese Turkistan, is still larger, but its character is imperfectly known. Another kind of such lakes occurs in the plains of Mexico and of South America, and almost exclusively in those parts which have no rain or very little. On the table-land of Mexico the greater number of rivers between 24° and 30° N. lat. terminate in lakes; and in the states which compose the Argentine Republic, rivers of this kind are numerous between 28° and 34° S. lat., west of 64° W. long. As very little rain falls in some of these countries, and in others none at all, the rivers are supplied with water by the rains which fall at certain seasons on the mountains in which they originate, and by the springs which exist there. But as the supply of water is very moderate, it does not give force sufficient to the currents to carry them through those extensive tracts which separate them from the sea. It is remarkable that some of these rivers and all the lakes in which they terminate, are salt in South America; and it is probable that this is also the case with most of those on the Mexican isthmus.

Most rivers overflow the low countries which are adjacent to their banks, either at regular seasons of the year or occasionally. This takes place when the supply of water is greater than the bed of the river can contain. In this respect rivers may be divided into three classes: the first comprehends the rivers whose inundations are produced by the melting of snow and ice; the second comprehends those which are annually swollen by regular rains; and the third those which only occasionally cause inundations.

All large rivers that drain countries of which the mean winter temperature is below 30°, are annually subject to great risings when the snow and ice melt. In such countries snow falls for several months, and as only a small part of it is dissolved, it accumulates to a great amount. As soon as the frost ceases, the snow begins to melt, and runs off by the smaller rivers, which suddenly swell and carry an unusual supply of water to the principal river, whose volume being thus increased to three or four times its ordinary magnitude, overflows the adjacent low country. These inundations, though they generally improve the soil, are very injurious to agriculture, by destroying the growing corn, and covering extensive tracts with sand, gravel, and other coarse earthy matter. Embankments are usually made to prevent these inundations, but after a very long winter, when the river is more than usually swollen, these embankments are often destroyed, and the injurious effects of the inundations are increased by the mass of earthy materials of which the embankments consist, and which are dispersed over the adjacent lands. In some rivers these inundations last only from two to four weeks; in others two or three months; and in some even five or six months. Where the inundations are long, they are less violent, and cause less damage than where they are short; in the latter case the whole mass of water suddenly deluges the country, while in the former the water rises slowly. This difference in the inundations of rivers is mainly to be attributed to the direction in which they flow. Let us take a river like the Mississippi, which flows from north to south through 17° or 18° of latitude. In winter the basin is covered with snow, and if the whole were melted in a few days, it would produce such a volume of water as would probably cover nearly half the basin. But the melting of the snow is gradual. Whilst the temperature in the northern districts is below the freezing-point, the spring has already made considerable progress in the southern districts, the snow which has there fallen has been dissolved, and the water thus produced has had the requisite time to run off and reach the sea. Thus with the progress of the sun towards the northern tropic, the line of the melting snow proceeds northward, and thus the supply of water runs off gradually, until the snow of the most northern region is dissolved. More than two months elapse between the melting of the snow in the northern region and the commencement of the melting in the lower part of the river. The inundations of the Mississippi therefore are not extensive, if the great length of that river and of its affluents are considered, but they last from three to four months. A considerable part of the delta of that river is indeed under water for six months, but this must be ascribed to the tract of elevated ground which extends not far from the sea between the Atchafalaya and the La Fourche, and prevents the enormous mass of water which collects in the lowlands near the first-mentioned branch from running off sooner. When a river situated in the northern hemisphere flows from south to north, the melting of the snow of course commences near the upper branches of the river, and proceeds northward. In this case the volume of water which collects at a certain period in the lower course, where the lowlands

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are generally most extensive, is much greater, and the inundations are much more extensive and attended with more mischief. But still they cannot be compared with the inundations of those rivers which run from east to west or from west to east. In countries which are drained by such rivers, the whole mass of snow is dissolved in a few days, especially when a thaw is accompanied by rain, and all the waters thus produced pass through the principal channel in the course of a week or two. In such rivers the volume of water during the inundations is three or four times larger than it is in the middle of the summer or the beginning of autumn, and the inundations spread to a great distance, and frequently cause great loss of property, and sometimes also of life, especially when the winter has been unusually long and the falls of snow very heavy. [NIEMEN.] But the river St. Lawrence forms an exception here also. As its general course is from west to east, one would suppose that a large extent of country within its basin would be annually subject to inundation, but this does not appear to be the case in any part of its course. If any portion of it is swollen by the melting of the snow within the basin, the river soon enters one of the lakes through which its course lies, and thus the addition of a comparatively small volume is not sufficient to raise the surface of the lake to any large amount. Thus the same cause which prevents its filling up the wide æstuary, prevents the river from overflowing the adjacent country.

Rivers whose inundations are produced by regular rains have the greater part of their course either within the tropics or at least between 30° N. lat. and 30° S. lat. It is a known fact, that in those regions heavy rain falls daily from three to six months in the year. These heavy rains commence when the sun in its progress from one tropic to the other approaches the zenith of a country, and they continue till it has passed a certain distance from it. In the beginning of the wet season, as this part of the year is called in those countries, the rains are sometimes so heavy that in the course of a day the level country is covered with water a foot deep. The rivers of course soon begin to increase in their volume of water, and after some time they rise to the level of the banks, and begin to run over. These inundations generally last from two to four months. They are more regular than those which are produced by the melting of the snow, and in general do not exceed a certain height. The rural economy of those countries in which they take place, is founded on the knowledge of this periodical event, and on the certainty that the inundations will fertilise the fields by depositing on them a fine mud, which enriches the soil more than the best manure. Whenever the inundations do not rise to the usual height, which is sometimes the case, a great part of the country which is not covered with water yields little or nothing, and the consequence is dearth and famine. When, on the other hand, the inundations rise higher than usual, they are also injurious to rural economy, by reaching those tracts which are set apart for the cultivation of plants, which cannot bear so much moisture as the districts that are regularly flooded. Thus, in 1831, the river Menam in Siam rose to an extraordinary height: the inundations reached the large orchards which for many miles in extent cover the more elevated tracts along the banks, and afford subsistence to a numerous population. Several kinds of fruit-trees were almost destroyed, and for some years the mangustans and durians were scarce.

All the rivers between the tropics which are swollen by periodical rains, lie only in one hemisphere, the northern or the southern. In the countries through which they flow the waters are low and the ground dry during part of the year, so as to admit of easy cultivation, and at another season the fields are fertilised by the inundations. The Amazonas alone is an exception. Though the course of this river is in the southern hemisphere, its affluents extend far to the north and south, into both hemispheres, and probably three-fourths of the tropical rains which descend upon South America find their way to that large river. To this circumstance are owing its immense volume of water and its great depth. The Amazonas, properly speaking, is never at its lowest level, in the sense in which that term is applied to other rivers. When the northern rivers cease to bring down the supply which is owing to the periodical rains, the southern begin to bring their contributions. This fact seems sufficiently to explain the immense tracts of alluvial soil which extend along the river to a great distance, but the same circumstance also keeps the soil in a state of continual moisture, and makes it a perpetual swamp. Accordingly we find that the banks of that river, which admits of a more extensive navigation than any other river in the world, remain nearly destitute of agricultural settlements, and are still in possession of savage tribes.

The rivers which drain the countries between 30° N. latitude and those in which the mean temperature of the winter season does not rise above 30°, are subject to occasional inundations. But these overflowings occur only in those rivers whose upper course lies within mountain-ranges which are covered with snow for a considerable part of the year. In such cases, while the snow covers the more elevated portion of the mountain-ranges, a sudden change in the weather, which produces a warm wind, brings great volumes of vapours, which, falling in abundant rain, soon dissolve the snow, and the mountain-streams pour down their waters with increased volume and velocity. As soon as the waters reach a level tract, it is inundated. As these inundations often take place unexpectedly, they cause great damage. Thus we find that some valleys in the Ozark Mountains, in the United States of America, are almost uninhabitable, owing to the sudden inundations to which the rivers of that mountain-region are subject. Many rivers however never inundate the adjacent country, unless a heavy gale of wind should blow directly up the river, and drive the sea into it with great force. Such inundations are very sudden, and sometimes also extensive, but they are of short duration.

In adverting to the advantages which a country derives from its rivers, we must first observe that the water is extensively used for the purposes of domestic economy. It is much purer than that of wells; for, with the exception of a few which are salt or brackish, river water contains only earthy particles in suspension, which may easily be separated by filtration, and which are deposited as a sediment when the water is left to stand for a short time. The water of wells generally contains a small quantity of some mineral in chemical combination. The water of rivers is nearly equal to rain water for all domestic purposes. Rivers accordingly supply water for the consumption of large cities, as in the case of the New River [MIDDLETON, HUGH], which supplies a large part of London, and the Schuylkill, which supplies Philadelphia. Many rivers also supply abundance of food. The upper courses of rivers are generally inhabited by a small number of species of fish, and the whole amount is not great. But towards their mouths the number both of species and individuals increases. The importance of a river fishery may be estimated when we consider the quantity of salmon which is taken in the rivers of Britain, or of the beluga and sturgeon which are caught in the neighbourhood of Astrakhan. Many rivers, which are not adapted to the purposes of navigation, are converted into powerful instruments for assisting the industry of a country by the moving-power which they supply for mills and other heavy machinery. The advantage of such a natural moving-power primarily determines the seat of manufactures, as was the case in South Lancashire, where this advantage is combined with abundance of coal. The Atlantic States of North America are generally provided with abundance of streams, a circumstance which favours the establishment of manufactures.

The greatest advantages however which a country derives from its rivers are the facilities which they supply for conveying the produce of agriculture and of manufacturing industry to distant parts at a moderate expense. In this respect the rivers may be compared to the arteries and veins of the human body, which diffuse life and strength through all parts. Navigable rivers vivify, maintain, and excite the efforts of human industry. In many countries, where roads are neglected, it is estimated that the transport of goods by land is four times as expensive as that by means of navigable rivers, and thus many heavy and bulky commodities could not be brought to market but for the cheap conveyance of rivers. In considering the capacity of a river for navigation, two circumstances mainly require notice—how far seafaring vessels may ascend, and how far the river is navigable for river boats.

Seafaring vessels can ascend many rivers as far as the tides extend. Indeed some rivers, as the Amazonas, may be navigated by large vessels to a much greater distance than the tide ascends, but in others the waters become shallow long before the limit of tide-water is reached. Still high tides facilitate the navigation of rivers by large vessels, not only by producing a current contrary to that of the river, but also by temporarily increasing the depth of water so that vessels can pass over shallows and sandbanks, which at low tides are nearly or quite dry. This is frequently the case in rivers where the tides rise more than 12 feet. The tides in rivers are not of equal duration, as is the case in most parts of the sea; but the ebb tides frequently last twice as long as the flowing tides. At Rotterdam the tides flow for about 4 hours and 5 minutes, but the ebb lasts 7 hours and 55 minutes. The Meerwede at Dordrecht flows against the current of the river for 3 hours and 51 minutes, and with it 8 hours and 9 minutes. This difference is easily explained, when the force of the river current is taken into account. The same circumstance explains the difference in the velocity of the ebbing and flowing tide. Between the North Sea and Hamburg, the flowing tide takes five minutes to run up a mile, but the ebb tide performs the same distance in less than four minutes. But it is difficult to explain the well-established fact that the tides advance much farther into a river than might be expected. When the tide at the mouth of a river rises four feet, we might suppose that it would advance only to such a point in the river, where the surface is four feet above the sea, but it has been ascertained that it advances farther. It seems that the volume of water which is carried up by the tide is pushed onwards by the mass behind it, and carried to a greater distance than the inclination of the river bed would seem to allow. It has also been observed, that during the flowing of the tide the surface of the water in the river presents a somewhat convex form, the water along the banks being a little lower than in the middle of the river, and that during the ebb the contrary takes place. The flowing tide raises the water from below, and thus sooner affects the main body of the river, where it has more room to operate, than the water near the margin. In accordance with this explanation, it is observed that the flowing tide is perceptible in the middle, while it is still ebbing along the banks, and that vessels which are at anchor near the banks are turned round before the water on the surface of the river near the banks begins to flow upward.

In a few rivers the tide ascends to a great distance from the sea. In the Amazonas it is perceptible in the Narrow of Pauxis near Obydos, a distance of nearly 500 miles from the mouth of the river, measured along its course. If we suppose that the tide in this river advances at the rate at which it runs in the Elbe between the North Sea and Hamburg, namely, nearly a mile in five minutes, the tide can only reach the Narrow of Pauxis in 42 hours, or in a space of time during which the direction of the tides has changed seven times at its mouth. It is therefore evident that the current of the Amazonas between the sea and the Narrow of Pauxis must, at the same time, in three or four different parts of its course, follow the impulse given to it by the tide, and run against the stream. We are of opinion however that the tide in the Amazonas advances more slowly than in the Elbe, owing to the stronger current of the Amazonas, and that the number of high tides in the Amazonas, between the two above-mentioned points, will probably be found to be five or six. The tide rushes into some rivers with great impetuosity, and produces what is called a bore. [BORE.]

Human ingenuity, even in the lowest state of civilization, has perceived the use of rivers as means of conveyance. Perhaps all rivers which have water enough to carry the smallest boats of any shape or form are navigated, except where the nature of the current opposes insuperable obstacles. These obstacles consist of *cataracts* or of *rapids*. When the river descends from a rock which rises several feet perpendicularly, it rushes down in a broken sheet of water, and is said to form a cataract. When the water descends with great velocity over an inclined plane of rock, it is said to form a rapid. A cataract may be descended when it is only a few feet high. Rapids may be ascended and descended in most cases with great labour and some danger, when they are not very long, and the bed of the river is free from projecting rocks, which however is rarely the case. The ascent of rapids is effected either by poling or by dragging the boats over the dangerous place by means of long ropes. Sometimes ropes are also used in the descent, as in the Rhine at Laufenburg in Switzerland. But generally either the whole cargo or a part of it must be taken out of the boat, and carried a certain distance by land. Such a tract, over which goods must be carried, is called a *portage*. At long and dangerous rapids the boats themselves must be carried or dragged over the portages.

River boats differ greatly in shape and construction, being always adapted to the nature of each river. Most rivers contain numerous shoals, on which the water is very shallow, and accordingly flat-bottomed boats are used, like the coal-barges in London. Keel-boats can only be used where the river has a depth of a few feet, and is free from shoals and sand-banks. When a river is shallow and rapid, but of considerable width, rafts are substituted for boats. Rafts generally consist of trees fastened together with ropes or the flexible branches of trees, or, in warm countries, by creeping plants; goods are placed upon the raft. When these rafts with their cargoes have arrived at their place of destination, the raft itself is sold, either as timber or as fire-wood, according to its dimensions and quality; and the crews return by land. When a river is too full of cataracts and rapids to allow either boats or rafts to descend, it may still be used for floating down timber or fire-wood. The trunks of trees, after being deprived of their branches, are thrown singly into the current, and towards the mouth chains are laid across the river, above which the trunks collect, and whence they are carried to their destination. This is frequently done in the rivers of the southern districts of Norway.

Rivers which traverse a mountain-region in some parts of their course, are either not navigable in this part or only in some places. Thus the Amazonas and Ganges, where they respectively flow within the ranges of the Andes and Himalaya Mountains, are not navigable, but the Rhine and the Danube are navigable even within the mountains, in some parts for a considerable distance. The most extensive system of internal navigation is presented by those rivers which have a long course, and whose sources are situated at a comparatively small elevation above the sea. The Volga is navigable in the whole length of its course, and the Mississippi up to the Falls of St. Anthony, a distance of about 1800 miles, measured along the river. Both these rivers, as already observed, have the greater part of their course between hills of small elevation, and they do not traverse a mountain-region.

The rivers of England supply the means of an extensive system of inland navigation, a circumstance partly due to their small fall, their sources being only a few hundred feet higher than their mouth, and partly to the abundant supply of water from rain, mists, and springs. Accordingly, if two rivulets unite, they generally form a small navigable river; and such as are not navigable, become useful as feeders to canals. The navigation of most of the rivers of England has been much improved by artificial means.

The Thames is navigable for large sea-vessels to London Bridge, a distance of 45 miles from the Nore, though the whole course of the river, measured along its windings, hardly exceeds 200 miles. No river in the world, perhaps the Amazonas excepted, is navigable for vessels of such dimensions for one-fourth of its course. This circumstance is not due solely to the height of the tides, which is about 19 feet at London Bridge, but mainly to the fact that there are no sand-banks at its mouth which prevent the access of large vessels. The river probably brings down sufficient earthy matter to form a bar, but owing to the direction of the tide, which is kept off from the mouth of the river by the projecting coast of Kent between the two Forelands, and there being consequently nothing to oppose the current of the river at its mouth, the earthy matter is carried farther from the coast, and deposited in deep water.

The advantages hitherto enumerated are common to rivers in all parts of the globe, but there are some countries in which the value of rivers is much increased by the use which is made of the water for irrigation. This occurs in those countries in which it either does not rain at all, or in which rain occurs only at a certain period of the year, and even then only for two or three months. The first class of such countries, for instance the western coast of South America between 5° and 28° S. lat., would be uninhabitable but for the rivers which descend from the western declivity of the Andes, and in their course to the sea have furrowed the surface with deep depressions or valleys, in which agriculture is carried on with success as far as the water of the river can be dispersed over the level part of the valleys by small canals. In those warm climates where the rains occur periodically, though only in two or three months of the year, the fields would certainly produce a crop, even without irrigation; but for more than half the year the soil would produce nothing for want of water. By using the water of the rivers for irrigating their lands, the inhabitants of those countries are enabled to get two and in many cases three crops annually. Even in the southern countries of Europe, where rain is very scarce in summer, and not sufficient to maintain vegetation, whilst the heat is excessive, irrigation is practised, and two crops of Indian corn are thus annually obtained, or one crop of wheat and a green crop.

In those countries in which the temperature for three or four months is under the freezing-point, the rivers during that time are covered with ice, and in this state they afford to the inhabitants, in some degree, the advantages which other countries derive from railways. Travelling and the transport of goods on the smooth ice of the rivers are much less expensive, and are performed in a shorter time than in summer in the ordinary way. This is the case on some of the rivers of New Brunswick and Lower Canada.

It has been observed that the outer borders of river-basins are the most elevated parts which occur in some given places between their respective beds, though it is not always the case that the watershed is formed by mountain-ridges. Owing to such a disposition of the surface, the waters which are collected on or near the borders, run to one or the other of the two rivers. Up to the commencement of this century it was thought improbable, if not impossible, that two different river systems or basins could be united by a natural water communication. But it is now ascertained that a low tract of country or a deep depression of the surface may occur, by which a portion of the water of a river, after being diverted from its own channel, may join a river which otherwise is not connected with that river from which the water branches off. The instances in which this occurs are very few, and we shall therefore enumerate those whose existence is beyond all doubt. The river Arno in Tuscany, in that part where it runs between the high ridges of the Apennines and approaches the town of Arezzo, sends an arm southwards through a narrow valley, under the name of Chiana, which falls into the Chiare, an affluent of the Tiber. The Chiana had been filled up with sand, but its course has been re-established by artificial means. Another case occurs in the kingdom of Hanover, a few miles east of the town of Osnabrück, where the river Haase divides into two branches, of which one, running west to Osnabrück, preserves its name, and after a course of many miles joins the Ems; the other, running east under the name of Els, falls after a short course into the Werre, an affluent of the Weser. In Sweden, two large rivers fall into the northern extremity of the Gulf of Bothnia, the Tornea Elf and the Calix Elf. About 100 miles from the sea, the last-mentioned river sends off an arm to the south-east, which after a course of about twelve or fifteen miles falls into the Tornea Elf: this arm is called Tarenda Elf. In these cases the rivers thus united by a natural water communication flow in the same direction or nearly so. But in South America two large rivers, the Orinoco and the Amazonas, are united in this way in a part of their extensive courses, where the Orinoco runs west and the Amazonas east. The branch of the Orinoco by which this natural water communication is is effected, is called Cassiquiare. [CASSIQUIARE.]

It is a kind of established rule that the whole course of a river should bear the same name, and that this name should be continued to that branch whose sources are farthest from the mouth. But practice is frequently at variance with this rule, and it may easily be accounted for. The inhabitants of a country preserve the name of that river which does not undergo any deflection of its course. At the confluence of the Mississippi and the Missouri, the latter is the larger river, and has had a course of above 1000 miles more than the former, but it does not deflect the course of the Mississippi by its junction, and the name of the last-mentioned river is preserved. The same occurs in South America as to the Amazonas and Madeira, where we find that the last-mentioned river changes the direction of its course to meet the Amazonas, whose name is preserved. In Europe, the Rhine is joined by the Aar in Switzerland, above Laufenburg. The Aar is the larger river and brings down a greater volume of water, but the Rhine, where it is joined by it, continues its westerly course, and its name is preserved.

The extent of a few river basins is here given in round numbers, but they must only be considered as rough approximations:—

Rivers.	Square Miles.
Thames	5,500
Rhine	89,000
Euphrates, including the Tigris	243,000
Brahmapootra	270,000
Danube	312,500
Indus	410,000
Ganges	443,000
Volga	653,000
Nile	707,500
Yan-tse-kiang	742,000
Mississippi	1,100,000
Plata	1,560,000
Amazonas	1,920,000

RIVESALTES. [PYRENEES ORIENTALES.]

RIVIE'RA, a name given by the Italians to certain long narrow strips of land extending between mountains and the sea-coast. The most familiar instance is that of the coast of Genoa, which is divided into Riviera di Levante, or Eastern Riviera, which extends from the city of Genoa to the Gulf of La Spezia, and Riviera di Ponente, or Western Riviera, which extends from Genoa to Nizza. The Western Riviera is the more fertile and populous; but in the Eastern Riviera, which is generally more rugged and barren, there are some delightful spots, especially about Nervi, Rapallo, and Chiavari, sheltered by the mountains from the north winds, and where the orange, lemon, and other southern plants thrive in the open air. [SARDINIAN STATES.] There is also a tract along the western shore of the lake of Garda which is called Riviera di Salò, from the town of that name. [GARDA, LAKE OF.]

RI'VOLI, in Piedmont, a town situated about ten miles west of Turin, on the road to Mont Cenis. A wide and straight avenue, lined with fine elm-trees, leads from Rivoli to the capital, through a rich plain irrigated by canals. Rivoli has 5000 inhabitants, and a royal palace situated upon a height.

There is another small town or village called Rivoli in the province of Verona, situated at the southern entrance of a defile through which the Adige coming from the Tyrol makes its way into the plain of Lombardy. Rivoli is on the right bank of the Adige, at the foot of a lofty ridge called Monte Baldo, which extends between the river and the lake of Garda. A hard-fought battle took place at Rivoli between the French under Bonaparte and the Austrians under General Alvinzi, on the 14th of January, 1797. The village was several times taken and re-taken by the two armies. At last General Massena, coming up with his division, carried the day, and Alvinzi was obliged to retire with great loss. Massena obtained afterwards, under the empire, the title of Duke of Rivoli.

RI'ZZIO. [MARY STUART, vol. xiv., p. 477.]

ROACH. [LEUCISCUS.]

ROAD. Under this head it is proposed to embrace road-making, with a brief sketch of the history of roads, referring for more detailed statistical information to the geographical articles in this work, and to WAY and TURNPIKE TRUSTS for an explanation of the laws respecting the formation and maintenance of the highways in this country.

The importance attached to roads by the great nations of antiquity is abundantly testified by historians, though, except in the case of the Roman roads, there are few remains existing. The Carthaginians are said to have been the inventors of paved roads, which were much used by the Romans, who were distinguished by the vast extent and solid construction of their highways, of which several thousand miles were made in Italy alone, while every country which was brought under their sway was more or less intersected by these channels of communication. Though formed mainly to facilitate military movements, the Roman roads were productive of the greatest civil benefits. Being made by a power whose resources were almost unlimited, these military roads were usually laid out in straight lines from one station to another, with little regard to natural obstacles, which were frequently passed by means of very extensive works, as excavations, bridges, and, in some instances, tunnels of considerable length. The solidity of their construction was fully equal to the boldness of their design; a fact proved by the existence of many that have borne the traffic of near two thousand years without material injury. The Roman engineers were very particular in securing a firm bottom, which was done when necessary by ramming the ground with small stones, fragments of brick, &c. On this carefully prepared foundation a pavement of large stones was firmly set in cement, the stones being occasionally squared, but more commonly of irregular shapes, though always accurately fitted to each other. For this purpose many varieties of stone were used, but the preference seems to have been given to basalt, where it could be had, it being used in many situations in which other suitable materials might have been procured with less labour and expense. Where large blocks could not be conveniently obtained, small stones of hard quality were sometimes cemented together with lime, forming a kind of concrete, of which masses extending to a depth of several feet are still in existence. The strength of their pavements is illustrated by a fact, related by a modern traveller, who states that the substratum of one still in use has been so completely washed away by a current of water without the surface being at all disturbed, that a man may creep under the road from side to side, and carriages pass over the pavement as over a bridge. The Roman roads were generally raised above the ordinary surface of the ground, and frequently had two carriage tracks separated by a raised footpath in the centre.

In some parts of the continent of Europe, especially in Italy, the Roman system of road-making has been imitated, particularly in city pavements; but in Britain the attempts to follow the Roman model appear to have been very limited, and road-making has been very imperfectly practised till within a few years. Many of the existing highways were originally mere paths or tracks from place to place, their course having been determined more by accidental circumstances than by a due attention to the properties of a good road. Thus deviations were made from the direct course in order to cross rivers at fordable points, and the road was conducted over a hill in preference to a more level course round its base, to take advantage of natural drainage. As improvements have been introduced in the systems of construction and repair, the direction and levels have been frequently left unaltered, to avoid the temporary inconvenience and expense attending a deviation from the established course. The scanty information we possess as to the state of the roads in early times indicates that it was very bad; and after the introduction of turnpikes, and even down to the commencement of the present century, the greater part of the roads were, owing to injudicious modes of construction and repair, in a state very unfit for traffic.

The inefficiency of the system of maintenance by parish and statute labour was proved before the passing of the first Turnpike Act in 1653; yet the necessity of improvement, and the obvious justice of maintaining roads by the produce of tolls, did not lead to the extensive adoption of the turnpike system for about a century after that time. In the latter half of the last century turnpike-roads multiplied rapidly, and superior principles of construction also made some progress.

During the last forty years the attention of government has been repeatedly directed to the importance of this class of public works, and the Highland and Holyhead roads, formed by Telford and others, have done much in improving and extending the science of road-making. The Highland roads alluded to were made under the commission of 1803, and originated in the military roads formed in consequence of the rebellions of 1715 and 1745, which had been found very beneficial to the districts to which they afforded the means of access. The roads made and improved under the management of the Highland-Road Commissioners extend to more than 900 miles, the whole being in a mountainous district, but so well laid out that their inclinations are always moderate. The works executed in the formation of these roads are very extensive, and comprise upwards of 1100 bridges. The Holyhead road improvements were commenced in 1815, and in these Telford and his able assistants had the opportunity of carrying into effect, under a government commission, a plan of road-making suitable to a great traffic, on principles generally considered to be nearly perfect. The principles on which these important works have been executed are very fully detailed by Sir Henry Parnell, in his valuable 'Treatise on Roads,' to which work the writer of this article is indebted for much of the following information. The name of M^c^Adam must not be passed over without notice in this place, as his exertions have done much towards attracting public attention to the improvement of roads, even where his peculiar principles have not been acted upon.

Though much remains to be accomplished, and the philosophy of road-making is yet very imperfectly understood by a large proportion of those to whom the care of the highways is committed, it is impossible to compare the past and present state of roads without feeling grateful for their improvement, and observing in how great a degree that improvement has benefited the agricultural, commercial, and moral interests of the community.

Designing a Line of Road; Earth-works, &c.—Though formerly little attended to, the design of a line of road is a subject which requires extensive knowledge and mature deliberation. It is often advisable to survey several different lines, in order to the selection of that which, on careful comparison, appears to have the preponderance of desirable qualities. To be theoretically perfect, a road should combine the qualities of straightness and level, and its surface should be smooth and hard; and the best road, practically, will be that which makes the best compromise between unavoidable deviations from this theoretical perfection. It may be observed however that although some writers speak of the absolute perfection of each of these qualities as essential to the idea of a good road, it may be questioned whether it is desirable of any, excepting the first. Of these qualifications the two first belong to the design or laying out of the line, and the last two to the execution of the road and the materials made use of.

The qualities of straightness and level, or the *line of direction* and *line of draught*, should be very carefully adjusted to each other. Some remarks on this subject will be found in the article RAILWAY, p. 250, which apply equally to the laying out of common roads, though the proportionate retardation due to a given ascent is very different, owing to the great comparative resistance of a common road. Among the circumstances that may authorise a deviation from the straight line, are the power of obtaining suitable materials for the road, avoiding valuable property or difficult ground, and including towns or villages in the route.

It seems to be a prevailing opinion with modern engineers, that the line of direction has not generally been made as subordinate as it should be to the line of draught; and it will be well to remember, in laying out a new road, that while the effect of gravity must ever remain the same, the resistance occasioned by imperfections in the road and carriages will be reduced by every prospective improvement in their construction; thereby increasing the *proportionate* effect of gravity, and making the line of direction still more subordinate to that of draught, or, in other words, increasing the length of level road that may be traversed with the same expenditure of power as would raise the load up a given elevation. Curves increase the resistance to the motion of carriages, and add to the risk of accident; but if slight, they increase the length of the road much less than might be supposed. Edgeworth, in his 'Essay on the Construction of Roads and Carriages,' says, 'A road ten miles long, and perfectly straight, can scarcely be found anywhere; but if such a road could be found, and if it were curved, so as to prevent the eye from seeing farther than a quarter of a mile of it, in any one place, the whole road would not be lengthened more than one hundred and fifty yards.'

The principle explained in p. 250 of the article RAILWAY of so arranging the inclinations on each side of the summit, or highest point unavoidably passed over, that there may be no unnecessary rise and fall, is equally deserving of attention in the design of a common road, although it has been much neglected. The following statement respecting an old road in the Isle of Anglesey, which was altered by Telford, shows how very much a road may be improved by judicious alterations; not only by shortening the line and lowering the summits, but also by diminishing the minor undulations:—

	Summit above high water.	Total rise and fall.	Length. Miles.	Length. Yards.
Old road .	339 feet	3,540 feet	24	428
New road .	193 „	2,257 „	21	1,596
Difference .	146 feet	1,283 feet	2	592

However desirable a perfect level may be in theory, a road with moderate inclinations, as of 1 in 100, is found to be preferable in practice, because without such a slope it is difficult to get rid of water fast enough, unless the road be raised a few feet above the surrounding land, and thereby exposed to the free action of sun and wind. Slight undulations are also considered, by most authors, to be desirable in all cases where animal power is employed; frequent changes in the amount of exertion being considered favourable to the horses. On this principle it is recommended that where an undulating road is reduced to a uniform gradient, occasional levels should be introduced to ease the draught. Any inclination exceeding the angle of repose, or that beyond which a carriage would roll down by its own gravity, occasions a loss of power; but all below it are attended with a compensating effect when the traffic in both directions is taken into account; the advantage gained by descending carriages being equal to the additional labour required in the ascent. This angle has been stated by Lardner to be about 1 in 40, with a good carriage on a broken stone road of the best quality; but the inclination allowed on the Holyhead road is 1 in 35, a slope which may be ascended at a good rate of speed, and descended at twelve miles an hour without risk. A greater slope not only occasions much additional resistance in the ascent, but, by rendering it unsafe to drive down at full speed, causes a loss of time in the descent also. Modern engineers consider it unadvisable in any case to exceed an inclination of 1 in 24, though there are hills at least twice as steep on some turnpike roads. The following table shows the effect of various inclinations in increasing the draught of a stage-coach at different velocities on the same description of road, as indicated by a dynamometer contrived by Mr. Macneill for experiments on the draught of carriages:—*

	Force required at		
Inclination.	6 m. p. hour.	8 m. p. hour.	10 m. p. hour.
1 in 20	268 lbs.	296 lbs.	318 lbs.
1 .. 26	213 ..	219 ..	225 ..
1 .. 30	165 ..	196 ..	200 ..
1 .. 40	160 ..	166 ..	172 ..
1 .. 600	111 ..	120 ..	128 ..

It should always be borne in mind that the occurrence of one steep hill on a line of road affects the working of the whole line, as the number of horses required for ascending it must be used, although a portion of their power may be unemployed on the greater part of the road. The inconvenience of a steep inclination may be diminished by laying a stone tramway for the use of ascending vehicles; a measure which has been adopted with success on the Holyhead road, where, on a slope of about 1 in 20, the power required to draw a ton has been reduced by this means from 294 lbs. to 132 lbs.

In arranging the works necessary for obtaining the required level, the preference should be given to embankments; and, wherever it is practicable, the bed of the road should be elevated two feet above the natural level, for the sake of efficient drainage. Tunnels are very rarely introduced on common roads, being very costly, and, when of considerable length, inconvenient from their darkness. When the road is in an excavation, the side-slopes should never be steeper than two horizontal to one vertical, and it is desirable to have those on the south side three to one; because, though many materials will stand at steeper inclinations, it is essential to the preservation of the road, and the comfort of horses travelling upon it, that the sun and air should have free access to its surface. Where stone can be readily procured, the erection of walls at the bottom of the slopes gives a neat and finished appearance to the road, and prevents earth, which may be loosened from the sides, from falling into the side channels or drains. The Highgate Archway road affords an example of the great difficulties that occasionally attend a deep excavation, owing to the accumulation of water; the remedy for which is described hereafter. Where embankments are required, strong fencing is especially necessary, to guard against the occurrence of accidents. Some of the roads formed by Telford are conducted across deep valleys by bridges or viaducts of great magnitude, in order to maintain the desired level without the inconvenience and expense of large earth embankments.

In old roads the bridges erected for the passage of rivers are frequently made much smaller than is advisable, so that the level of the road is made too low, and the water is impeded by the contracted arches to such a degree as to occasion much damage during floods. Modern engineers, by adopting bolder dimensions for the bridges, and forming raised approaches, avoid these inconveniences, and secure their roads from the risk of obstruction by floods. The raising of the road wherever it passes through marshy or low land is a very necessary measure. Many old roads still in use are sunk several feet below the surface of the ground, because they have originally been exposed to the destructive action of water, and the materials thus softened have been ground into mud and cleared away, until, by the repetition of these operations, the roads have been converted into deep trenches, which are frequently flooded in winter. Of the extent to which this process has been occasionally suffered to go on, an idea may be formed from the statement of Edgeworth, that 'the stag, the hounds, and the horsemen have been known to leap over a loaded waggon in a hollow way, without any obstruction from the vehicle.'

In conducting a road through a mountainous district, in addition to numerous bridges for the purpose of crossing ravines (for which purpose suspension bridges have been occasionally applied, as in the passage of the Menai strait), embankments between retaining walls of stone, and walls to support the road along the face of a precipice, are frequently necessary. Some works of the latter character have excited much admiration. If the slope of a precipice be only six inches horizontal to a foot vertical, such a road may be formed by building a wall thirty feet high, based on steps cut into the rock, and cutting into the rock to the depth of ten feet on a level with the top of the wall, the space between which and the face of the precipice is filled in with earth or stone. By this means a platform twenty-five feet wide is obtained. Many works of this character have been executed by Telford and other engineers, in various parts of Scotland, in the Highland roads, and those forming the communication between Edinburgh and London: and others, the boldness of which commands universal admiration, occur in the great mountain-passes of the Simplon and Mont Cenis, which form imperishable monuments of the talent and energy of the engineers of Napoleon, by whom they were executed.

When the works are completed to the proper level for receiving the hard materials that form the surface of the road, the earth should be formed into the intended width and a nearly level surface, the footpath or paths being elevated a few inches above the bed of the carriage-way. Thirty feet is the ordinary width of the carriage-way, exclusive of footpaths, of the Holyhead road; but owing to the diminution of traffic since the opening of the London and Birmingham railway, a recent Report suggested the propriety of reducing the width, in most places, to twenty-four or twenty-five feet. This width may be more or less exceeded in the vicinity of large towns, according to the amount of traffic, but should be exactly adhered to in other situations, as uniformity in this particular greatly improves the appearance of a road, and also contributes to economy, both as to the land and materials, and the cost of maintenance. Some engineers recommend that the bed should be made convex, in the same degree as the finished surface of the road; but it is quite flat in the Holyhead road, by which means a greater depth of materials is allowed in the centre than at the sides of the road. Much has been said on the subject of the best form for the transverse section of a road. Formerly it was common to make it very convex, often to a degree that was highly dangerous, with the idea of throwing off water: but this notion is very fallacious, because if a road be allowed to wear into ruts, no degree of convexity that can be given is sufficient to keep it dry; while, if the surface be good, a very moderate slope is sufficient to carry off water, and a steep inclination will cause it to run with such velocity as to wear away the road materials. Another disadvantage of too great an inclination is, that, by throwing the weight of a carriage on one side, the vehicle itself is injured, and the overloaded wheels cut up the road more than necessary. Some have gone so far in opposition to this practice as to advocate perfectly flat or even concave roads, in favour of both of which much may be said; but the general practice of modern roadmakers is to make the surface slightly convex. In Telford's roads the convexity is elliptical, the fall being half an inch at four feet from the centre, two inches at nine feet, and six inches at fifteen feet. It has been recommended to form the cross section into three flat planes, that in the centre being horizontal, and the others slightly inclined from it. Very narrow roads are often sloped in one direction only, like one-half of a convex road; and roads on the face of a steep hill are occasionally treated in this manner, the surface water being conducted towards the hill, and carried off by drains under the road. This plan has the advantage of checking any tendency in carriages to roll or turn over towards the least protected side of the road.

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* This useful instrument, which its ingenious inventor denominates a *Road Indicator*, is mounted in a light phaeton, and besides marking the draught at every ten or twenty yards, points out the distance run, and the rates of acclivity or declivity on every part of the road. A full description of it is given in Parnell's 'Treatise on Roads.'

Wherever the substratum of a road is wet and soft, great care is necessary to make the bed solid. If the ground be boggy or marshy, it is desirable to form an embankment of sufficient thickness to compress the elastic foundation; such embankment being sometimes supported by faggots. Telford and most engineers recommend that ramming with stone-chips should be resorted to where the bed is wet and spongy; and that where soft clay occurs, a stratum of earth should be laid between it and the road materials, a precaution which tends to diminish the injurious effect of frost on a road with a clay bottom. Though great care is usually considered necessary in order to obtain a firm foundation, Mc. Adam and some others have not only contended against its importance, but actually preferred, in certain cases, a yielding substratum to one of rock, on the supposition that the wear of the road is diminished by elasticity. Careful observations on the repairs of a road in Somersetshire, of which about seven miles are supported by a morass, and five or six by limestone rock, indicated a difference of expense in repair of about five to seven in favour of the morass, though it was so soft that the vibration caused by a carriage passing was sufficient to break the young ice in the side ditches; but extended experience seems to confirm the more general opinion in favour of a hard unyielding foundation.

Deep ditches should be cut for the efficient drainage of the road, which is of paramount importance; and these should be on the field side of the fences. They should extend to a depth of from two feet six inches to four feet below the bed of the road, according to the nature of the ground. The earth thrown out from them is commonly used in forming banks for the hedges; but in wet soils, where the ditches are made larger and deeper than usual, the additional earth excavated is applied to raising the bed of the road. Where brick- or stone-covered drains are substituted for open channels, it is usual to build them with open joints, to allow the passage of water through the sides. Cross-drains of masonry are introduced at intervals to connect the side channels, and numerous minor drains filled with rubble stones or clean gravel are formed in the bed of the road. The latter are frequently of the kind called mitre-drains, which are made V shaped in plan, diverging from the centre of the bed, and extending diagonally to the sides, their angle being regulated by the longitudinal slope of the road, so that their inclination may not exceed 1 in 100. These may be placed about sixty yards apart, or closer in wet soils, and they receive the water that filters through the surface materials. In cuttings or excavations it is advisable to make drains to catch the water descending from the sides, and prevent its reaching the surface of the road.

In treating of the choice and application of the hard materials which compose the surface of the road, the formation of *metalled* roads, or those made of broken stone and similar materials, will be first considered; and afterwards that of the principal varieties of pavement.

Metalled or Broken-Stone Roads.—In the formation of metalled roads the system adopted in the great works of Telford and his followers is that most decidedly sanctioned by experience. The distinguishing feature of this system is the use of a rough pavement of hand-laid stones on the bed of the road, to support the small broken stone of which the surface is composed. In the very imperfect mode of road-making formerly practised (which scarcely deserves the name of a system), it was very common to cover a bad road with a large quantity of stones, often unbroken, and generally of very irregular dimensions. These stones, owing to their rounded form and the softness of the substratum, never consolidated into a hard surface, and in course of time sunk into the soft earth beneath, which worked up among the stones in the form of mud. Thus enormous quantities of stone were used without producing a good road, the stone sinking into the earth to a surprising extent. This evil is greatly diminished by good drainage, and by the use of stones of uniform size broken into angular pieces, which have a tendency to lock together into a hard and compact mass,—a fact of the highest importance in the science of road-making, and which appears to have been first prominently brought forward by the late Mr. Mc. Adam. A great extent of excellent road has been made on the plan advocated by Mc. Adam, who considered paving unnecessary, and laid the broken stone immediately on the surface of the earth, depending on its forming a hard crust impervious to water; so that the earth, being always kept dry, may have no tendency to work up among the metal or broken stone. Mc. Adam used no stones exceeding six ounces in weight, and gave the preference to those of about one ounce, or an inch diameter, which he spread over the road in thin layers, each being worked over by carriages till in some degree consolidated; and he objected to the use of chalk or earth mixed with the stone for the purpose of binding it together. He considered a thickness of ten inches of broken stone, well consolidated, to be sufficient for bearing any load, even where the foundation is a morass, in which case he considered no intermediate substance necessary. Near Bristol a road in which the metalling had worn down to a thickness of only four inches, was found to have kept the substratum of earth perfectly dry. But, satisfactory as this plan of road-making has proved in some cases, there are others in which it has failed, and some in which a very large quantity of stone has been applied before a firm road could be obtained. A road from Lewes to Eastbourn, made on Mr. Mc. Adam's principle, is said to have required three feet of materials in many parts before it was consolidated, though it was ultimately brought into a good state.

The system of pitching or paving the bottom of a road has the advantage of preventing the subsoil from working up among the road materials, and, when well executed, of distributing the pressure of carriages over a larger base; while the size of the paving stones themselves prevents their sinking into the earth, as small stones are liable to do. The pavement also acts as a drain to the surface materials. In addition to these, the plan has, in many situations, the advantage of economy, as the cost of a pavement is considerably less than that of an equal depth of well-broken stone. In most, if not all, of the cases in which the paving system has failed, the want of success may be attributed to very imperfect execution; as, if the stones are very irregular in size or badly set, or the thickness of metal is insufficient to protect the pavement from the shake of passing carriages, the stones become deranged, and the subsoil, working up among them, quickly spoils the road.

The case of the Highgate Archway road, which has been before alluded to, is a remarkable illustration of the absolute necessity of a firm bottoming under some circumstances This road is over a subsoil of sand, clay, and gravel; and being partly in a deep cutting (originally intended for a tunnel), is much exposed to the influx of water. The road, which is rather more than a mile and a half long, was originally made of a quantity of gravel and sand laid on the natural soil, and covered with broken flints and gravel; but this plan not succeeding, the road was taken up, and pieces of waste tin were laid on the subsoil, over which were spread gravel, flints, and broken stone. This expedient did not produce the desired effect, and at length, in 1829, the road was placed under the management of the Holyhead-road Commissioners, its proprietors having failed, notwithstanding an enormous outlay, and the application of 1200 cubic yards of gravel annually, to bring it into a satisfactory state. A thick coat of broken granite was spread on a portion of the road; but owing to the unsoundness of the foundation, it never consolidated, the stones wearing into smooth pebbles by their attrition against one another, even down to the bottom of the mass. The commissioners therefore determined, as paving-stones could not be procured without great expense, to lay a coating of Roman cement and gravel as a bed for the road-metal, an experiment that has been attended with complete success. The work was executed by Macneill, and consists of a composition of Roman cement with eight times its quantity of washed gravel and sand, which, after being mixed in a box, was laid on the bed of the road to a thickness of six inches and a width of about eighteen feet. A few minutes after being laid, the upper surface was indented, by means of a triangular piece of wood sheeted with iron, with numerous channels or grooves, sloping about three inches from the centre to the sides; these channels serving for the stones to lie and fasten in, and conducting any water that might percolate through them into the side drains. This measure, combined with an extraordinary extent of drainage, amounting in the whole to a length of 12,803 yards, proved so complete a remedy, that in the first winter after the cement was laid, coaches were able to go up with four horses at a trot with the heaviest loads, though before the improvement six horses had mounted with difficulty at a walking pace. The effect of the alteration on the wear of the road was equally satisfactory, four inches of quartz being worn away on the old bottom while only half an inch of the same stone was worn where laid on the cement foundation. The expense of laying the cement composition, including the formation of the bed of the road, was about ten shillings per lineal yard, part of the gravel used being old. Macneill estimated the cost at from twelve to fifteen shillings per yard if new gravel were purchased.

The effect of a paved or concrete foundation in diminishing the draught appears, from the subjoined statement, founded on experiments with Mr. Macneill's road indicator, to be very great; but a more extensive series of trials is desirable for a comparison of different systems under various circumstances. The draught of a waggon weighing 21 cwt. was found to be as follows:—

On a well-made pavement	33 lbs.
On a road with six inches of hard broken stone on a rough pavement	46
On a similar road, with a foundation of Roman cement and gravel in lieu of pavement .	46
On a road with a thick coating of broken stone on earth	65
On a road with a thick coating of gravel on earth	147

For the formation of the pavement of a metalled road, almost any hard stone that may be easily dressed with the hammer may be used. The stones should be tolerably regular in size, and laid in rows with their broadest face downwards, the interstices being carefully filled up with stone-chippings, so as to pin the whole pavement together, and effectually prevent the earth from working up through the joints. In one of Telford's specifications for the Holyhead road the dimensions of the stones for a pavement thirty feet wide are given as seven inches deep in the middle of the road, five inches at nine feet from the centre, four inches at twelve feet, and three inches at fifteen feet, the stones to be laid lengthwise across the road, and the upper edge in no case to exceed four inches wide. All irregularities are to be broken off by the hammer, and the stone-chips used in packing the joints are directed to be wedged in by hand or with light hammers. No ramming is necessary, and it is desirable to prevent carts which are used in the conveyance of the road materials from being drawn upon the pavement before it is covered with broken stone.

Some road-makers use a pavement even on a substratum of rock, where it is uneven, but in many cases it is unnecessary; although, if the surface be smooth, it should be picked to a degree of roughness similar to that of a pavement, in order that the road materials may not slide upon it. Where paving the whole width of a road might be too expensive, the pavement is sometimes limited to a width of sixteen or eighteen feet in the centre. In situations where coarse stone of suitable quality can be easily procured, it is found to be cheaper to make a road with six inches of broken stone and a pavement, than with ten inches depth of broken stone without paving. Mr. Wingrove, surveyor of the Bath roads, mentions the use of freestone brash, chalk, &c. for forming the foundation pavement of metalled roads.

The quality and right application of the road-metal, or broken stone which forms the surface of the road, is of great importance. As a general rule the hardest stone is to be preferred, but this rule admits of some qualification, some very hard stones being found to wear much more rapidly than others of a softer but tougher quality. According to Parnell, whose experience renders him a good authority, the best descriptions of road materials 'consist of basalt, granite, quartz, syenite, and porphyry rocks. The whinstones found in different parts of the United Kingdom, Guernsey granite, Mountsorrel and Hartshill stone of Leicestershire, and the pebbles of Shropshire, Staffordshire, and Warwickshire are among the best of the stones now commonly in use. The schistus stones will make smooth roads, being of a slaty and argillaceous structure, but are rapidly destroyed by wet, by the pressure of wheels, and occasion great expense in scraping and constantly laying on new coatings. Limestone is defective in the same respect. It wears rapidly away when wet, and therefore, when the traffic is very great, it is an expensive material. Sandstone is much too weak for the surface of a road; it will never make a hard one, but it is very well adapted to the purpose of a foundation pavement. Flints vary very much in quality as a road material. The hardest of them are nearly as good as the best limestone, but the softer kinds are quickly crushed by the wheels of carriages, and make heavy and dirty roads. Gravel, when it consists of the pebbles of the hard sorts of stones, is a good material, particularly when the pebbles are so large as to admit of their being broken; but when it consists of limestone, sandstone, or flint, it is a very bad one; for it wears so rapidly that the crust of a road made with it always consists of a large portion of the earthy matter to which it is reduced. This prevents the gravel from becoming consolidated, and renders a road made with it extremely defective with respect to that perfect hardness which it ought to have.' Mr. Stevenson, in the article 'Road' in the 'Edinburgh Encyclopædia,' states the distribution of road materials in the British islands to be partial and irregular. 'Throughout Scotland, and even as far south as the approaching sources of the rivers Tees and Ribble, good road-metal is generally to be met with, containing the numerous varieties of granite, greenstone, basalt, porphyry, and limestone. South of this boundary, as far as the Trent and the Dee in Cheshire, the formation is chiefly coal, sandstone, and the softer varieties of limestone. In the southern counties chalk and gravel soils chiefly occur, affording flint and gravel, both of which, under proper management, make excellent roads. In North and South Wales we have all the varieties of road-metal which are common to Scotland. In Ireland they have excellent road materials, as granite and limestone are pretty generally distributed.'

An interesting experiment has been tried on a part of the Holyhead road between London and Birmingham, as to the effect of iron amongst the road-metal in diminishing the wear of the road. The iron is cast in the form of cubes, about an inch square, and when the road was consolidated, holes large enough to receive them were picked in its surface. A single cube was then placed in each hole, so as to be level with the road, and the small stone-chips were beat down about the iron with a mallet. One of these iron cubes is placed in every four inches of surface. They very soon become firmly imbedded, so as not to be disturbed by the rolling of carriages or the feet of the horses; and to assist their consolidation, it is recommended to water the road freely, if the cubes are inserted in dry weather. The iron was applied in March, 1835, since which time the portion of road in which they are used has continued in excellent repair, and the wear is so materially diminished, that a more extended trial of the plan appears highly desirable. Mr. Macneill, the patentee of this method of road-making, considers it particularly applicable to streets, on account of its durability, and thinks that the expense would be trifling, as iron of the worst quality may be used. It may be observed that the draught on the piece of road on which the experiment is made is very easy, and that horses do not show any tendency to slip upon it.

In the choice of materials, the expense of conveying them to the road must be taken into consideration, but it is often better economy to fetch good stone from a great distance than to use that which is less durable, though readily procured; as, in addition to the expense of frequent repairs to a road formed with weak materials, great additional labour is imposed upon the horses, which have to wear down repeated coats of fresh stones. This is one of the points in which the inexperience and ignorance of road surveyors have often been displayed, cases having occurred in which an inferior material has been procured from a distance at great cost, while stone of excellent quality existed in abundance on the spot.

With regard to the best size of the broken stone for the surface of a road, both Telford and M^c. Adam direct that no piece should exceed six or eight ounces in weight. In some districts the surveyors have been instructed to test the metal by a pair of scales and a six-ounce weight; but a more usual test is an iron ring two inches and a half in diameter, attached to a handle, through which every stone should be small enough to pass. Some writers have recommended that one inch should be the maximum diameter, but it is only the hardest and toughest materials that will bear breaking so small without much waste. The pieces should be as nearly cubical as may be, and should on no account be broken on the surface of the road; nor is it well to do it on the heap, the best method being to break one or two pieces at once on a large block of hard stone, the pieces being held steady by the iron ring that serves as a gauge. A sitting posture is considered best for those engaged in breaking road-metal, an operation which, under the modern system of road-making, gives employment to a great number of hands. Attempts have been made to perform this operation by machinery, but mechanical contrivances have not been found equal to manual labour. Pronged shovels are made use of in lifting the broken stone into barrows and carts, as they save labour by entering the heap with less resistance than ordinary shovels, and also prevent the admixture of earth with the metal.

The depth of metal on a paved foundation should be not less than six inches, and it should be laid on in two or three distinct layers, carefully spread with broad shovels, and carriages should work on each till it is in some degree consolidated before another is laid over it. While the metalling is fresh, men should attend to rake in the ruts as fast as they are formed, and to pick off any large stones that may have previously escaped notice, as they are sure to work up to the surface. The sides of the road may be covered with the smaller portion of the metal, separated by a sieve with meshes of an inch square; and a layer of about an inch and a half of clean gravel is occasionally added over the whole surface in order to ease the draught while the road is new, though its effect on the road is rather injurious than otherwise, nothing being needed to bind the metal together. Rolling a road on which fresh materials have been laid is a measure of doubtful utility, the most effectual consolidation being produced by the working of carriages which are compelled to vary their tracks, and to run on the new metal, by placing wooden trestles across the road, and altering their position when necessary; the road is frequently raked as long as any loose stones remain.

Where the traffic is not sufficient to justify so expensive a mode of formation as that which has been described, good roads may be formed with broken stone only, increasing in thickness from six inches at the sides to twelve inches in the centre. If nothing better than gravel can be procured, Parnell recommends that a coat of four inches be laid on the prepared bed, and worked over till pretty firm; then a layer three inches thick, once screened, and finally three distinct layers of the gravel well riddled, and free from earth, clay, or stones exceeding an inch and a half diameter; the road, when completed, to be ten inches thick at the sides, and sixteen in the centre, where the strongest and best part of the gravel should be laid. The drainage must be particularly attended to in a gravel road. Among the inferior materials occasionally used is limestone burnt to a vitreous state; but, though formerly often used in districts where coal is abundant, it is not approved for carriage-ways by modern road-makers.

In completing a road it is necessary to form the side channels with care, and to provide against their being interfered with by branch or field roads. The footpath, which is usually about five feet wide, may be made of gravel or broken sandstone, and is required in the Holyhead-road specifications to be level with the centre of the road, which is six inches above the sides. For fencing, walls are preferred where stone is plentiful, as they occupy less space than hedges, and have a neat appearance. If the stone is of favourable shape, such walls may be built without mortar, except in the coping; but if on the side of an embankment, the walls should always be strongly built with mortar. A hedge-bank and ditch occupy a width of about eight feet in ordinary cases, and the young quicks are protected by post and rail fencing; but where timber is scarce, it is sometimes well to make the ditch and bank rather larger, so that the wooden railing may be dispensed with. In cuttings and some other situations a mound or bank without a hedge forms a convenient fence, and these, as well as hedge-banks, may be improved in appearance and durability by being swarded. All fences should be kept low, that they may not exclude sun and wind; and for the same reason trees or buildings that overshadow the road should be removed when practicable. The situation of toll-gates must be regulated by circumstances, but it is very desirable to avoid placing them either on or at the bottom of a hill, an arrangement very liable to cause accidents. The gates, which, when single, may be fifteen feet, or, when double, without a centre-post, twenty-four to thirty feet wide, are usually painted white, that they may be readily seen at night. They should be well lighted, and supplied with comfortable toll-houses, which, on some of the modern roads, are erected in an ornamental style. Parnell advises the use of milestones of light-coloured stone, and of larger dimensions than usual; but cast-iron posts have been extensively used, and on some roads cast-iron tablets mounted on stone. A convenient arrangement is a stone or post with two tablets inclined towards the road, so that persons travelling in either direction see the distance of the town which they are approaching.

However well a metalled road may be made in the first instance, its preservation in a good state depends greatly on prompt and judicious repair. The mud that forms on the surface in wet weather should be scraped off and formed into heaps at the side (avoiding the side channels), until it is sufficiently dry for carting away; because, if left on the surface, it would while moist soften the road and cause it to break up, and after drying impede the running off of water from a subsequent shower. This operation has been usually performed by hand, but scraping-machines, patented by Messrs. Bourne and Harris, have been recently introduced with success, they being found to diminish the labour fully one-half. The winter season, from October to April, is considered the best time for the addition of fresh materials, which are laid on in thin coats, and should always be applied as soon as any hollow capable of retaining water is observed. For the purpose of keeping a supply of broken stone always at hand, depôts for holding about twenty-four cubic yards of metal are formed by the road-side, at intervals of a quarter of a mile or less, from which the stone is taken to the required spot in barrows. When laid on the road, according to Parnell, it is not necessary to pick up the old surface, as the new metal keeps the part under it wet and soft, and soon works in. Mc. Adam, however, recommends breaking up the surface of the road in every case where fresh stone is added.

Stone and Iron Tramways.—Though an improvement on ordinary pavement, this description of road may be considered as a link between metalled and paved roads, stone tracks having been occasionally applied to common roads, and with great benefit. Stone tramways consist of wheel-tracks formed of large blocks of stone, usually granite, the surface of which is made so smooth as to offer very little resistance to the rolling of the wheels, while the space between the tracks, being composed of broken stone, gravel, or rough pavement, affords secure footing for the horses. Iron tramways, in which cast or wrought iron plates are used instead of blocks of stone, have hitherto been very little used on ordinary roads, though their superior smoothness gives them a decided advantage, while their expense does not, as stated by Macneill, at all exceed that of granite. Iron tracks are sometimes made with a flat surface, but a slight concavity, as shown in the section of Woodhouse's rail in the article Railway (p. 246), tends to keep the carriages more accurately in the right course, and is therefore an advantage when all the vehicles used on the tramway are nearly uniform in width. The granite blocks used for stone tramways are generally from three to six feet long, twelve to eighteen inches wide, and eight to twelve inches deep. Great care is necessary in bedding such large blocks, and the joints require nice adjustment. They are frequently laid end to end without any fitting into each other, but it has been proposed to dovetail the ends together, to insert a small stone as a dowel between two blocks, to use iron clamps, or to join the stones with oak tree-nails. The granite tracks used on some steep ascents in the Holyhead road are bedded on a pavement eight inches thick, packed and grouted, and a layer of three inches of broken stones not exceeding an inch and a half diameter; a thin stratum of gravel, well rolled, being placed last of all to receive the blocks. When they are laid, the centre and side spaces are filled up with ordinary road material to the level of the tracks; a row of common granite paving-stones, about six inches deep, five wide, and nine long, being laid along each side of the tracks to prevent loose materials working on to them. Mr. Stevenson, in the 'Edinburgh Encyclopædia,' recommends the use of smaller stones, as being cheaper and less liable to injury from vibration than those of the usual size. The dimensions recommended by him are fourteen inches deep, eighteen inches wide at the base, twelve inches wide at the top, and six to nine inches long. The increased accuracy required in the numerous joints might probably counterbalance any advantage gained by the adoption of small stones.

The great saving of power effected by the use of tramways for ordinary carriages is shown by numerous experiments, some of which, tried on the granite tracks of the Commercial Road in London, proved that a well-made waggon will run with increasing velocity, by the force of gravity alone, down a mean slope of 1 in 155. On this road a loaded waggon weighing ten tons has been drawn with apparent ease by a single horse, up an ascent of 1 in 274, for a distance of about two miles. On an iron tramway laid in 1816 by the Forth and Clyde canal company at Port Dundas, near Glasgow, a horse has taken a load of three tons on a cart weighing nine cwt., up an acclivity of 1 in 15, without difficulty, though he could not proceed with it on a common causeway with an easy line of draught; and the carters agree that the horses take up three tons on the iron tracks as easily as they did twenty-four cwt. on the common causeway previously used.

In order to ascertain the comparative durability of different kinds of stone for tramways, and for paving generally, Mr. Walker tried some experiments on blocks laid in a toll gateway on the Commercial Road tramway, the results of which were as follows:—The blocks were eighteen inches wide and twelve deep, and were laid down in March, 1830; and the loss given in the table was ascertained after they had been in use seventeen months, in August, 1831:—

Description of Stone.	Loss of depth.	
	Absolute.	Comparative.
Guernsey . . .	·060 in.	1·000 in.
Herm*	·075	1·190
Budle†	·082	1·316
Blue Peterhead . . .	·131	2·080
Heyton	·141	2·238
Red Aberdeen . . .	·159	2·524
Dartmoor . . .	·207	3·285
Blue Aberdeen . . .	·225	3·571

Stone tramways have been adopted in many street pavements where a great traffic is carried on, particularly in some of the narrow streets in the city of London, with much advantage; but their application to acclivities on ordinary roads has hitherto been more limited than their merits deserve. By their judicious introduction on a few steep inclinations, many hilly roads might, at a small expense, be made nearly equal to level lines; and it is probable that such a measure would tend, in an important degree, to enable turnpike-roads to meet the formidable rivalry of railways. In his report to the Holyhead-road Commissioners in 1839, Mr. Macneill strongly recommends the application of stone or iron tracks to several hills, and states that an iron tramway laid down along the whole length of the road would reduce the expense of horse labour fully one half. 'If,' he writes, 'a tramway were constructed of iron plates, the whole way from London to Birmingham, a coach carrying sixteen passengers might be drawn at the rate of ten miles an hour with only two horses, and one horse would be able to draw a post-chaise more easily than two now can, so that the expense of travelling might be reduced one half, and a similar reduction might be made in the charges for carrying goods. The expense of forming such a railway would be about 2500*l.* a mile, making the whole expense from London to Birmingham 271,000*l.*' In addition to the immediate advantages of such an improvement, it would remove one of the greatest obstacles to the successful use of steam locomotives on common roads.

Pavements.—The formation of paved roads on correct principles appears to have been well understood by the Romans, whose pavements show great care in their essential features,—a good foundation and accurate fitting of the stones. Some of the modern imitations of the Roman system in the street-pavements of Italy show the like attention to these important points, the paving-stones being set in mortar on a concrete foundation with a degree of accuracy that has led some writers to designate these roads *horizontal walls.* In some instances the blocks of stone used are of considerable depth; but they are often thin, and, being of large dimensions, have more the character of flag-stones than of ordinary paving-blocks. At Naples and Florence, stones two feet square and six inches thick, laid diagonally across the road, and neatly set in Pozzolano mortar, are used; the surface being chipped where declivities or turnings occur, to prevent the slipping of horses, which become very sure-footed from habit. Occasionally, as at Milan, different kinds of paving are laid for the wheel-tracks and horse-path, so as to produce the effect of a stone tramway. These pavements have been recommended as models for imitation in paving the streets of London: but the durability with which they are constructed would form a disadvantage in a place where the pavement has to be frequently disturbed for the purpose of laying down or repairing water and gas-pipes, or cleansing the sewers; and it is probable that pavements which answer well for the light vehicles and limited traffic of many of the continental cities, would be found quite inadequate to bear the number of heavy carriages traversing the principal thoroughfares of the metropolis; of which some idea may be formed from the fact that upwards of 11,000 vehicles were observed to pass along King William Street, near London Bridge, on the 12th of August, 1840, between the hours of eight A.M. and eight P.M., being at the rate of more than fifteen per minute for twelve hours.

Another description of paved road, the origin of which is commonly referred to the Romans, is the *chaussée*, or roughly-paved causeway used in the principal highways of France and some other parts of the Continent. This kind of road has been much recommended for its durability when well made, but, unless laid with a degree of care that would render it too expensive for general adoption, it causes a very unpleasant and fatiguing jolting. In such roads the pavement usually covers only a part of the breadth of the road, leaving the sides available for the use of light carriages in dry weather; and it has been suggested, that where the width of the roadway would allow, it might prove advantageous to form, in all great roads, a track of pavement or hard broken stone for winter use, and another of inferior materials for the summer, both to save the wear of the hard road and increase the comfort of passengers. Such an arrangement is convenient in the principal approaches to great towns, where it is considered best to have the pavement at the sides, that carters may walk either on or near the footpaths, and that foot-passengers may not be incommoded by the dirt of the metalled road.

In Holland, pavements of brick, which are also probably derived from the practice of Roman engineers, are extensively used, not only for footpaths, but also for the passage of light vehicles, which run on them with great facility. The bricks used for this purpose are thin, and well bedded in lime.

Common stone pavements are, by most writers, divided into two classes: *rubble* causeway, in which the stones are of irregular shape, and very imperfectly dressed with the hammer; and *aisler* causeway, which is formed of stones of larger size accurately squared and dressed. In both kinds the excellence of the pavement depends greatly on the firmness and evenness of the bed, and the careful fitting of the stones to each other, which may be accomplished with very irregular stones by judicious selection. If one stone be left a little higher or lower than those adjoining it, or if it become so in consequence of defective bedding, the jolting of carriages in passing over the defective place will quickly damage the pavement; the wheels acting like a rammer in driving the depressed stones deeper into the earth, while the derangement of the lateral support that each stone should receive from those adjoining it, occasions the dislocation of the pavement to a considerable distance, and the consequent working up of the earth through the disturbed joints. Defective joints form another fruitful source of injury and inconvenience both to the pavement itself and to the vehicles jolted over it. If, as is often the case in inferior pavements, the edges of two adjoining stones do not meet with accuracy, narrow wheels will have a tendency to slip into the joint, and by doing so, to wear the edges of the stones, till, as may be frequently seen, the surface of each stone is worn into a convex form that renders the footing of horses insecure, and causes the motion of vehicles drawn rapidly over them to consist of a series of bounds or leaps from one stone to another, accompanied by a degree of lateral slipping highly injurious to the carriage, while the irregular percussion produced tends greatly to the destruction of the pavement.

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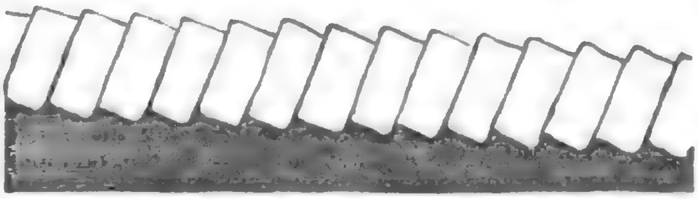
* Herm is an island adjoining Guernsey.

† A whinstone from Northumberland. All the rest are granites.

In order to procure a firm foundation, and to prevent earth from working up between the stones, it is advisable in the first instance to form a good carriage-way of gravel or broken stone, and to allow it to be used by carriages till consolidated, before laying the pavement. This plan is stated by Edgeworth, in his 'Essay on the Construction of Roads and Carriages,' 1817, to have been practised successfully by Major Taylor, of the Paving-Board, in some pavements in Dublin, and it is strongly advocated by more recent road-makers. Where broken stone is laid to a considerable depth, it should, as in the case of metalled roads, be applied in thin layers, each being separately worked into a compact state. The new pavement laid a few years since in Fleet Street affords an illustration of the necessity of this precaution, as the stones were well shaped, laid, and grouted, and the earth was removed to the depth of from twelve to eighteen inches, its place being supplied by broken stone; but the broken stone, being thrown in by cart-loads, and merely levelled, was not united into a compact mass, and therefore very soon gave way, causing the pavement to sink into hollows. In streets of very great traffic, it is a good plan to lay a sub-pavement of old or inferior stones, bedded on broken stone, as a foundation for the surface pavement, a measure which has been practised with advantage in Paris. The bed of the pavement should be formed into a slight convexity, the slopes being about two inches in ten feet. A thin coat of gravel or sand laid immediately under the paving blocks is of use in filling up slight irregularities in their shape, and enabling them to form a compact bed.

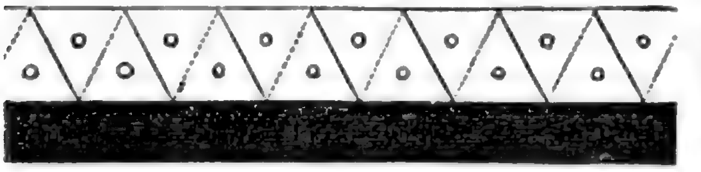
For the paving stones hard rectangular blocks of granite are preferred, though whinstone, limestone, and even freestone, may be used. Guernsey granite, as shown by the table in a previous column, appears to be the most durable, but it is more liable to become inconveniently smooth than some stones of inferior hardness. The stones may vary, according to the traffic, from six to ten inches deep, six to eighteen inches long, and four to eighteen inches wide; but it is very essential that the depth of all the blocks in one piece of pavement should be alike, and that where the width is unequal, the stones be so sorted that all used in one course are uniform in this particular. The accurate dressing of the stones is a point often too little attended to; and an injudicious mode of forming contracts for paving, in which the payment has been by the square yard of paving laid, has, in connection with the effect of competition in bringing prices below the remunerating point, led to the use of stones in which the base is smaller than the upper surface, and which, when laid, scarcely come in contact with each other except at their upper edges. In some pavements the stones are made smaller at the top than the bottom, the joints being filled up with stone-chips, concrete, or an asphaltic composition; and in those of the more common construction the sides of the stones are occasionally hollowed, so as to receive a small quantity of gravel or mortar, which serves as a kind of dowelling. Ramming the stones with a heavy wooden rammer is a practice that has been much recommended, and it is considered that a more efficient application of the process, by means of a ramming-machine, or *portable monkey*, would remove some of the defects arising from imperfect bedding; but when the stones are well laid, and bedded in strong mortar, as the best recent pavements are, a few blows with a wooden maul of about fourteen pounds weight are sufficient to fix them firmly in their place. Grouting with lime-water poured all over the pavement facilitates the binding of the whole together, and fills up the joints, so as to effectually prevent the working up of the substratum. The blocks are commonly laid in rows across the road, the joints in each row being different from those of the adjoining ones; but pavements of superior smoothness have been laid in courses stretching diagonally across the street, by which means all the joints are passed over by carriages with greater ease. This arrangement is particularly desirable at the intersection of streets, as it diminishes the risk of horses slipping. Longitudinal courses are objectionable on account of the tendency of narrow wheels to enter the joints. In paving steep inclinations, it is well to use narrow stones, on account of the number of cross joints; or, if large stones be used, to cut deep furrows across their surface, to afford secure footing. A plan of paving for such situations, which has been found very effectual, is represented in the annexed diagram, in which the stones are so inclined as to present a series of steps. The chief objection to this plan seems to be the jolting caused to carriages, which produces so deafening a noise that, in a recent instance, such a pavement was taken up at the request of the inhabitants of the street. Many patents have been procured for plans of forming stone pavements in which the pressure of carriages might be simultaneously distributed over several stones, by various contrivances for dovetailing and otherwise fitting the stones together; but such plans are generally too complicated, requiring an accuracy of formation that would be very expensive, owing to the hardness of the stone. Thin blocks of stone, bedded in asphalte, have been tried, and appear to make a good pavement.



When completed, a thin coat of gravel spread over the surface is useful in diminishing the effect of the jolting of carriages on the new pavement. In case of taking up any part of a pavement to attend to water-pipes, &c., great care is necessary in relaying the part, in doing which it is well to apply some fresh broken stone to the bed, and to lay the paving stones without mortar, until the foundation is settled.

The serious defects of the common stone pavements have led to a variety of experiments on other methods of forming carriage-ways suitable for streets, of which the adoption of broken stone, or macadamised roads, has been the most general. Opinions differ widely as to the propriety of this measure, but an idea seems to be gaining ground that the comparative quietness of such a road, and its superior ease to passengers, are insufficient to counterbalance the increased draught of carriages, the dust of summer, the mud rapidly formed in wet weather, and the great expense of keeping in repair a metalled road when subjected to the constant wear of a busy town. The first cost of forming the broken-stone roads of Regent Street, Whitehall, and Palace Yard, extending to a total length of 2010 yards, and embracing 45,251 superficial square yards, was 6055*l.* 8*s.* 3*d.*, and the estimated value of the old pavement taken up and broken for the purpose was 6787*l.* 7*s.*, making a total of 12,842*l.* 15*s.* 3*d.*; and the cost of keeping them in repair for the year ending January 5, 1827, was 4003*l.* 18*s.* 4*d.*, besides 628*l.* 11*s.* for watering, making the total expense for the year 4632*l.* 9*s.* 4*d.*, or rather more than two shillings per superficial yard.

The enormous expense of maintaining some of the metalled roads in London has recently led to much attention being given to the construction of superior pavements, and various plans of paving with wood have been tried, with great promise of success. A very coarse kind of wooden road, consisting of rough logs laid close together across the track, is much used in North America, under the name of *corduroy roads*, but the wooden pavement, properly so called, seems to have been first used in Russia, and tried on a limited scale at Vienna, New York, and some other places within a few years. One of the earliest kinds used consists of blocks of fir or other wood cut into hexagonal cylinders, of six or eight inches diameter, and from eight to twelve or fifteen inches deep, and placed close together, with the grain vertically. The blocks are sometimes tarred, or may be kyanised; but even where no such precaution is used, the wear is very trifling, as the swelling of the wood from moisture makes the joints very tight and impervious to water. Such a pavement is very smooth when first laid, but, unless the foundation be very carefully prepared, it is liable to sink into hollows like the common stone pavement, owing to the want of cohesion between the individual blocks, a deficiency which it has been proposed to remedy by pegging or dowelling the pieces together, though their form is not very suitable for the purpose. Some specimens have been laid on a flooring of planks, to avoid this inconvenience. Of the numerous other plans proposed, but one has yet been tried on an extensive scale, and it appears likely, in point of smoothness, quietness, cleanliness, and ease of draught, to prove the best of metropolitan pavements. In it the blocks are sawn into a rhomboidal shape, the upper surface forming an angle of about 63° with the direction of the grain, by which the durability of an end section is in a great degree preserved, while the inclination of the sides causes each block to receive support from those adjoining it, and affords facilities for pinning the whole pavement together by pegs. The following diagram may serve to illustrate this ingenious arrangement, which is the invention of the Comte de Lisle.



The solid lines represent part of one course or transverse row of blocks, which all incline in one direction, each block having on one side two projecting pegs, and on the other two holes. The adjoining course is laid in like manner, but sloping in the opposite direction, as indicated by the dotted lines, by which disposition the two pegs on one side of a block enter two distinct blocks in the adjoining row, while the holes on the other side receive in like manner the pegs of two other blocks; so that each block is pinned to four others, besides receiving support from the adjoining blocks of its own course. Where this principle of construction is fully carried out, the whole pavement of a street becomes, as it were, one mass, being so pinned together that no block could be raised without breaking the dowels; but as it is necessary sometimes to disturb the pavement in order to get at the gas and water pipes, some specimens have been laid down in masses of twenty-four or thirty-six blocks, so united by iron clamps that the blocks thus connected together may be laid down and taken up, when necessary, at once. The pavement laid down on this plan in Oxford Street is all pinned together in the manner first described, and consists of blocks six inches deep laid on a well-formed concrete foundation.

As far as a judgment can be formed at present, wood pavements appear likely to prove exceedingly durable; and it is stated by Mr. Finlayson, who in 1825 suggested the adoption of wood for paving the streets of London, that a few blocks of wood placed vertically in a granite pavement were less reduced by twenty-five years' wear than the stone itself. The principal disadvantage of wood appears to be its becoming slippery in wet weather, to obviate which, in some instances, the upper edges of the hexagonal blocks have been bevelled, so as to form zigzag grooves when laid down; but the most effectual plan seems to be to cut straight grooves along the centre of each block, by which the stability of the joints is not at all affected.

Another description of road that has lately attracted much attention is that consisting of an asphaltic composition. Many attempts have been made to form roads of gravel and other materials united by animal oleaginous or gelatinous substances, or coal-tar, into a kind of concrete; but such attempts have seldom proved successful on a large scale. Mineral substances of similar character have been found more advantageous, and the native asphalte procured near Seyssel, in the department of l'Ain, and some other places, has been found to produce, when mixed with a small portion of native bitumen, a substance admirably adapted for the formation of smooth roads, and a variety of other important purposes. Its application to carriage-ways has been in this country chiefly confined to court-yards, for which, as well as for terraces and footpaths, it is very suitable. The asphaltic mastic of Seyssel, as prepared for use, consists of ninety-three parts of native asphalte reduced to powder, and seven parts of bitumen; the two being melted together, and a little fine gravel or sand stirred in with the mixture. The composition is ready for use when it simmers with a consistency similar to that of treacle, and it is spread while hot so as to form a coating about an inch thick upon a levelled foundation of concrete. The thickness of the asphalte is regulated by slips of wood or iron, which are often so disposed as to divide the pavement into ornamental compartments, the asphalte being made of various colours by the admixture of different kinds of sand or other substances. Where the ornamental character of the pavement forms a distinguishing feature, beautiful imitations of mosaic work may be executed with asphalte. The genuine asphalte possesses a degree of elasticity that renders it exceedingly durable; but artificial compounds in imitation of it generally require too much bitumen, and are injuriously affected by great changes of temperature. Some experiments have been made, but, as far as the writer is aware, with very indifferent success, on the formation of carriage-ways with large blocks of asphaltic composition containing a considerable quantity of gravel or broken stone.

Foot-pavements of flagstones require very little remark. The curb-stones should be very hard, and firmly set in cement on a bed of gravel. They usually rise about six inches above the surface of the carriage-way, which may be made to abut immediately upon them, without the intervention of a gutter. Where gutters are introduced, those of cast-iron are to be preferred. The flagstones, which should never be less than two inches and a half thick, are commonly bedded in mortar on a layer of gravel; but sometimes, when there are no cellars underneath, are laid dry. The appearance of many of the new streets of London is greatly improved by the use of flagstones of extraordinary dimensions, extending the whole width of the pavement; and a similar appearance at much less cost may be obtained by the use of asphalte. A slight degree of slope should be given to the pavement, to conduct water to the gutters, for which purpose a fall of one inch in ten feet is sufficient, while a steep inclination is objectionable from its danger in slippery weather.

Among the substitutes for common flagstones that have been recommended, may be mentioned slate, which appears to be very durable. Some pavements or floors of this material have been laid at the London Docks, where, among other advantages, it is found preferable to wood in point of cleanliness. Trackways of slate two inches thick are found strong enough to bear waggons or carts with four or five tons of goods; and some are laid of only half that thickness on an old wooden floor.

(A 'Treatise on Roads,' &c., by Sir Henry Parnell, of which a second edition was published in 1838, may be consulted with advantage by those desirous of obtaining further information on the theory and practice of road-making. The works of Mc. Adam, Edgeworth, and several others; and the various Parliamentary Reports relating to roads from the commencement of the present century, as well as those of the Holyhead-road Commissioners, also contain much valuable matter on this subject.)

It may be interesting to add a concise statement of the extent of turnpike and other roads in each of the counties of England and Wales, condensed from the Appendix to the 'Report of the Commissioners for inquiring into the State of the Roads in England and Wales,' 1840. Owing to the difficulty of obtaining complete returns from some districts, the statement can only be received as an approximation to accuracy: and this circumstance, combined with some difference in the kinds of road embraced in the returns of different years, must account for some discrepancies. The returns being given for two periods, with an interval of about twenty-five years, afford data for calculating the extension of the roads in each county; and the addition of a column, stating the area of the county in square miles, tends to show the proportion borne by the extent of the highways to that of the district. The columns giving the mileage for 1812-13-14 show the average of the returns for those years, a circumstance which must account for a want of agreement between the items and the totals. It must be observed also that paved streets are embraced with turnpikes in this statement, and not in that for 1839.

From the same document it appears that the average cost of maintaining the turnpike-roads, amounting to about 22,000 miles, has been, for the last five years, 989,545*l.* per annum, or 45*l.* per mile per annum, including the estimated value of the statute duty performed on them. Of this sum about 36*l.* per mile has been expended on mere repairs, and 9*l.* per mile on improvements. The money expended on management is about 129,124*l.* annually, being nearly 6*l.* per mile, and raising the total annual expense to nearly 51*l.* per mile. The number of trusts is about 1116, averaging 19 miles, 5 furlongs, 28 poles, and 1 yard each; the number of toll-gates and side-bars about 7796, and of surveyors 1300. Of the parish highways, extending rather more than 104,770 miles, the average annual cost of maintenance, by highway rates, is about 11*l.* 3*s.* per mile; and the number of parochial surveyors or waywardens about 20,000.

Table showing the number of miles of turnpike-roads and other highways in England and Wales:—

COUNTY	Average of 1812-13-14. Paved Streets and Turnpikes.	Average of 1812-13-14. Other Highways.	1939. Turnpikes.	1939. Other Highways.	Area in Square Miles.
	Miles.	Miles.	Miles.	Miles.	
Bedford . .	163	667	215	715	463
Berks . .	233	1,335	210	1,419	752
Buckingham .	211	1,287	196	1,445	738
Cambridge .	239	834	205	1,001	857
Chester . .	506	1,602	531	2,357	1,052
Cornwall . .	291	3,530	340	3,734	1,330
Cumberland .	167	1,834	383	2,015	1,523
Derby . .	637	1,696	607	1,978	1,028
Devon . .	776	5,936	968	6,898	2,585
Dorset . .	308	1,696	475	1,761	1,006
Durham . .	349	1,318	490	1,508	1,097
Essex . .	320	2,813	282	3,113	1,533
Gloucester .	636	2,403	976	2,525	1,258
Hants . .	497	3,044	621	3,199	1,625
Hereford . .	456	1,195	505	1,374	863
Hertford . .	195	1,336	230	1,475	630
Huntingdon .	139	357	125	378	372
Kent . .	585	3,554	651	4,194	1,557
Lancaster . .	739	2,977	739	3,523	1,766
Leicester . .	340	1,401	367	1,597	806
Lincoln . .	492	3,933	495	4,620	2,611
Middlesex . .	304	666	173	675	282
Monmouth .	265	772	215	1,114	496
Norfolk . .	373	4,384	348	4,501	2,024
Northampton .	354	1,547	413	1,638	1,016
Northumberland	458	2,322	399	2,203	1,871
Nottingham .	312	1,330	335	1,412	837
Oxford . .	303	1,133	325	1,177	756
Rutland .	63	245	68	267	149
Salop . .	713	2,252	761	1,876	1,343
Somerset . .	817	3,165	930	3,724	1,645
Stafford . .	702	2,103	760	2,476	1,184
Suffolk . .	322	2,962	281	3,235	1,515
Surrey . .	248	1,508	282	1,416	759
Sussex . .	558	2,333	678	2,368	1,466
Warwick . .	431	1,813	463	1,814	897
Westmoreland .	194	738	210	809	762
Wilts . .	589	2,263	628	2,336	1,367
Worcester . .	443	1,409	391	1,426	723
York, E. Riding	244	1,944	1,684	1,858	1,119
City and Ainsty	—	—		142	86
N. Riding .	647	2,331		2,790	2,055
W. Riding .	946	4,054		4,674	2,576
Total of England	17,500	86,100	18,955	94,760	50,380
Anglesey . .	26	471	110	483	271
Brecknock .	169	727	185	850	754
Cardigan . .	141	687	222	836	675
Carmarthen .	356	1,158	507	1,440	974
Carnarvon. .	116	552	160	668	544
Denbigh . .	178	1,061	109	1,068	633
Flint . .	139	413	229	463	244
Glamorgan .	292	1,174	591	1,277	792
Merioneth .	206	393	238	420	663
Montgomery .	356	961	299	824	839
Pembroke . .	136	1,019	97	1,205	610
Radnor . .	76	410	260	478	426
Total of Wales .	2,200	9,000	3,007	10,012	7,425
Total of England and Wales .	19,700	95,100	21,962	104,772	57,805

Respecting the roads of Scotland and Ireland there do not appear to be published data for an equally minute statement. The following account of the number of miles of turnpike-roads in each county in Scotland, given on the authority of a paper presented to a Committee of the House of Lords in 1833, shows their total length to be 3666 miles, which, divided by 190 the number of trusts, indicates the average length of each trust to be about three furlongs less than in England and Wales:—

County.	Miles.	County.	Miles
Aberdeen . .	232	Lanark . . .	374
Ayr . . .	486	Linlithgow . .	117
Banff . . .	123	Nairn . . .	9
Berwick . .	126	Peebles . . .	113
Clackmannan .	71	Perth . . .	225
Dumbarton . .	57	Renfrew . .	195
Dumfries . .	251	Roxburgh . .	193
Edinburgh . .	273	Selkirk . . .	23
Elgin . . .	26	Stirling . . .	158
Forfar . . .	131	Wigton . . .	51
Haddington . .	120		
Kincardine . .	96	Total . .	3,666
Kirkcudbright .	216		

ROANNE, a town in France, capital of an arrondissement in the department of Loire, 238 miles south-south-east from Paris by the road through Fontainebleau, Montargis, Nevers, and Moulins.

It is mentioned by Ptolemy, and in the Peutinger Table; its Latin name appears to have been variously written Rodumna and Roidumna; it belonged to the Segusiani. In the middle ages it gave name to a district, Roannais, but had sunk into insignificance at the beginning of the last century, from which commerce has since revived it.

The town stands in a tolerably fertile district on the left or west bank of the Loire, which here begins to be navigable up and down the stream; boats can descend from St. Rambert, more than 40 miles above Roanne, but they cannot ascend. The town has never been walled; the houses extend in every direction into the country, becoming less crowded as they diverge, and as they are not very lofty the place presents the aspect of a large village rather than of a town. The interior is well laid out, with wide and straight streets and well-built houses. Several of the genteel families of the surrounding district have fixed their residence at Roanne. There is a fine wooden bridge over the Loire, and a good quay along the river. The church is a very inferior building, but the college is handsome; and there are good inns, a fine hospital, a handsome theatre, and public baths.

The population, in 1831, was 8890 for the town, or 9260 for the whole commune; in 1836 it was 9910 for the commune. There are manufactures of woollen, cotton, and linen yarn or thread, woollen cloths, muslins, calicos, and other cottons, leather, glue, and earthenware; there are some dye-houses. The trade is considerable, being carried on not only by the Loire, but by the lateral canal to that river, which extends from Roanne to Digoin; it comprehends the manufactured goods of Lyon, which are sent here on their way to Paris, the coals of the coal-field of St. Etienne, the wines and other produce of the neighbourhood and of other parts of the south of France, and the imports from the Levant. Some of the wines grown round the town are of fair quality, but the greater part are ordinary. Many boats are built here for carrying on this traffic.

The town has a college or high school, with a cabinet of natural philosophy attached to it, a public library, a subordinate court of justice, and some fiscal government offices.

The arrondissement has an area of 688 square miles, and comprehends 108 communes; it is divided into ten cantons or districts, each under a justice of the peace. The population, in 1831, was 121,817; in 1836 it was 124,871.

ROBBERY is theft aggravated by the circumstance of the property stolen being taken from the person, or whilst it is under the protection of the person, of the owner or other lawful possessor, either by violence or putting in fear. This offence appears to have been formerly confined to cases of actual violence to the person, but in later times it has been extended to constructive violence by putting in fear, and not only to cases where property has been taken or delivered under a threat of bodily violence to the party robbed or to some other person, but also where the fear has resulted from apprehension of violence to his habitation or to his property, or where it has been occasioned by threats of accusing the party of the commission of an infamous crime.

Robbery was formerly regarded not as an aggravation of the crime of theft, but as a distinct and substantial crime. Latterly however robbery has been treated as an aggravation of theft, and it has been held that if, upon the trial of an indictment for larceny, it appear that the taking amounted to a robbery, the party may nevertheless be convicted of the larceny charged.

The stealing is said to be by violence when it is effected by doing any injury, however slight, to the person of the party robbed, or when the act of taking is accompanied by any degree of force for the purpose of overcoming resistance. A snatching or taking of property suddenly or unawares from the person without some actual injury to the person does not amount to robbery. If violence be used, it is sufficient to constitute robbery, although resorted to under the colour of executing legal process or of the exercise of some other lawful authority. It is not essential to the offence of robbery that the violence should have been at first used for the purpose of obtaining the property, provided the violence be unlawful and the property is yielded up, or permitted to be taken, in order to prevent further violence.

Stealing is considered to be effected by threat of violence to the person, when possession of the thing stolen is obtained by any threat, menace, or other act calculated to excite fear or apprehension of violence, present or future, to the person of the party threatened or of any other party in whose welfare the party to whom the threat is addressed may feel interested. It is immaterial whether the threat, &c. be direct or indirect, or whether conveyed by words, gestures, or signs, or whether made under pretence of lawful claim or of acting under legal process or other lawful authority, or of asking charity, or of making a purchase, or under any other pretence. The existence of actual fear in the mind of the party robbed is not material, provided the act of stealing be accompanied by such threats or other acts as are calculated to create the expectation that force will be used in case of resistance. Where no actual violence is employed, and the threats, &c. used do not create any apprehension of violence or expectation that force will be resorted to in case of resistance, or if such apprehension or expectation has ceased to exist at the time when the property is taken, the offence of robbery is not committed. If property be taken by violence or by threats, &c., it is robbery, although the owner may have voluntarily exposed himself to the attack for the purpose of apprehending the offender. (*Fourth Report of Commissioners on Criminal Law.*)

At common law, robbery was a felony punishable by death, without regard to the quantity or value of the property stolen. The offender however was entitled to benefit of clergy [BENEFIT OF CLERGY], until this advantage was taken away in cases of robbery, under different circumstances of aggravation, by several statutes.

The offender was liable to be punished at the suit of the king after a trial upon an indictment, and, in certain cases, when taken in the very act, upon a trial without indictment. The party robbed also was entitled to bring his criminal action or appeal [APPEAL] against the robber, for the purpose as well of punishing the offender as of obtaining restitution of the property stolen. If the appellee waged battle, the combat took place between the appellor and appellee in person, as no champions were allowed in appeals of robbery. Though the appellor was always bound to offer to prove the offence charged by his body, the appellee was not obliged to accept that mode of trial. Thus in the Pleas of gaol delivery at Shrewsbury, in October, 1224, we find this entry, 'Robert de Haddeleg appeals Roger de Hybernia, for that whereas on the day of St. James the apostle he was coming through Trumpeleg between Bruges (Bridgnorth) and Worcester, came the said Roger and took him and bound him, and wickedly and in robbery, and against the king's peace, took from him 15½*d.* of bread. And Roger denies (defendit) the felony and robbery, and says that he did nothing against the king's peace, and he puts himself upon the township of Shrewsbury, where he resided two years, and upon the town of Bruges, and upon lawful men near Trumpeleg, for good and evil. And 16 men of Shrewsbury and 6 of Bruges with the men of the neighbourhood say upon their oath that they do not mistrust him of (non male credunt ei) of that robbery. Therefore let him be delivered; and let him go out of the lands of the lord the king unless he can find pledges. And he could not find them. Therefore let him go out. And he chose the port of Dover.' (*Placitorum Abbreviatio*, 104, b.)

The party robbed may without any formality retake his goods wherever he can find them, unless they have been waived or thrown away by the robber during his flight, or seized by the officer of the king or of the lord of the franchise, or sold in open market. [MARKET, p. 423.] But after such waiver, seizure, or sale, the owner cannot retake them of his own authority. Where there has been no improper neglect to prosecute, the party will in general be entitled to his writ of restitution. This at common law could be obtained only upon the successful prosecution of a writ of appeal. But by 21 Hen. VIII., c. 11, the court before which a party is convicted of robbery or of larceny upon an indictment, is authorised to award writs of restitution for the money, goods, or chattels stolen, in like manner as though the felon or felons were attainted at the suit of the party in an appeal. Restitution of stolen goods, whether taken by robbery or by larceny, is now regulated by 7th and 8th Geo. IV., cap. 29, sect. 57. [RESTITUTION.] The party robbed cannot sue for the goods stolen or their value against the robber or any person who may have acquired the goods stolen from the robber, unless he has done all in his power to bring the offender to justice.

By the statute of Winton, passed in 1284, the inhabitants of hundreds in which robberies take place are made answerable for the value of the property stolen, if they have not taken the offenders within a certain time after the offence.

To entitle the party to this remedy he must, in his action against the hundred, show that he was robbed in the daytime or while there was sufficient light to distinguish a man's countenance, that he was robbed openly, as on the highway, or in a lane or wood, or some other open place, and not in a dwelling-house, which a man is expected to defend at his own peril, that he was robbed in the hundred named in the declaration, but whether in the vill or parish named, or in some other vill or parish, is not material, and, if robbed on a Sunday, that he was not travelling at the time, the statute passed in the reign of Char. II. for the better observance of that day having expressly enacted 'that if any person who shall travel on the Lord's day shall be then robbed, the hundred shall not be answerable for the robbery so committed.' The plaintiff is also bound to show that he has given certain notices, and has submitted himself to examination before a justice of the peace, as required by different statutes. (2 Saunders's *Reports*, 374; 4 Mann. and Ryl. 130; 9 Barn. and Cress., 134.) And by 22 Geo. II., c. 24, the hundred is not to be liable beyond 200*l.*, unless the person or persons robbed shall at the time of the robbery be together in company, and be in number two at the least, to attest the truth of the robbery.

Under 7 Wm. IV. and 1 Vict., c. 87, s. 5-10, robbery is punishable by transportation for life or for any term of years not less than seven, or by imprisonment for any term not exceeding three years, and for any period of solitary confinement during such imprisonment not exceeding one month at a time, or three months in the space of one year, at the discretion of the court or judge, by or before whom the offender may be tried; but by sect. 4, where the robbery is effected by threatening to accuse the party of an infamous crime, the period of transportation is for life or for a term not less than 15 years. By the same statute, sect. 6, assaulting with intent to rob, and, by sect. 7, demanding any property of any person by menaces or by force, is made felony punishable by imprisonment not exceeding three years.

By the same statute, sect. 2, the punishment of death is imposed upon the offence of robbing any person, and at the time of or immediately after such robbery stabbing, cutting, or wounding any person.

Upon an indictment for robbery, as well as for any other felony which includes an assault upon the person, the jury are authorised by 7 Wm. IV. and 1 Vict., c. 85, sec. 11, to acquit of the felony, and to find a verdict of guilty of assault, against the party indicted, if the evidence will warrant such finding; for which assault the party may be sentenced to imprisonment for any term not exceeding three years.

ROBBERY, in the Roman law, was called Rapina, and the remedy of the injured person was the actio vi bonorum raptorum against the robber, which was given by the edict. Robbery was, in fact, a species of Furtum; for the definition of furtum was, 'a fraudulent carrying-off (contrectatio) of a moveable thing against the owner's consent.' The word 'fraudulent' comprehended the notion of a person carrying off the thing for the purpose of making it his own. Rapina only differed from Furtum in being effected by force.

Furtum was committed in various ways, besides by taking another person's property. A debtor committed furtum, if he fraudulently carried off a thing which he had pledged to his creditor. It was furtum to use a thing that had been lent, for a different purpose from that for which it had been lent. Furtum was either manifestum or nec manifestum. It was furtum manifestum beyond all doubt when the thief was caught in the act; but there was a difference of opinion as to whether it was furtum manifestum or nec manifestum in a variety of cases. According to some writers, it was furtum manifestum if the thief was taken with the thing before he had reached the place to which he intended to carry it. Furtum which was not manifestum was nec manifestum. The Twelve Tables made the punishment of furtum manifestum a capital offence, that is, an offence the penalty for which affected a person's caput or status. The edict changed this into an actio quadrupli. The remedy in the case of furtum nec manifestum, which the Twelve Tables gave, was an actio dupli, which the edict retained. All persons could have the actio furti who had an interest in the preservation of the stolen thing: consequently others besides the owner might bring the action, a bailee for instance: and sometimes the owner could not bring it, as in the case of bailment, provided the bailee was a responsible person. If he was a responsible person, he was bound to make good the loss to the owner, and consequently could bring the action, and the owner could not. Condemnation in an actio furti was followed by infamia.

The owner of the thing might also bring his action for the recovery of the thing itself or its value.

The law of the Twelve Tables permitted a person to kill a thief who was detected in the act of theft in the night; and a thief might be killed in the day-time, if he defended himself with any weapon (telum). But the severity of the old civil law was gradually mitigated by the edict, and the offence of theft was, as already observed, only punishable by an action of furtum, and the consequent pecuniary penalties.

The actio vi bonorum raptorum originated in the civil wars of the later republican period, and its object was not so much to repress robbery as all acts of violence committed by bands of armed men. Accordingly its terms comprehended those who carried off any thing (quid rapuerint), or committed any damage to property (damnum) in armed bodies (armati coactique). It appears that under the empire, when order was established, the provision against armed men was not wanted, and the word *armati* seems to have been dropped from the edict. Still the edict was directed against *assemblages* of men, and it became of comparatively little use in the peaceful times of the empire. Accordingly the jurists were led to make the discovery that the edict applied to individuals as well as to bodies of men, and thus ultimately an action might be maintained under the edict against a single person who committed damnum or rapina. Finally, damnum, against which the edict was originally mainly directed, disappeared from the edict, as we observe in the Institutes and the Code, and the action was reduced simply to an actio vi bonorum raptorum.

The Roman law of furtum is stated in Gaius, iii. 183-209. The following references will be useful: *Dig.*, 47, tit. 2; *Inst.*, 4, tit. 1; Savigny, *Zeitschrift*, &c., vol. v., *Ueber Cicero pro Tullio*, &c.; Dirksen, *Uebersicht der Zwölf Tafeln Fragmente*.

ROBERT I. of Normandie. [Normandie.]

ROBERT II. of Normandie. [Normandie.]

ROBERT, king of France, was elected king on the death of his brother Eudes, by that party of the French who rejected the claims of Charles le Simple. [Charles III.] He was recognised as king in an assembly of his partizans, held at Soissons (A.D. 922), and consecrated in the church of St. Remi, at Reims, by the archbishop of Sens. He fell in battle against his competitor Charles le Simple, near Soissons, 15th of June, 923, having reigned scarcely a year. He was grandfather to Hugues Capet, founder of the third or Capetian race of French kings.

ROBERT, king of France, surnamed *le Sage* (the wise), and *le Dévot* (the devout), was son of Hugues Capet, whom he succeeded on the throne, A.D. 996. He was born about A.D. 970, and had been twice crowned in the lifetime of his father; at Orléans, A.D. 988, and at Reims, A.D. 991. The character of Robert was devoid of shining qualities, but he was a prince of upright and peaceable disposition. Early in his reign France was afflicted by a scarcity of four years continuance, arising from the failure of the harvests, and the scarcity was followed by a pestilence, which again appeared in 1010, and a third time in 1030-33. These calamities are said to have reduced the population of France a third.

Robert was early embroiled with the church: he had married (A.D. 995) Berthe or Bertha, widow of Eudes, count of Blois, but there were some difficulties as to the lawfulness of the marriage, for which Pope Gregory V. refused a dispensation, and declared the marriage void. The king refused obedience, in consequence of which he was excommunicated; and it is said that under this terrible sentence his palace was deserted by all except two menials, who after every meal purified by fire the utensils employed at the royal table. Robert at length yielded; he put away Bertha (A.D. 998), and married Constance, daughter of the count of Toulouse, an imperious and vindictive woman, but one of the greatest beauties of her time. Robert and Constance may be compared in point of character to Henry VI. of England and his consort Margaret of Anjou.

In A.D. 1002, Robert engaged in a war to secure the succession of the duchy of Bourgogne, of which he was lawful heir; and, being supported by Richard, duke of Normandie, succeeded, after a struggle of thirteen years (A.D. 1002-15), in gaining possession of it. He bestowed it on his son Henry. In A.D. 1006 he marched to the assistance of the count of Flanders, one of his great vassals, attacked by the emperor Henry II., who was obliged to retire. Peace was concluded next year between the two princes.

Robert possessed a taste for music, and, prompted by this, as well as his devotional temper, frequently led the choir of St. Denis, and composed hymns for monastic use. He is charged with lavishing his treasure upon mendicants, conniving at thefts from his own person, and truckling to the fierce and cruel temper of his queen, who presumed so far on his tameness as to procure his favourite, Hugues de Beauvais, to be murdered in his presence.

Robert visited all the shrines in France, and went to Rome (A.D. 1019) to visit the tombs of the Apostles; perhaps also, as some have supposed, with the view of inducing the pope to annul his marriage with Constance, and to sanction his reunion with his first wife, Bertha.

He persecuted the Jews, and procured, in a council held, A.D. 1022, at Orléans, the condemnation of some priests charged with heresy, which was described as 'Gnosticism,' or 'Manicheism,' but the true character of which it is not easy now to ascertain. They were brought to the stake at Orléans, and Constance, with characteristic ferocity, struck out the eye of one of the sufferers, formerly her own confessor, as he passed her in the way to execution.

However Robert may have been led astray by the superstitious and persecuting spirit of the age, his moderation and love of peace were exemplary. He mediated between the duke of Normandie and the count of Chartres, who were engaged in hostilities, and obtained the confidence of the emperor Henry II., who visited him in his camp (A.D. 1023). On the death of this emperor, he refused, both for himself and his son, the crown of Italy, which was offered him by the malcontents of that country.

His eldest son, Hugues, to whom he had given the title of king (A.D. 1022), provoked by the cruelty of his mother, broke out into rebellion, but being taken and delivered up to the king, was pardoned. He died however soon after (A.D. 1026). Henry, his next son, was then associated with him in the royal title, in spite of the endeavours of Constance, who espoused the interest of Robert, the third son. Robert took up arms against his father, but his rebellion was suppressed. Shortly after quiet was restored King Robert died, at Melun (A.D. 1031), sincerely regretted, as it appears, by his subjects. 'While Robert was king,' said they, 'while he governed us, we have lived in security and have feared nobody.' He was buried at St. Denis.

ROBERT I., king of Scotland. [Bruce, Robert; Bannockburn.]

ROBERT II., king of Scotland, the first of the House of Stewart who reigned in that country, was born 2nd of March, 1316, and was the only child of Walter, the Stewart of Scotland, and his wife Marjory, daughter of King Robert Bruce, to whom he had been married the preceding year. All that is known of the House of Stewart previous to this date is, that a Walter, son of Alan, was Stewart or *Dapifer* of Scotland in the reigns of David I. and Malcolm IV.; that he was succeeded in that high office by his son Alan; this Alan by his son Walter; Walter by his son Alexander, who was one of the regents appointed during the minority of Alexander III., and who, in 1263, commanded the Scottish army at the battle of Largs; Alexander, by his son James, who was regent after the death of Alexander III., and died in 1309 at the age of sixty-six; and he, by his son Walter, the father of Robert II. This Walter was one of the commanders of the Scottish army at the battle of Bannockburn; and early in the following year, 1315, Bruce gave him in marriage his daughter and then only child Marjory, upon whom, provided she should marry with the consent of her father, or, after his death, with the consent of the majority of the community (or states) of the kingdom, the crown had been settled, failing the heirs male of her father and of his brother Edward, in a parliament held at Ayr on the 26th of April in that same year. Robert was the only issue of this marriage. Lord Hailes (*Annals of Scotland*, vol. ii., Appendix i.) has sufficiently refuted the tradition that Marjory was killed by being thrown from her horse when big with child, and that Robert was brought into the world by the Cæsarean operation; but it appears that she died either in giving birth to the infant or soon after her delivery. Her husband died 9th April, 1326, after having had another son, Sir John Stewart of Railstone, by a second marriage with a sister of Graham of Abercorn.

Bruce was succeeded by his son David II., born of a second marriage, 5th March, 1324; and his unfortunate reign—marked by a long minority and a succession of regencies, during which the kingdom was overrun by Edward Balliol and his ally Edward III., and David was obliged to make his escape to France, and after that by the defeat of Neville's Cross, when David was taken prisoner by the English—fills up the interval from 1329 to 1371. Robert, the Stewart, acted a principal part throughout this reign, and was as much distinguished by his personal merits and conduct as by his high rank. While yet only a youth of sixteen, he commanded the second division of the Scottish army at the decisive battle of Halidon, fought, and lost by the Scots, 19th July, 1333; and after that fatal day he was one of the first to uplift again the standard of the national independence. In 1334, he and the earl of Moray assumed the regency of the kingdom, and, although not formally invested with the government by any assembly of the states, were recognised by the people as entitled, in the infancy and exile of the king, to wield all the authority of the crown. Fordun's description of the Stewart at this time, as Lord Hailes translates the passage, is as follows:—'He was a comely youth, tall and robust, modest, liberal, gay, and courteous; and, for the innate sweetness of his disposition, generally beloved by true-hearted Scotsmen.' In a subsequent passage however he hints that his conduct as yet was not always regulated by absolute wisdom,—'qui tunc non magna regebatur sapientia.' On the earl of Moray being taken prisoner by the English the following year, the Stewart, in concert with the earl of Athol, concluded with Edward III., on the 18th of August, 1335, the treaty of Perth, which was in fact a submission, though upon honourable conditions, to the English king. After this we hear no more of the Stewart till 1338, when, upon the death of the regent, Sir Andrew Moray, we find him again appointed to that supreme office. His resumption of the government was soon followed by the expulsion of the English from all their strongholds to the north of the Forth, and his regency was terminated by the return of the king, on the 4th of May, 1341. In 1346, after the capture of the king at the battle of Neville's Cross, where he commanded the left wing of the Scottish army, in conjunction with the earl of March, the Stewart was again elected regent, or 'locum tenens serenissimi principis David,' &c., and he held this post till the release of David, in 1357, governing the country, it is affirmed, with remarkable prudence and ability in the difficult circumstances in which he was placed. In 1359 the earldom of Strathearn was conferred upon him by the king. When David, in 1363, astonished the nation by proposing to a parliament, held at Scone, that in the event of his dying without issue, Lionel, duke of Clarence, son of Edward III., should be chosen king, the Stewart, whose interests, as well as his patriotic prejudices, this project so nearly touched, was one of the foremost of those who adopted instant measures to defeat it. He entered into an association with the earls of March and Douglas, and with his own sons, and he even appears to have taken up arms with the avowed determination of driving the king from the throne, if he persisted in his purpose. David however found means, without making any formal concession, to put down this threatened resistance; and, upon a general amnesty being granted, the Stewart, on the 14th of May, 1363, renewed his oath of fealty, and entered into a bond to abstain from all such confederacies in time coming, on pain of forfeiting for ever all right and title to the crown, as well as to his private inheritances. Soon after this David, who had lost his first wife, Joanna, a daughter of Edward II., in the preceding year, contracted a second marriage with Margaret Logan: but she also bore him no children; indeed he had separated from her some time before his death, which took place on the 22nd of February, 1371.

Upon this event the states of the kingdom immediately assembled at Linlithgow; and after a slight opposition on the part of the earl of Douglas, who conceived that he had himself a claim to the vacant dignity, as representing the families both of Comyn and Balliol, the Stewart was unanimously declared king, by the title of Robert II. He was crowned at Scone, on the 26th of March, and next day, according to custom, received the homage of the bishops and barons, seated on the moot-hill there.

Robert II., when he thus succeeded to the throne, was somewhat peculiarly situated in regard to his domestic relations; and the point demands particular notice, inasmuch as a controversy has thence arisen on the question of the legitimacy of the Stuarts, which continued to be agitated, both among antiquaries and political writers, down to the middle of the last century. His first wife was Elizabeth, daughter of Sir Adam Mure, of Rowallan; but the family he had by her, consisting of four sons and six daughters, had all been born before their marriage. In ordinary circumstances a subsequent marriage might probably, in Scotland, even at this early date, have legitimatized these children, at least in the eye of the church, although their right of civil succession, and especially of succession to the crown, might not have been in that way so certainly established; but there was a very awkward speciality in the present case. Robert and Elizabeth Mure had been living not only in concubinage, but in what the church considered incest, for they were related, it seems, in the fourth degree. Nay, to make matters worse, the Stewart, before his acquaintance with Elizabeth Mure, had been connected in the same way with Isabella Boutelier, who was related to her in the third degree; and this, according to the canonical doctrine, placed him in a relationship by affinity of the same, that is, of the third degree, to Elizabeth Mure. His marriage in any circumstances therefore with that lady, would have demanded a papal dispensation; but it was far from being universally admitted that even the authority of the pope could establish the legitimacy of children born in a connection which thus openly violated and set at defiance what was believed to be the divine law. It is obvious that a dispensation to persons within the prohibited degrees to marry is an exercise of prerogative on the part of the head of the church much inferior to the legitimization of the children already produced from an incestuous connection. So strongly in the present case does this appear to have been felt, that the pope's dispensation actually proceeds upon the monstrous supposition that Robert and his wife Elizabeth Mure, long as they had lived together, had been all the while ignorant of their relationship, and on that manifestly fictitious ground alone does his holiness profess to sanction their marriage, and to pronounce the legitimacy of their children. But the dispensation by no means satisfied the popular feeling of the time; and there is reason to believe that the supposed defect in the right of the reigning family materially contributed in exciting and sustaining some of the most formidable of the insurrectionary attempts which convulsed the Scottish kingdom in the course of the succeeding century. Robert, after the death of Elizabeth Mure, had married Euphemia Ross, a daughter of the earl of Ross, by whom he had two more sons and four daughters, also all born when he came to the crown. Thus circumstanced, in 1371, immediately after his accession, he got the states to pass an act recognising John, earl of Carrick, his eldest son by Elizabeth Mure, as his successor; and, still better to secure the rights of his first family, he procured, in 1373, another act expressly entailing the crown upon his heirs male of both families, and after them upon *his heirs whatsoever*. It is obvious that, whatever might be the force of this parliamentary settlement in securing the crown to Robert's heirs male by the sons of Elizabeth Mure, who were named in it, as soon as such heirs failed, the question would legally arise, who were his heirs whatsoever, or general? and if the papal legitimization of the first family should be set aside, then his heir whatsoever would have to be looked for among the descendants of one of his sons or daughters by Euphemia Ross. Now, it so happened that such was the case on the death of James V., leaving only a daughter, Mary, in 1542. At this moment the heir-general of Robert II., on the supposition of his family by Elizabeth Mure being illegitimate, was the earl of Menteith, the lineal descendant of Euphemia Ross's eldest son, David earl of Strathearn; and it is a remarkable fact that in the early part of the seventeenth century the pretensions put forward on this ground by the then earl of Menteith, who was justice-general, and president of the Scottish privy council, occasioned no small uneasiness to Charles I., and brought down ruin upon himself. For the latest and also the most learned and acute discussion of this question, the reader is referred to 'Tracts, Legal and Historical, with other Antiquarian Matter, chiefly relative to Scotland,' by John Riddell, Esq., Advocate, 8vo., Edinburgh, 1835; dissertation iii., entitled 'Remarks upon the Law of Legitimation per Subsequens Matrimonium, the Nature of our Antient Canons, and the Question of the Legitimacy of the Stewarts.' pp. 155-211. Mr. Riddell, we may add, states that the undoubted representative of the earls of Menteith, and of the eldest son of Robert II. by his second wife, is the present Mr. Barclay Allardyce of Ury, the head, we suppose, of the once famous Quaker family: a singular enough destination for the truest hereditary right to the sceptre of Robert Bruce.

A truce for fourteen years had been concluded with England two years before the death of the late king; and as long as Edward III. lived, the two countries remained at peace. In 1377 however, immediately after the accession of Richard II., a war arose out of what appears to have been at first a private quarrel between the English garrison at Roxburgh and the earl of March. Hostilities continued, with a few short interruptions, till November, 1380, when a truce for twelve months was arranged, which was afterwards extended to the summer of 1383. In 1384 however, the war broke out again with more violence than ever, the Scots being now assisted by a body of French auxiliaries, who arrived in May, 1385, under the command of Jean de Vienne, admiral of France. In the summer of that year, while the young English king led his army in person into the north, laying waste the country and burning every town and village he came to in his progress [Richard II.], a force of Scots and French, entering England by the western marches, ravaged Cumberland and laid siege to Carlisle, but withdrew when the enemy returned southwards, without having effected an entry into that town. Soon after this, the French, who had found the Scots and everything in Scotland very little to their mind, and had also made themselves cordially disliked by the people they came to assist, or more truly to make use of for their own purposes, returned home, though not till they had agreed to pay the expense of their maintenance, and had been forced to leave their leader Vienne as a hostage for the performance of that engagement—a conclusion of the business which has drawn much obloquy upon the Scots from those who have not considered the real object of the French in this expedition, which was certainly much more to annoy the English than to benefit the Scots. A truce for another year followed the departure of the foreigners; but the fighting was renewed in 1387. That year the town of Carlingford in Ireland was plundered and burned by a force under the command of William Douglas, recently created Lord Nithsdale, and married to one of the king's daughters; and in 1388 the famous battle of Otterbourne, or Chevy Chace, was gained from the Percies, though at the expense of his own life, by the earl of Douglas. [Richard II.] By this time however the reins of government had nearly dropped from the hands of king Robert. Froissart tells us that, being unfitted by his years and broken health for going out any more to war, he was no longer consulted in public affairs by the nobles, by whom and also by the nation in general the king's second surviving son, Robert, earl of Fife (afterwards duke of Albany), was now looked upon as the true ruler of the country. In 1389 indeed, the earl of Fife was formally recognised as governor of the kingdom by an assembly of the estates held at Edinburgh. After this the old king appears to have lived almost entirely on his ancestral estate in Ayrshire, where indeed he had been much in the habit of secluding himself for some years previous. It was probably now, in his old age, that his originally engaging personal appearance was deformed by the breaking out of an inflammation in his eyelids, from which he derived his popular designation of *Blear-eye*. The fable about his birth makes him to have been wounded in one of his eyes by the surgeon who cut him from his mother's side.

The war with England was prosecuted by the regent for some months with considerable vigour; but before any action of importance had taken place, hostilities were terminated for the present, in June, 1389, by a truce concluded between France and England for three years, in which the allies of both powers were comprehended. The country was therefore at peace when Robert II. died, after a short illness, at his castle of Dundonald in Kyle, on the 19th of April, 1390.

Besides his six sons and ten daughters by his two wives, this first of the royal Stewarts had a numerous illegitimate progeny by various other women. His six lawfully begotten daughters married into the families of the earl of March, Lyon of Glamis (now earls of Strathmore), Hay of Errol (now earls of Errol and earls of Kinnoul), Macdonald of the Isles, Douglas of Nithsdale, Lindsay of Glenesk, the earl of Douglas, Keith earl Marischal, Logan, and Swinton. From six of his illegitimate sons the Stuarts of Bute, Cairney, and other families of that name deduce their descent. Robert II. was succeeded by his eldest son Robert III.

ROBERT III., king of Scotland, the eldest son of Robert II., relinquished his original name of John on succeeding to the crown, on account, it is said, of a popular superstition of his countrymen which regarded that name as unlucky or ominous. But if so, it is rather strange that the heir apparent should have ever been so christened. He was known throughout the preceding reign by the title of the earl of Carrick, a dignity which had been bestowed upon him by King David II. Before acquiring that dignity he appears to have been designated the lord of Kyle. He was probably born before the year 1340, so that he was past fifty when he came to the throne, on the death of his father, in 1390. It is known that he had been married at least since the year 1357, to Annabella Drummond, a daughter of Sir John Drummond of Stobhall. He had been lamed in his youth by a kick from a horse; and this accident, combined with his mild and pacific disposition, of which perhaps it was in part the cause, made him be regarded, both before he became king and afterwards, with feelings of something very like contempt by the generality of his countrymen.

The coronation of Robert III. took place at Scone on the 14th of August, 1390. No events of any note mark the first eight or nine years of the reign, during the whole of which the king's brother, the Earl of Fife (who was in 1398 created Duke of Albany), continued to retain the management of public affairs, and even, according to some authorities, the title of governor or regent. [Robert II.] The truce which had been made with England in 1389, was kept up by various continuations throughout the reign of the English king Richard II. But war broke out again on the accession of Henry IV., in 1399; France, as usual, exciting the Scots to harass England by predatory expeditions across the borders, which could only end in drawing down signal vengeance upon themselves. In August of the following year, accordingly, Henry entered Scotland at the head of a powerful army, and advanced as far as Edinburgh, which was however successfully defended by the king's eldest son, the duke of Rothsay; and Henry returned home after having received the submission of various towns and villages through which he passed, but without having given the country cause to remember his visit further than by this mere demonstration of his power. In the following year however Henry Percy (Hotspur) made a more destructive inroad as far as to Preston in East Lothian. On this occasion Percy was joined by the Scottish Earl of March, who had recently thrown up his allegiance and gone over to the English king, in a fury of revenge provoked by the ill usage he held himself to have received from the Duke of Rothsay, who, after having been affianced to his daughter, had actually married a daughter of the Earl of Douglas. The following year, 1402, is memorable for the tragical catastrophe of Rothsay, who, at the instigation of his uncle Albany, the friend of March, was, on the pretence of restraining or punishing his dissoluteness, seized under an order professing to be signed by his father, and confined first in the castle of St. Andrews, and then in that of Falkland, where he is believed to have been left to perish of famine. He was only in his twenty-fourth year when he thus fell a victim, in all probability, to the dark ambition of his kinsman. A few weeks after the prince's death, a pardon or remission in very ample terms for any concern he might have had in this affair was granted by the king to Albany; and has been published by Lord Hailes in chapter vi. of his 'Remarks on the History of Scotland,' Edinburgh, 1772. In this remarkable paper it is stated that Albany admitted the capture and arrest of the prince, but justified what he had done by reasons which the king did not then hold it expedient to publish to the world. No express denial of the fact of the murder is ventured upon; it is merely recited that the prince departed this life in his prison at Falkland, through divine providence, and not otherwise—'ubi ab hac luce, divina providentia, et non aliter, migrasse dignoscitur.' 'The reader,' observes Hailes, 'will determine as to the import of this phrase. If by it a natural death was intended, the circumlocution seems strange and affected.' It ought to be added that Archibald, the young earl of Douglas, the brother-in-law of Rothsay, who had acted throughout the affair along with Albany, was equally charged by the voice of common fame with the murder, and was included in the same acquittal or indemnity. It is conjectured that Rothsay had made the proud baron his enemy by his infidelity to or neglect of his sister.

This same year, on the 22nd of June, the Scots, commanded by Patrick Hepburn of Hales, were defeated with great loss, at West Nisbet in the Merse, by the English under the conduct of the Earl of Northumberland and the renegade Earl of March; and on the 14th of September following the Earl of Douglas received a still more disastrous discomfiture from the Lord Henry Percy at Homilton Hill in Northumberland. When immediately after this the Percies rose in rebellion, the Duke of Albany put himself at the head of a numerous force and set out for the south with the design of taking advantage of the embarrassing circumstances of the English king; but the news of Henry's victory at Shrewsbury turned him back before he had got across the border. In the course of the two following years several attempts were made to arrange a peace, or long truce, between the two countries, but without success. Hostilities however had been for a considerable time suspended by these negociations, when King Robert, now awakened to a strong suspicion of the designs of his brother Albany, resolved to send his only surviving son James, styled earl of Carrick, to France for safety; and the prince, then in his eleventh year, was on the 30th of March, 1405, captured at sea by an English vessel on his way to that country. [James I.] His detention by King Henry is believed to have broken the heart of his father, who expired at the castle of Rothsay in Bute, on the 4th of April, 1406. He was succeeded by his son, James I.

ROBERT, King of Naples. [Sicilies, Two.]

ROBERT GUISCARD. [Naples.]

ROBERT OF GLOUCESTER is supposed to have been a monk in the abbey there, but of his personal history nothing whatever is certainly known. It may however be collected, from a passage in his work, that he was living at the time of the battle of Evesham, and he seems to have lived not very long after that event, as the history of English affairs which he has left us ends before the beginning of the reign of Edward I.

This history is the only writing that is attributed to him, and is, in more points of view than one, among the most curious and valuable writings of the middle period that have come down to us. It is a history of English affairs from the beginning, including the pictures of Geoffrey of Monmouth, and ending with the death of Sir Henry of Almaine, valuable in the latter portions for the facts which it contains, whether peculiar to itself or correlative with the statements of other chroniclers; and abounding throughout with anecdotes or minor historical circumstances peculiar to itself, and sometimes of an interesting if not useful nature.

It is in the vernacular language of the time; that is, in the language in which we find the Anglo-Saxon passing into the language of Chaucer and Wickliffe, this work and the similar work of Robert of Bonne being the best specimens which remain of the language. It is in verse, and may stand therefore as a specimen of the poetry of the time. It consists of more than ten thousand lines.

The work was popular in the middle ages, as appears by the number of manuscripts that still exist of it. The principal are the Bodleian, the Cottonian, and the Harleian. There is one in the library of the Herald's College. There are slight variations in the text of each, and that at the Herald's College appears to have had the language modernised by some early copyist. Little regard was paid to Robert by the persons who, in the reign of Elizabeth, collected and printed the manuscripts of the best English chroniclers, though Camden, in his 'Britannia,' and still more frequently in his 'Remains,' has citations from him. Weever, in his 'Antient Funeral Monuments,' has many quotations from him; and Selden quotes him on several occasions. The work was given at large to the public in 1724, by Hearne, in two octavo volumes, of which there was a reprint in 1810.

ROBERT (GROSSETESTE), bishop of Lincoln, a very eminent scholar and prelate in the early years of the reign of Henry III. The exact time and the place of his birth, and the family from which he sprung, are alike lost in the obscurity of those remote times; but it may be calculated from the dates ascertained of other events in his life, that he was born about the year 1175. He studied at Oxford, and, like most of the very eminent of the English theologians of that period, he went from thence to Paris. He there applied himself to the study of the Hebrew and Greek languages, of both of which he attained the mastery, and distinguished himself by his attainments in the whole course of study presented to the students in that learned university. He returned to England skilled not only in the five languages, English, French, Latin, Greek, and Hebrew, but skilled also in logic and philosophy, divinity and the Scriptures, and possessing also a knowledge of medicine and ecclesiastical law. There is no exaggeration in this, for many of his writings have descended to our time, which prove the statement, to a considerable extent at least. We may refer particularly to his numerous treatises in natural philosophy, which it will not be expected of us to describe individually, as the titles, with little more respecting them, fill four quarto pages of Dr. Pegge's Life of him (4to., 1793, p. 278-283).

When he returned to England, he settled at Oxford, where he delivered lectures. There is extant a letter of Giraldus Cambrensis to the bishop of Hereford, recommending Grosseteste to his notice, but the bishop died so soon after, that little advantage can have arisen from it. He found however a very efficient patron in another prelate, namely, Hugh de Wells, bishop of Lincoln, who, as a first mark of his favour, gave him the prebend of Clifton in the church of Lincoln. He had also several archdeaconries, as of Chester, Northampton, and Leicester, and in 1235 he succeeded his patron in the bishopric of Lincoln, then a diocese of immense extent. This dignity he held for eighteen years, dying in 1253.

Bishop Grosseteste made the power which his acknowledged and extraordinary attainments gave him, subservient to the accomplishment of important public objects. He was a great reformer of his diocese, a vigilant superintendant of his clergy, a maintainer of order among them and in all ecclesiastical affairs. If one of the great earls or barons offended, he did not scruple to assert at once the right he possessed to correct the abuse, of which an instance is related in his calling the earl of Warren to account for irregular religious solemnizations. He stood up against the king when he would interfere with the rights of the clergy, who formed in those times the strongest part of the opposition to the will of kings, who, if there had been no clergy, would have been almost absolute; and he opposed with equal firmness and success the pope, when he would support antient abuses or introduce new to the injury of the English clergy or people. In short he can hardly be regarded in any other light than one of the great benefactors to the English church and nation in the discharge of his political duties as a bishop, and he was one of the lights of his age by the lectures which he delivered and the books which he wrote.

His attainments in natural science gained for him the reputation of being a magician and a sorcerer, and many fables gathered about his name.

Many of his writings have been printed, and many remain in manuscript, and are found in most of the great libraries of Europe. An ample list of these is given in Dr. Pegge's work before referred to; in which work may be found critical inquiries into all the particulars of his life, and a great mass of curious information respecting the state of ecclesiastical affairs in England in the first half of the thirteenth century.

ROBERT, LEOPOLD, a modern French artist of great and deserved celebrity, was born at Chaux-le-Fonds, in the canton of Neuchâtel, in 1797. His father intended to bring him up to his own trade, which was that of a watchmaker, but yielding to the boy's decided inclination for the arts, sent him to Paris to study engraving under Girardet, an artist known by his print of the Transfiguration, after Raphael. His progress was so rapid, that in 1812 he obtained the second grand prize at the Ecole des Beaux-Arts, after which he began to study painting in the school of David. He then proceeded to Italy, and, renouncing engraving altogether, devoted himself entirely to his pencil, leading a life of solitude and privation, without either patrons or friends. But though his enthusiasm for his art was great, it was marked rather by severe application than by that promptitude which is generally supposed to characterise genius. Though he did much, he executed few productions, being not only remarkably slow with his pencil, but in the habit of destroying or laying aside picture after picture until he could satisfy himself with the subject that he had commenced. He is said to have thus spent between three and four years on a single picture; for instance, that of the 'Reapers,' which excited so much admiration when first exhibited at Paris in 1831. In that piece, in the 'Neapolitan Improvisatore,' the 'Madonna dell' Arco,' and similar subjects, he succeeded in delineating Italian life and character in the happiest manner, with perfect fidelity, but also with a touching refinement and grace, at the same time without any of that affectation which the French schools are apt to mistake for refinement. His last work was his 'Venetian Fishermen,' a picture that has served to raise his name as that of the greatest artist of his age in the peculiar walk which he had chosen. The general admiration which it excited when exhibited at Paris, was however mingled with mournful regret at the fate of the artist himself; for he had previously put an end to his life at Venice, where he had resided several years, and where he drowned himself, March 20th, 1835, in his 38th year.

ROBERT, HUBERT, an artist, celebrated for his admirable architectural compositions and subjects of that class, was born at Paris, in 1733.

On quitting school, Robert applied himself assiduously to his studies. In 1753 he set out for Rome, and spent twelve years in that city, occupied not merely in making drawings and views of nearly all the numerous architectural monuments, but studying their character completely. Thoroughly impressed with the poetry of such subjects, he enabled others to feel it likewise, by the peculiar charm with which he invested them and by his felicitous treatment, so different from that whose chief merit consists in literal exactness and cold correctness. On his return to Paris, he was immediately elected by the Academy, and his reputation became established as a master-genius, — one whose productions formed an epoch in that department of the art which he had selected.

Among his numerous works are many chefs-d'œuvre of first-rate excellence. Two of the most remarkable for the singularity of the idea are those representing the Musée Napoleon, the one in all its pride and pomp, and the other, an architectural wreck, as it may perhaps present itself to the eye after the lapse of centuries.

Robert was a true artist, an enthusiast in his profession. He was indeed one of those fortunate persons whose existence seems to form an exception from the common lot of mortals; happy in himself, happy in his union with a most amiable woman, possessing a source of constant enjoyment in his art, his life passed in one uninterrupted tenor; in a calm, undisturbed even by the stormy period of the Revolution. Nor was he less happy at its close, for he died almost without a struggle, and with pencil in his hand, April 15, 1808, at the age of seventy-six.

ROBERTSON, WILLIAM, was the son of a clergyman who for some time had the congregation in the old chapel of London Wall, and afterwards was one of the ministers of Edinburgh, where Dr. Robertson was born in 1721. His mother was daughter of Pitcairn of Dreghan. In 1743 he was presented to the living of Gladmuir in East Lothian. He distinguished himself as a preacher, and also as one of the most powerful speakers and most eminent leaders in the General Assembly of the Church of Scotland. In addition to his professional pursuits, he applied himself to historical studies, and in 1759 published his 'History of Scotland during the reigns of Mary and of King James VI. till his accession to the crown of England, with a Review of the Scottish History previous to that period, and an Appendix containing original Papers,' 2 vols. 4to., 1759. The work was very well received, and went through numerous editions in the author's lifetime. In 1761 Dr. Robertson was made one of the king's chaplains, and in 1762 he was appointed Principal of the university of Edinburgh. Two years after he was made historiographer to his majesty for Scotland, with a salary of 200*l.* In 1769 he published his 'History of Charles V.,' in 3 vols. 4to., a work which raised his reputation still higher, and which, from the general interest belonging to the subject, was very popular: it was immediately translated into several languages. The introductory part consists of an able sketch of the political and social state of Europe at the time of the accession of Charles V., a most important period which forms the connection between the middle ages and the history of modern European society and politics. This part of the work has been deservedly admired for the comprehensiveness of its views, for clearness of exposition, and graphic power; but the narrative of the reign and age of Charles is his master-piece. For his 'History of America,' 2 vols. 4to., 1777, Robertson obtained, through several friends, much valuable information from the Spanish and other archives. In 1785 he published some valuable 'Additions and Corrections to the former Editions of the History of Scotland.' In one of these additions, after saying that the licentious conduct of the clergy previous to the Reformation, a conduct so much in opposition to their vows of celibacy and their assumption of superior holiness, was perhaps the first thing that excited suspicion as to the truth of the doctrines which they taught, he justly observes that when the Reformation had gained the ascendency in various states, 'the form of ecclesiastical polity which was introduced in those states was modelled in some measure upon that of the civil government, as it had already happened on the first establishment of Christianity in the Roman empire. Thus the episcopal form was retained in England, in the kingdoms of Sweden and Denmark, and in some parts of Germany, as most consistent with the spirit of monarchy; whilst in Switzerland and the Netherlands the principle of equality was established, as being more suitable to the spirit of a republic.'

His celebrity as an author, and the powers which he displayed as a party chief in the church, where his influence was unbounded, gave rise to a proposition from the court, at the end of George II.'s reign, having for its object his promotion to the dignities of the English church. This (says his biographer, Dugald Stewart) met with such a repulse as effectually prevented a repetition of the attempt.

In 1791 Dr. Robertson published an 'Historical Disquisition concerning the Knowledge which the Antients had of India, and the progress of Trade with that country previous to the Discovery of the Cape of Good Hope.' This agreeable and well written essay is now nearly superseded by more recent works.

Dr. Robertson died at Grange House, near Edinburgh, in June, 1793. He is justly reckoned among the best British historical writers. His style is easy and flowing, his language correct, his opinions enlightened and sober, his investigation most diligent, and his expressions temperate. Hume, who was his intimate friend notwithstanding the difference of their opinions, greatly extolled Robertson's 'History of Scotland,' and Gibbon has borne ample testimony both to his accuracy and his style.

The works of Robertson have been lately published together in French, 'Œuvres complètes de W. Robertson, précédées d'une Notice par J. A. C. Buchot,' 2 vols. large 8vo., Paris, 1837.

ROBERVAL, a French mathematician, whose proper name was GILES PERSONIER. He was born in 1602, at a place called Roberval in the diocese of Beauvais, and having completed an extensive course of study, he came, in 1627, to Paris, where he connected himself with Père Mersenne and other learned men of the age, among whom his talents soon acquired for him considerable reputation. He was chosen professor of mathematics in the college of Gervais, which had been founded by Ramus at Paris, and, together with this appointment, he was allowed to hold, after the death of Morin, the chair of mathematics at the college of France.

The *Method of Indivisibles*, which forms a link between the antient geometry and the fluxionary or differential calculus, had been (1635) made public in Italy by Cavalleri, who is always considered as its inventor. In a letter to Torricelli however (1644), Roberval states that he himself had long before that time discovered a similar method of investigating propositions; and he adds, that he kept his processes to himself, in order that he might have a superiority over his rivals in solving such problems as were proposed to them. The statement may be correct, but if so, it happened that the French mathematician, by his reserve, like many others in similar circumstances, lost the honour which he might have obtained; a just punishment, observes Montucla, for those who, from such unworthy motives, make a mystery of their discoveries. At the end of the treatise of Roberval on this subject, there is explained a method of finding the areas of spaces comprehended between curve-lines of indefinite length, and it may be that the credit of the discovery is due to him, though it is right to observe that the investigation of such areas had been made in England by James Gregory and Dr. Barrow before the publication of Roberval's work. Curves with infinite branches, and which admit of an expression for the area between them, were called Robervallian lines by Torricelli.

Roberval discovered an ingenious method of determining the direction of a tangent at any point of a curve-line by the rule for the composition of forces or motions; but he applied it only to the conic sections in which the component forces are supposed to act in the directions of lines drawn from the point in the curve to the foci. It appears that Torricelli laid claim to the first discovery of the method, which he asserts that he had made in 1644, but Roberval states, in a letter to the Italian philosopher, that he was acquainted with it in 1636, and that in 1640 he had communicated it to Fermat.

As early as the year 1616, P. Mersenne suggested the idea of the cycloid, and having made some fruitless attempts to find its area, he proposed the subject to Roberval in 1628; the latter, not succeeding immediately, abandoned the research, and apparently thought nothing of it during about ten years. At the end of that time, the question being revived, he resumed the inquiry with the advantage of greater experience, and fortunately discovered a method by which the area might be determined. Descartes afterwards proposed to Roberval and Fermat to determine the position of a tangent to the cycloid, and the latter soon resolved the problem, but the former appears to have failed, or to have succeeded with difficulty, and only after many trials. He subsequently however discovered the rules for finding the volumes of the solids formed by the revolution of a cycloid about its base and about its axis.

In 1646, Descartes, Roberval, and Huyghens attempted at the same time to investigate the duration of the oscillations made by planes and solids moving about an axis; and here Roberval appears to have been more successful than his competitors, though the state of science was not then sufficiently advanced to allow any of them to attain a solution which should be applicable to every kind of vibrating body.

None of Roberval's works were printed during his life, except a treatise on Statics, which was inserted by Mersenne in his 'Harmonie Universelle.' The others were published by his friend the Abbé Galois, in 1693, among the mathematical and physical works in the old 'Mémoires' of the Academy of Sciences. These relate chiefly to the subjects above mentioned, and include a treatise on the 'Recognition and Construction of Equations,' a work of little utility, since it is formed agreeably to the ideas of Descartes and Fermat, and is expressed in the language and notation of Vieta. Among them also is an account of a new kind of balance (a sort of steelyard) which Roberval had invented, and which was thought to be useful in finding the weight or pressure of the air.

Roberval, unfortunately for his fame, appears among the opponents of Descartes in matters relating to algebra: he is said to have made some objections to the theorems of his countryman in the construction of equations and concerning the nature of the roots; but the objections are without foundation, and serve only to expose his own jealousy and obstinacy.

To Roberval is ascribed the reply, 'Qu'est ce que cela prouve?' when, having been present at the representation of a tragedy, some one asked what impression it had made on him. The story is perhaps untrue, but such a circumstance is not improbable, since, in those days, science was profoundly studied, and the mathematicians were so completely absorbed in their pursuits, that they had little time to spare for other subjects. It is said that Roberval could never express his ideas with clearness and precision, and certainly readers well acquainted with the antient methods of investigation can with difficulty follow him in his tedious demonstrations.

He was elected a member of the Academy of Sciences when the latter was formed (1665), and he died in the year 1675.

ROBES, MASTER OF THE, an officer of the household who has the ordering of the king's robes. By statute 51 Henry III., the 'Gardein de la Garderobe de Roi,' the warden of the king's wardrobe, was to make accompt yearly in the Exchequer, on the feast of St. Margaret. Under a queen, the designation of the office is changed to that of a mistress of the robes. The office has always been one of great dignity. High privileges were conferred upon it by King Henry VI., and others by King James I., who erected the office of master of the robes into a corporation.

ROBESPIERRE, FRANÇOIS MAXIMILIEN JOSEPH ISIDORE, was born at Arras in 1759. His father, a provincial advocate of no reputation, quitted France during the infancy of his children, who were not long afterwards left in a desolate condition by the death of their mother. François Maximilien was the eldest, and Augustin Bon Joseph the second son: the third child was a daughter. Augustin imitated his brother, and perished with him; the daughter lived in quiet respectability, and became a pensioner of the state.

Through the kindness of the bishop of Arras, Robespierre was well educated at Paris. He studied jurisprudence; and having returned to his native town, followed his father's profession, in which he gained some reputation. By his legal talents, and his situation as president of the academy at Arras, he obtained an influence, through which, on the summoning of the States-General in 1789, he was elected a deputy of the tiers-état. No sooner was he elected, than he went to Versailles to enter on his duties. Within the Assembly, for several months after its meeting, he was of little importance; without its doors he gradually gained authority by gathering idlers and adventurers round him in the coffee-houses, and haranguing them on liberty and equality. It was by dexterity of address, and the coincidence or adaptation of the opinions which he expressed, to those of his low, discontented, and excited hearers, that this authority was raised. He had no physical advantages to assist him: he was a short insignificant-looking man; his features small, his complexion pale, his face deeply marked with the small-pox, and his voice harsh, shrill, and disagreeable. Notwithstanding these disadvantages, he increased in popular estimation. It was on the 17th of June, 1789, that he delivered his first speech in the Assembly. From that time he daily threw aside more and more of the backwardness and reserve that he had hitherto maintained: he clearly saw that the weakness and want of energy in the government were so great, that he might with safety assert in the National Assembly the most violent democratic opinions, and throw the populace into excitement. His importance in the Assembly was in a great measure attributable to the prominent part which he played in the Jacobin Club. [JACOBINS.] This club already contained so many members, that the large church in which its meetings were held was continually filled, and it had corresponding affiliated societies throughout the provinces, which disseminated its revolutionary views and projects, and rendered its power most formidable. Here was Robespierre's principal scene of action; here he decried every attribute of monarchy, and denounced those who would control the people as conspirators against their country, knowing that the pikemen of the suburbs, bloodthirsty and ungovernable, took the speeches of the Jacobins for their word of command. Robespierre laid down this principle, 'that France must be revolutionised;' and for this object he laboured with a determination which his opponents could find no means of diminishing. It was certain that he could not be tampered with; and the Jacobin newspapers, daily overflowing with his praises, surnamed him 'The Incorruptible.' His exclusion from the Legislative Assembly, to which he was rendered ineligible by a vote in which he himself had joined, enabled him to devote his whole time and energies to the direction of the Jacobin Club. Its violence had somewhat diminished, but its power was increased by the enrolment of many of the municipal officers, who could carry out its projects by their authority. (Thiers.) At this time he was named Public Accuser.

When the attack was made upon the Tuileries (Aug. 10, 1792), Robespierre was not present; and for three days afterwards he forsook the Club and remained in seclusion. It was his custom neither to take an active part in the great overt acts of massacre or rebellion, nor to appear immediately after their commission; but rather to pause awhile, that he might see by what means they might best be turned to the promotion of his political objects, and the increase of his own popularity. It was with joy that he saw the National Assembly suspend the royal authority and call upon the nation to elect a convention which should determine on a new form of government. He became a member of the Convention; and on its opening (Sep. 21, 1792), seated himself on the 'montagne,' or higher part of the room, occupied by the most violent, which was also rapidly becoming the most powerful party. It was now that Robespierre first appeared in the foremost rank, which comprised the most powerful men: until now, notwithstanding all his efforts, he had had superiors even in his own party;—in the days of the Constituent Assembly, the well-known leaders of the time; during the continuance of the Legislative Assembly, Brissot and Péthion; and, on the 10th of August, Danton. In the first assembly he could attract notice only by the profession of extravagant opinions; during the second he became more moderate, because his rivals were innovators; and he maintained peace before the Jacobins, because his rivals called for war. Now, as we have said, he was in the first rank, and his chief aim was to annihilate the Girondins, who hoped, on the other hand, that the eminence he had attained was insecure as well as high, and that he might be overthrown himself. Barbaroux, Rebecqui, and Louvet dared to accuse him of seeking to be dictator. But the time had not come for accusations to be successful; the tide of his popularity had not turned. He demanded time to prepare his defence, and absented himself for eight days both from the Convention and the Jacobin Club. During this absence the Jacobins protested his innocence and intimidated his accusers, the excitement in the Convention subsided, and on his re-appearance he was triumphantly exculpated.

At this time the king was in prison, but his days were drawing to a close. Robespierre vehemently combated those who either asserted the necessity of a trial or declared the king inviolable: he demanded that he should be beheaded at once, and promoted unscrupulously the execution of his whole family. The death of the king augmented both party strife and private bitterness: each faction and each leader had some rival to destroy. The Montagnards struggled with the Girondins for supremacy, gained their end, and massacred their opponents. The kingdom was chiefly governed by the Committee of Public Safety [COMMITTEE OF PUBLIC SAFETY], of which Robespierre, Couthon, and St. Just became the triumvirate. Their schemes for a moral regeneration will be found in all the histories of the time, and also an account of Robespierre's presidency at the great public acknowledgment of the existence of a Deity. This took place when his career was nearly run, when there were divisions in the Montagne, where he had lost the support of many who, though they had been rivals, had been likewise powerful allies, when Marat had been assassinated, when he had sanctioned the execution of Péthion and Danton and Desmoulins, when he had put a countless host of victims to death, and raised a proportionate number of enemies. In July, 1794, his adversaries became too strong for him: Billaud-Varennes, one of his own party, jointly with the remnant of the Dantonists, who still were furious because of the execution of their leader, accused Robespierre of seeking his own aggrandizement by the sacrifice of his colleagues. In vain Robespierre retired, in vain he took forty days to prepare his defence, in vain he strained every nerve to refute their charges. After a scene of frightful excitement, he was condemned to death, his brother, Couthon, St. Just, and Lebas being included in the same condemnation. Robespierre was separated from the other prisoners, and led to the gaol at the Luxembourg. Here accident gave him a chance of escape. The gaoler, who was his friend, released him; he marched against the Convention with a number of soldiers and partizans, and it is not impossible that he might have re-established his power, if he had possessed courage, and his allies dexterity. As it was, he was again seized, and having blown his jaw to pieces, in an unsuccessful attempt to destroy himself, was dragged groaning to the guillotine, amidst the taunts and acclamations of the people.

The characters of few men have been more deservedly decried than that of Robespierre. He was totally without any great quality; he was cowardly, cruel, and vain; 'one of the most intimate compounds of self-esteem and circumspection that ever met in the same character.' His success, which was partly due to his egotism, 'his excessive caution not to commit himself, made him the safest guide and model for all that multitude of cautious egotists which form so large a portion of human society.' (*Edin. Rev.*, vol. lxxii., p. 428.) 'He had another great source of strength in being the very apostle and prolocutor of the populace, of that vague and indefinite religion which Rosseau had created, and which then enjoyed so immense a popularity—a religion of sentiment without belief.' He was honest in his efforts for the democratic cause, he never sought money, and he well deserved the name of 'Incorruptible.' He long depended on his sister for support, and died worth fifty francs. The powers of his mind, his judgment, and his oratory have been frequently underrated; he must have been at least plausibly eloquent: he chose with adroitness the topics upon which he spoke; he was acute, and had considerable foresight. But on the whole, his low and vile qualities so greatly predominated, that he was not only the terror of the monarchical and aristocratic party, but he likewise injured the democratic cause, for he was guilty of no small portion of that violence and cruelty which rendered a reaction inevitable.

(Thiers, *Hist. French Rev.*; Mignet: Walter Scott, *Hist. of Nap.*, vol. i.; Carlyle, *Hist. French Rev.*; Mad. de Stäel, *Thoughts on the French Rev.*; *Ed. Rev.*, vol. lxxii.; *Biog. Universelle.*)

ROBIN HOOD. [HOOD, ROBIN.]

ROBI'NIA, a name given to a genus of plants in commemoration of John Robin, a botanist in the time of Henry IV. of France. This genus is known by having an inferior perianth; teeth of calyx 5, lanceolate, two upper ones shorter and approximate; corolla papilionaceous; ovary with from 16 to 20 ovules; style bearded in front, and legume subsessile and many-seeded. They are North American trees, bearing nodding racemes of white or rose-coloured flowers. The genus Robinia formerly comprehended the plants now included under *Caragana*, from which it is distinguished by its long gibbous legume and unequally pinnate leaves.

The best known species of Robinia is the *R. pseudacacia*, the Bastard or False Acacia, or *Locust-tree*. It has stipular prickles, with loose pendulous racemes of white sweet-smelling flowers, which, as well as the legumes, are smooth. This tree, which is now so well known, was first grown in Europe by Vespasien Robin, the son of the botanist, after whom the genus was named, in the Jardin des Plantes at Paris. It was named locust-tree by the missionaries, who supposed it to be the same tree as that which grows in Asia, and is supposed to have produced the locusts spoken of in the New Testament. It was one of the first trees received in Europe from North America, where it grows in great abundance. It grows in the Atlantic States of North America, but it is very abundant in the south-west, in the valleys of the Alleghany Mountains. It is also found in the Western states and in Upper and Lower Canada.

Since its first introduction into Europe, this tree has met with very different treatment, at one time being extolled as the most valuable of trees, at another time condemned as worthless. This has arisen in a great measure from the soils and situations in which it has been accidentally cultivated. It has always been known in America as affording an exceedingly hard and durable wood; hence it has been recommended to be cultivated on this account, but the great tendency which this tree possesses to branching and its seldom attaining a great size render it impossible to obtain from it timber of a useful kind. In America it is used for making posts, and occasionally trees are found large enough to be employed in ship-building; but its greatest consumption is for making trenails, by which the timbers of ships are fastened together, and for this purpose large quantities are used in the royal dock-yard at Plymouth, which are imported from America.

Cattle are fond of the young shoots, and on this account it has been recommended to be cultivated as forage. At one time it was thought to be an excellent tree for planting on the banks of rivers and canals, as the roots, being very large and spreading, would bind the soil together. In 1823, Cobbett wrote on this tree, recommending it strongly in his various publications. He imported immense quantities of the seeds from America for the purpose of growing the plants for sale. He stated that in this way he had distributed in Great Britain more than a million of plants. His praises of the tree were extravagant in the extreme, and it has failed to answer most of the promises that he held out.

The tree is of rapid growth when young, and forms heartwood at a very early age. In America it attains a height of 70 or 80 feet, but in this country it is seldom seen so high. Its tendency to form branches, even when young, prevents its being used for hop-poles as recommended by Cobbett.

The roots and other parts of the plant, like many of its order (Leguminosæ), contain a saccharine principle, which accounts for the nutritive properties of the leaves. In St. Domingo the flowers are used for making a distilled liquor, which is said to be very delicious. It folds up its leaves at the approach of night.

The tree grows best on a soil of sandy loam, rich rather than poor; a good garden soil is the best. It should not be planted in exposed situations, as, from the great brittleness of its branches, it is likely to be destroyed by winds. It may be propagated by cuttings from the roots or by planting large truncheons or suckers, but producing it from seeds is the best mode. The seeds should be sown in the spring, and in the summer of the following year they may be transplanted. The seeds will not retain their vitality more than two years. American seed should be always used, as it does not come to perfection in this country.

There are two other species frequently cultivated in this country, *R. viscosa*, Clammy Robinia, and *R. hispida*, Hairy Robinia, or Rose Acacia. The former is characterised by the sticky secretion with which it is covered, and which has been discovered to possess a peculiar vegetable principle; the latter, which is the smallest of the three species here mentioned, has very large flowers, and forms a very ornamental shrub when grown on an espalier rail or against a wall.

ROBINS, or ROBYNS, JOHN, an English astronomer and mathematician, who was born in Staffordshire, about the close of the fifteenth century or the beginning of the sixteenth, as it appears he was entered a student at Oxford in 1516, and educated for the church. In MS. Digby, 143, are preserved several inedited tracts by Robins, and from a note at the end it appears that he was of Merton College. It seems that, in common with many others of that college, he devoted himself to the study of the sciences, and he soon made such a progress, says Wood, in 'the pleasant studies of mathematics and astrology, that he became the ablest person in his time for those studies, not excepting his friend Recorde,' whose learning was more general. Having taken the degree of bachelor of divinity, in the year 1531, he was the year following made by King Henry VIII., to whom he was chaplain, one of the canons of his college in Oxford. In December, 1543, he was made a canon of Windsor, and afterwards one of the chaplains to Queen Mary, who highly esteemed him for his learning. He died on the 25th of August, 1558, and was buried in the chapel of St. George at Windsor. He left behind him several works in manuscript, of which two, 'De Culminatione Stellarum Fixarum,' and 'De Ortu et Occasu Stellarum Fixarum,' are preserved in MS. Digby, 143, in the Bodleian Library. According to Wood, Sir Kenelm Digby also possessed three other tracts by Robyns, viz.: 1, 'Annotationes Astrologicæ,' lib. 3; 2, 'Annotationes Edwardi VI.;' 3, 'Tractatus de Prognosticatione per Ecclipsin;' and Wood adds that these were also in the Bodleian Library. We suspect Wood is here in error, for in the sale catalogue of the library of George, earl of Bristol, sold by auction in April, 1680, a copy of which is in the British Museum, we find an account of several manuscripts said formerly to have belonged to Sir Kenelm Digby, and among these (No. 49) is 'Johannis Robyns Annotationes Astrologicæ.' We are inclined to think that Wood may have taken the titles from the catalogue of Thomas Allen's library, in the Ashmolean Museum, nearly the whole of which came into the hands of Kenelm Digby, and that the two titles of 'Annotationes' do in reality belong to the same book. We are not aware that any copy of this work of Robyns's is now in existence, although there are some extracts from it in MS. Bodl. 3467, and the loss of it is perhaps not much to be regretted. Wood slightly refers to a book by Robyns under the title of 'De Portentosis Cometis,' but he says that he had never seen a copy. Bale however mentions having seen one in the Royal Library at Westminster, and this copy is now in the British Museum. Sherburne, in the appendix to his 'Manilius,' mentions another in the possession of Gale, and this is now in the library of Trinity College,—O. i. 11. We find also that there is still another copy in the Ashmolean Museum, MS. No. 186. The preface to this latter work, which is partly plagiarised from Cicero, is printed in Halliwell's 'Rara Mathematica,' p. 48-54.

ROBINS, BENJAMIN, a celebrated mathematician and artillerist, was born at Bath, in 1707, of parents who were members of the society of Friends, and in such humble circumstances as to be unable to give their son the benefits of a learned education. By the aid however of some occasional instruction and a mind by nature formed to comprehend readily the processes of mathematical investigation, he early attained to a considerable proficiency in the pure sciences; and, as the best means of being enabled to prosecute his favourite studies, he determined to establish himself in London as a private teacher. Some specimens of his skill in the solution of problems having been forwarded to Dr. Pemberton, this learned mathematician conceived so favourable an opinion of his abilities as to encourage him in his design; and accordingly, about the year 1725, Mr. Robins came to town, in the garb and professing the doctrines of a Quaker. The former, after a time, he exchanged for the ordinary dress of the country.

In the metropolis, and apparently in the intervals of leisure which his employment as a teacher afforded, Mr. Robins applied himself to the study of the modern languages, and diligently cultivated the higher departments of science by reading the works of the antient and the best modern geometers; these he appears to have mastered without difficulty, and in 1727 he distinguished himself by writing a demonstration, which was inserted in the 'Philosophical Transactions' for that year, of the eleventh proposition in Newton's treatise on quadratures.

During the following year he published, in a work entitled the 'Present State of the Republic of Letters,' a refutation of John Bernoulli's treatise on the measure of the active forces of bodies in motion, a subject which had been proposed as a prize question by the Royal Academy of Sciences at Paris, and successfully answered by Maclaurin. The foreign mathematician had endeavoured to support the hypothesis of Leibnitz, that the forces are proportional to the squares of the velocities which they produce, while both Maclaurin and Robins were in favour of the original opinion of Descartes, that the forces are proportional to the velocities simply.

About this time Mr. Robins began to make those experiments for determining the resistance of the air against military projectiles, which have gained for him so much reputation. He is said also to have directed the energies of his mind to the construction of mills, the building of bridges, draining marshes, and making rivers navigable; but it does not appear that he was ever employed in carrying such works into execution. The methods of fortifying places became a favourite study with Mr. Robins, and, in company with some persons of distinction, probably his pupils, he made several excursions to Flanders, where he had opportunities of examining on the ground the works of the great masters in the art.

In 1734, the celebrated bishop of Cloyne, author of the 'Treatise on Human Knowledge,' published a small work called the 'Analyst,' in which, without intending to deny the accuracy of the results, it is attempted to be shown that the principles of fluxions, as they were delivered by Sir Isaac Newton, are not founded upon strictly correct reasoning, inasmuch as it is assumed that the ratio between two variable quantities may have a finite or infinite value when the quantities are nascent or evanescent; that is, as the objector supposes, when both quantities become zero. The objection is founded on a misunderstanding of the subject, for by the term nascent or evanescent is meant, not that each quantity is nothing, but that both are infinitely small, or that they are less than any thing assignable; in which case one of them may, notwithstanding, exceed the other in magnitude a finite or even an infinite number of times. The talents of both Maclaurin and Robins were employed in answering the objection; and for this purpose the latter published, in 1735, 'A Discourse concerning the Certainty of Sir I. Newton's Method of Fluxions, and of Prime and Ultimate Ratios.' It is easy to imagine however that great difficulty would at first be felt in admitting a principle so different from any which occurs in the antient geometry; and, before the subject was set at rest, Mr

Robins added to the first, two or three other discourses explanatory of the calculus.

In 1738 he wrote a defence of Newton against an objection on the subject of the sun's parallax which occurs in a note at the end of Baxter's 'Matho;' and, in the following year, he published some remarks on Euler's treatise of 'Motion,' on Smith's 'Optics,' and on Dr. Jurin's discourse concerning vision.

Mr. Robins's principal work, entitled 'New Principles of Gunnery,' was published in 1742. To this is prefixed an account of the rise and progress of modern fortification, and a history of the invention of gunpowder, with a statement of the steps which had been taken towards a knowledge of the theory of gunnery. Having then determined the value of the explosive force of fired gunpowder and the effect of the heat and moisture of the atmosphere on that force, he proceeds to describe the ballistic pendulum which he had invented, with the manner of employing it in determining the velocities of shot when the guns are charged with given quantities of powder; and he treats at length of the resistance of the air on shot and shells during their flight, a subject till then but little understood. This work had the honour of being translated into German, and commented on by the learned Euler. Some of the opinions advanced in it being questioned by the author of a paper in the 'Philosophical Transactions,' Mr. Robins was induced to reply to the objections, and to give several dissertations on the experiments made by order of the Royal Society in 1746 and 1747; for these he was presented with the annual gold medal. A number of experiments in gunnery subsequently made by Mr. Robins were, after his death, published with the rest of his mathematical works, by Dr. Wilson, and the collection, which makes two volumes 8vo., came out in 1761.

Besides the pursuits of science, Robins appears to have been occasionally occupied with subjects of a political nature. A convention which had been made with the king of Spain, in 1738, respecting the payment of certain claims made by British merchants in compensation for the seizure of their ships and the destruction of their property by the subjects of that monarch, not being considered satisfactory, the opponents of the minister, Sir Robert Walpole, made it the ground of an inquiry into his conduct, and Robins wrote three pamphlets on the occasion. These gained for him considerable reputation, and a committee of the House of Commons being appointed to manage the inquiry, he was chosen its secretary; he did not however hold the post long, as a compromise took place between the opposing parties. About ten years afterwards (1749) Mr. Robins wrote, as a preface to the 'Report of the Proceedings of the Board of Officers on their Inquiry into the Conduct of Sir John Cope,' an apology for the unsuccessful issue of the action at Preston Pans in 1745.

Great difference of opinion exists concerning the share which Mr. Robins had in writing the account of Lord Anson's 'Voyage round the World' (1740-1744). The work was certainly commenced by the Rev. W. Walter, the chaplain of the Centurion, who was in that ship during the greater part of the voyage; but, on the one hand, it is said that the account of the reverend gentleman consisted chiefly of matters taken verbatim from the journals of the naval officers; and that Robins, using the statement of courses, bearings, distances, &c. as materials, composed the introduction and many of the dissertations in the body of the work. On the other hand, we are told that Mr. Robins was consulted only concerning the disposition of the plates, and that he left England before the work was published. It is scarcely probable that a clergyman professing to write the history of such a voyage should have merely copied a sailor's journal, and it may be reasonably supposed that the greater part of the work as it stood in the first edition came from his pen; while, with equal reason, it may be allowed that Mr. Robins added the introduction and the scientific notices. The first edition appeared in 1748, and four were disposed of in the course of that year.

Mr. Robins was offered, in 1749, his choice between two good appointments; the first, to go to Paris as one of the commissioners for settling the boundaries of Acadia; and the other, to be engineer in general to the East India Company. He accepted the latter, and departed in December for Madras, where he arrived in July, 1750. His intentions were to put the fortifications in a good state of defence, and he had actually prepared plans for the purpose when he was taken ill with a fever. He recovered from this attack, but soon afterwards fell into a declining state, and died on the 29th of July, 1751, at the age of forty-four years.

He left behind him the character of being one of the most accurate mathematicians of his age: and the interest which he took in astronomy may be inferred from his having availed himself of his interest with Lord Anson to procure a new mural quadrant for the Royal Observatory at Greenwich, and having taken with him to India a set of instruments for the purpose of making observations in that country.

Dr. Hutton relates that, in 1741, he was a competitor with Mr. Müller for the post of professor of fortification in the Royal Military Academy at Woolwich; and that the latter succeeded through some private interest in obtaining the appointment.

ROBISON, JOHN, was born in 1739, at Boghall in the county of Stirling. His father, who had been a merchant at Glasgow, but who then resided on his estate, intended that he should enter the clerical order, and accordingly he sent him, at eleven years of age, to the university of that city. Here the youth studied the classics under Dr. Moore, and moral philosophy under Dr. Adam Smith; and at the same time he received instructions in mathematics from Dr Robert Simson. He took his degree of M.A. in 1756, but he declined the church as a profession.

Being thus compelled to seek an occupation in some other line, he went to London in 1758, with a recommendation from Dr. Simson to Dr. Blair, a prebendary of Westminster, who was then desirous of obtaining some person to instruct the young duke of York in navigation, and to accompany his royal highness in a voyage to sea, an intention being entertained that the prince should serve in the royal navy. The project was afterwards abandoned, but Mr. Robison consented to embark on board the Neptune with a son of Admiral Knowles, who had just then received his appointment as a midshipman. This ship was one of a fleet destined to co-operate with the land-forces under General Wolfe in the reduction of Quebec; and during the voyage Mr. Knowles being promoted to the rank of lieutenant on board the Royal William, Robison, who was then rated as a midshipman, accompanied him. In May, 1759, the fleet arrived in the St. Lawrence, and Mr. Robison was employed in surveying the river and the neighbouring country; at the same time he had an opportunity of making observations concerning the effects produced by the aurora borealis on the magnetic needle.

The success of the expedition is well known; and on the return of the Royal William to England, Mr. Robison accepted an invitation from Admiral Knowles to reside with him at his seat in the country.

In 1762, lieutenant Knowles being appointed to the command of a sloop of war, Robison accompanied him in a voyage to Spain and Portugal, but after being absent six months he returned to England, and quitted entirely the naval service. His great friend and patron the admiral however recommended him to Lord Anson as a person qualified to take charge of Harrison's timekeeper, which, after the labour of thirty-five years, was considered fit to be used for the important purpose of determining the longitude of a ship at sea, and which it was proposed by the Board of Longitude to try during a voyage to the West Indies. In consequence of this recommendation, Mr. Robison, accompanied by a son of Mr. Harrison, sailed to Jamaica, where, on January 26, 1763, the chronometer (whose rate had been determined at Portsmouth, November 6th, 1762) was found, after allowing for that rate, to indicate a time less by 5″ only than that which resulted from the known difference between the longitudes of the two places; and on his return to England, April 2nd, 1763, that is, after an absence of one hundred and forty-seven days, the whole error was found to be but 1′ 54½″.

Mr. Robison, being disappointed in his expectations of promotion from the Admiralty, set out for Glasgow in order to resume his studies. Here, enjoying the friendship of Dr. Black and Mr. Watt, the former of whom was on the point of developing his theory of latent heat, and the latter of bringing forward his great improvements on the steam-engine, he felt himself irresistibly impelled towards the pursuit of the physical sciences.

On the removal of Dr. Black to Edinburgh, Mr. Robison was appointed to succeed him, and for four years he gave lectures on natural philosophy at Glasgow; but at the end f that time he accepted (1770) the appointment of secretary o admiral Sir Charles Knowles, who had been invited by the empress of Russia to superintend the improvements which that sovereign contemplated making in her navy. Two years after his arrival at St. Petersburg, Sir Charles became president of the board of admiralty, and Robison was made inspector of the corps of maritime cadets at Cronstadt, with a liberal salary and the rank of lieutenant-colonel in the Russian service. He gave no instructions, but his duty was to receive the reports of the masters, and to class the cadets in the order of their merits; this he performed for four years, but finding Cronstadt a dreary place of residence during the winter, he accepted the professorship of natural philosophy at Edinburgh, which had become vacant by the death of Dr. Russel. He arrived in that city in June, 1774, bringing with him two or three of the Russian cadets, whose education he had undertaken to superintend; and in the same year he gave a series of lectures on mechanics, optics, electricity, astronomy, &c. This course he continued to deliver annually during the rest of his life, except when ill health obliged him to appoint a substitute for the purpose, improving each subject from time to time by the introduction of every important discovery which it received from the researches of his contemporaries. The lectures are said to have been distinguished by accuracy of definition and clearness as well as brevity of demonstration; and the experiments by which they were illustrated, to have been performed with neatness and precision. But it has been objected to them that they were delivered with a rapidity of utterance which made it difficult for the students to follow him; that he supposed his pupils to possess a higher degree of preparatory information than they had in general attained, even when they had gone through the university course of study, and that the experiments were too few in number to serve the purpose intended by them.

It may be thought that the second objection might have been obviated by merely requiring, in the pupils who were to attend the course of lectures, an adequate portion of mathematical knowledge previous to their admission; but it is probable that the ground of the complaint lay, partly, in the difficulties inseparable from the communication of scientific instruction by general lectures. The result attained after a geometrical investigation on paper may be admitted by a reader who can take the time necessary to satisfy himself of the truth of the several steps and of their dependence on each other; but this is seldom possible when the investigation is delivered from the mouth of a lecturer, who must go on with his subject without waiting for the slow operations of the judgment in the mind of his auditor, and the consequences too often are that, at the expiration of the hour, the latter carries away only a number of ideas in a state of inextricable confusion. In former ages, when books were scarce, there was no other method of conveying instruction to a number of persons than that of general lectures; but at present such lectures can only be useful as auxiliaries in teaching the physical sciences, and probably the chief advantage to be derived from them consists in the opportunities they afford for exhibiting experiments which it may not be in the power of students individually to make. It seems to follow that such exhibitions should not be omitted whenever they can be made conducive to the illustration of the subject.

On settling in Edinburgh, Mr. Robison became a member of the Philosophical Society of that city. In 1785 he was attacked by a disorder which was attended with pain and depression of spirits, but he was only occasionally prevented from performing his duties and following his literary avocations. In 1798 he was made doctor in laws by the University of New Jersey; and in the following year, by that of Glasgow; and in 1800 he was elected a foreign member of the Academy of Sciences at St. Petersburg. In 1785 he wrote a paper which was published in the first volume of the 'Philosophical Transactions of Edinburgh,' on the determination, from his own observations, of the orbit and motion of the Georgium Sidus; and he afterwards wrote one which appeared in the second volume of the same work, on the motion of light as affected by reflecting and refracting substances which are themselves in motion. But his most important works are the numerous articles which, in 1793 and the following years, he contributed to the third edition of the 'Encyclopædia Britannica' and its supplement: a series of treatises which may be considered as forming a complete body of physical science for that time.

Mr. Robison was prevailed upon to superintend the publication of Dr. Black's lectures on chemistry, and they came out in 1803, but that science had undergone so great a change since the death of the learned lecturer, that the work excited little interest. In the following year he published a portion, containing dynamics and astronomy, of a book entitled 'Elements of Mechanical Philosophy;' but the substance of it, together with that of some MSS. which had been intended by the author to form part of the second volume, and also the principal articles which had been written for the 'Encyclopædia Britannica,' were collected by Dr., now Sir David, Brewster, under the title of 'A System of Mechanical Philosophy,' and published in 1822, with notes, in 4 vols. 8vo. This work is considered by the late Professor Playfair as firmly establishing the character of Mr. Robison for scientific attainments.

While Mr. Robison was on his journey to Russia in 1770, he was hospitably entertained by the bishop of Liége, who, with all his chapter, constituted a lodge of freemasons; and into this society our traveller was induced to enter. It is unknown from what source he obtained his information respecting its proceedings, but twenty-nine years afterwards he published a remarkable work containing 'A History of the German Illuminati,' whom he describes as the agents in a plot formed by the freemasons to overturn all the religions and governments of Europe. The work met with little attention, and Robison was charged with a degree of credulity scarcely to be expected in a person so well acquainted with the laws of philosophical evidence.

Having taken a slight cold, and suffered an illness of only two days' duration, Mr. Robison died on the 30th of January, 1805, in the 66th year of his age, leaving a widow and four children. He is stated to have been a person of prepossessing countenance, a good linguist, a draughtsman, and an accomplished musician; and it is added that his conversation was both energetic and interesting.

ROBORTELLO, FRANCIS, was born of a noble family, September 9th, 1516. He was educated at Bologna under the celebrated Romulo Amaseo, and he began about 1538 to teach the belles-lettres at Lucca. Five years afterwards he went to Pisa, where he lived during the next five years, and laid the foundation of his fame, which was soon spread over the whole of Italy. In 1549 the senate of Venice elected him successor to Battista Egnazio, professor of rhetoric there, whose advanced age obliged him to retire from public duties. In 1552 Robortello was promoted to the chair of Greek and Latin literature in the university of Padua, in the place of Lazaro Buonamici, who died in that year. Thence he removed in 1557 to Bologna, in order to undertake a similar office in that city. Having been appointed to pronounce here the funeral oration in honour of the emperor Charles V., who died in 1558, he is said to have forgotten the exordium, and to have been incapable of proceeding, which brought him into some disrepute. About this time he had violent disputes with Sigonius, in which Robortello appears to have been the aggressor, and which did not terminate till the senate of Venice employed their authority in imposing silence upon both. Robortello died at Padua, March 18th, 1567, in the fifty-first year of his age, so poor that he did not leave enough to defray the expenses of his funeral, which however was celebrated by the University in a style of great magnificence.

Robortello seems to have been naturally pugnacious, and he was continually involving himself in disputes with men superior to himself. He could not refrain from attacking such writers as Erasmus, Paulo Manuzio, Muretus, and Henry Stephens. He was however a man of considerable talent and learning, and he published several books of great utility. The following are his principal works: 1, 'Variorum Locorum Annotationes tam in Græcis quam in Latinis Auctoribus,' Venice, 1543, 8vo.; 'De Historica Facultate,' &c., Florence, 1548, 8vo., being several treatises on Greek and Roman literature, all of which are inserted by Gruter in his 'Thesaurus Criticus.' 3, 'De Convenientiâ Supputationis Livianæ Annorum cum Marmoribus Romanis quæ in Capitolio sunt; De Arte sive Ratione corrigendi Veteres Auctores Disputatio,' Padua, 1557, folio; 4, 'De Vita et Victu Populi Romani sub Imperatoribus Cæs. Augustis,' Bologna, 1559, folio. Besides these he published editions of Aristotle's 'Poetics,' the 'Tragedies' of Æschylus, the 'Tactics' of Ælian,' and Longinus 'On the Sublime.'

(Weiss in *Biographie Universelle.*)

ROBULI'NA. [FORAMINIFERA, vol. x., p. 348.]

ROBUSTI. [Tintoretto.]

ROCCA, in Italian, means a strong hold or fortified place, perched upon a rock or steep hill, a position common to many provincial towns in Italy. Rocca, properly speaking, means the castle or keep, but it has also become an appellative for the town or village which generally adjoins it. The appellative Rocca is most frequent in the Neapolitan and Papal states, and in Piedmont. The most notable places of this name are Rocca Morfina, in Campania, once the capital of the Aurunci; Rocca di Papa, on the Alban Mount, near Rome; Rocca Gorga, near Piperno; Rocca Rasa, and Rocca Vall' Oscura, two stations in the Abruzzo, on the high road from Naples to Sulmona, in the mountain tract which divides the valley of the Sangro from that of the Pescara; Roccabruna, in the province of Cuneo in Piedmont; Roccaforte, in the province of Mondovi; Roccabione, in the province of Cuneo, &c.

ROCCELLA. [Orchil.]

ROCHDALE, a parliamentary borough in the hundred of Salford, 12½ miles north-west of Manchester, and 202½ from the General Post-office, London, by the mail road through Dunstable, Northampton, Market Harborough, Leicester, Derby, Belper, Matlock, and Buxton to Manchester; in 53° 37′ N. lat. and 2° 10′ W. long.

The parish of Rochdale is one of the most extensive in the kingdom. It extends into Agbrigg wapentake, in the West Riding of Yorkshire, and comprises 58,620 statute acres; with a population, in 1831, of 74,427, of which 40,340 acres and 58,441 inhabitants are in Lancashire. The Lancashire part was formerly divided into four parts, now into ten townships, as follows:—

Former Division.	Present Division.	Pop. 1831.
Honorsfield or Hundersfeild .	Blatchinworth and Calderbrook .	4,221
	Todmorden and Walsden . .	6,054
	Wardleworth . .	9,360
	Whitworth and Brandwood .	*
	Wuerdale and Wardale . .	6,754
Spotland . .	Spotland, further side . .	15,325
	Spotland, nearer side . .	
Castleton . .	Castleton . .	11,079
Butterworth .	Butterworth . .	5,648
		58,441
	YORKSHIRE.	
Chapelry of Saddleworth cum-Quick	.	15,986
		74,427

Rochdale derives its name from the Roch (which flows into the Irwell, a tributary of the Mersey); it is called Recedham in the Domesday Survey. In the time of Edward III. some Flemings introduced the woollen manufacture into the parish; and two centuries afterwards, viz. in the reign of Elizabeth, it was still famous for its woollens. In 1610 there were no fewer than five fulling-mills established on the Spodden or Spotland brook in this parish.

The town of Rochdale is situated on both sides of the river Roch, into which, on the north bank, two brooks flow, the Hee brook just above, and the Spodden or Spotland brook just below the town. That part of the town which is on the south side of the Roch is in the township of Castleton, and is connected by three bridges with the more extensive part on the north side of the Roch, which extends into the townships of Wardleworth and Spotland, and a small part into the township of Wuerdale and Wardale. The streets are irregularly laid out, and many of them are narrow and inconvenient. Within the last fifteen years however great improvements have taken place, several of the streets have been widened and otherwise improved, and a new market-house completed. The houses are chiefly of brick; some of the best are built of freestone quarried in the neighbourhood: the streets are well paved, and lighted with gas; and the town is supplied with water from four reservoirs in Castleton township. The old bridge over the Roch (a stone bridge of three arches) has been widened and improved; about a quarter of a mile below it is another stone bridge of one arch, and just above it an iron bridge for foot passengers. There are several churches and chapels, episcopal and dissenting. The parish church was built within about a century of the time of Domesday Survey, and was dedicated to St. Cedd or St. Chad. It is partly in the early English style, with a few remains of Norman character in the interior. The nave and south aisle, and the tower, which is embattled and crowned with pinnacles, are of later date. The windows of the choir have rich tracery; and the font and many of the monuments are very antient. St. Mary's church was built in 1740 as a chapel-of-ease to the parish church; it is a plain brick building. St. James's, built in 1814, is a Gothic stone edifice, with a square embattled tower. There are other churches or episcopal chapels (some of them erected of late years) in the outparts of the parish. There are in the town chapels for Presbyterians, Baptists (two), Methodists (Wesleyan, New and Primitive), Independents, the countess of Huntingdon's connexion, Unitarians, and Roman Catholics: all these, except the Presbyterian chapel, have been built or rebuilt in the present century.

The manufactures of this place are very important; they comprehend woollen goods, as baize, flannels, coatings, and friezes, and strong calicos and other goods in cottons; but the woollen fabrics form the staple. Hats are also made, and cotton yarn is spun. Coal is dug, and slates, flagstones, and freestone are abundantly quarried in the parish, and there are iron-works in Butterworth township. Steam-power is extensively employed by the manufacturers. There are two weekly markets; on Monday for manufactured goods, wool, oil, dye-stuffs, and grain; and on Saturday for provisions. There are three yearly fairs: on May 14th; on Whit-Tuesday; and on November 7th; all for cattle, horses, and pedlary. The Rochdale canal, which unites the duke of Bridgewater's canal at Manchester with the Calder and Ribble navigation near Halifax in Yorkshire, passes near the town on the south-east side of it.

The town is in the jurisdiction of the county magistrates. The lord of the manor holds a court baron every three weeks for the recovery of debts under 40*s*. There are a neat town-hall, used also as a news-room, and a commodious gaol called the New Bailey.

Rochdale was erected into a parliamentary borough by the Reform Act; and the boundary, as defined by the Boundary Act, coincides with the boundary laid down in a previous local police act, and is a circle drawn with a radius of three-quarters of a mile from the old market-place in the very heart of the town. Rochdale returns one member to parliament: the number of voters on the register for 1834-5 was 746; for 1835-6, 695.

The borough of Rochdale is a vicarage, one of the richest in the kingdom, at present in the archdeaconry and diocese of Chester; but to be transferred to Manchester when that see is erected. Its clear yearly value is estimated at 1730*l*., with a glebe-house: it is in the gift of the archbishop of Canterbury. The glebe comprehends 200 acres of land, a part of it built upon.

There were, in 1833, in the three townships of Castleton, Wardleworth, and Spotland, sixty-eight schools of all kinds for daily instruction, with 2289 scholars; and twenty-eight Sunday-schools, with 4036 scholars. Some of these schools are probably out of the town in the outparts of the townships. We have not included Wuerdale and Wardale township, as only a very small part of the town is in it. Four of the day-schools are endowed; one is a national school, the children of which attend also on Sunday.

Littleborough, in the parish of Rochdale, was a Roman post, but the remains of it have nearly or quite disappeared. Roman coins, and part of a statue of Victory, of silver, have been dug up. The mound of an antient castle, said to be of Saxon original, to which the township of Castleton owes its name, is mentioned in the 'Beauties of England and Wales.' In the chapelry of Saddleworth, in the Yorkshire part of the parish, are some Druidical remains. (Baines's *Hist. of Lancashire*; *Parliamentary Papers*.)

ROCHEFORT, a town and port of France, capital of an arrondissement in the department of Charente Inférieure, 300 miles south-west of Paris by the road through Orléans, Tours, Poitiers, and Niort; in 45° 56′ N. lat., and 0° 59′ W. long.

Rochefort was in the middle ages in the power of the English, from whom it was taken by Charles VII. Its capabilities as a naval station having attracted notice, works were commenced, in the reign of Louis XIV., in A.D. 1666; since which time the immense works carried on have rendered it one of the most important naval stations of France. An expedition against Rochefort was sent out from England, A.D. 1757, but from cowardice or mismanagement it ended in a disgraceful failure.

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* Not given in the Population Returns; probably included in one of the other divisions.

The town stands in a low marshy district, which in the summer and autumn renders the town unhealthy: it is on the northern bank of the Charente, about ten or twelve miles from the sea; the river, though not very large, affords sufficient depth of water at all times to float the largest vessels. The town is regularly fortified, and the approach is defended by forts on the Isle of Aix, and at the mouth or on the banks of the river. The ramparts are planted with trees. The streets are well laid out, broad, and straight, and well lighted with lamps and reflectors; they are watered daily in the summer months by a forcing-pump from a large reservoir. Some of the streets are planted with poplars and acacias, and the principal of them terminate on the parade. The houses are well built, but low, so as less to impede the circulation of the air. The harbour is formed by the Charente. The arsenal is one of the most extensive and finest in the kingdom; it comprehends an armoury, a large dock for building, basins for repairing, and immense storehouses, extending more than 1300 feet, of every necessary for equipping vessels, a cannon-foundry, a ropewalk about 1250 feet long, a victualling-office, barracks, a depôt for convicts, with a saw-mill, and a mill which cleans the harbour, moves the cylinders for rolling out sheet-metal, and performs other work; and a fine naval hospital, including eighteen wards, besides the officers' apartments, and containing 1240 iron bedsteads. In the part of the harbour reserved for merchantmen, ships of 600 tons, fully laden, can come up to the quays. There is an Exchange.

The population of Rochefort, in 1831, was 10,332 for the town, or 14,040 for the whole commune; in 1836 it was 15,441 for the commune. Besides the business connected with the arsenal, vessels are fitted out for the cod fishery, and a considerable coasting-trade is carried on. The chief exports are wine, brandy, corn, and salt. There are three yearly fairs. Rochefort has two churches, three chapels, a general hospital, besides that for the navy, a foundling hospital, a high school, a school of navigation and hydrography, a school of naval medicine, schools of surgery and mathematics, schools on the monitorial system for drawing, singing, and music; a society of literature, science, and art; a public library of 1500 volumes, a library of 10,000 volumes for the navy, a cabinet of natural history, a botanic garden, and a theatre. A consistory of the Reformed (or Calvinistic) church is established here; and there is a Protestant Bible Society.

The arrondissement of Rochefort contained, in 1831, forty-seven communes, and was divided into four cantons or districts, each under a justice of the peace. Its population at that time was 48,836.

ROCHEFOUCAULD, or ROCHEFOUCAULT, LA. [CHARENTE.]

ROCHEFOUCAULD, FRANÇOIS, DUC DE LA, of a distinguished noble family of France, was born in 1613. He appeared early at the court of Louis XIII., and showed some talents and ambition, but was kept out of employment and favour by the jealousy of Cardinal Richelieu. In the early part of the subsequent reign of Louis XIV. he figured in the civil war of La Fronde. He attached himself to the party of the Duchess of Longueville, whose avowed admirer he was, and he was severely wounded at the siege of Bordeaux, and in the battle of St. Antoine at Paris. After Louis XIV. had firmly established the monarchical authority, La Rochefoucauld withdrew to private life. In this second part of his career he exhibited private virtues which atoned for the folly and violence of his younger years. He was intimate with Madame de la Fayette, and with Madame de Sévigné, who speaks of him, in her correspondence, in terms of real esteem. He died in 1680, with calm and christian-like resignation. The Cardinal de Retz, his contemporary and fellow-partizan, in his 'Memoirs,' says of him, that he was always irresolute in his temper; a good soldier, with no military talent; a bad courtier, though ambitious of figuring and meddling in intrigue; but at the same time he praises 'his natural good sense, the ease and mildness of his manners,' and says that 'he was a very upright man in private life.' La Rochefoucauld left several works, the principal of which are, 'Mémoires de la Régence d'Anne d'Autriche,' and his 'Maximes,' or 'Pensées,' for which he is best known as an author. This book has made much noise in the world; it has been abused, criticised, controverted, and yet no one can deny that there is a great deal of truth in it, though it generalises too much. La Rochefoucauld attributes all the actions of men, good or bad, to the moving-spring of self-interest. Friendship is an exchange of good offices, generosity is the means of gaining good opinion, justice itself is derived from the fear of suffering from the oppression of others. This may be all true, but still there are actions in which men can have no self-interest in view, in which they act from enthusiasm, or a strong sense of duty, or from benevolence, or some motive other than self interest; such are, for instance, the self-devotedness of the patriot, the perseverance of the upright man through good and evil report, the sacrifice made by pure love, and above all the calm resignation of the Christian martyr. These and other similar instances La Rochefoucauld has not taken into account, because probably he had seen no specimen of them. La Rochefoucauld has accounted for most actions of a great proportion of mankind, perhaps by far the greater, and for so doing he has been abused, because, as a French lady observed, he has told every body's secret. He has placed himself, with regard to private morality, in the same predicament as Machiavelli with regard to political morality. [MACHIAVELLI.] J. J. Rousseau, who was certainly not free from selfishness, has abused La Rochefoucauld's Maxims, and yet in his 'Emile' he observes that 'selfishness is the main spring of all our actions,' and that 'authors, while they are for ever talking of truth, which they care little about, think chiefly of their own interest, of which they do not talk.' La Fontaine, in his fable (b. i., 11) 'L'Homme et son Image,' has made an ingenious defence of La Rochefoucauld's book.

La Rochefoucauld's 'Maximes' have gone through many editions. The 'Œuvres de la Rochefoucauld,' 1818, contain, besides his already published works, several inedited letters and a biographical notice.

Several other individuals of the same family have acquired an historical name, among others, Louis Alexandre de la Rochefoucauld, Peer of France, who embraced the popular part at the beginning of the great French revolution, and displayed considerable violence in his sentiments, notwithstanding which, after the 10th of August, he was massacred by the Jacobins as an aristocrat.

ROCHELLE, LA, a town in France, capital of the department of Charente Inférieure, 301 miles south-west of Paris by the road through Orléans, Tours, Poitiers, and Niort; in 46° 8′ N. lat. and 1° 8′ W. long.

La Rochelle was antiently a small town and fort belonging to the lords of Mauléon, from whom it was taken by one of the counts of Poitou. On the marriage of Henry II. of England with Eléonore of Guienne, heiress of Poitou, it came into the hands of the kings of England, from whom it obtained considerable municipal privileges. It was taken from the English by Louis VIII., A.D. 1224, was again ceded to them by the treaty of Bretigny, A.D. 1360, but finally recovered, A.D. 1372, by Duguesclin. Under the French kings the privileges of the town were further augmented; the importance of the place increased, and upon the acquisition of it by the Huguenots, A.D. 1557, it became a sort of republic, and the stronghold of their party. It was besieged in 1574, by the duke of Anjou, but in vain: the garrison was commanded by La Noue. In 1627 it was again besieged by the royal forces under Louis XIII. and his minister Richelieu. By means of an immense barrier of piles carried across the entrance of the harbour, assistance from the sea was precluded, and the attempt of the English to succour the townsmen was defeated by the incapacity of the duke of Buckingham, the favourite of Charles I., who commanded the expedition. The townsmen, under the mayor Guitton, held out for thirteen months, but, after undergoing the most dreadful extremities from famine, were compelled to surrender, and the power of the Huguenot party was finally broken. Rochelle was fortified anew by Vauban, by order of Louis XIV., and is still maintained as a fortified town.

The town stands on the northern side of a small inlet of the Atlantic, which extends eastward about two miles into the land, and terminates, just above Rochelle, in a salt marsh. The entrance of this inlet, which serves as the roadsted or outer harbour of the town, is defended by forts;

and the approaches are further protected by the works on the Isle of Ré and the Isle of Aix. The fortifications on the land side, though extensive, including nineteen large bastions and eight half-moons, are not reputed to be strong, but on the sea side the security of the place is regarded as complete. There are seven gates. The town is well laid out; the streets are for the most part straight, broad, clean, and lined with well-built houses adorned with porticos, but not of great elevation. There are several fountains, which contribute to the cleanliness of the place. The squares are tolerably numerous, but all of irregular form: the principal are the Place de la Préfecture and the Parade, both planted with trees. The promenade of Le Mail commands a fine prospect of the harbour and the sea. The principal public buildings are the cathedral, the seminary for the priesthood, the bishop's palace, the town-hall, a fine Gothic building, the courts of law, the Exchange, the post-office, the guard-house of the departmental guard, the theatre, the curious clock-tower, the general hospital (or hospital of St. Louis), the orphan hospital, the office of the prefecture, the mint, the markets, the abattoir, or public slaughter-house, the barracks, and the elegant sea-bathing rooms erected in 1827. There are four churches besides the cathedral, several chapels, four nunneries, a Protestant church, a house of correction, one military and two other prisons, and an hospital or almshouse, besides the two mentioned above.

The dock or inner harbour is in the south part of the town, by which it is surrounded on nearly every side, and comprehends two basins, one (Le Hâvre), adjacent to the roadsted, dry at low water, and bounded by a range of fine quays; the second is closed by flood gates, by means of which the shipping are kept constantly afloat; this basin also is surrounded by quays. The Canal Maubec, which runs from the north-eastern corner of this basin, divides the city into two parts, which communicate by three bridges over the canal. Ships of any burden can get up to La Rochelle at high water.

The population of La Rochelle in 1831 was 14,632; in 1836 it was 14,857. The exports from the port comprehend brandy and other spirits, wine, salt, flour, cheese, butter, oil, and linen cloth: the imports comprehend colonial produce and groceries. The townsmen refine sugar, spin cotton-yarn, make pitch, tar, catgut, and gloves, build ships, and engage in the Newfoundland cod fishery. There are two fairs in the year, each of five days. Besides the establishments already noticed, there are courts of law, a chamber of commerce and several administrative or fiscal government offices, an academy of belles-lettres, sciences, and arts; a high school or college, a school of navigation, a drawing-school, and a school of midwifery; a public library of 20,000 volumes, a museum of natural history, and a botanic garden; an agricultural society, a Protestant Bible society, and some charitable institutions.

Rochelle is the head-quarters of the twelfth military division, which comprehends the departments of Charente Inférieure, Deux Sèvres, and Vendée. The bishopric of Maillezay was transferred to Rochelle in 1665: the bishop is a suffragan of the archbishop of Bordeaux: his diocese comprehends the department of Charente Inférieure. The arrondissement of Rochelle comprehends fifty-five communes, and is divided into seven cantons or districts, each under a justice of the peace. The population in 1831 was 77,589.

Rochelle salt, a purgative medicine of some reputation, was discovered by M. Seignette, an apothecary of Rochelle, whence its name. It is sometimes called Seignette salt. Réaumur, well known from his graduation of the thermometer and in other respects, and Billaud-Varennes, the conventionalist, were natives of Rochelle.

ROCHESTER, an antient city in the county of Kent, situated on the south or right bank of the Medway, immediately adjacent to the parliamentary borough of Chatham [CHATHAM], with which it forms one continuous town: it is 29 miles from the General Post-office, London, by the road through Dartford and Gravesend; and nearly the same distance in a direct line.

Rochester probably existed antecedently to the Roman invasion, at any rate antecedently to the conquest of the southern part of the island under Claudius, and its antient name, which is of Celtic origin, denotes that it was at a passage over the river. Its Roman and Saxon names, from the latter of which by corruption the modern Rochester is derived, are given elsewhere. [KENT, vol. xiii., p. 192, col. 1.] During the independence of the Saxon kingdom of Kent it was of importance both as the seat of a bishopric (established about A.D. 604) and as a place of strength situated at the passage of the Medway. It was destroyed by Ethelred, king of Mercia, A.D. 676, and by the Danes in the time of Ethelwulf, A.D. 839: it was besieged by the same enemies (A.D. 885), but relieved by Alfred, who drove the invaders to their ships. In the time of Ethelred II. (A.D. 986) it was besieged, but in vain, by that king, who had a quarrel with the bishop; and was sacked (A.D. 998 or 999) by the Danes. After the Conquest, William the Conqueror either built or more probably repaired and strengthened a castle here, and placed it under the command of his brother Odo, bishop of Bayeux. In the reign of William Rufus this castle was besieged and taken by the king; against whom Odo had rebelled. In the reign of Henry I. (A.D. 1130), and again in that of Stephen (A.D. 1137), and a third time in that of Henry II. (A.D. 1177 or 1179), the city was nearly destroyed by fire. In the civil war of John, the castle was taken by that prince from the insurgent barons (A.D. 1215), and retaken next year by the Dauphin Louis. In 1264 the town was taken, and the castle besieged and reduced to extremity, by the confederate barons under Simon de Montfort, Earl of Leicester, but he was obliged to raise the siege and march against the king. In the rising of the commons under Wat Tyler, the castle was assailed, with what success is not clear. Edward IV. was the last king who paid any attention to the repair of the castle. James II. embarked at Rochester when he fled to France after his abdication, A.D. 1688.

The town stands chiefly on a low narrow tract which borders the Medway, and is backed by the chalk hills, which rise from the river with a rather steep ascent. It consists of several streets irregularly laid out; the principal street leads from the bridge at the west end of the town into Chatham on the east side. On the western side of the Medway are Strood and Frindsbury, considerable portions of which two parishes have been added to the town both for parliamentary and municipal purposes. A part of Strood and also a small part of Chatham were previously in the city of Rochester. The streets are paved, and lighted with gas, and the houses commonly of respectable appearance. The environs are extremely pleasant, and in the outskirts of the town are a few handsome villas, and rows of neat modern houses built on the higher ground which rises from the low margin of the river.

The cathedral is situated on the south side of the High-street within the antient Priory gate. It consists of a nave with side aisles, a choir (the floor of which is raised ten steps above the floor of the nave), a principal transept, at the junction of the nave and choir, and a smaller transept at the east end of the choir. At the intersection of the principal transept is a central tower erected in 1825; at the western end of the church there appear to have been originally four low towers, two on each side the doorway and two at the extremities; of these only two now remain, which are of different style. On the north side of the choir, between the two transepts, but nearer to the principal one, is a low square tower, now in ruins, called Gundulph's tower. The dimensions of the building are as follows: length of the nave 150 feet; breadth with side aisles 66 feet; length of the choir 156 feet; making the total length of the church 306 feet; length of the principal transept 122 feet; of the smaller transept 90 feet; area of Gundulph's tower, inside, 24 feet square; walls of Gundulph's tower 6 feet thick. Extent of the west front of the cathedral 81 feet. The chapter-house is in ruins; a mean building, erected in the place of it, serves for chapter-house and library. The nave is part of the structure of Bishop Gundulph, who rebuilt the cathedral near the close of the eleventh century. The west front is a fine specimen of enriched Norman architecture; but the great west window is an insertion of perpendicular character, as are most of the other windows of the nave. The nave has Norman piers and arches, except in the part nearest the choir, where the arches are early English. The roof of the nave is now flat; but there are indications that it was intended at first to be vaulted. On the south side of the church are some other Norman portions, which appear to have been the cloisters, and some other of the usual monastic adjuncts. Most of the eastern part of the church is of plain early English architecture, of good composition, without much ornament: the details of the doors and of some other portions are very good: the roof of the choir and of both transepts is vaulted and groined, except in one part, which was never finished. The pillars of the choir are of Petworth marble. The crypt is very spacious, extending under the buildings of the choir; its character is early English, scarcely differing, in one part, from Norman. There are a few antient monuments, singular rather than beautiful, and much mutilated. The old altar-piece, a painting by West, of the Angels appearing to the Shepherds, is now in Chatham church. There are several chapels, in one of which the bishop holds his consistory court. The architecture and masonry of Gundulph's tower give reason to think that it is improperly ascribed to him. The interior of the cathedral, has lately (1841) been repaired, and in many places restored to its original beauty, by the present dean and chapter, who have exhibited equal taste and liberality in the improvements which they have suggested or sanctioned. Arches and windows for a long time filled up have been opened, especially in the north transept, which now forms a valuable study for the architect and antiquary, as a specimen of early English, not excelled, if equalled, by any in the kingdom.

There are two parish churches in Rochester, St. Margaret and St. Nicholas; they are not remarkable for their architecture, but each has a very antient stone font, and St. Margaret's contains several antient monuments. Within the city is a commodious Wesleyan chapel, and a meeting-house belonging to the Society of Friends.

There was probably a bridge at Rochester at a very early period, but there is no distinct mention of it till the time of Henry I., when it appears to have been of wood, with ten arches or spaces between the piers, and a total length of about 431 feet. The frequent damage sustained by this wooden bridge and its continual need of repair led to the erection of the present one (a little above the site of the more antient structure), which was completed in the reign of Richard II. It is a stone bridge of eleven arches, 560 feet long, with a stone parapet and balustrades. The conservators of the bridge are an incorporated body under the title of the 'Wardens and Commonalty of the new Bridge of Rochester,' and have considerable funds appropriated to the repair of the bridge. The approach to Rochester from the London side of the bridge is very striking.

The castle is on the bank of the Medway, just above the bridge. The outer walls were 20 feet high above the ground, and 7 feet thick, strengthened with towers, square and round, and defended by a ditch on every side except the west side, where it was washed by the Medway. These walls enclosed a quadrangular area nearly 300 feet square, and are, with their towers, now in ruins. In the south-eastern angle of the court was the keep, a massive building yet standing, about 70 feet square on the outside, and rising about 104 feet from the ground, with a tower at each angle rising 12 feet above the rest of the building; three of these towers are square, that at the south-east angle is round. On the north side near the north-eastern angle is another tower, through which was the entrance; it joins the keep, and rises about two-thirds of its height. This smaller tower covers half the breadth of the northern side of the keep, and projects from it about 18 or 20 feet. The roof and floors have been destroyed: there were originally three stories besides the vaulted basements: each story was divided into two apartments by a partition wall rising to the top of the keep, with open arches or doorways on each floor, and having a well 2 feet 9 inches in diameter curiously built into it, to which well there was access from each floor. The walls of the castle are of great thickness, built of Kentish ragstone, cemented with a grouting or mortar equal to the stone itself in hardness. The coigns are of Caen stone. The architecture is Norman, except perhaps the round tower at the south-eastern angle, which was rebuilt in the place of the original square one destroyed when King John besieged and took the castle. The four towers at the angles rose one story above the keep, and, as well as the keep itself and the entrance tower, were surmounted with a platform, with parapet and embrasures.

The other public buildings are, a commodious town-hall, with a market-house beneath, and a small gaol adjacent; a clock-house, built by Sir Cloudesley Shovel on the site of a former town-hall; a neat theatre; and the bridge chamber or record-room, opposite the east end of the bridge. There are some remains of the city walls; and part of the fortifications of Chatham, especially Fort Pitt, are within the city.

Strood and Frindsbury, considerable portions of which have been added to Rochester both by the Boundary and Municipal Reform Acts, are on the north-west side of the Medway; Strood on the London road, and Frindsbury a little to the north-east. Strood consists of one principal street of irregularly built houses; the place has improved considerably of late years; it has a neat church. Frindsbury consists chiefly of one long street. The church is on an eminence commanding a very fine prospect. There is a Methodist meeting-house. Upnor Castle on the Medway is in Frindsbury parish: it consists of an oblong central building, with a round tower at each end, and is surrounded by a moat; it was used during the late war as a powder-magazine.

The population of the borough, as enlarged by the above acts, was as follows, according to the census of 1831:—

Rochester old borough:

St. Margaret's	5,025
St. Nicholas	3,050
Cathedral precincts	138
Strood intra	1,173
Chatham intra	505
	9,891
Addition—Strood extra and Frindsbury	2,167
	12,058

There are no manufactures in Rochester. Trading vessels come up to the bridge, where they discharge their cargoes, chiefly coals, which are conveyed up the river in small craft. The oyster fishery is carried on with great activity under the direction of the corporation, who have jurisdiction over the fisheries in the creeks and branches of the Medway. Considerable quantities of oysters are sent to London or exported to Holland; a considerable quantity of shrimps also are sent to London. There are two weekly markets, one, lately established, on Tuesday for corn, and one on Friday for provisions; and there is a monthly cattle-market. The fairs are almost disused. A canal was cut some years ago from the Medway to the Thames at Gravesend Reach, but the undertaking has not been profitable. This canal is carried through the chalk hills by a tunnel two miles and one furlong in length, which commences near Rochester bridge.

The corporation of Rochester, under the Municipal Reform Act, consists of six aldermen and eighteen councillors: the city is divided into three wards. The corporation have exclusive jurisdiction over all offences committed within the city and liberties. There are no quarter-sessions; but petty sessions are held twice a week; and there is a court of requests having jurisdiction over several neighbouring parishes. Some other courts connected with the corporate jurisdiction are held. Rochester has returned members to parliament since the reign of Edward I. The number of voters on the register for 1834-5 was 967; for 1835-6, 1002.

The livings of St. Nicholas and St. Margaret are vicarages of the value of 389*l.* and 136*l.* respectively; there are glebe-houses to both. Strood is a perpetual curacy, of the clear yearly value of 238*l.*, and Frindsbury a vicarage, of the clear yearly value of 449*l.* They are all in the diocese and archdeaconry of Rochester.

There were in the city of Rochester and in the parishes of Frindsbury and Strood, in 1833, forty schools, in which 1219 children, viz. 567 boys and 574 girls, and 78 of sex not specified, were receiving daily instruction; and five Sunday schools, with 761 scholars, viz. 369 boys and 392 girls. One of these schools is a proprietary school; and another, called the King's School, is governed by the dean and chapter. An endowed mathematical free-school was established in 1701. Among the schools enumerated were two large national schools. There is an almshouse and dormitory for poor travellers in the town, where they receive entertainment and a night's lodging.

Rochester Diocese.—The diocese of Rochester is one of the smallest in the kingdom, and one of the most slenderly endowed. It contains but one archdeaconry, that of Rochester, divided into the three deaneries of Rochester, Dartford, and Malling, all in the western part of the county of Kent. The deanery of Shoreham, though nearly on every side enclosed within the diocese of Rochester, and frequently reckoned as a part of it, is in the peculiar jurisdiction of the archbishop of Canterbury. The number of parishes in the diocese (not including the deanery of Shoreham) is given by Hasted (*Hist. of Kent*, vol. ii., Canterbury, 1782) at ninety nine: in Lewis's 'Topographical Dict.' it is given at ninety-one. We believe the latter account to be nearly correct as to the number of parishes, but the additions of dependent chapelries will swell the number to that given by Hasted, and by including ecclesiastical divisions lately formed, to a greater number still. The clear yearly revenue of the bishopric is estimated at 1459*l.* The gross yearly revenue of the cathedral is estimated at 7178*l.*; but the payment of stipends, the maintenance of the fabric, and the support of the grammar-school, cause a deduction of 2072*l.*; leaving 5106*l.* to be divided among the corporation, which consists of the dean and six prebendaries. (*Report of the Ecclesiastical Revenue Commissioners*, 1835.) There were formerly six minor canons, but now there are only three, who fill in succession the offices of sacrist and precentor, and a master and usher of the King's School.

It is recommended by the Church Commissioners to make great alterations in this diocese. They propose to transfer to the diocese of London those parishes of the deanery of Dartford which are nearest the metropolis; and to the diocese of Canterbury the remainder of the deanery of Dartford and the whole of that of Malling: these additions, with that of the deanery of Shoreham, will place nearly the whole of Kent under the see of Canterbury. In return it is proposed to add to Rochester nearly the whole of the archdeaconry of Essex (including the deaneries of Rochford, Dengey, Chelmsford, Barstaple, Chafford, Ongar, and part of Barking) and the whole of the archdeaconries of Middlesex (containing the deaneries of Hedningham, Dunmow, Harlow, and Braughing), Colchester (containing the deaneries of Tendering, Colchester, Lexden, Witham, Sampford, Newport, and the jurisdiction of Waltham), and Saint Alban's; all taken from the diocese of London; and the four deaneries of Baldock, Hitchin, Berkhampsted, and Hertford, in the archdeaconry of Huntingdon, taken from Lincoln. By these changes nearly the whole of Essex and the whole of Hertfordshire will be placed under the see of Rochester, which will retain only the deanery of Rochester of its more antient diocese.

The diocese of Rochester was founded A.D. 604. Justus, one of the companions of Augustin, the apostle of the Anglo-Saxons, was the first bishop; but on the relapse of Eadbald, king of Kent, into paganism, he fled to the Continent. On the reconversion of Eadbald, he returned. He was translated to Canterbury, A.D. 624. Gundulph, who was bishop from A.D. 1077 to 1107, rebuilt the cathedral: part of his building remains in the nave of the present edifice. Walter de Merton, who was bishop from A.D. 1274 to 1277, was chancellor of England and founder of Merton College, Oxford. John Fisher, bishop from A.D. 1504 to 1535, was beheaded by Henry VIII. for denying the king's supremacy, in the 80th year of his age. Thomas Sprat, bishop from A.D. 1684 to 1713, was a writer of considerable note; and his successor, Francis Atterbury (bishop from 1713 to 1723), is celebrated both as an eminent writer and a leading Jacobite. Zachary Pearce, bishop from A.D. 1756 to 1774, is well known as a commentator and critic.

ROCHESTER, LORD. [WILMOT.]

ROCHFORD. [ESSEX.]

ROCK ALUM. [ALUM.]

ROCK CRYSTAL. [QUARTZ.]

ROCK MANAKIN. [RUPICOLINÆ.]

ROCK-PLANTS are those plants which are distinguished by growing on or among naked rocks, and are confined to no particular region or latitude. De Candolle (*Dictionnaire des Sciences Naturelles*, vol. xviii.) observes that they pass by insensible gradations into the plants that inhabit walls, rocky and stony places, and even gravelly places, from which they pass into those that are found particularly on sands and barren soils. Most of the plants growing on rocks have but a small development of root, as they derive their nutriment principally from the air, through the medium of their leaves and stems. A large number of the Cryptogamia, especially mosses and lichens, belong to this class. Many of these plants present a remarkable diversity, according to the nature of the rocks on which they grow. This is a subject which has not received the attention that it deserves.

Rock-plants are often introduced into gardens for the purposes of ornament, for which the size and beauty of the flowers of many of them peculiarly adapt them. [ROCK-WORK.]

ROCK RIVER. [MISSISSIPPI, River.]

ROCK SALT. [SODIUM.]

ROCK-WORK, in gardening, an elevation, composed of earth and other loose materials, and covered with stones and fragments of rock, &c., amongst which plants adapted for such a situation are grown. When the rock-work is managed skilfully, and in accordance with surrounding objects, it may be made to add much to the beauty and interest of the garden. In the first place a proper situation should be selected, and the character of the rocks should harmonise with the situation. Simple outlines and surfaces not broken into fantastic shapes, are best suited to show off the plants; in this respect hints should be taken from the natural rock-work that often meets us by the mountain side. Cones and peaks of unnatural shape and size should be avoided. A ground-plan in the form of a crescent or of an irregular figure is best; the middle portions should be the broadest and most elevated. When large portions are thus laid out, steps may be formed leading to basins of water on the sides or summits of the rock-work. These basins of water have two advantages: first, in permitting the growth of various aquatic plants; and secondly, in keeping the great mass of earth in the rock-work moist and cool. The best stones for rock-work are those which resist the action of the air, and they may be selected according to convenience from the rocks of the neighbourhood in which they are used. The most irregular ought to be chosen, especially those with cavities in them, which may be filled with earth for the growth of mosses, ferns, and small plants. Frequently stones are met with covered with lichens, which, from their picturesque colours, have a pleasing effect. Of these, the *Lichen atroflavus, geographicus, ventosus, perellus*, and *stellaris*, are most common. Such stones are mostly large, and are best adapted for the base of the rock-work. Portions of ruins, antiquities, corals, petrefactions, idols, shells, and Chinese garden-ornaments are often introduced into rock-work, but they give too much of an artificial character to the work, and it is questionable whether they can ever be introduced among plants with good effect.

Although the rock-work is intended to present a mountainous or rocky vegetation in a small space, yet there are many circumstances that prevent the growth of true mountain and rock plants in such a situation; but the dry ridges of earth and stones of which it is composed afford a favourable situation for the plants that chiefly occupy the dry soil of plains. On this account, small shrubs and creeping plants of any kind that will grow in a dry soil are selected for rock-work. We shall here point out those which may with advantage be cultivated for this purpose.

The natural order Leguminosæ affords a great number of plants fitted for rock-work. The triangular Genista (*Genista triquetra*) is a trailing shrub, evergreen in winter. From its winged triangular green shoots it produces a vast profusion of flowers of a golden colour from April to July. Anxantic Genista (*Genista anxantica*) is a diffuse plant producing an abundance of yellow flowers from June to July. The dwarf Cytisus (*Cytisus nanus*) is a pretty procumbent shrub, flowering in July. It should be planted in a dry soil, which should be covered over with broad flat stones. The Rest-harrows (*Ononis*) are suffruticose plants, with purple and red flowers. Most of the woody Leguminosæ have yellow flowers; hence the Rest-harrows form an agreeable variety. *Astragalus altaicus, aristatus*, and *brevifolius*, are all suffruticose plants, the last with purple flowers, which would form good plants for rock-work. To these may be added *Hedysarum coronarium* and *pallidum; Astragalus tragacantha, campestris, hypoglottis*, and *uralensis*.

Almost all the Rock-rose tribe (Cistaceæ) may be grown with success on rock-work. The procumbent and Fumana Sun-roses (*Helianthemum procumbens et fumana*) have both procumbent branches, small beak-like leaves, and yellow flowers, which appear in June and July. *H. Rodantha* has bright red flowers inclining to crimson. It is quite hardy, of easy culture, and produces its flowers in abundance.

Several of the hardier species of the natural order Mesembryaceæ will bear exposure; and as they require little nutriment and soil, are well adapted for growth on rock-work. Many of the species also of the order Crassulaceæ will grow under the same circumstances. Cotyledon umbilicus requires nothing more than a little sand. Several species of Stone-crop (*Sedum*), as *S. anglicum, Forsteri, glaucum, hybridum, rupestre, sexangulare*, and *villosum*, will flourish in very dry situations.

Many of the Cruciferous plants are naturally rock-plants. The common stock (*Matthiola incana*) and wall flower (*Cheiranthus Cheiri*) are well known on walls and rocky situations. *Alyssum calycinum, montanum, muruel, saxatile, Iberis Tenoredna, Cochlearia saxatilis, Aubrietia alpina, Arabis alpina, bellidifolia, petræa, Draba aizoides, Aizoon, stellata, tomentosa, Thlaspi alpestre*, &c., will all grow on rock-work, and many of them bloom all the summer round. The False Cytisus (*Vella pseudo-cytisus*) is a shrub with yellow petals and purple claws, which may be prettily associated with the dwarf furze and the Nitraria.

Of the Labiate plants, the species and varieties of the thyme claim the first place. They grow well amongst rocks, especially of a calcareous kind; and patches of the various species, especially *Thymus vulgaris* and *grandiflora*, should form a part of every rock-work. They are not only beautiful in flower, but are exceedingly fragrant, and are a source of attraction to bees. *Betonica alopecurus*, and *Ajuga alpina* and *pyramidalis* may be also cultivated.

Many of the species of the order Caryophylleæ may be grown. One of the most prolific of these is the *Cerastium repens*, which grows very rapidly, and is consequently adapted to cover parts that do not look well exposed. It is for this purpose often used to cover heaps of rubbish. Various species of Dianthus will grow well, and are very ornamental, as *D. deltoides, armeria, collinus, hyssopifolius, plumarius, virgineus*; also *Cerastium latifolium, alpinum, Silene atocion*, and *rubella*.

Many of the Saxifrages are true rock-plants: they mostly blossom early in the year. The following species may be grown amongst rocks:—*S. oppositifolia, paniculata, aizoides, nivalis, petræa, densa, retusa, elongella*.

Many of the Campanulas may be grown successfully. *C. carpatica, collina, alba*, and *saxatilis* blossom nearly all the summer: the latter is a very ornamental plant. Many other plants have been recommended for cultivation in rock-work: of these we shall add the names of a few that are deserving of attention on account of the continuance of their flowers during the greater part of the summer:—*Oxalis violacea, Rubus arcticus, Chamæmorus saxatilis, Illecebrum Paronychia, Linaria alpina, Epimedium alpinum, Arnica montana, Achillæa Clavenæ*.

ROCKET is a cylindrical vessel or case, of pasteboard or iron, attached to one end of a light rod of wood, and containing a composition which, being fired, the vessel and rod are projected through the air by a force arising from the combustion.

Rockets have long been used as a means of making signals for the purpose of communication when the parties have been invisible from distance or darkness, or otherwise inaccessible to each other; and they have occasionally served the important purpose of determining the difference of longitude between two places. In the latter case the rocket is fired at some convenient spot between the stations, from both of which the explosion must be visible; and the latter being instantaneous, the difference between the times at which it is observed, as indicated by chronometers regulated so as to show the mean times at the places, is the required difference of longitude. Rockets have also been constructed for the purpose of being used in warfare, and such missiles were so employed for the first time at the siege of Copenhagen in 1807.

In signal rockets the part of the case which contains the composition, by whose combustion the projectile force is produced, is joined, at the upper extremity, to a conical case containing the composition for producing the explosions or *stars* of light which constitute the signal, and the length of this part is always rather greater than the diameter of the cylindrical part of the case. Such rockets are made to weigh half a pound, one pound, or two pounds. The exterior diameter of the one-pound rocket is 1¾ inch; the length of the cylindridal case is 12¾ inches, and the length of the conical head is 3¼ inches. The rod is generally attached near the base and on one side of the rocket: its length is about 8 feet, or 60 diameters of the rocket, and its thickness is about half a diameter of the latter. The composition with which the cylinder is filled consists generally of saltpetre, sulphur, and charcoal or gunpowder; the whole is reduced to a mealed state, and well mixed together in the following proportions:—saltpetre, 4 lbs. 4 oz.; sulphur, 12 oz.; and charcoal or mealed powder, 2 lbs. The composition which produces what are called the stars consists of saltpetre, 8 lbs.; sulphur, 2 lbs.; antimony, 2 lbs.; mealed powder, 8 oz.; and isinglass, 3½ oz. The latter is dissolved in one quart of vinegar, after which one pint of spirit of wine is added, and then the mealed composition is mixed with the liquid till the whole becomes of the same consistency as a stiff paste.

The composition for burning is rammed or driven into the rocket-case; but in the interior and about the axis, a void space of a conical form is left in order that a considerable surface of the composition may be at once in a state of combustion; and, at the *choke* or neck of the rocket (the part to which the rod is attached), there are several apertures, by one of which the fire is communicated to the composition. The combustion of the latter immediately takes place on all the concave conical surface about the void space just mentioned.

In order to understand the cause of the rocket's motion, let it be observed, that if the composition were to be fired within a vessel or case closed on all sides (combustion being supposed to be possible in such circumstances), the pressure of the flame would be equal in every direction, and the case would either burst in pieces, or, if sufficiently strong, would remain at rest while all the composition was being consumed. Now, the case having apertures at the choke or lower extremity of the cylinder, the pressure which would have taken place against that extremity is in great part annihilated by the flame escaping into the atmosphere; consequently the pressure exerted against the opposite extremity, being no longer counteracted, impels the rocket forward or upwards. This force of impulse acts in a manner similar to that by which a gun recoils when the charge is fired; but, in the latter case, the fluid escaping almost instantly from the bore, the force of impulse on the bottom of the chamber ceases nearly as soon as it is generated, whereas, in a rocket, the composition continuing to burn during several seconds, the force of impulse becomes a force of pressure, which continues to act till the material is consumed. Hence it follows that a rocket ascends, or moves forward, with an accelerated motion till the resistance of the air becomes equal to the accelerative force; and when the composition is burnt out, the rocket falls to the ground.

The rod serves to guide the rocket in its flight: for the common centre of gravity of the rocket and rod being a little below the top of the latter (in the one-pound rocket it is 2 feet from the upper extremity of the rocket, or 7 feet from the lower extremity of the rod); if we suppose the rocket to be fired vertically upwards, and a vibration should take place about the said centre of gravity by any excess of pressure on one side arising from an irregularity in the burning of the composition, the resistance of the air against the long portion of the rod below that centre, like a force acting on the longer arm of a lever, will exceed the force by which the vibration is produced, since the latter force acts on the rocket and the upper part of the rod which constitutes the shorter arm of the lever; and thus the vibration is checked, or prevented, and the rocket is enabled to ascend steadily. But, in proportion as the composition burns out, the common centre of gravity approaches nearer the middle of the whole length of the rocket and rod: and the resistance of the air acting at length nearly equally above and below that centre, it can no longer counteract any inequality in the burning of the composition. Thus, in falling, the top of the rocket, or the rocket end of the rod, is downwards.

The rod performs a similar service when the rocket is impelled horizontally or obliquely; for, while the force of projection is great enough to carry the rocket forward, and the centre of gravity of the whole is near the rocket end of the rod, the resistance of the air against the tail of the latter will nearly prevent any vibration; but, when the centre of gravity has got near the middle of the length, the head of the rocket begins to droop, and at length the whole comes obliquely to the ground. It has happened however, from the rod being too short or too light, that the weight of the rocket, when the latter has been projected with a small elevation, has so much incurvated the line of its path before the composition has burnt out, that the rod has turned over it, and the whole has been driven to the ground in a direction tending towards the place from whence it was projected.

Rockets whose diameters vary from 1 to 2 inches, have been found to ascend vertically to the height of about 500 yards; and those whose diameters vary from 2 to 3 inches, have ascended to the height of 1200 yards. The distances at which rockets can be seen vary from 35 to 40 miles; and the times of ascent, from 7 to 10 seconds. (Robins's *Tracts*, vol. ii.)

Rockets, to be employed as military projectiles, were invented by Sir William Congreve, and, in the British artillery service, a body of men, called the rocket troop, has been organised expressly for their management. Sir William caused the rockets to be made with strong iron cases of cylindrical forms, and terminating at the head with a paraboloid or cone; and he attached the rod so that its axis should coincide in direction with that of the rocket. They serve either as shells or carcasses, and their weights are 3, 6, 12, 24, and 32 pounds. Military rockets are, in general, fired from tubes in order that the direction of their flight may be more certain; and the proper elevation, at least for the smaller rockets, is about one degree for each hundred yards in the required range. From their form they penetrate to a considerable depth when fired against timber or earth: 12 pounder rockets, after a range of 1260 yards, have been found to enter the ground obliquely as far as 22 feet. The principal inconvenience attending the rocket practice is the powerful action of the wind when it blows in a direction perpendicular, and even oblique, to the intended line of flight.

Rockets, being much lighter than any other kind of ordnance, and capable of being used with or without carriages, are well adapted for conveyance in mountainous countries. When fired in volleys against troops, their effect is likely to create much disorder; and those which act as carcasses, when fired against buildings, will almost certainly cause their destruction. Besides being employed in the siege of Copenhagen, rockets were used at the bombardment of Flushing (1809); and in 1813 the British rocket-troop rendered considerable service at the battle of Leipzig. The advance of a French column against an inferior force of British troops was checked by a well directed fire of rockets at the passage of the Adour in the last-mentioned year; and it is said that the explosion of the powder-magazine which lately (1840) produced such disastrous effects at Acre, was caused by the fall of a rocket on the building.

ROCKINGHAM. [NORTHAMPTONSHIRE.]

ROCKINGHAM, CHARLES WATSON WENTWORTH, MARQUESS OF, was the only son of the first Marquess of Rockingham, and was born 13th May, 1730, two years after the title of Baron of Malton had been conferred upon his father, who, in 1734, was advanced to the dignity of Earl of Malton, and, having succeeded to his cousin in the barony of Rockingham in 1746, was created Marquess of Rockingham the same year. The Watsons, barons, and for some time earls of Rockingham, had originally acquired importance by the marriage of one of them with the sister of the great earl of Strafford, whose vast estates they in this way came to inherit.

In September, 1750, while his father was still alive, the subject of the present article was created earl of Malton in the Irish peerage; but before the end of the year his father's death left him in possession of the marquesate. Young as he was when he thus entered the House of Lords, he did not wait long before beginning to take a share in debate. Horace Walpole, in his 'Memoirs of the Last Ten Years of the Reign of George II.,' notices one or two of his earliest appearances in not very complimentary terms. When what was called the Scotch Bill (for planting colonies of foreign Protestants on the forfeited estates in Scotland) was under discussion in March, 1752, he says, 'The young marquess of Rockingham entered into a debate so much above his force, and partly applied the trite old apologue of Menenius Agrippa, and the sillier old story of the fellow of a college, who asked why we should do anything for posterity, who had never done anything for us!' Again, in his account of the debates in the following February, about the charge of Jacobitism brought against the solicitor-general Murray (Lord Mansfield) and other persons connected with the court, he notes, in the same sarcastic style:—'Lord Northumberland, perceiving it was a day for great men to stand forth, thought it a good opportunity to announce his own dignity; but he said little to the purpose. Still less was said by the young marquess of Rockingham, though he had prepared a long quotation from Tacitus about informers, and opened with it.'

But although never rated high as a man of talent, the mere wealth and independent position of the marquess necessarily secured him great influence, which was much strengthened by his upright and honourable character in private life, as well as by the moderation and consistency of his political conduct, although that was no doubt partly owing to the very narrowness of his understanding, which prevented him from ever looking beyond the particular set of notions he had originally taken up. He had been educated in the principles of what was then considered constitutional Whiggism, and he evidently to the end of his life never entertained a doubt about the truth of his political opinions. In February, 1760, he was made a Knight of the Garter. His political career from this date forms part of the history of the next reign, and of the several persons of much greater mark than himself with whom he was brought into association or collision in the fluctuating contest of parties. [GEORGE III.; BURKE; PITT.] He was first lord of the treasury and prime minister from 10th July, 1765, to 12th July, 1766, and was again placed at the head of affairs with the same office on the resignation of Lord North, in March, 1782, but died the 1st of July of that year. The marquess of Rockingham married, in 1752, the daughter of Thomas Bright, Esq., of Badsworth, but had no children. His eldest sister was married in 1744 to the first Earl Fitzwilliam, whose son, having succeeded to the family estate on the death of the marquess, took the surname of Wentworth in 1807.

ROCKS. A knowledge of the various earthy and metallic substances which compose the parts of the globe near the surface, seems indispensable to the geologist, whose reasonings on the origin and changes of these substances form no inconsiderable portion of the science which he is cultivating. It is therefore with some surprise and disappointment that a student of geology finds the classifications of rocks used in works of reputation formed with no harmony in detail, and little agreement in principle. In many works on mineralogy, compound rocks, as basalt, are classed among simple minerals; and a place is assigned even to clays and slates. On the other hand geologists have not hesitated to employ names originally designed to express particular mineral constitution, in a vague and general sense as regards the *nature* of the rock, though strict and definite as relating to its *age*. Such writers, in fact, do not by the name which they use, as 'gneiss,' or 'grauwacke,' or 'trap,' mean, or wish to express, *what* the rock is which they thus designate, but *where* is its place on the scale of stratified rocks, or *how* its mineral aggregation is related to particular circumstances of melting or cooling. That this latter method, if carried to extreme, would be subversive of accurate notions concerning the origin of rocks, is not only probable on general grounds, but has been amply proved by experience. The terms 'gneiss,' 'grauwacke,' clayslate, &c., as given by Werner, or adopted by his followers, had a mineralogical meaning; but each of these terms has been freely employed by modern geologists to include a great variety of rocks but slightly related to, or even merely associated with, the typical compound signified. When we are told that 'there is no gneiss in Cornwall,' the assertion is true, or nearly so, even in a Wernerian sense; but it is equally true that some part of the vast and various rocks of Scotland, combined in the 'gneiss' of MacCulloch, may as well be ranked with clayslate as much of the killas of Cornwall, and that other members of this gneiss series might be called mica slate, hornblende slate, or quartz rock. (See MacCulloch *On Rocks*.) To avoid this confusion of mineralogical and geological meanings in one term, several able attempts have been made upon one of the following plain principles:—

1. To assign to a series of rocks in which several mineral types (as sandstone, limestone, argillaceous beds) occur, and which therefore cannot be well described by a mineralogical term, a name depending on locality. Hence 'the Silurian system,' 'the Devonian system,' &c.

2. To give to such a series a title derived from its most characteristic member; as the 'Cretaceous group,' the 'Oolitic system,' the 'New Red-Sandstone series,' the 'Granitic formation.'

3. To avoid all such specially characteristic names, and to substitute terms expressive merely of relative place in the supposed or established series of geological events. Hence Mr. Conybeare's method of superior, supramedial, medial, submedial, and inferior orders of strata. It is perhaps to be wondered at that this simple and expressive method has neither been fully developed nor followed.

4. A view almost equivalent in practice, and founded mainly on the same basis, but distinctly involving an important inference regarding the lapse of time, gives us such terms as Primary strata, Transition rocks, Secondary series, Tertiary formations; and, as a subdivision of these latter, Eocene, Meiocene, Pleiocene deposits. It is somewhat strange, that while the use of Transition rocks is pro-

scribed as too hypothetical (it merely involves an inference seldom disputed), the equally hypothetical titles of Eocene, Meiocene, and Pleiocene deposits, should be freely admitted even by those who think Lower, Middle, and Upper less objectionable in this particular instance, and more useful and applicable in regard to all the older stratified deposits. Brongniart classes rocks under the Saturnian (antient) and Jovian (actual or modern) periods. (*Tableau des Terrains.*)

Systematic views of rocks, considered as mineral aggregates without any reference to their geological history, have been seldom completed. M. Brongniart has presented a classification of 'mixed rocks' nearly conformed to this principle, which has been of service. Dr. MacCulloch's 'Treatise on Rocks' is a mixed method, mineralogical in detail, geological in the large features. This writer gives the following list of

'Minerals which enter into the composition of rocks:'—

Indurated clay, from the softest substances found in trap to jasper and silicious schist.
Clinkstone.
Compact felspar, including the hornstone and petrosilex of some writers.
Common and glassy felspar.
Quartz.
Carbonate of lime.
Mica.
Chlorite (foliated).
Talc.
Hornblende.
Actinolite.
Augite.
Hypersthene.
Diallage.
Tourmaline.
Serpentine.
Steatite.
Noble Serpentine.
Gypsum.
Iron, in various states of oxidation, and combined with carbonic acid, water, &c.
Bitumen.
Pitchstone.
Chert.

He then adds a list of minerals occasionally imbedded in rocks, so to modify their aspect, viz.:—

Garnet.
Olivine.
Cyanite.
Pinite.
Spodumene.
Chiastolite.
Staurotide
Epidote.
Mesotype.
Zircon.
Topaz.
Beryl.
Chrysoberyl.
Fluor Spar.
Corundum.
Oxydulous Iron.
Pyrites.
Chromate of Iron.
Prehnite.
Andalusite.
Apatite.
Sphene.
Oxyde of Tin.
Molybdena.

He then names the rocks in which the minerals of the first class occur. We extract the most important of these notices:—

Indurated clay occurs in claystone not schistose, some porphyries and amygdaloids, some basalts; also in argillaceous schist, shale, limestone.

Compact felspar occurs as a simple rock; also in gneiss, porphyries, amygdaloids, syenites, greenstones, augite rocks, hypersthene rocks, granite.

Quartz occurs in quartz rock, granite, gneiss, mica schist, chlorite schist, talcose schist, argillaceous schist, sandstone, porphyries, syenites, and greenstones.

Felspar occurs in granite, gneiss, chlorite schist, hornblende schist, actinolite schist, sandstone, quartz rock, greenstone, porphyry, syenite, pitchstone.

Mica occurs in granite, gneiss, mica schist, quartz rock, sandstone, shale, limestone, claystone, syenite, porphyry.

Chlorite occurs in chlorite schist, granite, gneiss, actinolite schist, argillaceous schist.

Talc occurs in talcose schist, primary limestone, granite, serpentine.

Hornblende occurs in granite, gneiss, hornblende schist, micaceous schist, argillaceous schist, primary limestone, serpentine, syenite, greenstone, basalt, porphyry, chloritic schist, actinolite schist.

M. Brongniart's general view of mixed rocks may be put in the following abbreviated form:—

A. Crystallized isomerous rocks (the parts equally mixed).

1. Felspathic rocks.
   a. Granite. Laminated felspar, quartz, and mica, equally disseminated.
   b. Protogine. Felspar, quartz, steatite, or talc, or chlorite.
   c. Pegmatite (graphic granite). Laminated felspar, and quartz.
   d. Mimose. Laminated felspar, and augite.
2. Hornblendic rocks.
   a. Syenite. Laminated felspar, hornblende, and quartz.
   b. Diallage. Hornblende, and compact felspar disseminated.
   c. Hemithrene. Hornblende and limestone.

B. Crystallized Anisomerous Rocks (the parts unequally mixed).

1. Base of quartz.
   a. Hyalomicte. Crystallized quartz, and disseminated mica.
2. Base of mica.
   a. Gneiss. Mica abundant in plates, lamellar or granular felspar—a laminated rock.
   b. Mica schist. Continuous mica and quartz.
3. Base of schist.
   a. Phyllade. Clay slate containing various minerals.
   b. Calcischist. Argillaceous schist and limestone variously mixed.
4. Base of talc.
   a. Steaschist. Talcose base with disseminated minerals.
5. Base of serpentine.
   a. Ophiolite. Serpentine, including various minerals, as chromate and oxide of iron, diallage, garnet, &c.
6. Base of limestone.
   Cipolin. Granular limestone with mica.
   b. Ophicalce. Limestone, with serpentine, talc, or chlorite, imbedded.
   c. Calciphyre. Limestone enveloping crystals, as felspar, garnet, hornblende, &c.
7. Base of cornean (compact felspar of MacCulloch).
   a. Variolite. Including nodules and veins of various kinds.
   b. Vakite. Including mica, augite, &c.
8. Base of hornblende or basalt.
   a. Amphibolite. Base of hornblende, with disseminated minerals.
   b. Basanite. Base of compact basalt, with disseminated minerals.
   c. Trappite. Base of hard compact dull cornean trap, with mica, felspar, &c.
   d. Melaphyre (Trap porphyry). Black petrosilicious hornblende, with crystals of felspar.
9. Base of petrosilex, coloured by hornblende.
   a. Porphyry. Paste of reddish petrosilex, with crystals of felspar.
   b. Ophite. Paste of green petrosilex, with crystals of felspar.
   c. Amygdaloid. Paste of petrosilex, with nodules of petrosilex of a different colour.
   d. Euphotide. Enclosing crystals of diallage.
10. Base of petrosilex or compact felspar.
   a. Eurite. With mica, &c. disseminated.
   b. Leptenite. Base of granular felspar, with mica and quartz.
   c. Trachyte. With crystals of glassy felspar.
11. Base of claystone.
   a. Clay porphyry. Crystals of felspar.
   b. Domite. Crystals of mica.
12. Base of pitchstone.

Stigmite. With crystals of felspar (commonly called porphyritic pitchstone).

13. Base undetermined.
   Lava.

C. Aggregated rocks (uncrystallized: the parts irregularly mixed).

1. Cemented rocks.
   a. Psammite. Grains of quartz, &c. united.
      (This includes sandstones, grauwacke, &c.)
2. Imbedded rocks.
   a. Mimophyre. Cement argillaceous, uniting distinct grains of felspar, &c.
   b. Psefite. Cement argillaceous, including fragments of mica schist, slate, &c.
   c. Pudding-stone. Cement including large rounded pieces of different kinds in different varieties of pudding-stone, as quartz, limestone, flints.
   d. Breccia. The fragments angular.

The most prevalent classification of rocks in actual use is founded on one leading feature of their origin and history. Rocks are of igneous origin (pyrogenous rocks), or of aqueous origin (hydrogenous rocks), and thus make two great classes: the former being often considered, with reference to the circumstances of their occurrence in two divisions, viz. hypogene or Plutonic rocks (as granite), and volcanic rocks (as obsidian); the latter being distinguished into freshwater and marine deposits, the result of chemical, vital, and mechanical agencies exerted in water. Many cases are known of an alteration of these hydrogenous rocks by contact with Plutonic or volcanic masses: by this change they acquire the name of metamorphic rocks. These clays and sandstones are hardened, and have their structure altered so as to resemble clay slate, quartz rock, or jasper; and chalk and limestone are rendered crystalline.

Adopting as the best and most applicable the fundamental distinction of pyrogenous and hydrogenous rocks, the student will find by experience that the best if not the only good way of describing and recognising rocks, is by attention to their elementary composition. The granitic, porphyritic, amygdaloidal, or other structures of igneous rocks, are so many variable circumstances due to particular accidents in the fusion or cooling of the masses, and belong more or less to all of them, as the compact, oolitic, arenaceous, and other characteristic textures of hydrogenous rocks mark peculiarities of their aggregation or solidification.

Mr. Scrope has successfully shown, in his 'Synopsis of Volcanic Rocks' (*Journal of Science*, vol. xxi.), that these various compounds may be easily and philosophically classed by consideration of the relative abundance of two minerals, seldom absent from any of them, viz. felspar and augite. (The felspar is sometimes replaced by leucite, haüyne, olivine or mellite; the augite by hornblende or titaniferous iron.) Hence we have only three great groups:—

Felspathic	Trachyte.
Augito-felspathic. .	Graystone.
Augitic	Basalt.

To each of these belong many varieties, and many gradations of granitic, porphyritic, amygdaloidal, and other strucsures. [Lava.] By a similar method we may class the older or Plutonic rocks of fusion, as: Felspathic,—granite, porphyry, felspar rock, claystone, eurite, pitchstone; Augito-felspatic,—sienite, euphotide; Augitic,—sienite, hypersthene rock, greenstone, basalt, wacké, melaphyre.

The hydrogenous rocks of most importance may be classed according to their arenaceous, argillaceous, calcareous, or other basis, as—

Arenaceous, uniform, as sandstones, sands; aggregated as conglomerates, pudding-stones.

Argillaceous, uniform, as clay and shale; containing fragments, as some clay conglomerates.

Argillo-calcareous, as marls properly so called.

Calcareous, as chalk, limestone.

Calcareo-magnesian, as dolomite.

Haloid, as gypsum, rock salt.

Carbonaceous, as coal, lignite.

Ferruginous, as ironstone.

Cupriferous, as the kupferschiefer.

Finally, all these hydrogenous rocks are liable to local changes, by contact or proximity with the rocks of fusion. These metamorphic rocks may be classed according to the same form as those which are unaltered. We give below authentic examples of several cases of metamorphism:—

1. Arenaceous rocks, metamorphic by *induration*, as along greenstone dykes in Arran, and Salisbury Crags. Similar effects happen beneath iron-furnaces, and when the effect is in extreme the result is *quartz rock*.

2. Argillaceous rocks, metamorphic by *induration*, and a certain confluence of grains. In extreme cases the result is a kind of clay slate, or hone slate, or Lydian stone, with cubic pyrites, and rarely *garnets*, embedded. An example of the latter occurs at Plas Newydd.

3. Calcareous rocks, metamorphic by re-arrangement of particles. Thus granular or saccharoid limestone is found by the side of the basaltic dykes in Antrim, on the greenstone of Teesdale, near the hypersthene of Sky, &c. The limestone among primary strata is of similar appearance, though not in contact with igneous rocks.

4. Carbonaceous. Coal becomes coke or anthracite near basaltic dykes.

Examinations of this kind have shown that ordinary sedimentary rocks altered by heat acquire aspects and structures and compositions resembling almost exactly those most common among the earliest or primary strata, as quartz rock, clay slate, garnet mica slate, garnet gneiss, granular marble, &c.; and it is therefore a probable inference that in all such cases of strict resemblance those antient rocks have undergone on a great scale, and under the general influence of the intense heat of the earth, the changes which are certainly proved to have happened locally, from limited agencies, on substances of similar chemical quality. Very careful investigations on these points are however still needed to fix limits and give precision and certainty to the inferences from phenomena.

The circumstances which accompany the appearance of pyrogenous rocks will often lead us to probable views as to the conditions under which they were fused and cooled. Thus from the granite masses of Arran and Cornwall, very coarse in their granulation, veins proceed into the adjoining slate rocks, and become more and more fine in grain, and porphyritic or merely felspathic in aspect; the coarse greenstone of Salisbury Crags acquires compactness where it touches the sandstone rocks; in a modern furnace the centre of masses of fused rock or melted metal is usually the most porous part; and all these facts are linked together in the more general proposition, that slow cooling allows of large and regular, while rapid refrigeration generally forces a minute, hasty, and confused structure, in which crystallization is sometimes quite destroyed. [See Basalt for some notice of Mr. Gregory Watt's experiments on this substance cooled from fusion.]

Considerations of this kind explain the generally greater compactness of Plutonic, as compared with the cellularity of volcanic rocks, and indeed there is little other difference between them than that which is intelligible as a consequence of the outpouring of one class at or near the surface, and under air, and the solidification of the other under great depths of water, as some greenstones; inclosed in masses of preconsolidated rock, as some porphyries; or slowly cooled in enormous quantity, as granite, and hypersthenic sienite.

Similarly, by attention to the texture and structure of the rocks deposited by water, we find marks of sedimentary accumulation in sandstones and clays, and proofs of chemical precipitation or vital arrangement in limestones. We may put some of the results on this subject in a very simple series, which can hardly fail to suggest important reflections.

Littoral and Flood Deposits, as conglomerates and sandstones: the latter showing often ripple-mark, sometimes impressions of littoral or terrestrial animals; the former, a confused aggregation resulting from local agitation.

Sea and River Sediments.—Shales and clays, often finely and regularly laminated, and of very uniform composition, the fruit of more tranquil deposition in deeper or calmer water.

Pelagian Deposits, as some limestone strata, the accumulation of dead shells, crinoidea, foraminifera, &c., and others which are in part the preserved structures of coral. Thus some beds of marble are really masses of crinoidea, others of coral, some of shells, some chalk is full of spiculæ of sponges, &c., and other calcareous beds are replete with foraminifera.

[Basalt; Granite; Grauwacke; Gneiss; Lava; Mica Schist; Porphyry; Stratification.]

ROCROY, a fortified town in France, capital of an arrondissement in the department of Ardennes, 161 miles north-east of Paris by Soissons, Reims, and Mézières. Rocroy, then a village, was fortified by François I., a.d. 1537, to defend the frontier on that side: the fortifications were finished, and the place raised to the rank of a town, by his son Henri II. It was besieged, a.d. 1643, by the Spaniards under Don Francisco de Melos, who occupied a very strong position, covered by marshes and woods, and accessible only by a single causeway. The French under the duke of Enghien, afterwards better known as prince of Condé (*Le Grand Condé*), then only twenty-two years of age, advanced against the Spaniards, and obtained a splendid and decisive victory (19th May), which laid the foundation of his military renown. The town stands in an extensive plain, about five miles from the left bank of the Meuse. The fortifications are of no great importance at present, though it still ranks as a fortress. The population in 1831 was 3623: the townsmen make tin ware and carpenters' tools. There are four fairs in the year. The town has a society of agriculture, a military hospital, and some government offices.

The arrondissement comprehends sixty-eight communes, and is divided into five cantons or districts, each under a justice of the peace. The population in 1831 was 43,807.

ROCKY MOUNTAINS is a term usually applied to an extensive mountain-system in North America, but as this term has too general a signification, and therefore cannot with propriety be applied to a particular system, geographers call the North American range the *Chippewyan Mountains*. These mountains occupy the central parts of that continent, but, like the Andes in South America, they are much nearer to the Pacific than to the Atlantic Ocean. The Chippewyan Mountains are far less known than the Andes in South America. Perhaps more than one-half of the eastern declivity has been seen by travellers, who have given some account of it, but, with the exception of a comparatively small part, the whole of the western declivity is almost entirely unknown.

It was formerly supposed that this mountain-system was only a continuation of the Andes of South America, and that these two mountain-regions were connected by a chain which traversed the Mexican Isthmus in its whole length. But it is now ascertained beyond doubt that a flat country of considerable extent intervenes between the Andes and the mountains of the Isthmus. [PANAMA.] It is also ascertained that the mountain-range which is known under the name of the Sierra Madre, in the northern of the Mexican States, is not connected with any of the southern offsets of the Chippewyan Mountains, but terminates about 150 miles south of the Sierra de Mogollon, or that branch of the Chippewyan Mountains which approaches nearest to it.

This mountain-system may be divided into three parts—the Southern, Central, and Northern Chippewyan Mountains. The first extends from 29° to 42° N. lat.; the Central Chippewyans from 42° to 49° N. lat.; and the Northern from 49° to nearly 70° N. lat. The whole length, from 29° to 70° N. lat., exceeds 3000 miles, and when the ridges, which probably traverse the north-western peninsula of North America from east to west, and apparently are only offsets of the great mountain-range, are included, the whole length is about 4000 miles.

The *Southern Chippewyans* resemble the Northern Andes in being divided into three long ranges, which run off in diverging lines. The point from which they diverge is a mountain-knot, about 42° N. lat., and is called Sierra Verde. From this point the three ranges run southward. The most eastern range forms one elevated mass of rocks between 42° and 34° N. lat., and within these limits preserves the name of Chippewyan or Rocky Mountains. It runs nearly due south between 104° and 106° W. long. Between 35° and 34° N. lat. it divides into two ranges, both of which run southward and parallel to one another, including the narrow valley of the Rio Puerco, and terminate in the great bend of the Rio del Norte, between 29° and 30° N. lat. In the present state of geographical knowledge, these two ranges, which are called the Sierra de los Comanches, must be considered as the most southern extremity of the Chippewyan Mountains. It is hardly known on what authority these two ranges have been laid down on our maps, as the valley of the Rio Puerco and the countries east of it are in possession of the savage and warlike tribe of the Comanches, who do not allow strangers to enter their country. Only the western declivity of the western range has been seen by travellers, who describe the range as rising only to a moderate elevation, but having a very desolate and barren aspect, and being almost entirely without water and wood.

That part of the Southern Chippewyans which extends from 34° to 42° N. lat. is perhaps the best known part of the whole system, the eastern declivity having been examined for a considerable extent by Major Long. He says that the breadth varies from 50 to 100 miles. The mountains rise abruptly from the plains to the east of them, towering into peaks of great height, which are visible at the distance of more than 100 miles east of their base. They consist of ridges, knobs, and peaks variously disposed, among which there are many wide and fertile valleys. The more elevated parts of the mountains are covered with perpetual snow, which gives them a luminous, and at a great distance even a brilliant appearance, whence they have derived the name of the 'shining mountains.' The height of the James Peak has been ascertained to be about 8500 feet above its base, which is considered as between 2000 and 3000 feet above the sea-level. Though considered the highest summit in this part of the range, Major Long says, that judging from the position of the snow near the summit of other peaks and ridges at no great distance from it, it is apparent that they are much higher. The western declivity of this range is not so steep as the eastern, and does not descend so deep, the upper valley of the Rio del Norte being considerably more elevated than the plains east of the mountains.

The central range of the Southern Chippewyans runs nearly parallel to the eastern along the meridian of 107° W. long., and terminates near 34° N. lat. with the Sierra de Mogollon, a name which is sometimes applied to the whole range, though others called it Sierra de los Mimbres. It appears not to attain the elevation of the eastern range. On the eastern side its slope is well defined, as no offsets branch off from it, but the width and the western declivities are not known. It was formerly supposed that the Sierra de Mogollon was united by a mountain-chain to the Sierra Madre in Mexico; but the last-mentioned range terminates near 32° N. lat., and a level plain about 160 miles in extent intervenes between the two ranges.

The western chain of the Southern Chippewyans is called the Sierra de los Guacaros, and it is supposed to join the principal chain at the Sierra Verde. But with the exception of a mountain tract, which occurs about 37° N. lat., and 112° W. long., and is properly called Sierra Guacaros, this range is unknown in its whole extent. It is not even known whether this range is connected with the snow-capped summit of the St. Bernardin, which occur near 34° N. lat. and 117° W. long. If a chain of high lands should be found to extend between the last-mentioned high summit and the Sierra de los Guacaros, which is not improbable, the mountainous and rocky peninsula of California would constitute the most southern extremity of the Chippewyan Mountains.

As the countries surrounding the Southern Chippewyans are almost entirely inhabited by savage tribes, which seem to have no intercourse with one another, the routes are unknown, with the exception of one over the eastern range, near 36° N. lat., which is used by the North American caravans, which start from the town of Franklin in the state of Missouri, for the town of Santa Fé in New Mexico, whence they proceed to Chihuahua. The elevation of the mountain-pass does not appear to be very great.

The *Central Chippewyans* between the Sierra Verde (42° N. lat.) and 49° N. lat. have been often crossed by American travellers, in passing from the United States to the river Columbia. In this part the mountain-region seems to contain two ranges of great elevation, running parallel to one another at the distance of 100 miles, and enclosing high valleys, which are generally filled up by the rocky masses, which protrude from the great chains to a considerable distance within the valleys. The two chains however do not subside either on the east or on the west into plains, being separated from the level ground, which only occurs at a great distance from them, by hilly regions of considerable extent.

Not far from the Sierra Verde, towards the north, between the Spanish River, supposed to be the Rio Colorado, which falls into the most northern recess of the Gulf of California, and the Big Horn River, an affluent of the Missouri, the eastern chain of the mountains contains a deep and wide depression, which presents an easy passage over the range, so easy indeed that it may be crossed by carriages. In these parts there is a plain between moderate heights, which is about ten miles in circumference, and the surface of which is encrusted with salt as white as snow to a depth of twelve or eighteen inches. North of this depression the mountains rise to a greater height; but they do not present a range of uniform elevation; they are rather extensive groups, here and there overtopped by high peaks, among which there is one which probably rises to 15,000 feet above the level of the sea. The eastern range is furrowed longitudinally by deep and narrow valleys drained by small and rapid streams. The higher parts of the ranges consist of granite, and are bleak and bare, being nearly destitute of vegetation, but many of the inferior ridges are scantily clothed with scrub pines, oaks, cedar, and furze. In some places these mountains have traces of volcanic action. Some of the interior valleys are strewed with scoria and broken stones, evidently of volcanic origin, and vestiges of extinct craters are seen on the highest points.

Farther north, between 45° and 47°, the eastern range appears to maintain a more equal elevation, and to rise to a great height. Their highest parts are covered with snow in the months of August and September, and in the lower parts, along the watercourses and in the ravines, snow does not disappear till the month of June. The mean elevation of this range may be between 8000 and 9000 feet. This chain probably does not exceed 30 or 40 miles in width. The western chain, which is somewhat lower, appears to be of greater width. The middle of this range, which is called the Blue Mountains towards its northern extremity, is in some parts covered with dense and gloomy forests, and cut up by deep and precipitous ravines; but along its western side there is a hilly region, in which several wide depressions occur, most of which are well watered, and are prairie lands. Clarke River, one of the upper branches of the Columbia runs through a narrow valley, which at the place where it opens on the Columbia River expands into a plain about 60 miles in circumference, which has a good soil. In this part of the Chippewyan Mountains two easy passes are found between 46° and 47°, or between the upper branches of the Missouri and Clarke River; and it is stated, that they could be rendered fit for carriages without much labour. It is supposed that the base on which this part of the mountain system rests is between 4000 and 5000 feet above the sea-level.

But the approach to these passes is not easy, as the greatest part of the country immediately east of the mountains is covered with high and very rugged hills. The outer edge of this extensive mountain-region seems to be formed by a range of high hills, called the Black Hills, which at its southern extremity, on the north bank of the southern fork of the Platte River or Nebraska, is about 100 miles from the principal chains of the Chippewyan Mountains, but as it proceeds northward, diverges from their direction. The last-named ranges run north-north-west, whilst the Black Hills, beginning at the southern fork of the Nebraska, stretch thence in a north-east direction, and terminate in the great bend of the river Missouri, enclosing the valley of the Little Missouri on both sides. Thus the Black Hills near 48° N. lat. are more than 400 miles from the eastern chain of the Chippewyans. The connecting link between these two chains is formed by the Big Horn Mountains, which consist of two ridges that extend along both sides of Big Horn River to the place where that river joins the Yellow Stone River. The eastern of these two ridges seems to join the Black Hills south of 45°, near the sources of the Little Missouri. The Big Horn Mountains are described as a very rugged region of hills and rocky masses, of moderate height, but rising very steep. Their surface is diversified by numerous glens, in which clumps of pine-trees occur, and a profusion of grass and different plants. The Black Hills rise to a considerable elevation. In some parts they are covered with loose stones, and intersected by deep valleys, especially towards their northern extremity, but farther south they consist mostly of bare rocks, and there is little vegetation on their declivities. The country west of the Black Hills and south of the Big Horn Mountains is generally level or undulating. It is destitute of trees, but in most places covered with coarse grass, on which the buffaloes find abundant pasture. The extensive country which lies between the Black Hills and north of the Big Horn Mountains is entirely covered with ridges of hills rising to a moderate elevation, but presenting a great variety of shapes, like the ruins of old castles, domes, peaks, &c. In this region originate the numerous rivers by whose confluence the river Missouri is formed, besides its first great confluent the Yellow Stone River, which receives the waters of the Big Horn River. The great velocity with which the Missouri flows all through its course, and the numerous falls on its upper branches, favour the supposition that the base of this hilly region is at least 5000 feet above the sea-level. This supposition is also confirmed by the severity of the climate. Night-frosts occur in the higher parts of the narrow valleys in the month of August. As none of the numerous peaks which are dispersed over this region are covered with snow all the year round, it appears that the elevation of the summits above their base can hardly exceed 2000 feet.

The first attempts of the North Americans to pass to the west of the Chippewyan mountains were made along the course of the Missouri river by Lewis and Clarke, and they traversed the rugged hilly region which we have just noticed. Though, according to their report, the mountain-passes in these parts are of very easy access, and of such a description that even carts might pass them without great inconvenience, they found extensive tracts covered with snow in the month of June, and besides the great length of this road, it was tedious, fatiguing, and not exempt from danger. Later travellers have taken a shorter, and, to all appearance, a more convenient road. They ascend the Missouri to the vicinity of 45° N. lat., then pass by a due west route to the Black Hills, which they traverse near the sources of the Little Missouri, and south of the place where this range is connected with the Big Horn Mountains. They then travel along the south-eastern declivity of the last-mentioned range to its junction with the Chippewyan Mountains, where they pass by the wide depression above noticed to the upper branches of Lewis River.

The hilly region which lies west of the Chippewyan mountains is far more extensive. In fact it occupies the whole country which lies between the western of the two principal ranges and the shores of the Pacific. In some places indeed there are plains of considerable extent, but they are surrounded by ranges of hills, and their surface is generally undulating. The general declivity of the surface is also far from being gentle, as the rivers which drain this region are interrupted by rapids and cataracts. In some places the rapids are 30, 40, and even 60 miles long, and of course render nearly the whole course of the rivers unfit for navigation. Among the higher ranges which traverse this region, that should be noticed which begins at Cape Mendocino on the Pacific, and is supposed to extend eastward, and to join the principal range of the Chippewyans near the Sierra Verde. It is not known whether a continuous mountain-range exists in these parts, but from the fact that these districts contain the watershed between the rivers which fall into the lower course of the Columbia River and those which run to the S. Francisco or Buenaventura, the existence of such a range is inferred. It seems very probable that another range, which extends along the Pacific from 100 to 150 miles from the shore, and terminates on the banks of the Columbia River opposite the Long Narrows, is immediately connected with the mountains near Cape Mendocino. This last-mentioned range, which is pretty well known in the vicinity of the Columbia River, contains some summits which rise above the snow-line. Mount Hood, about 50 miles south of the cataracts and rapids called the Long Narrows, attains the elevation of 15,900 feet above the sea.

The *Northern Chippewyans* extend from 49° N. lat. to the mouth of the river Mackenzie, a distance of more than 1500 miles. Their direction is nearly due north-west. The southern portion, between 49° and 55° N. lat. seems to be the highest part of the whole range. Most of the summits are covered with snow all the year round. Two of them have been measured. Mount Hooper is 15,690 feet, and Mount Brown nearly 16,000 feet high. These two summits are between 52° and 53° N. lat. On their eastern declivities rise the northern fork of the Saskatchevan and the river Athabasca, and from the western descend the rivers that form the two principal branches of the Columbia River. These two branches flow northward and southward in a deep and narrow valley which extends above 300 miles along the western base of the mountains. To the west of this valley rises the western chain of the Chippewyan Mountains: it is very little known, except as to its general direction and its elevation, which is much inferior to that of the eastern range. There are two mountain-passes over this portion of the Chippewyans which are used. The more southern is near 52° 30′ N. lat., probably along the southern declivity of Mount Hooper. It leads from the head of the northern branch of the Saskatchevan, by a short portage to one of the affluents of the Columbia, which enters that river near the place where its two upper branches, running in opposite directions, meet one another. The northern mountain-road occurs near 53° 30′ N. lat., between the Red Deer River, a branch of the Athabasca, and the northern branch of the Columbia River. It appears that these two passes are only practicable from the end of June to the middle of September, when they are crossed by the agents of the Hudson's Bay Company who bring the furs collected in the countries west of the Chippewyan Mountains to their establishments on the east of that range. The country along the eastern base of this part of the Chippewyans is a level, which has a dry sandy soil towards the south, with a scanty vegetation of coarse grass, but farther north it is covered with woods, and in many places is swampy. The tracts which skirt the foot of the range seem to be about 2000 feet above the sea-level.

Farther north, between 56° and 57° N. lat., the Chippewyans were traversed by Mackenzie, who followed the course of the

Peace River. This river breaks through the eastern range of the mountains, its upper course being in a valley between the two principal ranges, which appear to be here of nearly equal height. Both of them contain summits which are always covered with snow. Their height above the sea-level however seems to fall short of 4000 feet. Their elevation above the flat country east of the range does not exceed 1500 feet, and their base is hardly more than 2000 feet above the sea. The western range, which is about 200 miles from the Pacific, constitutes the watershed between the rivers which run east to the Atlantic and west to the Pacific. The valleys of the Peace River, or Unjigah, and its tributaries, contain very little level ground. Steep rocks commence at a short distance from the banks of the rivers. In some places the summits of these rocks extend in level plains to some distance from the lower valley of the river, but in others their surface is broken into small ridges or isolated hills. These rocky masses are furrowed by narrow valleys, in which the tributaries of the Upper Peace River run with great rapidity between steep rocks. Though it is very cold in these elevated valleys, even in the earlier part of the summer, and this region on that account is only visited by the native tribes in that season, yet nearly the whole of it is covered with trees, whilst the mountains farther south are generally bare, or only clothed with stunted trees and shrubs. The low tracts along the Peace River and some of its tributaries are covered with willows and alders, interspersed with spruce and white birch, and the uplands are overgrown with pines, cypress, spruce, and some other trees. Later information confirms these observations of Mackenzie. North of 52° or 53° N. lat. the forests that cover the declivities of the Chippewyan Mountains are very extensive, and the trees themselves are large and of very vigorous growth.

North of 57° the mountains appear rather to sink lower, than to rise. We have no information as to the elevation and character of the mountain-system as far north as 62°. It seems, that it occupies a much greater width, and consists of three or more ranges running parallel to one another, or nearly so, in the direction of the whole chain. Owing to this circumstance, the watershed between the rivers which fall respectively into the Atlantic and Pacific is advanced much more to the west, and seems to occur about 100 miles from the shores of the Pacific. The Turnagain River, which after having left the mountain-region assumes the name of the Southern Branch of the Mackenzie, rises on the watershed just mentioned, and breaks through two ranges of mountains before it reaches the great plain east of the Chippewyans. Between the ranges which fill up this immense tract of country there are low tracts, which however are partly covered with water, if it be true, as it is said, that about one-sixth of the entire surface of this region consists of extensive lakes. This circumstance shows that the mass of snow which falls every winter must be very great, and that the general slope of the country must be gradual. It is said that a great part of the country is also covered with trees.

Between 62° and 69° N. lat. the eastern ranges of the Chippewyan Mountains approaches the valley of the Mackenzie River, and within these limits they were seen by Franklin on his second expedition to the Polar Sea. Dr. Richardson says that they appear to consist of short conical peaks, scarcely rising 2000 feet above the river. Lateral ridges project from their sides, which stretch south-south-west and north-north-east, being nearly at right angles to the general course of the great range, to which they belong. Their bases are from one to two miles wide, and their eastern slopes present a succession of precipices, with shelving acclivities beneath them, formed of débris, and exhibit on their faces regular lines of stratification. The valleys which separate these ridges and open upon the river, are narrow, with level bottoms, but very steep sides well clothed with trees. One of these ridges presents towards the river a very precipitous descent, 1200 feet high, which extends for at least 15 miles. According to information obtained on the spot, the mountain-range consists of 14 or 15 ridges, of which the three easternmost are the most rugged, those that succeed being broader and more rounded. It seems that a large portion of this mountain-region is drained by the Peel River, which breaks through the eastern ridge near 67° 40′ N. lat., but is only known at its junction with the Mackenzie River, where it is a river of considerable size, and brings down a great volume of water.

The statement, that the most northern portion of the Chippewyan Mountains consists of several parallel ridges is partly confirmed by the manner in which this mountain-sytem terminates on the shores of the Arctic Ocean. Between the embouchure of the most western arm of the Mackenzie River (137° W. long.) and 146° W. long., four distinct ridges are seen from 12 to 25 miles from the shore. At their northern extremity, they are divided from one another by valleys about 20 or 30 miles wide. The summits of the two eastern chains, called Richardson Chain and Buckland Chain, are lower, being free from snow in summer, but the two western, called British Chain and Romanzow Chain, are always covered with snow. Romanzow Chain occupies the greatest width, and presents to the Arctic Ocean a front exceeding 60 miles in extent. These chains consist of slate-rocks; their summits are rounded and naked, but the narrow valleys between them are covered with grass. No bushes nor even shrubs appear on their declivities. At a great distance farther west, between 151° and 152°, the northern extremity of another chain, called Pelly Mountains, is seen from the shores of the Arctic Ocean, but it is not known if this chain is connected with the Chippewyans.

It is not improbable that the mountain-chain which is observed to skirt the shores of the Pacific, at no great distance from the sea, and in numerous places to advance with its offsets close to the water's edge, forms a part of the Chippewyan system and is connected with it. But on this point we are without information, the interior of the countries along this coast not having been visited by Europeans. Nor do we know how far the rocky peninsula of Aliaska, with its snow-capped volcanoes, may be considered as an appendage of the Chippewyan Mountains, as the interior of that large peninsula, which extends between the Pacific and the Arctic Sea, is closed against our researches by the inhospitable nature of the country.

Nothing certain is known respecting the minerals of this range. Some traces of iron and lead have been observed. Rock-salt exists in several places, especially in the Southern Chippewyans, where several rivulets occur, whose water is salt or brackish. Coal has been found in several places in the Northern Chippewyans, especially in the southern portion, near the Saskatchevan and Peace River, and also towards the mouth of the Mackenzie River.

(Humboldt's *Essai Politique sur la Nouvelle Espagne*; Pike's *Exploratory Travels through the Western Territory of North America*, &c.; James's *Account of Major Long's Expedition to the Rocky Mountains*; Lewis and Clarke's *Travels to the Source of the Missouri*, &c.; Irving's *Astoria*; Mackenzie's *Voyages through the Continent of North America to the Frozen and Pacific Oceans*; Franklin's *Second Expedition to the Polar Sea*; Dease and Simpson's 'Account of the recent Arctic Discoveries,' in the *London Geographical Journal*, vol. viii.)

ROD. [Perch.]

RODE'NTIA, *Rongeurs*, the name of Cuvier's fifth family of mammals.

Speaking of the *Phalangers* [Marsupialia, vol. xiv., p. 460], Cuvier observes that their canine teeth are so small that they may be considered as null; and, consequently, the nourishment of those animals consists in great part of vegetable productions; their intestines are long, and their cæcum ample; and the Kanguroos, which are entirely without canines, live altogether upon herbage. He then states that the series of animals under consideration, and which possess a still less perfect mastication, may be commenced by the Wombat. [Marsupialia, vol. xiv., p. 463.]

Cuvier in continuation remarks that two great incisor teeth in each jaw, separated from the molars by a wide space, could hardly seize a living prey, nor rend flesh; they could not even cut aliments, but they might serve for reducing them by continued labour into fine molecules—in a word, for gnawing them; whence the term *Rodents*, or *Gnawers*, applied to this order. With these weapons they attack the hardest vegetable productions, and frequently feed on wood and bark. The better to effect this object, these incisors have enamel in front only, so that their posterior border being worn away more than their anterior edge, they are always kept set like a chisel; their prismatic form causes them to grow from the root in proportion to the wearing down of their cutting edge, and this disposition to grow or push forward from the root is so strong, that if one of them is lost or broken, its antagonist, meeting with no opposition to keep it within bounds, develops itself so as to become monstrous. [Beaver, vol. iv., p. 121.] The lower jaw is articulated by a longitudinal condyle, so as to have no horizontal movement except from behind forwards, and *vice versâ*, convenient for the action of gnawing; the molars consequently have flat crowns, the enamelled eminences of which are always transversal, so as to be in opposition to the horizontal movements of the jaw, and to be better adapted for trituration.

The genera in which these eminences are simple lines, and which have the crown of the tooth very flat, are more exclusively frugivorous; those which have the eminences divided into blunt tubercles are omnivorous; and, finally, the small number of those which have points more willingly attack other animals, and approximate a little to the *Carnivora*.

The form of the body of the Rodents is in general such that their hinder parts exceed their anterior ones, so that they leap rather than walk; this disposition in some of them is as excessive as in the kanguroos.

The intestines of the animals of this order are very long; their stomach simple or slightly divided, and their cæcum often very voluminous, even more so than the stomach. The *Myoxi* (Dormice) want the cæcum.

Preparations illustrative of the male organs of the *Rodentia* will be found in the *Physiological Series* of the Museum of the College of Surgeons; Nos. 2483 to 2504, both inclusive: of these Nos. 2483 to 2487, exhibiting those of the Beaver with the preputial or castor-pouches, and Nos. 2492, 2492 A, those of the Acuchi with the penis armed on each side with a dentated horny ridge, are remarkable. Those of the other *Cavies*, Nos. 2493 to 2497 (both inclusive), exhibit similar peculiarities. The placenta is simple. Preparations Nos. 2742 to 2751, both inclusive, illustrate the female organs.

The brain of the Rodents is nearly smooth and without convolutions; the orbits are not separated from the temporal fossæ, which have but little depth; the eyes are entirely directed laterally; the zygomatic arches, delicate and curved below, announce the weakness of the jaws; the fore-arms have scarcely any rotatory motion, and their two bones are nearly united; in a word, the inferiority of these animals shows itself in the greater part of the details of their organization. Nevertheless, the genera which have the strongest clavicles enjoy a certain dexterity, and use their fore-feet for carrying their food to their mouth: others again (the squirrels) climb trees with facility. (*Règne Animal.*)

The following animals are arranged by Cuvier under the order *Rodentia*:—

The Squirrels (*Sciurus*, Linn.), viz.: the Squirrels properly so called (*Sciurus*, Cuv.); the Flying Squirrels (*Pteromys*); the Aye-Aye (*Cheiromys*).

The Rats (*Mus*, Linn.), viz.: the Marmots (*Arctomys*, *Spermophilus*); the Dormice (*Myoxus*, Gm.); the Spiny Rats (*Echimys*), *Hydromys*, *Capromys*; the Rats properly so called (*Mus*, Cuv.); the Jerbilles (*Gerbillus*, *Meriones*); the Hamsters (*Cricetus*); the Field Rats (*Arvicola*, Lácèp.), subdivided into the Ondatras (*Fiber*, Cuv.), the ordinary Field-Rats (*Arvicola*, Cuv., *Hypudæus*, Ill.), and the Lemmings (*Georychus*, Ill.); *Otomys*, and the Jerboas (*Dipus*, Gm.).

The Jumping Hares (*Helamys*, F. Cuv.; *Pedetes*, Ill.).

The Rat-Moles (*Spalax*, Guld.).

Bathyergus (*Oryctères*, F. Cuv.).

Geomys (*Pseudostoma*, Say; *Ascomys*, Licht.)

Diplostoma, Raf.

The Beavers (*Castor*).

The Couias (*Myopotamus*, Com.).

The Porcupines (*Hystrix*, Linn.), viz.: the Porcupines properly so called (*Hystrix*, Cuv.); *Atherurus*, Cuv.; *Erethizon*, F. Cuv.; and the Coendous (*Synetheres*, F. Cuv., *Cercolabes*, Brandt).

The Hares (*Lepus*, Linn.), viz.: the True Hares (*Lepus*, Cuv.), and *Lagomys*, Cuv.

The Capybara (*Hydrochærus*, Erxl.).

The Guinea Pigs (*Anæma*, F. Cuv.; *Cavia*, Ill.).

The Mocos (*Kerodon*, F. Cuv.).

The Agoutis (*Chloromys*, F. Cuv.; *Dasyprocta*, Ill.), and

The Pacas (*Cœlogenys*, F. Cuv.).

Mr. G. R. Gray, who observes that the animals of this order are exceedingly difficult to arrange, gives the following as an attempt to classify the *Glires* according to their habits, in the tenth volume of the 'Annals of Philosophy.'

* Fur, *with scattered larger hairs or spines; tail spiny or scaly.*

Family 1. *Muridæ*; 2. *Histricidæ*.

** *Fur nearly equally soft; tail none, or hairy.*

Fam. 3. *Leporidæ*; 4, *Jerboidæ*; 5, *Aspalacidæ*. For the further development of Mr. Gray's arrangement, see the articles Leporidæ, Muridæ, and Porcupines.

Mr. Swainson (*Classification of Quadrupeds*) divides the *Glires*, or *Gnawing Quadrupeds*, into two main divisions, viz.: 1, Those with clavicles; 2, those with rudimentary, or no clavicles; and a third division, *Marsupial Rodentia*, 'situation uncertain.'

The first division consists of the genera *Castor*, *Fiber*, *Myopotamus*, *Rats and Mice*, and *Squirrels*. [Muridæ, vol. xv., pp. 496, 497.]

The second division embraces the genera *Hystrix* (with the subgenera *Acanthion*, *Erethizon*, *Synætheres*, and *Sphigurus*), *Lepus* (with the subgenus *Lagomys*), and *Cavia* (with the subgenera *Hydrochærus*, *Cobaya*, *Cavia*).

Under the Marsupial Rodents are placed the genera *Phascolomys* (with the subgenus *Amblotes*), and *Phascolarctos*.

In the 'Magazine of Natural History,' New Series (1839), will be found Mr. Waterhouse's interesting 'Observations on the *Rodentia*, with a view to point out the groups as indicated by the structure of the *Crania* in this order of Mammals.' And in November, 1839, the same accurate observer laid before a meeting of the Zoological Society of London a tabular view of the distribution of this numerous order.

Mr. Waterhouse stated, that in the construction of the following table he had endeavoured to display the geographical distribution of the sections of the order *Rodentia*, and that to accomplish this, it of course became necessary to combine some system of classification, with an arrangement of the genera according to the countries in which they were found. The table is divided into five columns, one column being devoted to each of the following portions of the globe: 1st, Europe and North Asia; 2nd, North America; 3rd, Africa; 4th, India and the Indian islands; 5th, South America and the West Indian islands.

In these columns the names of the genera found in each province are inserted, and the number of known species belonging to each genus (as nearly as can be ascertained) is also indicated. Horizontal lines separate the genera according to the sections to which they are supposed to belong.

The few Rodents found in Australia all belong to the family *Muridæ*. About six species are known, and these appertain to the genera *Mus*, *Hapalotis*, Licht. (which is the *Conilurus* of Mr. Ogilby), *Hydromys* and *Pseudomys*.

'The first thing that strikes the attention,' observed Mr. Waterhouse, 'is, that the great mass of South American Rodents belong to a different section from those of the northern portions of the globe, and that they are of a lower grade of organization, as is also the case with respect to the Old and New World Monkeys.'

The next point to which Mr. Waterhouse drew attention was the relative number of species found in warm and in temperate climates. 'If the number of species found in the two provinces, Europe (including North Asia) and North America, be added together, the total is 180 species; whilst in all the rest of the world taken together the amount is only 206; and if from this last number those species which inhabit the temperate portions of South America and Australia (amounting to about 30) be deducted, and added to the first amount, it would appear that the Rodents are most abundant in temperate regions. In the Mammals of large size the case is reversed.

'The total number of species inhabiting each of the provinces pointed out in the table varies less than perhaps might be expected. The European province, North America, and South America, are nearly equal as to the number of species they contain; India and Africa are also nearly equal, but they contain fewer species than either of the other provinces.

'The Squirrels, Rats, Porcupines, and Hares (constituting the genera *Sciurus*, *Mus*, *Hystrix*, and *Lepus*) are the only groups which are found in all the provinces.

'The *Sciuridæ* abound most in North America and India, and are least abundant in Africa and South America. In the latter country they appear to be chiefly confined to the northern portions, and are totally wanting in the southern.

'The *Muridæ* are about equally abundant in Europe, Africa, and South America; in North America and India they are much less numerous.

'The *Arvicolidæ* appear to be confined to North America and the European province. In South America they are apparently replaced by the *Octodontidæ*, *Chinchillidæ*, and *Caviidæ*.

'The family *Leporidæ* is but feebly represented in each of the provinces above mentioned, excepting in North America, where the number of species already discovered is almost equal to all those found in other portions of the globe taken together. In earlier periods these Rodents, which are very low in the scale, appear to have been much more numerous, judging from the fossil remains which have been found—at least in the European province.

'The remaining families of Rodents are almost entirely confined to South America. The genus *Aulacodus* of Western Africa, the genera *Petromys*, an inhabitant of the Cape of Good Hope, and *Bathyergus*, found both at the Cape and north-eastern portions of Africa, possess certain characters in which they approach the South American forms. *Petromys* analogically appears to represent the Octodons of South America, and *Bathyergus* may be compared to the genera *Poephagomys* and *Ctenomys*; whilst in *Aulacodus* we possess a representative of the *Capromys* of the West Indies.'

		Europe and North Asia.	North America.	Africa.	India and Islands.	South America and West India Islands.
MURINA	*Sciuridæ*	5. Sciurus. 1. Pteromys. 1. Tamias. 3. Spermophilus. 2. Arctomys.	20. Sciurus. 3. Pteromys. 5. Tamias. 10. Spermophilus. 8. Arctomys. 1. *Aplodontia.*	5. Sciurus. 3. Xerus.	25. Sciurus. 9. Pteromys.	6. Sciurus.
	Muridæ	3. Myoxus.		2. Graphiurus. 3. Myoxus.		
		8. Dipus.	2. Meriones.	4. Dipus.		
		16. Mus.	6. Mus. Hesperomys.	10. Mus. 2. Dendromys. 6. Gerbillus. 1. Psammomys. 3. Euryotis.	12. Mus. 2. Gerbillus. 1. Phlœomys. 2. Rhizomys.	30. Mus. Hesperomys. 3. Reithrodon.
		6. Cricetus.	1. Sigmodon. 2. Neotoma.			
	Arvicolidæ	1. Castor. 20. Arvicola. 4. Lemmus. 2. Spalax.	1. Castor. 1. Ondatra. 8. Arvicola. 4. Lemmus. 10. Geomys.			
HYSTRICINA	*Hystricidæ*	1. Hystrix.	1. Erethison.	1. Hystrix.	1. Hystrix. 1. Atherura.	3. Cercolabes. 2. Synetheres.
				1. Aulacodus 1. Orycterus. 4. Bathyergus. 1. Petromys.		3. Capromys. 1. Myopotamus. 10. Echimys. 6. Nelomys. 1. Cercomys. 2. Dasyprocta. 1. Cœlogenys.
	Octodontidæ					2. Ctenomys. 1. Poephagomys. 1. Octodon. 2. Abrocoma.
	Chinchillidæ					1. Chinchilla. 2. Lagotis. 1. Lagostomus.
	Caviidæ					6. Cavia. 2. Kerodon. 1. Dolichotis. 1. Hydrochœrus.
LEPORINA	*Leporidæ*	5. Lepus. 3. Lagomys.	15. Lepus. 1. Lagomys.	6. Lepus.	4. Lepus. 1. Lagomys.	1. Lepus.
		81 spe. 16 gen.	99 spe. 19 gen.	53 spe. 16 gen.	59 spe. 10 gen.	89 spe. 25 gen.

Mr. Waterhouse observed, 'that he had not yet been able to satisfy himself as to the precise situation, in a systematic classification, of the genera *Ctenodactylus* and *Helamys*, the former from North and the latter from South Africa. Four other genera are omitted in the above table for the same reason; they are *Otomys*[*] of Dr. Smith, a genus found at the Cape of Good Hope; *Akodon*, Meyen, which inhabits Peru; *Heteromys*, Desmarest, founded on the *Mus anomalus* of Thompson, an animal found in the island of Trinidad: and lastly, *Saccomys* of F. Cuvier, which is supposed to be from North America. These four genera in all probability belong to the family *Muridæ*.

'The genus *Aplodontia* is placed with *Sciuridæ*, but it must be observed that it differs much from the typical species of that group, there being no post-orbital process to the skull, and the molar teeth being rootless.' (*Zool. Proc.*)

The student should further consult *The Zoology of the Voyage of H.M.S. Beagle*, Nos. ii., iii., iv. of part ii. (*Mammalia*), where many Rodents are described and figured, and the characters of the *Octodontidæ* (pp. 83, 84) clearly pointed out.

We have good reason for stating that besides the *Leporidæ*, which differ considerably from all other groups of Rodents, there are only a few genera which Mr. Waterhouse has not yet sufficiently examined to determine satisfactorily to himself how many families they form. These genera are the South American forms *Capromys*, *Myopotamus*, *Echimys*, *Cercomys*, *Dasyprocta*, and *Cœlogenys*; they are, in his opinion, certainly very nearly allied to each other, and may perhaps with propriety be collected into one family under the name of *Dasyproctidæ*. There are moreover certain African genera which Mr. Waterhouse has not yet had an opportunity of thoroughly examining. Some observations by the same author on the families *Chinchillidæ* and *Caviidæ* will be found in the *Zoological Proceedings* for 1839 (p. 61).

Brandt has admirably worked out the family *Hystricidæ*, in his *Mammalium Exoticorum novorum, vel minus rite cognitorum, Musei Academici Zoologici Descriptiones et Icones, &c.* (Petropoli, 1835) 4to.

Fossil Rodentia.

Dr. Lund, in his view of the Fauna of Brazil, previous to the last geological revolution,[*] after noticing the living Rodents inhabiting that district, proceeds to notice the remains found in the limestone caves there.

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[*] This is a different genus from the *Otomys* of Cuvier, which is *Euryotis* of Brandt.

[*] There is a good translation of this most interesting paper in the *Magazine of Natural History*, New Series, 1840.

He commences with the common Brazilian wood-rat, *Mus lasiurus*, observing that he knows of very few caves in which remains of this animal are not found, and that in many they occur in such prodigious quantities as to excite astonishment. He cites as an instance the numbers which he found in a cavern near Caxoero do Campo, which is 120 feet long, from 6 to 9 feet wide, and from 30 to 40 feet high. Its floor for a distance of 20 feet from the entrance was covered with a bed of earth perfectly identical with the soil outside, and which had evidently been washed in by rain-water. Farther in, this bed of earth disappeared, and was replaced by a layer of very loose brownish or black mould, about a foot thick, and completely full of small bones, more abundant in some places than in others. Dr. Lund filled a box, containing about half a cubic foot, with this mould; and counted in it about 2000 separate *rami* of the under-jaw of *Mus lasiurus* and about 400 of *Didelphis murinus*, besides a small number of the jaws of other animals. Most of the bones were broken; the smaller ones only, such as those of the feet, the vertebræ, and the strongest long bones being entire. All the skulls were fractured, so that a portion of each was usually wanting: those which lay deepest were brown, brittle, and adhered to the tongue; the uppermost bones were all very fresh. Upon the surface of the earth the *elytra* and legs of beetles were scattered. Dr. Lund is of opinion that the *Strix perlata*, which is met with abundantly in the caverns, is the predatory animal which collected these bones. The remains of the Paca and Gutiá are frequently found unconnected with the heaps of bones cast up by the owls.

Dr. Lund further observes that the most numerous genus of the family of Rodents is the genus *Mus*, with six species of which, indigenous to the district, he is acquainted, besides two which have been introduced from Europe (*Mus musculus*), the other, as he suspects, from Asia (*Mus setosus*, Lund). The abundant remains of this genus collected by him from the caverns prove its existence in the antient world. The species, difficult to distinguish by external characters, are, he remarks, still more so when fragments only of their skeletons remain. He was however able to make out two or perhaps three extinct species. In several caverns he found remains of a fossil species of *Echimys* which approaches very nearly to *Echimys Apereoïdes*, Lund. He also found traces of a species belonging to the fossil period which agree very closely with *Echimys sulcidens*. A gigantic *Synetheres* (*Cercolabes*, Brandt) belonged to the antient Fauna of the district; for the fragments in the possession of Dr. Lund indicate a creature very little inferior in bulk to the wild hog. The fossil species moreover presents, he tells us, a nearer resemblance to the smaller existing species (*Syn. insidiosa*) than to the larger (*Syn. prehensilis*), so that, he observes, it would be classed, by those zoologists who make a generic division, between these two species, under the genus *Sphiggurus*. He discovered a small Rodent which did not agree with any of the genera at present existing in that country. The fossil remains of the genera *Lepus* and *Anæma* were abundant in the caves, and those of a species of *Dasyprocta* still more so: these more or less closely resemble the recent species of their respective genera. A second species of *Dasyprocta* was rare and of extraordinary size, the long bones of the hinder extremities being almost as large as those of the roebuck. Dr. Lund proposes the name of *Dasyprocta Capreolus* for this fossil animal. Of the *Capivar* or *Capybara* two fossil species were found; one identical with that now in existence, the other of great size. For this last Dr. Lund proposes the name of *Hydrochærus sulcidens*. It was nearly five feet in length, so as to stand, as Dr. Lund observes, midway between the existing species of this genus and the South American Tapir. The remains of the genus *Paca* (*Cœlogenys*) were found fossil in most of the Brazilian caves, and were amassed to a great extent. Two extinct species are named by Dr. Lund—*Cœlogenys laticeps* and *Cœlogenys rugiceps*: a third, much larger, having been not inferior to the living *Capybara*, is named by him *Cœlogenys major*.

Dr. Lund remarks that with reference to the numerical relations of this order in the present and former periods, we see that only one of the existing Brazilian genera is absent from the list of fossil genera, namely, that of the squirrels. Dr. Lund further observes that the total number of species at present existing in the district examined by him is 18: but he only discovered 16 belonging to the extinct Fauna. This however does not militate against his opinion that the antient Fauna was numerically richer than the modern in animal forms.

Notices of the fossil animals belonging to this order will also be found under the articles which treat of the families and genera.

RODERIC, the thirty-fourth and last of the Visigothic line of kings who filled the throne of Spain from 411 to 711. The circumstances which attended the elevation and fall of this prince are as doubtful as most events of that dark period. He appears to have been the son of Theodofred, duke of Cordova, and the grandson of Chindaswind. Having been entrusted by Witiza with the command of the army, Roderic revolted against his sovereign in 708, deprived him of the crown, and banished him to Toledo. For some time after his usurpation, Roderic had to contend against the sons and partisans of the dethroned monarch, who had taken refuge in the northern provinces of Spain. At last the sons of Witiza, perceiving their inability to cope with the forces of the usurper, crossed over to Africa, where they were kindly received by Ilyan (the Count Don Julian of Spanish chronicle), lord of Ceuta and Tangiers, and a friend of Witiza, who offered, if assisted by the Arabs, whose tributary he was, to restore the princes to the dominions of their father. Having communicated his project to Músa Ibn Nosseyr, then governor of Africa for the Khalifs of Damascus [MUSA; MOORS], that general, who had long wished to carry his arms into Spain, gladly embraced the opportunity offered to him, and promised his powerful assistance. By his orders Tarif Abú Zorah, with four hundred Berbers, landed at Tartessus (since called Tarifa, in commemoration of this event), and after ravaging the adjoining country, returned to Africa laden with plunder and captives. This happened in Ramadhán, A. H. 91 (Oct., A.D. 710). The success of the enterprise filled the Arabian Amír with joy, and a second and more formidable expedition was, the ensuing year, directed against the shores of Spain, on Thursday the eighth of Rejeb, A.H. 92, answering to the 30th April, 711. Tárik Ibn Zeyyád, a freedman of Músa Ibn Nosseyr, landed with eight thousand men at the foot of the rock of Calpe, to which he gave his own name, *Jebal Tárik* (the mountain of Tárik), since corrupted into Gibraltar. Soon after their landing, Tárik and his followers were attacked by Theodomir, the governor of Andalucia. The Goths however were unable to force the positions taken up by Tárik, who, seeing his number daily increase by fresh reinforcements from Africa, descended into the plain, and advanced without opposition as far as Medina Sidonia. He was there met by Roderic, who, at the head of numerous but ill-disciplined forces, hastened to repel the invasion. After some sharp skirmishing, which lasted for six consecutive days, the two armies came to a general engagement on the 5th of Shawwál, A.H. 92 (26th July, 711). According to Ar-rází and other historians, this memorable battle, which decided the fate of the Gothic monarchy, was fought on the banks of the river Barbate, not on those of the Guadalete, as the generality of the Christian historians have erroneously asserted. It was at first hardly contested on both sides, until the defection of Oppas and other partisans of Witiza, to whom Roderic had imprudently entrusted the command of the right wing of his army, gave the victory to the Arabs. The rout then became general, and the flower of Gothic chivalry fell by the sword of the Arabs, Roderic himself being in the number of the slain. This last fact has been brought into question by the generality of the Spanish historians, from Rodericus Toletanus down to Masdeu, on the ground that Sebastianus Salmanticensis, a monk and chronicler of the tenth century (in *Flores, Esp. Sag.*, vol. xiii.), speaks of a tomb being discovered in his time, at Viséo in Portugal, bearing this inscription, '*Hic requiescit Rodericus ultimus Rex Gothorum*;' from which they conclude that Roderic escaped the field of battle, and retired into Portugal, where he passed the remainder of his days in penance and prayer. The statement however is entitled to little credit; for not only have we the testimony to the contrary of the Arabian writers, who universally agree that Roderic perished in the action, though they are divided as to the manner of his death, some asserting that he was slain by Tárik, and others that he was drowned in attempting to cross the river; but the assertion is further corroborated by Isidorus Pacensis, and the anonymous continuator of the 'Chronicon Biclarense'—two contemporary Christian writers, who positively declare that Roderic died in the action. Roderic's reign had lasted nearly three years. There is a fabulous chronicle of this king, or rather a romance of chivalry, in which the popular traditions current among Moors and Christians respecting the invasion and conquest of Spain, as well as many ridiculous fables like that of Florinda, and the enchanted Tower of Toledo, have been embodied by an anonymous writer of the fourteenth century. It was printed for the first time at Toledo, 1549, and has since gone through several editions. Another fabulous history of Roderic and the events in which he was engaged, was written towards the middle of the sixteenth century, by a converted Moor of the name of Luna (Granada, 1592, 4to.). These, and other books of the same stamp, have furnished ample materials for some of the best works in English literature. (Scott, Southey, and Irving.)

(Al-makkari's *History of the Mohammedan Dynasties in Spain*, vol. i., chaps. 1 and 2.)

RODNEY, ADMIRAL, LORD. GEORGE BRYDGES RODNEY was born at Walton-upon-Thames, in the county of Surrey, February 19, 1718. He was taken from Harrow School, and sent to sea at twelve years of age. In 1739 he was made a lieutenant; in 1742, a captain; and in 1748 he was sent out as governor and commander-in-chief on the Newfoundland station, with the rank of commodore.

In October, 1752, Rodney returned to England, and was elected member of parliament for the borough of Saltash. He was appointed successively to the Fougueux, 64 guns; the Prince George, 90; and the Dublin, 74. After twenty-eight years of active service, he was raised to the rank of rear-admiral, May 19, 1759.

In 1761 Admiral Rodney was appointed commander-in-chief at Barbadoes and the Leeward Islands. Having captured the islands of Martinique, Santa Lucia, and Granada, he was recalled on the conclusion of peace in 1763. Soon after his return he was created a baronet, and by successive steps reached the rank of vice-admiral of the red. He was also appointed governor of Greenwich Hospital; but resigned this office on being sent out, in 1771, as commander-in-chief on the Jamaica station. In 1774 he was recalled.

Under the pressure of pecuniary difficulties, Sir George Rodney now retired to Paris, where he remained till May, 1778, when he was promoted to the rank of admiral of the white, and in the autumn of 1779 was again appointed commander-in-chief on the Barbadoes station, for which he sailed December 29, 1779. His fleet consisted of 22 sail of the line and 8 frigates. France and Spain were at this time united against England. Before he had been ten days at sea he had captured seven Spanish ships of war, and on the 16th of January, 1780, fell in with a Spanish fleet, under Admiral Langara, near Cape St. Vincent, consisting of 11 ships of the line, and 2 frigates. Of these five were taken and two destroyed; but the action being in the night, and the weather tempestuous, the rest escaped.

On the 17th of April, 1780, Rodney came in sight of the French fleet, under the Comte de Guichen, near Martinique. Rodney intended to attack the enemy, which was a little superior, with his fleet in close order; but the greater part of his captains disobeyed, and kept at a cautious distance. Only five or six ships supported him, while in his own, the Sandwich, he engaged a 74 and two 80-gun ships for an hour and a half, and compelled them to bear away, and broke through the enemy's line. In his dispatches Rodney censured the conduct of his captains, but the Admiralty suppressed the passage, and only one of them was brought to trial, who was dismissed from the service. The admiral was rewarded with the thanks of the House of Commons, and a pension of 2000*l.* a-year, to be continued after his death to his family in specified portions for their respective lives. In 1780, he was chosen, free of expense, to represent the city of Westminster, and was also made a Knight of the Bath. Soon afterwards war was declared against the states of Holland, and instructions were sent to Rodney to attack their possessions in the West Indies. The Dutch island of St. Eustatius surrendered, without a shot having been fired, Feb. 3, 1781; and in the course of the spring, the Dutch colonies of Demerara, Essequibo, and Berbice were taken. Rodney, having returned to Europe in the autumn of 1781 for the recovery of his health, was received with universal enthusiasm, was created vice-admiral of England in the place of Admiral Hawke, deceased, and was appointed to the command of the whole of the West Indies. Both the French and Spanish fleets were at this time in the West Indies, and it was intended to form a junction, and attack Jamaica and the other British possessions. The French fleet was commanded by the Comte de Grasse, and consisted of 33 or 34 sail of the line, besides frigates. Intelligence having been brought to Rodney, on the 8th of April, 1782, of their having sailed from Fort Royal Bay, Martinique, he immediately followed them. A partial action took place on the 9th, when two of the French ships of the line were disabled, and a third was rendered useless by an accident in the night of the 11th, thus reducing the French fleet to 30 or 31 ships of the line. The British fleet was rather more in number, but much less in weight of metal. The general action commenced on the 12th of April, 1782, at seven o'clock in the morning, and lasted till half-past six in the evening. Rodney, in the Formidable, broke through the French line, and engaged the Ville-de-Paris, De Grasse's flag-ship, and compelled her to strike. The result was, that seven ships of the line and two frigates were taken by the British.

About this time the Whigs had come into office, and Rodney having been always opposed to them, an officer was appointed to succeed him, who had only just sailed when the news of this great victory reached England, and the Admiralty immediately sent an express to overtake and bring back the officer, but it was too late. Rodney reached England, September 21, 1782. He was raised to the peerage with the title of Baron Rodney, and received an additional pension of 2000*l.* a-year. He lived chiefly in the country, till May 23, 1792, when he died, in his 75th year. He was twice married, and left a numerous family. A monument was erected to his memory in St. Paul's cathedral, London, at the national expense. His portrait by Reynolds was in the royal collection at St. James's Palace, but has since been sent to Greenwich Hospital.

(*Gallery of Portraits*, vol. ii.; Mundy's *Life and Correspondence of Lord Rodney*, London, 2 vols., 8vo.)

RODOLPH. [GERMANY.]

RODRIGUEZ, VENTURA, the most eminent Spanish architect of the eighteenth century, was born at Cienpozuelos, July 14, 1717, and commenced his first studies in his profession under Esteban Marchand, who was then employed on the works carrying on at Aranjuez. After the death of Marchand, in 1733, he still continued at Aranjuez, until Juvara engaged him as his assistant in making drawings for the design of the new palace at Madrid; and after the death of Juvara, he was similarly engaged by his successor Sachetti, with whom he was subsequently associated in the execution of that vast pile, as aparejador, or principal clerk of the works, 1741. In 1747 he was made honorary member of the Academy of St. Luke at Rome; and on that of St. Fernando being established at Madrid, in 1752, he was appointed chief director or professor of architecture in it, an office for which he was peculiarly fitted, not only by his talents, but by his zeal for his art, and his solicitude for the improvement of the pupils. Commissions poured in upon him from every quarter; for there was scarcely a work of any importance throughout the country on which he was not either engaged or consulted. He was employed on various cathedrals, churches, colleges, hospitals, and other structures at Zaragoza, Malaga, Toledo, Granada, Valladolid, and numerous other places; and a mere list of the works designed or executed by him would be one of considerable extent. We can here merely point out, as being among the more remarkable for their design, the sanctuary at Cobadonga, the church of San Felipe Neri at Malaga, that of the hospital at Oviedo, and the palace of the Duque de Liria at Madrid.

These multiplied engagements, and the frequent journeys which they occasioned him, prevented his visiting Italy; but he collected all works of engravings relative both to its antient and modern buildings. He also carefully studied the various monuments of Roman, Moorish, and Gothic architecture in his own country. He died at Madrid, 1785, in his sixty-eighth year, and was buried in the church of San Marcos, the only one in that capital erected by himself. Rodriguez has been honoured with an Elogio by the celebrated Jovellanos, to which we must refer those who wish for a more detailed notice of his character and works. He is also repeatedly mentioned with high commendation by Ponz, in his 'Viage de España;' and he doubtless deserves the title he received from his contemporaries, of the Restorer of Architecture in Spain; yet whether his merit lay chiefly in the reform of a puerile and vitious taste, and in purifying Spanish architecture from the barbarisms that had crept into it, or whether his works display any high degree of positive talent, is what we ourselves have not the means of judging.

ROEBUCK. [Deer, vol. viii., p. 360.]

ROGATION DAYS. It was a general custom formerly, says Bourne, and it is still observed in many country parishes, to go round the bounds and limits of the parish on one of the three days preceding Holy Thursday; when the minister, accompanied by his churchwardens and parishioners, used to deprecate the vengeance of God, beg a blessing on the fruits of the earth, and preserve the rights and properties of the parish. Spelman considers this custom as an imitation of the Roman Terminalia. The primitive custom used by Christians on this occasion was, for the people to accompany the bishop or some of the clergy into the fields, where Litanies were made, and the mercy of God implored, that he would avert the evils of plague and pestilence, that he would send them good and seasonable weather, and give them in due season the fruits of the earth. The Litanies or Rogations then used gave the name of Rogation Week to this time. They occur as early as A.D. 550, when they were first observed by Mamertius, bishop of Vienna, on account of the frequent earthquakes that happened, and the incursions of wild beasts, which laid in ruins and depopulated the city. (Walifred, Stral., c. 28, *De Repub. Ecclesiast.*) In the canons of Cuthbert, archbishop of Canterbury, made at Cloveshoo, in the year 747, it was ordered that Litanies, that is Rogations, should be observed by the clergy and people, with great reverence, on the seventh of the calends of May, according to the rites of the church of Rome, which terms this the Greater Litany, and also, according to the custom of our forefathers, on the three days before the Ascension of our Lord, with fastings, &c. (Wilkins, *Concil. Brit.*, p. 249; Spelm., *Gloss.*, *v.* 'Litania.') The continuance of this custom through later times is evidenced by old parish accompts, and by the various episcopal articles of inquiry. In the injunctions issued in Queen Elizabeth's reign, it is ordered that the curate, at certain and convenient places, shall admonish the people to give thanks to God, in the beholding of God's benefits, for the increase and abundance of his fruits, saying the 103rd Psalm, &c.; at which time the minister shall inculcate these or such sentences, 'Cursed be he which translateth the "bounds and doles of his neighbours," or such orders of prayers as shall be hereafter.'

Rogation Week, in the northern parts of England, is called Gang Week, from *to gang*, which in the north signifies to go. Ganᵹ-ƿuca, gang-week, occurs in the rubric to John, c. 17, in the Saxon Gospels: and Ganᵹ-ꝺaᵹaꞅ are noticed in the laws both of Alfred and Athelstan.

(Brand's *Popular Antiq.*, 4to. edit., vol. i., p. 168-178; Brady's *Clavis Calendaria*, 8vo., 1812, vol. i., p. 321-326.)

ROGER OF HOVEDEN. [Hoveden.]

ROGER OF SICILY. [Sicilies, Two—*History*.]

ROGUE AND VAGABOND. [Vagrant.]

ROHAULT, JAMES, was the son of a merchant at Amiens, where he was born in 1620. He received the rudiments of a scientific education in that city, and was afterwards sent to Paris for the purpose of prosecuting his studies in philosophy.

In that age the physical works of Aristotle had begun to give place to those of Descartes, and most of the learned men in France received with complacency the explanation of the phenomena of Nature which were given in the 'Principia,' the 'Dioptrice,' and the 'Meteora' of their illustrious countryman. Among the persons alluded to, Rohault was one who diligently studied the writings of the Greek philosopher and of his numerous commentators, but who also applied himself with ardour to the productions of the new school, of which he professed to be a zealous disciple. This circumstance appears to have brought him to the notice of Clarselier, who, being himself a warm Cartesian, conceived so great a regard for the young philosopher, that he gave him his daughter in marriage, and engaged him to write a commentary on the works of the man who was the object of their common admiration. Rohault seems to have executed the task assigned to him in a manner which gratified the wishes of his patron and father-in-law, and in the spirit of an enthusiastic follower; for in the preface to his 'Traité de Physique' he designates Descartes as a man who, by his works, had shown that France was capable of forming philosophers as illustrious as those of antient Greece. This work was translated into Latin by Dr. Samuel Clarke, and published with notes, in which are given explanations of the principal phenomena agreeably to the philosophy of Newton, which, in a very few years, had entirely supplanted that of the French school.

After the above-mentioned work was finished, Rohault appears to have been occupied for several years in giving instructions in mathematics, and the subjects of his lessons were published after his death in two volumes. The course comprehends geometry, both plane and practical; trigonometry, plane and spherical; fortification, mechanics, perspective, and arithmetic.

Besides the 'Traité de Physique,' Rohault published also a work entitled 'Entretiens sur la Philosophie,' consisting of a series of dialogues, in which the subjects are treated according to the Cartesian principles. He died in 1675.

ROHILCUND. [Hindustan, p. 218.]

ROLAND, MANON. Manon Philipon, for such was her maiden name, was born in Paris in 1756. Her father was an artist of moderate talent; her mother was a woman of superior understanding and of a singularly amiable temper. Manon learned to read so early and so easily as not to be able to recollect the process; and, having once learned to read, she read everything that came in her way. In her father's house she enjoyed, to a certain extent, the means of cultivating painting, music, and general literature. It is probable that her early devotion to these pursuits tended to exalt her imagination and to influence the whole of her future career. Whilst yet a girl, she was, at her own earnest request, placed for one year in a conventual school. At this age her religious enthusiasm was extreme; in after-years it subsided, and her opinions, she confesses, went through every change, until they rested in scepticism; a result in some degree due to her perusal of the writings of many celebrated authors. Her reading, under her father's roof, was of a most miscellaneous description. The works of the fathers and the free writings of the seventeenth and eighteenth centuries were equally accessible to her, and perused with equal avidity; but the most powerful and lasting impression was made on her by an early familiarity with Plutarch's 'Lives of Illustrious Men.' From this time, Greece and Rome were constantly present to her thoughts, and when she was fourteen years old, she is said to have wept to think that she was not a Roman or a Spartan woman.

At the age of five and twenty, she became the wife of M Roland, a man twenty years her senior, of laborious habits, great ability and integrity, and manners described as of antique severity. A daughter was the fruit of this marriage, and Madame Roland's time became divided between the care of her child's education, and giving assistance to her husband, from whose knowledge she derived great advantage in return. He held the office of Inspector of Manufactures, of which he fulfilled the duties in a liberal spirit well according with the previous impressions of his enthusiastic partner. With him Madame Roland visited England, Switzerland, and other countries of Europe—everywhere industriously inquiring into the nature of the civil institutions, and manifesting the warmest sympathy with the advocates of political liberty. On witnessing the comforts enjoyed by the English cottagers, she is said to have observed, that in this country a handful of wealth did not constitute the nation, but that *man*, whatever his station, was reckoned as something.

The intense interest with which such a woman regarded the first movements of liberty in her own country, may easily be conceived. Her husband being appointed to represent the city of Lyon in the National Convention, left his residence near that city, and, accompanied by his wife, proceeded to Paris, where the curiosity of Madame Roland was gratified, and her zeal, if possible, increased, by the opportunity of observing some of the most distinguished actors on the political stage—as Mirabeau, Cazalès, Maury, Barnave, and others of less note. To the cause espoused by these notable persons Madame Roland and her husband were warmly attached; and, during the ministry of the party of the Gironde, Roland was appointed minister of the interior, for which his information, his assiduity, and his strict probity highly qualified him. It was, whilst holding this office, that he appeared at court with a round hat and strings to his shoes; and was regarded by the courtiers as a symbol of a monarchy about to fall. His sincere language was as unwelcome to the court as his plain attire was displeasing to the courtiers. The talents of his wife were at this time applied to assist him in the composition of public papers. Without pretending to direct him, she avows her belief that by mingling with the severer accents of patriotism the expressions and feelings of a woman of sensibility, she rendered these documents more impressive and effectual. The famous letter of M. Roland to Louis XVI. (May, 1792) was drawn up by her: a letter designated, according to the political feelings of the readers, as an enlightened although a severe remonstrance, or as audacious and full of evil prophecy. This production occasioned M. Roland's dismissal by the court; for which he was compensated by the warm applauses of the Convention. He again became a minister after the events of the 10th of August; but his party had then passed the bounds prescribed by his judgment, and entered upon extremes repugnant to his high-minded and generous wife. Still they were apparently favoured by their party, to whom Roland's character and popularity were necessary. Amidst the real and affected grossness of dress, manners, and language of the republicans, society preserved its respectability in the circle assembled round the table of the minister of the interior.

The events of the reign of terror do not require to be detailed. The frightful massacres in the prisons of Paris on the 2nd and 3rd of September, were boldly denounced by Roland in his capacity as minister; but the Convention, which applauded him, wanted courage, or virtue, or power to act upon his advice; and from that hour his own doom and that of his wife became only more certain. Madame Roland had herself been already arraigned before that assembly, on an absurd charge of treasonable correspondence with England; and by her presence of mind, her acuteness, and her wit, had baffled and mortified her accusers. The recollection of this defeat is said to have so haunted the minds of Marat, Danton, and Robespierre, that in every subsequent difficulty, and in every attack made upon their proceedings, they imagined they recognised the boldness, sagacity, or sarcasm of Madame Roland. She and her husband began to receive warnings of their danger, and for a short time consented to take the precaution of not sleeping at the Hôtel of the Interior. The appearance of deception was little agreeable to Madame Roland. 'I am ashamed,' she said, on an occasion on which she had almost consented to leave her house in the dress of a peasant, 'of the part I am made to play. I will neither disguise myself nor leave the house. If they wish to assassinate me, it shall be in my own home. This courageous example is due from me, and I will afford it.' Her husband quitted Paris, and she might have done so, but she declared that the care of evading injustice cost her more than it would do to suffer from it.

The time arrived when the intellectual superiority hitherto maintained in the Convention by M. Roland's party, or the Girondists, was overcome by absolute force. Forty thousand men were marched against the Convention, by the Jacobins, on the 31st of May, 1793; and in the evening of the same day Madame Roland was arrested and thrown into the prison of the Abbaye. Here she displayed her usual firmness, and continued to exercise towards the poor and unfortunate a benevolence for which in her prosperous days she had been remarkable. Before her friends she appeared cheerful; she always maintained the language of a patriot when speaking of the aspect of affairs, flattering and fearing none; and she professed herself capable of overcoming her ill-fortune. In solitude the feelings of the wife and the mother overcame her, and the attendants remarked that she passed many hours in tears. Her sufferings were greatly aggravated by her being one day unexpectedly liberated, as if the danger was past. She drove home with extreme delight; sprung out of the coach, as she says it had always been her habit to do, but with more than usual vivacity; and was running gaily up stairs, when she was again arrested by an officer, and at once taken to Sainte Pelagie, a prison of a lower order than the Abbaye, where she was shut up with the worst of her sex. In this second prison she remained until her trial and execution. The only explanation given of this circumstance was that her first arrest had been illegal. The wretchedness of her situation at Sainte Pelagie was only alleviated by her literary occupations, and by the kindness of her gaolers or of their families, whom her fascinating manners and behaviour converted into friends. Well knowing that her life would be sacrificed, she devoted all her hours to the composition of her Memoirs, writings full of lively description, entertaining anecdotes of her contemporaries, and remarks indicative of penetration and habitual reflection. A letter to her daughter, written in these circumstances, is one of the most affecting of farewells. But Madame Roland seldom gave way to melancholy emotions in her writings. Her pages detail the events of her childhood and youth with matchless sprightliness and grace, and, excepting in certain passages wherein candour is carried to an excess which modern delicacy would not permit to a female writer, her Memoirs are models of that kind of composition.

As the narrative advances, events of a deeper interest are related with great facility of expression, sometimes with mournful pathos, generally with great judgment, not always without satire, but always with easy eloquence. From a very early age we may discern in this relation the extraordinary decision of her character, her naturally commanding manners, her fervent but well-controlled temperament, her indefatigable love of improvement, and her unswerving adherence to truth.

Several unhappy prisoners delivered themselves from certain execution by taking poison; and Madame Roland had at one time resolved to do the same. But communicating her resolution to a friend, who represented to her that a nobler course would be to wait for death, and leave the memory of so great a sacrifice to the cause for which she had lived, she calmly determined to abide the result.

It was in the month of October (1793) that the Girondists were destroyed. On the 31st of that month she was sent to the Conciergerie. On the 10th of November she appeared before the Revolutionary tribunal. She had declined the proffered aid of M. Chauveau-Lagarde, the great advocate of the Girondists, of the unfortunate queen, and of Charlotte Corday; knowing that no talents could save her, since her innocence could not, and not wishing to expose him to useless danger. Part of the night was occupied by her in writing her eloquent defence. Her courage did not desert her during her trial or at her execution. She sustained the insults of the unmanly tribunal, not without womanly emotion, but also with a dignity worthy of the greatest women of the times with which her early reading of Plutarch had made her familiar. To the last moment she preserved her presence of mind, and even her gaiety. On the same day and at the same hour a man was also to be guillotined; and in such extremity, to die first being thought a privilege, she waived it in favour of her less courageous companion in misfortune; overcoming the scruples of the executioner, whose orders were to execute her first, by representing to him the impoliteness of refusing a woman's last request. It is said that bending herself before the statue of Liberty, close to this scene of death, she exclaimed, 'Oh! Liberty! what crimes are committed in thy name!'

She had often been heard to say that her husband would not survive her. As soon as he heard of her execution, he took leave of two attached female friends in whose house, at Rouen, he had found a refuge, and to whom his resolution was known; walked in the evening of the 15th of November as far as Baudouin, four leagues on the road to Paris; sat down by the side of a tree in an avenue leading to a private house, and passed his cane-sword through his chest. By his side was found a paper, in which these words were written:—'Whoever you are who find me lying here, respect my remains; they are those of a man who devoted his whole life to being useful, and who died, as he had lived, virtuous and honest.'

These particulars are principally taken from a very recent edition of the 'Memoirs of Madame Roland,' published in Paris, in two volumes, 8vo., with abundant notes, by MM. Berville and Barrière.

ROLLE, MICHEL, a French mathematician, was born at Ambert in Auvergne, in 1652. He appears to have possessed from nature a remarkable facility in solving propositions relating to arithmetic and algebra, and to have acquired by practice a great proficiency in the calligraphic art. After having served during several years as an attorney's clerk, he came, in 1675, to Paris, where he obtained a subsistence as a writing-master, and where he spent his leisure time in cultivating the mathematical sciences. An accidental circumstance procured for him the notice of M. Colbert. Ozanam, who was himself a good analyst, hap pening to propose to mathematicians a problem of the kind called indeterminate, which, he conceived, could be solved only by a process involving very high numbers. Rolle was so fortunate as to discover a neat solution; and the minister, being informed of it, was induced, in 1685, to recommend him for election as a member of the Academy of Sciences, then recently formed.

From this time Rolle devoted himself to analytical pursuits; and in 1690 he published a treatise on algebra, in 4to. This work contains, among other methods for the solution of equations, one which he calls the method of *cascades*, a name given to it because it consists in successively depressing the equation one degree lower at each operation. It has some analogy to a method given by Newton, in the 'Arithmetica Universalis;' but its want of generality has caused it ever since to be neglected. An affectation of peculiar modes of expression prevails throughout the whole work, which is otherwise very obscurely written: the author was however particularly skilful in the management of questions of the kind called diophantine, and he published a treatise on that subject in 1699.

Rolle, unfortunately for his fame, entered the lists as an opponent of the algebra of Descartes, and of the differential calculus which had been then recently discovered by Newton and Leibnitz; and he is accused of using towards those who endeavoured to point out his mistakes a tone of anger which is very unbecoming in a philosopher. He began in 1701 to attack the differential calculus, objecting both to its principles and its applications; and, with respect to the latter, he endeavoured to show that in particular examples the results are inconsistent with those which are brought out by the antient processes. The new calculus, as it was called, found however in France a zealous and temperate advocate in Varignon, who, in replying to the objections of Rolle, explained the true meaning of the differential symbols, and pointed out that the supposed discrepancies in the results of the examples arose entirely from the haste and inadvertency of the objector.

This dispute agitated the French Academy of Sciences for a long time, Rolle continuing to raise one objection after another; and though they were answered by Varignon, the former always pretended to have the victory. It is said that the Academy was then composed of men who had been long accustomed to the antient analysis, and therefore saw with pleasure an opposition raised against methods to which they were not yet reconciled. In 1705 however the Academy, without pronouncing a judgment on the subject, recommended that Rolle, in moderating his language, should conform to the rules of the institution; and the dispute was for a time terminated. This was twenty-nine years before Bishop Berkeley attempted to revive the subject in the 'Analyst.' [ROBINS.]

It appears that, subsequently, Rolle acknowledged his error, and thus he may be supposed to have deserved the pardon of posterity. He was admitted second geometrical pensioner of the Academy in 1699, and he died on the 5th of July, 1719, at sixty-seven years of age.

ROLLER (Ornithology), the name of an insessorial or perching bird, *Coracias garrula*, Linn.

Some difference of opinion has prevailed among ornithologists as to the place of the *Rollers* in the system.

Linnæus arranged the genus *Coracias* between *Corvus* and *Oriolus*. Pennant (*British Zoology*) gives it a position between the Nut-cracker and the Oriole; M. Duméril placed it between the Birds of Paradise and the Crows; and Meyer arranged it in his second order, *Coraces*, among which it stands in Illiger's method. Cuvier placed the Rollers (*Coracias*, Linn.) between the Crows (*Corvus*, Linn.) and the Birds of Paradise (*Paradisea*, Linn.), the position assigned to them by Lacépède, and includes under that title the Rollers properly so called (*Coracias garrula*, Linn., &c.), and the *Rolles* (*Colaris*).

M. Vieillot, like Meyer and Illiger, places the Rollers among the *Coraces*.

M. Temminck gives them a position between *Bombycivora* and *Oriolus*.

M. de Blainville's method presents them between the Trogons and Bee-eaters (*Merops*).

Mr. Vigors places them in his family *Corvidæ*. [CORVIDÆ, vol viii., p. 67.]

M. Lesson's family *Eurystomidæ* (*Rolliers* of Cuv.) consists of the Rollers (*Galgulus*, Brisson, and *Coracias*, Linn.); the genus *Rolle* (*Eurystomus*, Vieill. [MEROPIDÆ, vol. xv., p. 118], *Colaris*, Cuv., and *Coracias*, Linn.); the genus *Mainatus* (*Eulabes*, Cuv., *Gracula*, Linn.); and the genus *Mino*, Less. M. Lesson rejects the term *Coracias*, because many authors have so dismembered it, according to their different views, that a confusion calculated to produce error is the result.

In the system of Mr. Swainson, who retains the generic name *Coracias*, the Rollers appear among the *Meropidæ* [MEROPIDÆ, vol. xv., p. 118.]

The Prince of Canino (C. L. Bonaparte) arranges the genus *Coracias*, giving as an example the common Roller (*Coracias garrula*, Linn.) in the family *Ampelidæ* (*Birds of Europe and North America*).

In Mr. Gould's great work on 'The Birds of Europe,' the Roller (*Coracias garrula*) comes between the Bee-eater (*Merops Apiaster*) and the Kingfisher (*Alcedo aspida*).

Mr. Yarrell (*British Birds*) arranges the *Common Roller* under the family *Meropidæ*.

Description.—Bill black towards the point, becoming brown at the base with a few bristles; irides of two circles yellow and brown; head, neck, breast, and belly various shades of verditer blue changing to pale green; shoulders azure blue, back reddish brown, rump purple, wing-primaries dark bluish black, edged lighter, tail-feathers pale greenish blue, the outer ones tipped with black, those in the middle also much darker in colour; legs reddish brown; in old males the outer tail-feathers are somewhat elongated.

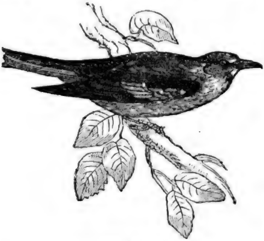
Adult females differ but little from the males; young birds do not attain their brilliant colour till the second year. (Gould, *Birds of Europe.*) Length about 13 inches.

This is the *Pica marina* and *Pica merdaria* of the Italians; *Rollier* of the French; *Birk-Heher*, *Blaue-Racke*, and *Mandelkrahe* of the Germans; *Spransk Kraka*, *Blakraka*, and *Allekraka* of the Swedes; *Ellekrage* of Brunnich; *y Rholydd* of the antient and *Roller* of the modern British.

Geographical Distribution.—This bird appears to have a wide range. In Europe, it is found in Denmark, Sweden (where it arrives with the Cuckoo), and the southern provinces of Russia; is more common in Germany than France, where however it has been found in Provence; and it has been taken at Gibraltar. In Italy, according to Prince C. L. Bonaparte, it is rather common, arriving in the spring and departing in September. In Malta and Sicily it is exposed for sale in the shops of poulterers, and is said to have the taste of a turtle-dove. In the Morea it is considered a delicacy in the autumn, when it is fat with its summer food. It has been captured at Aleppo, and at Trebizond and Erzeroum. It visits the countries between the Black and the Caspian seas; and Dr. von Siebold and M. Bürger include it among the birds of Japan. In North Africa it is found from Morocco to Egypt; flocks were seen by Adanson at Senegal, and he concluded that they passed the winter there. Dr. Andrew Smith records it among the birds of South Africa. In Great Britain it has been killed in Cornwall, in Suffolk and Norfolk, in Cambridgeshire, in Yorkshire, Northumberland, Perthshire, the east of Scotland and Orkney. We can find no account of its occurrence in Ireland; but that it is known in Wales is evident from one of its names above given.

Habits, Food, &c.—Deep forests of oak and birch appear to be the favourite haunts of the Roller. In the 'Annals of Natural History' for 1839, it is stated by a traveller in Asia Minor, that the Roller, which was most common throughout the south and west parts of the country wherever the magpie was not found (for it was not seen in the same district with that bird), was observed to fall through the air like a Tumbler Pigeon. Temminck states that it makes its nest in the holes of trees, where it lays from four to seven eggs of a lustrous white. M. Vieillot states that in Malta, where trees are scarce, the bird builds on the ground. In Barbary it has been observed to form its nest in the banks of the Sheliff, Booberak, and other rivers; and Pennant remarks that where trees are wanting, it makes it in clayey banks. These last modes of nidification bring it very close to the Bee-eaters and Kingfishers, whose eggs quite resemble those of the Roller in colour and shape, and only vary in size. The male takes his turn to sit. The food is very varied, according to Temminck, who enumerates moles, crickets, cockchafers, grasshoppers, millipedes, and other insects, slugs and worms. Gould states that it feeds on worms, slugs, and insects generally. Yarrell informs us that the food consists of worms, slugs, insects in their various stages, and berries.

Bechstein observes that till lately he had thought that the Roller was untameable; but Dr. Meyer of Offenbach had convinced him to the contrary, having himself reared them in his room by the following method:—The young ones must be taken from the nest when only half grown, and fed on little bits of cow's heart, or any other meat which is lean and tender, till they can feed alone; small frogs, worms, and insects may then be added. Its mode of killing and swallowing insects is thus described:—it commences by seizing and crushing them with its bill, and then throws them into the air several times, in order to receive them in its throat, which is very capacious. When the morsel is too large, or the insect is still alive, the bird strikes it hard against the ground, and begins again to throw it into the air till it falls not across, but so as to thread the throat, when it is easily swallowed. Bechstein says that he had never seen the bird drink. The translator of Bechstein's interesting little book states that he once saw a Roller drink after having swallowed dry ants' eggs; it then ate greedily of lettuce and endive. 'Another which I kept,' adds the translator, 'liked the outside of lettuces and spinach after having eaten insects, especially beetles, which are very heating. To judge from what I have observed, the Roller is by nature wild and solitary; it seldom changes its situation, except to seek its food or to hide itself from strangers. It is a good thing, whether kept in a cage or let range, always to have a box in its way, in which it may take refuge when frightened; it will not fail to hide itself there, and by this means will not be tempted to beat itself violently, which it does when it cannot fly from the object of its fright. It knows its mistress very well, lets her take it up, comes near her, and sits without any fear on her knees for whole hours without stirring. This is as far as it goes even when tamed. It is neither caressing nor familiar; when frightened it utters harsh cries, softer ones when its food is brought, but *crag, crag, craag*, at the same time raising its head, is the expression of its joy or triumph.'



Coracias garrula.

The *Mino Bird*, *Gracula religiosa*, Linn., *Bëo* and *Mencho* of the Javanese, *Teeong* of the Sumatrans, will find a more appropriate place among the *Sturnidæ*, according to Mr. Swainson. Mr. G. R. Gray arranges it under the family *Corvidæ*, in the subfamily *Graculinæ*. Mr. Swainson states that analysis has convinced him that neither the *Rollers* nor the bird in question belong to the *Corvidæ*; and he remarks that the little value that can be attached to speculations on the rank of the present genera founded upon mere synthesis, will best appear by looking to those artificial arrangements that place the short-legged Rollers close to the long-legged and powerfully constructed Grakle (Gracula religiosa).

M. Lesson, as we have seen, places this bird next to the Rollers, and among the *Eurystomidæ*, and though we are by no means satisfied that this is its proper position, we shall, in the present state of opinion, notice the form here.

The *Gracula religiosa* then, the type of Cuvier's genus *Eulabes*, formed, says M. Lesson, the genus *Mainatus* of Brisson, and was placed by Linnæus and Gmelin among the *Graculæ*, next after the Orioles. M. Temminck retained the genus *Gracula*, reduced to the Mino Bird alone, among his omnivorous birds, and M. Vieillot kept it also, arranging it in his family of *Caronculés*.

Generic Character.—Bill short, stout, not so long as the head; entirely compressed. Frontal feathers advancing far upon the base, but not dividing the front. Culmen gradually curved from the base to the tip, which is distinctly notched. Commissure but slightly angulated. Under mandible with the base broad and dilated. Nostrils basal, naked, round, sunk in a depression. Frontal feathers short, velvety. Head with naked wattles. Wings as in *Pastor*. Tail short, even. Feet rather short, very strong. Tarsus and middle toe equal; hinder toe shorter; inner toe almost equal to the outer toe. (Sw.)

Example, *Gracula religiosa*.

Description.—Deep velvety black; a white space in the middle of the wing; bill and feet yellow; behind the eye spring fleshy caruncles of a bright orange-colour, and extend beyond the occiput.

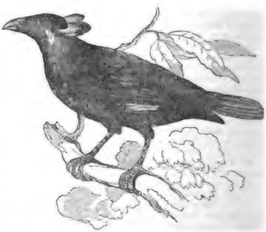
Geographical Distribution.—Java, Sumatra, and the great Eastern Islands.

Habits, Food, &c.—Insects and fruits form the food of the Mino-Bird, which is easily tamed, and learns to whistle and talk with great facility. With the natives it is a great favourite in consequence. Marsden says of it, that it has the faculty of imitating human speech in greater perfection than any other of the feathered tribe. Bontius, who terms it *Pica, seu potius Sturnus Indicus*, heads the chapter where he figures and describes it with the following lines:—

> 'Psittacus Eois quamvis tibi missus ab oris
> Jussa loquar: vincit me Sturnus garrulus Indus.'—

And tells the following story:—There was, when he was in Batavia, an old Javanese woman, the servant of a Chinese gardener, who kept one of these birds which was very loquacious. Bontius was very anxious to buy it: but this the old woman would not hear of. He then begged that she would at least lend it to him that its picture might be taken, a request which was at last granted with no very good grace, the antient Mohammedan dame being under great apprehension that Bontius would offer that abomination, pork, to her beloved bird. This he promised not to do, and had the loan of the Mino, which kept continually saying *Orang Nasarani Catjor Macan Babi*. This being interpreted, means 'Christian Dog, Eater of Pork:' and Bontius came to the conclusion that the unwillingness of the old woman arose not only from the fear of her bird being desecrated by an offer of swine's flesh, but also from the apprehension that he or his servants, irritated by its contumelies, would wring its neck. M. Lesson also saw one at Java which knew whole phrases of the Malay language.

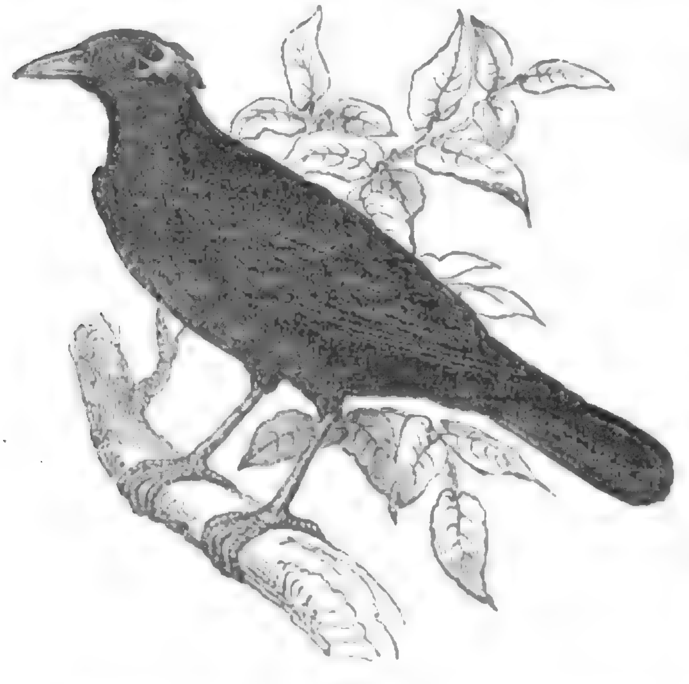
The general opinion seems to be that there is but one species of Mino Bird.



Gracula religiosa. (Eulabes Javanus, Vieill.)

Cuvier however states that Linnæus confounded two species under the name of *Gracula religiosa*, viz. *Eulabes Indicus* and *Eulabes Javanus.*

M. Lesson, who states that only one species is known, viz. the *Mainate Religieux*, *Gracula religiosa*, Linn., *Bëo* and *Mencho* of the Javanese, remarks afterwards that there is said to be a smaller variety: this is probably the *Eulabes Indicus* above noticed.



Eulabes Indicus.

The last-mentioned ornithologist applies the old Indian word *Mino* as a generic term for a very different bird, *Mino Dumontii*, described by him in *The Zoology of the Coquille*, and there figured at pl. 26. He is also of opinion that *Gracula calva*, Linn., should be added to this genus.

ROLLIN, CHARLES, born at Paris, January 30, 1661, was the second son of a master cutler, and was intended by his father for the same trade. Attracting the notice of a Benedictine monk, by the taste and aptitude for learning which he showed at a very early age, he was rescued from his obscure destiny, and placed at the college of Plessis with a pension. Here he pursued his studies with great zeal, industry, and docility, was much noticed by the Principal of the college, and was selected by the minister Le Peletier as the companion of his two sons, with whom he had disputed the prize of academic distinction in generous rivalship. After having been instructed in humanities and philosophy, he devoted three years to the study of theology at the Sorbonne. At the age of twenty-two he had distinguished himself so much in the college of Plessis, that Hersan, the professor of rhetoric there, pointed him out as his own successor in the professorial chair, which he wished to vacate, and Rollin, in spite of his own diffidence, was made his assistant in 1683, and professor in his stead in 1687. The next year he received the additional honour of the professorship of eloquence in the Royal College. In both these capacities he did not disappoint expectation. The orations which he delivered in public were very correct and elegant Latin compositions; and the reforms and regulations introduced by him into the discipline of the university deserve much praise. He revived the study of Greek, which had been greatly neglected, gave more prominence to the cultivation of the French language in the course of general instruction, introduced the plan of learning by heart fine passages of different authors, as an exercise of taste and memory, and substituted exercises in the room of the dramatic representations which the scholars had been in the habit of performing. In 1694 he was appointed rector of the university, in which office he continued two years, and made himself remarkable not less for his constant attention to its internal management than for his zeal in maintaining its privileges against all attempts to impair them.

At the expiration of the rectorship, he was engaged by Cardinal Noailles to superintend the studies of his nephews, having resigned all his public employments, except the professorship of eloquence in the Royal College, in order that he might have more leisure for his private literary labours. Shortly after he was dragged from his retirement, and unwillingly persuaded to become coadjutor in the college o Beauvais. In this situation he passed fifteen years, devoting himself with as much assiduity to the improvement of the system of education there, as he had before done in the college of Plessis. In consequence of the disputes between the Jesuits and Jansenists, which latter party he was thought to favour, and the intrigues thence arising in his college, Rollin was compelled to quit his office at Beauvais. In 1715 he published his edition of Quintilian, in two volumes, 12mo., with a preface and a popular outline of rhetoric, short notes and summaries of the chapters. The text was not published entire, but selections were made according to the judgment of the editor.

In 1720 he was again chosen rector of the university, but in consequence of the religious feuds already mentioned, he was displaced very shortly by a lettre-de-cachet, the university being desired to choose a more moderate rector. From this period till his death he seems to have withdrawn from public life as much as possible, and devoted himself to study, the fruit of which was given to the world in several works. In 1726 appeared his 'Traité de la Manière d'Etudier et d'Enseigner les Belles-Lettres,' a work which presents a popular view of such classical and French literature as he considered suited for the instruction of the young, and contains such a system of education as his own experience in teaching had suggested. This treatise, though deficient in philosophical principles, and inferior to subsequent writings of the same nature, was well adapted for the age in which it was published, and contributed probably very much to diffuse a general taste for literature throughout France. It was translated into English, in 1735, under the title of 'Thoughts concerning Education, translated from the French.' There is extant a letter from Bishop Atterbury to Rollin, in which he speaks in high terms of it. Encouraged by the general approbation with which this publication was received, Rollin composed his 'Histoire Ancienne,' an account of the chief nations of antiquity drawn from profane authors, and terminating with the establishment of the Roman empire under Augustus, in thirteen volumes, which appeared successively in the interval between 1730 and 1738. His last work was a history of Rome, which was afterwards continued by Crevier, from the end of the republic to the time of Constantine, in completion of the original plan.

Rollin's latter years were disturbed occasionally by the religious troubles which agitated his country. His friendship with many distinguished Jansenists drew upon him from time to time the suspicions of the government, and he was accused of joining in conspiracies, and his house searched in consequence, though his enemies could not succeed in criminating him. He died 14th September, 1741, having exceeded his eightieth year.

From the testimony of his contemporaries it appears that Rollin's character was a model of piety and virtue. He was remarkable for his liberality, modesty, integrity, and single-heartedness. This last quality is shown not less in the whole tenour of his actions than in his writings, which please more from a certain simplicity than from any other cause. The merits and defects of his 'Belles-Lettres' are of the same kind as those observable in his 'Histoire Ancienne.' There is the same want of profound thought, and the same absence of critical judgment, the same easy style, attractive to a young mind, and pleasing from its very carelessness, while the want of critical judgment is compensated by the love of truth and the morality which pervade the whole.

Great praise has been bestowed on Rollin by his contemporary admirers, among the most illustrious of whom were the duke of Cumberland and Frederic the Great, who was his frequent correspondent. Montesquieu styled him 'the bee of France,' and Voltaire and Rosseau have confirmed this eulogium.

Modern readers will perhaps think that Rollin's merits as an author have been overrated by the zeal of personal friendship and esteem for his private character, and that his works are chiefly valuable as having contributed to form the taste and strengthen the moral feelings of his age. His 'Opuscules' were collected and published, 2 vols. 12mo., in 1771; they contain orations and poems, written in very classical and graceful Latin, correspondence with Frederic the Great, Rousseau, and other distinguished persons, and other smaller compositions.

Extracts from his works, by M. l'Abbé Lucet, were published in 8vo., Paris, 1780, under the title of 'Pensees sur plusieurs points importans de Littérature, de Politique, et de Réligion.' He is said to have written a 'History of the Arts and Sciences of the Antients,' London, 1768, 3 vols. 8vo. His 'Histoire Ancienne' has frequently been reprinted. A new edition of all his works was commenced at Paris, 8vo., 1837. This history was edited by Emile Beres, with new maps and plates.

The materials for a biography of Rollin are contained in the 'Eloge de M. Rollin,' written by M. de Boye, secretary of the Académie des Inscriptions (of which Rollin was a member), and read before this Society, 14th November, 1741. It was printed, with additional matter in the form of notes, in the edition of the 'Opuscules,' in 1771, already referred to. See also Chaufepié's 'Dictionnaire Historique' and the 'Biographie Universelle.'

ROLLO. [NORMANDIE.]

ROLLS. [RECORDS.]

ROLLS-COURT, the Court of the Master of the Rolls, of which there are two, one at Westminster in the new buildings adjoining the hall, the other in the Rolls Buildings in Chancery Lane. The latter was originally a house or hospital for the reception of Jewish converts: but when the Jews were banished from England by King Edward I., there was little use for an hospital of this kind: whereupon it was assigned to the Master of the Rolls, who had thenceforth the denomination of *Magister Rotulorum, Recordorum, &c., et Custos Domus Conversorum.* One or two converts were maintained on a poor pittance in this house in the sixteenth century.

ROLLS, MASTER OF THE, a very eminent officer of the Court of Chancery, second only to the chancellor himself. Originally he had, as the name implies, the custody of the rolls or recorded proceedings of that court, and, it seems also, of any other documentary matter belonging to that court. But the custody had long been merely nominal, the actual care of them being vested in certain keepers, who were not even appointed by the Master of the Rolls: the two chief depositaries being at the Tower, where the records previous to the reign of Richard III., and at the Rolls Buildings, where are kept those of the later period. But this state of things was altered by the act 1 and 2 Victoria, chap. 94, entitled an 'Act for the better custody of the Public Records,' by which the custody is restored to the Master of the Rolls for the time being, and very extensive powers are given to him with respect to the custody and use of them. The act further commits to him the records also of the Common-Law Courts and of the Court of Exchequer.

By what means the Master of the Rolls became divested of the peculiar duties indicated by the name, is a point of legal antiquarianism which has not been satisfactorily elucidated; nor is it quite clear when or how he came to sit to hear causes in equity. Now the chief duties of this officer are judicial; but from his decrees there is an appeal to the chancellor. He signs all injunctions of the Court of Chancery.

ROMA, COMARCA DI, is the name of a province of the Papal state, in which the city of Rome is situated, and which is under the same administrative authorities as the metropolis itself. It consists of the Agro Romano, or territory immediately around Rome, and of the districts of Tivoli, Albano, and Subiaco. The province extends on both banks of the Tiber, including Bracciano, Monte Rosi, and Monte Sant' Oreste (the antient Soracte) on the west or right bank of the river, and it extends as far as Magliano on the eastern or left bank, including Palombara, Tivoli, Vicovaro, and the whole valley of the Anio, with Palestrina, Frascati, Albano Genzano, and Porto d'Anzo and Nettuno on the sea-coast. It is bounded on the north by the province of Spoleto e Rièti, on the east by the kingdom of Naples, on the south by the province of Frosinone, south west by the Mediterranean, and west by the province of Viterbo. The city of Velletri forms a separate government under the Cardinal Decano, or senior cardinal, who is by custom legate of Velletri and Ostia. For a description of the Comarca see CAMPAGNA DI ROMA.

ROMAGNA, ROMANDIO'LA, a name which was given in the middle ages to a tract of country north of the Apennines, extending along the coast of the Adriatic, from the river Foglia near Pesaro, which was the northern boundary of the Picenum, or March of Ancona, to the Scoltenna, or Panaro, which flows half way between Bologna and Modena. This extent of territory corresponds to that of the modern Papal legations, Bologna, Ravenna, Ferrara, and Forli. The Po was its boundary on the north, and the Apennines of Tuscany on the south and west. Ravenna was the chief town. The name of Romagna, or rather Romandiola, 'Little Rome,' is said by Alberti to have been given to it in consequence of the Exarchs having fixed their residence at Ravenna, which thereby became a second Rome, being the seat of the Imperial government in Italy. But the appellation came into common use later than the period of the Exarchs, for in their time the old administrative names of the time of the empire, 'Flaminia' and 'Æmilia,' were still in use. (Paulus Diaconus, *Hist. of the Longobards*, ii. 19.) In the quarrels between the popes and the Greek emperors on the subject of images, the people of Ravenna and the neighbouring country took part with the former, and afterwards Pepin and Charlemagne bestowed Æmilia, Flaminia, and Pentapolis on the see of Rome, and although the popes could not for a long time after enforce their political supremacy over the whole of that country [PAPAL STATE], still they considered it as their own, and gave it the name of Romandiola. Such is the account of Giannone and other historians. During the middle ages several popes strove to maintain their authority over the petty princes and towns among which the country was divided. [ALBORNOZ.] Alexander VI. commissioned his son Cesare Borgia to conquer the country, which be effected in great measure, partly by force and partly by treachery, and the pope created him duke of Romandiola; but after the death of Alexander VI., Julius II. annexed it to the Papal state. The country was afterwards divided into administrative divisions styled legations, but the general appellation of Romagna continued in use, being applied more especially to the eastern part of the country near the Adriatic, between Rimini and Ravenna, the inhabitants of which are called at Rome to this day 'Romagnoli.' The people of Bologna and Ferrara are not understood as included in this denomination. The Romagnoli are lively and quick, but they have the character of being hasty and violent. Of late years they, as well as their neighbours of Bologna, have shown themselves the most impatient of Papal control of all the populations of the Papal State. The principal towns of Romagna are: CESENA; FAENZA; FORLI; IMOLA; RAVENNA.

ROMAGNO'SI, GIAN DOME'NICO, born near Piacenza in 1761, studied first in the College Alberoni, where he had for a schoolfellow his countryman Gioia, who afterwards distinguished himself as a publicist and a political economist. [GIOIA, MELCHIORRE.] Romagnosi continued his studies at Parma, where he took his degree of Doctor of Law in 1786. He afterwards practised as an advocate. In 1791 he published his 'Genesi del Diretto Penale,' being an investigation of the grounds on which the infliction of punishment for offences is founded. Beccaria, Filangieri, and other Italian jurists of that age had adopted the French theory of a social contract, by which each member of incipient societies was supposed to have given up a portion of his original independence into the hands of the collective body, and to have thus bound himself and his descendants. Romagnosi rejected this hypothesis, and he derived what he called the right of punishing from the principle of necessity and of self-defence, inasmuch as the whole of society is concerned in an injury which is done to any of its members. His work was well received in France and Germany; but it has been little noticed in Italy until of late years, where it has been republished five or six times; and it is now much studied, especially in Tuscany. Soon after the publication of the work, the prince bishop of Trent named him prætor, or chief magistrate, of that town, an office held for one year, but in which Romagnosi was confirmed for three consecutive years, after which the bishop named him his aulic councillor.

During the turmoil of the French revolution, Romagnosi did not participate in the blind admiration of many of his countrymen for what were called the new ideas, and he tried to define the just meaning of liberty and equality in two little works, 'Che Cosa è Eguaglianza,' 'Che Cosa è Libertà,' 1793. When the French invaded Italy in 1796, Romagnosi remained in the Italian Tyrol, to whose population he was greatly attached: he said of them, among other things, that they did not know how to tell a lie. When the French entered the Tyrol, Romagnosi was named secretary of the provisional council instituted at Trent, in which capacity he did all he could to alleviate the evil of foreign invasion.

When the French were driven away in 1799, he was accused by some invidious person of disaffection to his legitimate sovereign, and was arrested and confined at Innsprück; but he was soon released, and the emperor Francis himself declared him innocent, and banished his accuser. In December, 1802, he was appointed professor of law in the university of Parma, where he published his second professional work, 'Introduzione allo Studio del Diritto Pubblico Universale,' a treatise on general jurisprudence, or what has been styled by Hobbes 'civil philosophy,' and by Barbeyrac and Burlamaqui, 'droit naturel,' or 'law of nature.' Romagnosi maintained that moral and political science is as susceptible of demonstration as the natural and metaphysical sciences. He took for the basis of his system the principle of moral necessity, saying that man and society tend not only to their preservation, but to their physical and moral improvement, in the quickest and at the same time safest progression. This progression can only be effected by raising the intellectual and moral powers. The understanding and the heart ought to be educated so as to create only wishes and habits consistent with the general welfare, and so that utility and justice shall coincide.

A second edition of Romagnosi's work appeared at Milan in 1825, with the addition of five letters by the author to Professor Valeri of Siena, in which he develops and illustrates his principles.

In 1806 Romagnosi was requested by the government of the so-called kingdom of Italy, then under Napoleon, to repair to Milan, in order to assist other distinguished jurists in compiling a code of criminal procedure. Romagnosi attended all the sittings of the Commission in which the draught of the new code was discussed. He wished to introduce the jury; but Napoleon put his veto on it, saying that he did not think that the state of Italy allowed of such an institution. Some one proposed to introduce into Italy the 'lettres-de-cachet,' or royal orders for imprisoning individuals for state reasons without trial, which existed in France under Napoleon, as well as under the old monarchy; but Romagnosi strenuously opposed the measure. Perceiving much coldness among his colleagues on the subject, he told them that the crosses and decorations which they wore on their breasts produced on them the effect of Medusa's head: finally he carried his point. He had also the merit of introducing into the code the heads 'rehabilitation' and 'revision of trials.' The code, as revised by Romagnosi and his colleagues, was adopted, and published under the following title, 'Codice di Procedura Penale del Regno d'Italia,' 8vo., Brescia, 1807. In France it was praised by Cambacères. The suggestions of Romagnosi during the discussion of the code were published separately under the title 'Ultime e più necessarie Aggiunte e Riforme al Progetto del Codice di Procedura Penale,' Milano, 1806.

Romagnosi was likewise employed in the compilation of a penal code for the kingdom of Italy, which however never became law. In consequence of the numerous revisions to which it was subjected, and the dilatoriness of the Italian ministers, the project had not reached Paris when Napoleon asked for it. Finding that it was not ready, with his characteristic impatience he ordered the French penal code to be forthwith translated purely and simply, and enforced in Italy, to the great regret of the Italians, who complained of the arbitrary and perverse character of many of the French criminal laws, which are decidedly the worst portion of the existing law of France. [CODES, LES CINQ.] The proposed Italian code was conceived in a very different spirit: it was printed, together with the discussions which it had elicited, in six volumes, 8vo.: 'Collezione dei Travagli sul Codice Penale del Regno d'Italia,' Brescia, 1807. These particulars are useful for enabling us to understand the history of those times and the true character of Napoleon's legislation and administration.

In 1807 Romagnosi was appointed professor of civil law in the university of Pavia, and in 1809 he was recalled to Milan to lecture on legislative science, in order to form a kind of academy of advocates and magistrates. As part of his scheme, he published his 'Discorso sul Soggetto ed Importanza dello Studio dell' alta Legislazione,' Milan, 1812; and also 'Principii fondamentali di Diritto Amministrativo,' 1814. From his lectures he compiled, in 1820, his 'Assunto primo della Scienza del Diritto Naturale,' which may be considered as a continuation of his 'Introduzione al Piritto Pubblico Universale' mentioned above. He demonstrates that society is the natural state of man, from which all his rights and duties are derived; that agriculture, arts and commerce, education and instruction, and religion, are necessary to the social state; and that knowledge, will, and power are the three conditions required for its improvement. On being appointed inspector of the schools of law in the kingdom, he laid down the principle, that candidates for professorships ought to be examined more especially on the system of teaching which they propose to follow, even more than on the subject-matter of their lessons; he insisted, in short, on the importance of pedagogical science and aptitude.

His 'Saggio filosofico-politico sull' Istruzione Pubblica Legale,' Milan, 1807, belongs to this period. He had previously written a 'Progetto di Regolamento degli Studj Politici Legali.' He also edited a 'Journal of Civil and Administrative Jurisprudence.'

When Napoleon's power was overthrown in 1814, Romagnosi lost his offices, but he continued to lecture on jurisprudence till September, 1817, when the special chairs at Milan were suppressed. He continued however to teach privately at Milan. In June, 1821, during the political agitation of that period, he was summoned to Venice to be tried on a charge of high treason, of which however he was fully acquitted in December of the same year, and the emperor confirmed the sentence of the court in words most honourable to Romagnosi.

He still continued to live at Milan, teaching, and writing for several journals, and especially for the 'Annali di Statistica,' to which he was one of the chief contributors. He wrote also on matters of law, especially on the important subject of property in water, and water-ways and channels for irrigation, questions of the utmost importance to Lombardy: 'Della Condotta delle Acque secondo le vecchie, intermedie, e vigenti Legislazioni dei diversi Paesi d' Italia,' Milan, 1822-5, six volumes, with an appendix in two volumes. This work was very well received, not only in Italy, but also in Holland. A second work by Romagnosi on the same subject is entitled 'Della Ragione Civile delle Acque nella Rurale Economia,' two vols., Milan, 1829-30.

He also began a 'Dizionario Ragionato delle più importanti Parole della Giurisprudenza Romana, Francese, ed Austriaca,' but the work was not continued. His work entitled 'Dell' Indole e dei Fattori dell' Incivilimento con Esempio del suo Risorgimento in Italia,' contains a brief sketch of the progress of human civilization through different ages, a subject which Herder has more fully and elaborately treated in his 'Philosophy of the History of Mankind' (*Ideen zur Philosophie der Geschichte der Menschheit*). Long before Romagnosi, the Neapolitan jurist Gianbattista Vico, in his 'Principii di una Nuova Scienza,' and Jacopo Stellini, a native of Friuli, in his remarkable work, 'De Ortu et Progressu Morum,' had laboured in the same field, but their works have scarcely been noticed. Romagnosi had the merit of rendering their inquiries and his own, on the vast subject of the progress of civilization, familiar to the Italian readers.

The other works of Romagnosi are: 1, 'Che Cos' è la Mente Sana?' Milan, 1827; 2, 'Della Suprema Economia dell' Umano Sapere in relazione alla Mente Sana,' Milan, 1828; 3, 'Dell' Insignamento primitivo delle Matematiche;' 4, 'L'antica Morale Filosofia;' 5, 'Elogio storico di Melchiorre Gioia;' 7, 'Elogio del Cardinale Alberoni;' 8, 'Note, Supplementi, ed Illustrazioni all' India Antica di Robertson.' He left several works in MS., among others: 1, Della vita degli stati;' 2, 'Della Civile Filosofia in relazione alla Vita degli Stati;' 3, 'Ricerche sù la Validità dei Giudizii del Pubblico à discernere il Vero dal Falso.'

Romagnosi was no dreamer. In an age of confusion of ideas, he retained his mental self-possession, and was not led away by crude theories, nor was he entrammelled by any superstitious veneration for irrational though antient custom. He was an original thinker, and as such not justly appreciated in his life-time; but he is now remembered as an able supporter and expounder of sound political principles. Some of the most distinguished living writers of that country, Rossi, Cantù, and others, boast of having been his disciples. Romagnosi was a member of the Italian Academy, of the Academy of the Georgofili, of the French Institute for the class of moral sciences, and of other learned societies. He died at Milan, in June, 1835. His funeral was attended by more than two hundred of the most distinguished men of that capital, who felt the value of departed merit, and who subscribed on the spot to raise a monument to his memory. (*Notizia di G. D. Romagnosi, stesa da Cesare Cantù*, Milan, 1835.)

ROMAINE, WILLIAM, was born at Hartlepool, in Durham, on the 25th of September, 1714. His father was one of the French Protestants who fled to England upon the revocation of the Edict of Nantes, and a man of the strictest piety and integrity. Mr. Romaine was his second son. He was educated at the grammar-school of Houghton-le-Spring, in the county of Durham, whence he proceeded to Oxford in 1730 or 1731, and entered first at Hertford College, and afterwards at Christchurch. He resided principally at Oxford, devoting himself especially to the study of the Hebrew and Greek Scriptures, till he took his degree of M.A. in 1737. He had received deacon's orders the year before. His first curacy was that of Loe Trenchard, in Devon, which he served for six months. In 1738 we find him residing at Epsom, in Surrey, and about the same time that he received priest's orders from Dr. Hoadly, bishop of Winchester, he became curate of the parishes of Banstead and Horton, in Middlesex. At Banstead he became acquainted with Sir Daniel Lambert, who, on his election to the mayoralty of London in 1741, appointed Mr. Romaine as his chaplain. In this capacity he preached a sermon at St. Paul's, on *Romans* ii., 14, 15. This was the second sermon he published, the first having been one which he preached before the university of Oxford in 1739, entitled 'The Divine Legation of Moses demonstrated, from his having made express mention of, and insisted so much on, the Doctrine of a Future State; whereby Mr. Warburton's Attempt to prove the Divine Legation of Moses from the Omission of a Future State is proved to be absurd and destructive of all Revelation.' At the end of the year 1741, he returned to the attack on Warburton's theory, in a sermon preached at St. Mary's, Oxford, having in the mean time been engaged in an epistolary controversy with Warburton. The next seven years of his life were devoted to the preparation of a new edition of Calasio's Hebrew Concordance and Lexicon, which was published in 1747. He discharged his office as editor of this work most faithfully. He was chosen lecturer of St. George's, Botolph-lane, and St. Botolph's, Billingsgate, in the year 1748. In the following year he was elected to two lectureships at St. Dunstan's in the West, the duties of which he had discharged for some time, when the rector thought fit to deny him the use of the pulpit. The matter was referred to the Court of King's Bench, which deprived Romaine of one of the lectureships, but confirmed him in the other, with a salary of eighteen pounds a year; but he was still refused the use of lights in the church, and used to preach by the light of a single candle held in his own hand, till this unseemly contest was put an end to by the mediation of Dr. Terrick, the then bishop of London. This lectureship was held by Romaine till his death. In 1750 he was appointed assistant morning preacher at St. George's, Hanover-square. He held this office till September, 1755, when he was removed from it, his biographer tells us, on account of 'the popularity and plainness of his ministry.' About the time of his appointment to this lectureship, he was chosen professor of astronomy in Gresham College. His views of natural science were Hutchinsonian, and he always expressed his opinions with boldness, and not always without bigotry. Accordingly he spoke of the Newtonian views as having 'a difference in their demonstrations of no less than one hundred and twenty-one millions of miles,' and of 'the modern divinity as bringing you no nearer than one hundred and twenty-one millions of miles short of heaven.' It is not surprising that he gained little reputation from this office. He seems however to have regained his credit with the citizens by his opposition to the bill for naturalizing the Jews in 1753.

In February, 1755, he married Miss Price; and in the following year he became curate and morning preacher at St. Olave's, Southwark, where he remained till 1759. During this period he resided in a pleasant retreat in Walnut-tree Walk, Lambeth, where he was in the habit of inviting young clergymen to his early breakfasts, and many have spoken with great gratitude of the instruction and encouragement they received from him.

Romaine had frequently preached before the university of Oxford up to the year 1757, when he was refused the use of the University pulpit, in consequence of the offence which was taken at a sermon he delivered there on 'the Lord our Righteousness.' This sermon he published in vindication of his conduct. In the same year he published a tract, addressed to members of the Established Church, exhorting them to set apart one hour in every week for prayer on behalf of the church and nation.

About this time he received pressing invitations to the ministry of a church in Philadelphia, which Mr. Whitfield strongly urged him to accept, but he preferred remaining in his own country.

In 1764 he was chosen to the rectory of St. Andrew by the Wardrobe, and St. Ann's, Blackfriars. His election was disputed, but in 1766 it was confirmed by the Court of Chancery. He spent the rest of his life in the faithful and zealous discharge of the duties of this office. He died July 26th, 1795, and was buried in the rectory vault of Blackfriars' Church, on the 3rd of August.

Romaine has been compared to a 'diamond, rough often, but very pointed, and the more he was broken by years, the more he appeared to shine.' His firm attachment to what he esteemed truth was not always tempered with moderation towards his opponents, and sometimes, if we are to believe anecdotes that are told of him, his bold impetuosity betrayed him into acts of rudeness, for which however he always apologised with Christian humility. His deportment in private life was mild and amiable, and he was most exemplary in his domestic relations. He was especially remarkable for the diligence and regularity with which he improved his time. His religious sentiments were strongly Calvinistic, and he spent his life in boldly maintaining them in an age when such a course was sure to excite violent opposition and to shut out all hopes of preferment. During his whole life he continued strongly attached to the Church of England. His chief works, in addition to those already mentioned, are the following:—'Nine Sermons on the 107th Psalm,' 1747; 'A seasonable Antidote against Popery, in a Dialogue upon Justification,' 1757; 'Twelve Sermons upon Solomon's Song,' 1759; 'Twelve Discourses upon the Law and the Gospel,' 1760; 'The Life of Faith,' 1763; 'The Scriptural Doctrine of the Sacrament of the Lord's Supper briefly stated,' 1765; 'The Walk of Faith,' 2 vols., 1771; 'An Essay on Psalmody,' 1775; 'The Triumph of Faith,' 1795; and some Sermons and Letters. His works were published in 8 vols., in 1796, with a Life by the Hon. and Rev. William Bromley Cadogan, M.A., some account of whom is contained in 'The Life and Times of the Countess of Huntingdon,' vol. ii., chap. 49.

(The *Life* of Romaine, by Cadogan and by Haweis; 'Memoir' in the *Evangelical Magazine* for November, 1795.)

ROMAN ARCHITECTURE. Of the Grecian style an account has been given under CIVIL ARCHITECTURE, to which article we refer for such information as is necessary for understanding the present one, which is to be considered as supplementary to the other.

With regard merely to the orders, Roman architecture presents chiefly a corruption of the Doric and Ionic, for it may claim the Corinthian as almost entirely its own, the Roman examples of that order being not only numerous and varied, but at the same time exceedingly different in character from the almost solitary specimen of one with foliaged capitals which occurs in a Grecian building. But even as regards the application of the orders, there is a wide difference between the two styles; in the Roman they are frequently employed as mere decoration, the columns being *engaged* or attached to the walls, or in some cases (as that of triumphal arches) though the columns are insulated and advanced from the structure, they are in a manner detached from it, inasmuch as they do not support its general entablature, but merely projecting portions of it. Nor are these the only differences, for besides the frequent employment of pilasters as substitutes for columns—that is, as constituting the order without columns—the practice of *supercolumniation*, or raising one order upon another, was by no means uncommon; a practice that was indeed a matter of necessity in such enormous edifices as the Colosseum, if columns were to be employed at all. From all this it will be evident that, as regards the orders alone, there is a very marked difference between Roman and Grecian architecture; yet such difference is by no means the whole, the two styles being almost opposites in nearly every respect. If there were no other distinction between them, that arising from the arch, and diverse applications of its principles to vaults and domes, would be a very material one; but we also meet with a variety and complexity in Roman buildings which does not occur in those of Greece.

The only instance that we are acquainted with in Grecian architecture, of anything like grouping or combination of building, is that of the Erechtheion, or triple temple on the Acropolis of Athens. With this exception, Greek temples were merely simple parallelograms, differing from each other as to plan only in the number and disposition of the columns around the cella [Civil Architecture, p. 221]; consequently, however beautiful when considered separately, a very great monotony prevailed in that class of buildings, at least, in which the forms were so limited and fixed as to preclude any fresh combinations, or anything approaching to what is understood by composition.

By the adoption of the circular form in their plans, whether for the whole or parts of a building, the Romans introduced an important element of variety into architectural design; especially when we consider that to such shape in the ground-plan is to be ascribed the origin of the *tholus*, or concave dome, which harmonizes so beautifully with all the rest, and renders the rotunda-shape at once the most picturesque and the most complete for internal effect,—that in which both unity and variety are thoroughly combined. The Pantheon alone [Pantheon] would suffice to convince us that the Romans were not mere copyists, and that if as such they deteriorated the Greek orders, they also added much to the art, and greatly extended its powers by new appliances. As regards its exterior, the Pantheon presents what is certainly a strikingly picturesque (and what we consider to be also a consistent and appropriate, because a well-motived) combination, namely, of a rectangular mass projecting from a larger circular one. In that example the body of the edifice, or rotunda itself, has no columns externally; but circular peristylar temples, or rotundas, whose cella was enclosed by an external colonnade, were not uncommon. Of this kind is the temple of the Sibyl, or, as it is otherwise called, that of Vesta, at Tivoli, an edifice of singular beauty, and highly interesting as a very peculiar and unique example of the Corinthian order, the first application of which in any modern building was made by Soane, at the Bank of England. Edifices of this kind were covered with hemispherical domes, or with smaller sections of a sphere, which consequently did not show themselves much externally, as they were raised only over the *cella*, and therefore the lower part was concealed by the colonnade projecting around it. The dome of the Pantheon is hemispherical within, but is of very low proportions and flattened form without, for its spring commences at about the level of the first or lower cornice of the exterior cylinder, and is further reduced by the base of the outer portion of the dome being expanded and formed into separate cylindrical courses or gradini. If the dome had sprung immediately from the upper cornice, so as to present a perfect hemisphere on the outside, the rotunda itself would have looked merely as a *tambour* to it, and the effect would have been as preposterous as if the cupola of St. Paul's and the colonnaded rotunda on which it is raised were placed immediately on the ground, instead of being elevated upon a larger pile of building.

Polygonal forms of plan were sometimes employed, of which there is an instance in what is called the temple of Minerva Medica at Rome, which is circular on the exterior, but internally decagonal, with nine of its sides occupied by as many recesses, and the other by the doorway—a remarkable peculiarity, it being very unusual to enclose a polygon within a cylindrical structure, although not the contrary, nor to erect a cylinder upon a square or polygonal basement. Octagon plans were by no means uncommon: such form was frequently made use of for the saloons of public baths; and there is an instance of an octagonal temple, supposed to have been dedicated to Jupiter, in one of the courts of Diocletian's palace at Spalatro. Of hexagonal structures we are acquainted with no example, but a court with six sides occurs in the remains of the temple of Baalbec, not however a regular hexagon, but of elongated figure, two of the sides being 110, and the remaining four 88 feet each. In the later periods of Roman architecture, circular and polygonal structures became more frequent, and those of the first-mentioned kind deviated considerably from the original simple rotundas and circular temples. An inner peristyle of columns was introduced so as to make a spacious circular or ring-shaped ambulatory around the centre, which was much loftier than the colonnade, being covered by a dome raised upon a cylindrical wall over the columns. What is now called San Stefano Rotundo, at Rome, supposed by some to have been originally a temple dedicated first to Faunus, and afterwards to the emperor Claudius, and by others to have been a public market, is a structure planned according to the arrangement just mentioned, with a circular Ionic colonnade of twenty columns and two piers. The Church of Santa Costanza, traditionally reported to have been a temple of Bacchus, but now generally supposed to have been erected by Constantine as a baptistery, and afterwards converted by him into a funeral chapel to his daughter Constantia, is a remarkable example, owing to the columns being not only coupled, but unusually disposed, and to there being arches springing from their entablature, that is, there are twenty-four columns (with composite capitals) placed in pairs, on the radii of the plan, or one behind the other, forming twelve inter-columns and as many arches; and as far as the mere arrangement goes, this interior is strikingly picturesque; but it would be an improvement, if the dome were in such case to spring immediately from the imposts of the arches, and the latter to groin into it; or at least were it to spring from the vertex of the arches.

The circular form was a favourite one with the Romans for their sepulchral structures of a more pretending class than ordinary. It will be sufficient here merely to mention those in honour of Augustus and Hadrian, an account of which has been given under Mausoleum. The tomb of Cæcilia Metella is a low cylinder, the height being only 62 feet, while the diameter is 90; and it may be considered as nearly solid, the chamber or cella being no more than 19 feet in diameter. This cylindrical mass is raised upon a square substructure; which combination of the two forms is productive of agreeable contrast; and it was accordingly frequently resorted to. The tomb of Plautius Sylvanus near Tivoli consists also of a short cylindrical superstructure on a square basement, but is otherwise of peculiar design, one side of that stereobate being carried up so as to form a sort of low screen or frontispiece, decorated with six half-columns, and five upright tablets with inscriptions, between them. The tomb of Munatius Plancus, at Gaeta, is a simple circular structure, of low proportions, the height not exceeding the diameter, and therefore hardly to be called a tower, notwithstanding that it is now popularly called Roland's or Orlando's Tower. Of quite different character and design from any of the preceding ones, is the antient Roman sepulchral monument at St. Remi, which consists of three stages; the first a square stereobate raised on gradini, and entirely covered on each side with sculptures in relief; the next is also square, with an attached fluted Corinthian angle, and an open arch on each side; and the uppermost is a Corinthian rotunda, forming an open or monopteral temple (i.e., without any cella), the centre of which is occupied by two statues.

As instances of other combinations, we may briefly refer to what is called the tomb of Virgil, near Naples, consisting of a square substructure surmounted by a conical one; to the Roman monument at Constantina, in Africa, conjectured to have been a cenotaph in honour of Constantine, the lower portion of which is a cylindrical structure surrounded by a peristyle of twenty-four Doric columns, and carried up as a lofty cone, in receding courses or gradini, leaving at its summit a platform for an equestrian statue.

These notices may serve to convey some idea of the variety aimed at by the Romans in the distribution of the plans and general masses of their edifices, independently of decoration. Their thermæ, or public baths, a class of structures remarkable for their vast extent and magnificence, are most interesting studies of combinations of plan, as they were not merely baths, but places of public resort and amusement, and consisted of an assemblage of courts, porticos, libraries, and spacious saloons and galleries, most of which presented some peculiarity of form and distribution. If therefore we estimate Roman architecture by the manifold resources which it opened to the art, rather than by its debasement of what it borrowed from that of Greece, we shall find much in it both to admire and to imitate, as well as to censure and reprove. Its Greek rival has nothing that will bear a parallel with it in this respect. Judging from its remains, we can see nothing in it that answers to the title of interior architecture; whereas some of the Roman temples were striking on account both of the size and the magnificence of their interiors. That of the Pantheon has been already referred to, and we shall now bestow some notice on two very singular examples of a different kind, viz. the Temple of Peace, erected by Vespasian, and the double one of

Venus and Roma, by Hadrian. Of neither of them however more than the mere ruins now remain, owing to which they have never been cited as examples of the orders. What was the external design of the first-mentioned temple is now altogether doubtful, but its interior is very remarkable, the plan being divided in its breadth into three nearly equal portions, the centre one of which formed a spacious nave, terminating in a large semicircular tribune, or apsis, covered by a semi-dome. This nave was disposed in three compartments, presenting as many arches of exceedingly wide proportions, opening into as many divisions of the lateral portions of the plan, which did not constitute continuous aisles along the nave, but small chapels or recesses. Of these the centre one on each side terminated, like the nave, in a semicircular tribune, of the same dimensions as that apsis, so as to form a transept, and give the whole a marked cruciform appearance. The side divisions were covered by semicircular vaults, concentric with the arches opening into the nave; and this latter had a vaulted roof, in three groins or compartments, the ribs of which sprung from eight Corinthian columns, placed against the piers of the arches. Besides other peculiarities, we have here an instance of the effect resulting from the application of the semicircular form to plans in interiors, and of further varieties of design arising out of it, for the semidomes of the tribunes exhibit a rich specimen of coffering, being composed of octagons and squares.

Assisted by the excavations made of late years in the Roman Forum, M. Caristie, a French architect, has given us a restoration of the temple of Venus and Roma, judging from which we may pronounce it to have been one of the most splendid edifices in the city. According to his plan of it, the temple stood in the centre of a quadrilateral enclosure, or peribolus, measuring 525 by 318 feet, and was enclosed by double colonnades of the Corinthian order, consisting altogether of 264 columns. The temple itself was of the same order, upon a considerably larger scale, and its dimensions about 350 by 166 feet. It was consequently large in proportion to the area within which it stood; and when viewed in combination with the extended files of columns around it, must have produced a powerful effect,—one in which harmony and regularity were blended with contrast. This main edifice was further remarkable as being not only decastyle, but pseudo-dipteral also, that is, the space between the columns and the walls of the cella was equal to two intercolumns and a column; accordingly the width of the cella corresponded with six columns and five intercolumns of the decastyle fronts. Each end elevation of the cella was therefore made a tetrastyle in antis to a pronaos or inner loggia; and these pronai, being of greater depth than the surrounding porticos, were vaulted hemi-cylindrically in a transverse direction, or from end to end, whereas the others were ceiled horizontally with beams and lacunaria. The cella was divided internally into two distinct halls, placed back to back, each of which was of nearly square proportions, but extended by a magnificent semicircular recess or tribune, containing a colossal sitting figure of the deity to which it was' dedicated. Along each side were five tabernacle niches, with pediments alternately angular and segmental, and placed within the intercolumns of a small order, with statues upon its entablature, over each column. The ceiling was a richly coffered hemicylindrical vault, and the dome of the tribune was similarly decorated with coffers of a lozenge-form pattern. If we have dwelt somewhat at length upon this edifice, it is because we regard it as a very important example of Roman, as contradistinguished from Grecian architecture, and of that accumulated richness and pomp, together with that diversity of plan, which it affected. While they have noticed small and common-place temples, most writers have adverted but slightly, if at all, to other circumstances than those relating to their respective orders, as if architectural design was confined to or depended upon such matters alone, or as if they constituted the chief differences between the styles of Greece and Rome, and their respective application. By no means are we insensible to the refined taste displayed by the former, but neither are we to the grand compositions furnished us by the latter. Taking therefore the above temple according to Caristie's restoration of it, we agree with a writer who has said that it 'must have produced an effect perhaps unrivalled in sublimity by any work in the antient world;' for whether viewed from within the peribolus, or as seen through and towering above the open colonnades which formed that court, it must have been a varied and magnificent architectural scene.

The Romans seem to have affected the practice of grouping buildings together as features in one general symmetrical plan. Their temples and basilicas were frequently placed, as the principal architectural objects, at the extremity of a forum, or other regular area enclosed with colonnades. The temple of Nerva stood at one end of, and partly projected into an enclosure (measuring about 360 by 160 feet), the entrance end of which had five open arches, and the sides were formed by screen walls, decorated with Corinthian pilasters, and columns immediately before them, over which the entablature formed breaks. Of Trajan's forum, which was surrounded not only by colonnades, but various stately edifices, nothing now remains except the celebrated triumphal column that occupied its centre, and which, so placed as a principal object, must have heightened the splendour of the whole. Like that of Nerva, the temple of Antoninus and Faustina was placed at one end of a court of moderate dimensions, whose sides were adorned with coupled columns placed immediately against the walls; and only the portico part of the temple (a Corinthian hexastyle, triprostyle) [PORTICO] advanced into the enclosed area in front. The forum of Caracalla was nearly a square, entirely surrounded by arcades, presenting thirteen arches on each of the longer and eleven on each of the shorter sides. In the centre was a Corinthian temple very similar in plan to the Pantheon, with an hexastyle, triprostyle portico in front, and remarkable for having inner columns behind the second from each angle, so that there was a double range of them at each end, and the central space within the portico was a perfect square equal to three intercolumns. The notices we have incidentally made in regard to these temples may not improperly be followed by some additional remarks upon Roman edifices of that class. Unlike those of Greece, peripteral temples were of comparatively rare occurrence among the Romans: they were mostly prostyle, the portico being attached only in continuation of the cella, whose walls formed the flanks of the building, though the order of the portico was frequently continued along them either in half-columns or pilasters. Such is the plan of that celebrated one at Nismes, known by the name of the Maison Quarree, which is a Corinthian hexastyle, pseudo-peripteral, the cella being ornamented with attached columns, thereby making ten intercolumns on each flank, three of which are open, or belong to the portico, which latter is accordingly *triprostyle.* The Corinthian temple at Assisi was similar in plan, except that it was not pseudo-peripteral, the sides of the cella being plain. That of Fortuna Virilis at Rome was an Ionic tetrastyle, diprostyle, and pseudo-peripteral. Besides contributing to variety, temples of this kind possess a certain variety of effect in themselves, owing to the depth of the portico, and the contrast between that part and the cella. The portico announced itself more decidedly as the façade *par excellence;* particularly as such temples were generally raised upon a stereobate continued as pedestals to enclose the steps leading up to them in front, and which sometimes, as in the temple of Nerva, and that of Antoninus and Faustina, projected very considerably. As our object is rather to direct attention to the modes of composition affected by the Romans and the elements of their style, than to describe their chief architectural monuments, either historically or according to their respective classes and destination, we proceed now to consider some of the individual peculiarities and features belonging to their buildings.

In the application of sculpture, particularly of statues, they were prodigal; but they employed the latter chiefly as architectural accessories, frequently placing them over columns, or on the summits of their edifices as acroteria to pediments, by way of giving variety to the outline of their buildings, and also of indicating at first sight their particular appropriation—a practice almost unknown to the Greeks, there being only one instance of it. In Italian buildings, on the contrary, the practice has been frequently carried to a preposterous extent, rows of statues being placed on the pedestals of balustrades, so as almost to look like pinnacles, and to produce rather a stiff and formal effect than one of richness; whereas when they are introduced on the angles and apex of a pediment, or when there is merely one in the latter situation, such monotony does not take place, and additional importance and loftiness may be given to that portion of the edifice by such decoration. The abundant use of statues led to the adoption of the niche—a feature unknown in Greek architecture—as a convenient mode of inserting them within the surface of walls, and thereby decorating them; at the same time space was gained in interiors, where, if otherwise placed, they would have taken up room. Niches frequently occur in Roman temples and baths; and, as we have seen, from the account given of the temple of Venus and Roma, were occasionally decorated with a frontispiece of small columns, with their entablatures and pediments, but were generally left plain, and were for the most part semicircular in plan, in which case they usually terminated in an arch and semidome, after the manner of a tribune or large recess, of which the niche was in fact a miniature copy. Niches however were very frequently rectangular in plan, as were also exhedræ, or recesses, in which case the latter formed arches vaulted hemicylindrically.

These various applications of curvilinear forms, both in plan and elevation, undoubtedly furnished Roman architecture with resources unknown to that of Greece. Nor can it be denied that the arch itself is a very beautiful feature, although it was employed by the Romans to such excess as rather to occasion monotony than to contribute to variety of design; for if the general character of Greek temples was invariably uniform, presenting in the exterior merely lines of columns, the amphitheatres and similar works of the Romans consisted only of continuous tiers of arches, which constituted their more strongly marked features, the columns placed against their tiers being merely ornamental accessories, and comparatively of little effect, and even that not of the very best kind. In either case—the Roman or the Greek—a single compartment of an edifice, whether arcaded or colonnaded, serves as a pattern for the whole; and although uniformity and continuity conduce to grandeur, yet if precisely the same kind of uniformity recurs in every building of the same class, it becomes wearisome. In this respect Gothic architecture is far more favourably constituted than either Grecian or Roman, for it admits of infinite diversity of expression, where that of the general design is nearly similar to other buildings. There was one class of structures however, which though consisting uniformly of arches and piers alone, were eminently impresssive and picturesque, namely, the Roman aqueducts, works of extraordinary grandeur, if estimated by their prodigious extent, and the colossal massiveness of their construction, but not otherwise entitled to be termed magnificent, their architecture being in the plainest and severest style. In these there were sometimes two or even more tiers of arches, at others only a single one, as in that at Metz on the Moselle, which has exceedingly lofty arches, or, to speak more correctly, arches on exceedingly lofty piers, divided by offsets into three stages, the effect of which is no less advantageous than it is uncommon.

We now come to consider a practice eventually adopted, by means of which the arch and column became amalgamated as integral parts of the same ordinance, viz. that of supporting arches upon columns, making them spring either directly from their capitals or from an entablature-shaped block over them. We are aware that this practice is almost uniformly condemned as barbarous and absurd; yet in our opinion somewhat too hastily, and with more of prejudice than of fair examination. That it was introduced during the decline of the art, and that it was an innovation subversive of former principles, is not to be denied. Yet if it must be reprobated, it ought to be so for its own demerits, not as an innovation; for all invention is such. It appears a very poor argument against it, to say that columns were originally designed to support horizontal architraves: we do not see how that circumstance, of necessity, renders every other application inadmissible. At that rate we must censure as vitious a great deal of both Roman and modern architecture, where attached columns are employed merely as ornaments, yet, as frequently as not, in such manner as to produce a character of littleness and poverty, they being so small in proportion to the rest as to appear insignificant, and at such intervals from each other that all the beauty and harmony of a columnar ordinance is lost. Where columns are employed to support, it certainly cannot be alleged that they are idle unmeaning expletives; nor that they are mutilated by being apparently partly embedded in the wall behind them. 'A pier,' it has been remarked by an intelligent writer, 'is but a differently shaped and more massive column;' which being granted, what impropriety can there be in employing the latter as a substitute for the other, provided it be done with judgment and discretion, and where upon the whole it will prove an advantageous mode of treatment? It certainly is a barbarous mode to turn small arches upon columns, which are not more than between two and three diameters apart, of which we have examples in the basilica of S. Paolo, and Santa Agnese fuor delle Mura, at Rome. The intercolumns are such that they might easily have been closed horizontally; indeed the openings between the columns have scarcely the appearance of being arches; but the whole looks as if the wall resting upon the columns was scooped out into diminutive arches over the intercolumns. In those instances too the arches themselves are quite plain, without archivolt or mouldings of any kind, and consequently all keeping is destroyed; the architectural embellishment terminates with the capitals of the columns, and so far the effect is similar to what would be produced by placing a plain horizontal mass upon a range of columns, instead of a moulded entablature. Although one of an opposite kind, it it equally a fault to make the arches spring not immediately from the capitals of the columns, but from square fragments of entablature over them (as, for example, in the interior of St. Martin's, London) not only because such fragments are unmeaning in themselves, and suggest the idea of the columns having been found too short for their intended purpose, but because they remind us quite unnecessarily of the original application of the column to the horizontal entablature. If entablature be admissible at all, it is when the columns are coupled, as in the church of Costanza already noticed; for then some kind of architrave at least becomes requisite, in order to connect the two capitals, as it were, together. One very great advantage attending the combination of the arch with the column as its support, is that it allows the openings to be considerably wider than they otherwise could be, because such intervals as would produce a poor and straggling effect in a colonnade, become well proportioned and agreeable when spanned by arches. Such columnar arcades have frequently been employed by the Italians with happy effect in *cortili* and places of that kind, where piers of the usual kind would obstruct the view too much, and where intercolumns of the same proportions, between pillars supporting a horizontal entablature, would have a poor and disagreeable effect, particularly if, as is generally the case, other stories of the building rested upon the porticos below. In fact, ordinances composed of arches and pillars constitute the best specimens of Italian columnated architecture. That in the cortile of the Palazzo Piccolomini at Siena, the work of Francesco di Giorgio, is singularly beautiful in its distribution, remarkable for the richness of its details, and also for the variety which it presents in perspective, as may be judged from the view of it given in Grandjean and Famin's 'Architecture Toscane.' We have already mentioned the interior of St. Martin's as containing an example of arches upon columns, and that of St. Bride's, London, furnishes another, but neither is a favourable one. A more satisfactory example may be found within the loggia of the Strand portion of Somerset-house, where, though the arches spring from entablatures over the columns, yet as the latter are placed in pairs, those horizontal parts are more than mere upright blocks over the capitals. The quadrangle of the late Royal Exchange, London, had arches springing immediately from the capitals of the columns, but their breadth was excessive in proportion to the height of the latter, and their elliptical form was a great defect, and certainly did not at all contribute to beauty. All that we contend for is the principle on which the practice is founded; for as to the merits of the buildings in which it is adopted, that must, like everything else in architecture, depend upon the taste shown in the particular application of it, which may be exceedingly good or altogether the reverse. Hungerford-market affords a good example of an ordinance composed of columns and arches, and also an idea of the general character of a basilica, though of course somewhat modified, and without any sort of architectural luxury.

If we have dwelt somewhat at length upon this particular point, it is because we consider it rather an important one, were it merely as showing how what was introduced barbarously and ignorantly was afterwards refined into an ordinance or mode of composition not without elegance, frequently combining both that quality and picturesque effect in an eminent degree. In regard to the orders, we shall, on the contrary, be more concise than others, who have confined their notice of Roman architecture almost to them alone.

Of the two Grecian orders, the Roman specimens usually referred to, namely, the Doric of the theatre of Marcellus, and the Ionic of that building and the temple of Fortuna Virilis, are exceedingly poor and meagre, spiritless and tasteless; while the Ionic of the temple of Concord may be pronounced detestable. In this last example the volutes of the capitals are turned diagonally, a mode afterwards adopted by Scamozzi for that order, and also practised in what is called the Composite. Both the Roman and Italian examples are ill-composed and totally devoid of grace; yet it does not therefore follow that such arrangement is radically defective and altogether inadmissible; on the contrary, we find it partially employed even in the Grecian Ionic, namely, in the capitals at the angles of porticos, where the volute is so turned, in order that there may be two adjoining faces, instead of a baluster side showing itself externally; and a similar disposition of the volutes throughout, giving four faces to each capital, might be made, perhaps, to produce an agreeable variety; and if authority alone be required to justify it, it may in fact be found in the Ionic order of the temple of Apollo at Bassæ. [Column, p. 384.] Even when comparatively pleasing in its contours, the Roman Ionic capital is poor and devoid of expression, in consequence of the smallness of the volutes, which is such that they almost cease to be characteristic features of the order. To this defect may be added the meagreness arising from the few revolutions made by the spirals, and the omission of intermediate ones; and also the harshness occasioned by the great projection of the ovalo, the narrowness of the face of the capital above it, and by that part forming a straight line, instead of the gracefully-flowing festoon-hem which unites the volutes together in all the Athenian specimens of the order. Perhaps it is unfortunate that any Roman examples of it are to be found in buildings, because that circumstance has led to their being regarded as authorities, whereas many better specimens are to be met with in single capitals and relics of that kind, which, though faulty in many respects, and evidently susceptible of improvement, are at least treated with more taste, and possess a certain richness of character. Numerous studies of both voluted and foliaged capitals may be seen in Piranesi's 'Magnificenza de' Romani;' and the variety of composition displayed in the latter very greatly exceeds what would be imagined by those who are acquainted only with what are referred to as standard examples of that order. This last may in fact be emphatically denominated the Roman order, although such distinctive title is usually applied to what is otherwise called the Composite, but which is only a variety of the foliage-capitalled class, and by no means the most striking as such, there being instances of compound capitals, in which griffins, eagles, human figures, or masks, are introduced above the foliage; consequently, if the voluted variety is to be received as a separate order, each of the others is quite as much entitled to the same distinction. How far the ordinary Corinthian capital differs from that in which the small volutes, or caulicoli, at the angles of the abacus are developed and enlarged to the size of those of the Roman Ionic capital, may at once be seen by referring to Column, p. 386, where a half of each example is placed in juxtaposition; and at page 383 will be found a similar comparison between the capitals of the Tivoli Corinthian and that of the monument of Lysicrates. The contrast presented by the two last is striking enough, there being no similarity of character, but merely such degree of resemblance as serves to make the differences the more obvious. And if that Tivoli example be compared with the one shown in the other cut, and which may be received as an average sample of the order, it will be tolerably evident, even from such comparison alone, that the foliaged capital was treated by the Romans in a variety of modes and in a free artistical spirit. Neither are such distinctions confined to the capitals alone, for different examples present equal diversity in their entablatures and cornices. That of the Tivoli temple is remarkable throughout; and has such a peculiar character stamped upon it, that it almost deserves to be considered a separate order—certainly much more so than the Composite. Among other examples, that of the three columns of the temple of Jupiter Stator is the richest and most elegant in its capital, and is beautifully composed throughout. The Romans bestowed great diversity of character and expression upon this order, as the Greeks had done upon their Doric and Ionic; whereas, if they erred in nothing else, the Italian revivalists and their followers did so in pursuing a directly opposite course, endeavouring to establish a fixed and unalterable standard for each order, reducing them to merely so many architectural formulas, to be applied without any change, on every occasion.

For information respecting Roman buildings adapted to particular purposes, the reader is referred to the articles Arch, Triumphal; Amphitheatre; Aqueduct; Baths; Forum; Mausoleum; Naumachia; Pantheon; Theatre: &c.

ROMAN CATHOLICS. [Catholic Church; Recusants.]

ROMAN DE LA ROSE. [France—*Language and Literature.*]

ROMAN HOUSE and **VILLA.** [House; Atrium.]

ROMAN LAW. [Rome.]

ROMAN LANGUAGE and **LITERATURE.** [Rome.]

ROMAN MUSIC. [Music, p. 26.]

ROMAN SCHOOL OF PAINTING. That style of art which was eventually formed, or prevailed, at Rome during the golden age of painting, in the beginning of the 16th century, is termed the Roman school, whether it was practised by subjects of the papal government, natives of the city of Rome, or strangers resident there. The simple fact however, of having practised the art of painting in Rome, does not constitute a disciple of that school. The works of Raphael exhibit this style in its full development or most perfect form, and he is accordingly the head or representative of the Roman school.

The history of this school may be divided into three periods: its origin or gradual formation from the revival of painting in Italy; its development, which was accomplished in the works of Raphael; and lastly, its decline, through his imitators and those of the great Florentine at Rome.

The art of the earlier period cannot be said to have any further connection with the subsequent style, which, through its peculiar characteristics, became distinguished as one of the great schools of Italian painting, than that of having been its basis; although the natural simplicity and dignity of the earlier style characterised the latter throughout, in its purer form.

The immediate founder of the Roman school in its less extended sense was Pietro Vannucci of Citta della Pieve, commonly called Il Perugino, from his having obtained the citizenship of Perugia: although that which may be termed essentially the Roman school both commenced and ended with Raphael, in the same manner as the Florentine did with Michael Angelo; for the styles of these two great masters were rather destroyed than preserved by their imitators.

I. In retracing the progress of the Roman school, we must go back to that original and most antient school of Italian painting, which flourished in the 14th century in various cities of the Roman states, within the limits of antient Umbria; in Gubbio, Fabriano, Maselica, Borgo S. Sepolcro, Urbino, Assisi, and other places.

But the influence of this school, which has been termed the Umbrian, was not confined within these limits. It extended not only throughout Romagna, but over many cities of Tuscany; and although the term Umbrian school has been restricted to the works of the masters of the district alluded to, it might be applied with equal propriety and more system to designate the style of art which prevailed in the works of the revivers of painting in Italy generally, or all the antient masters (gli Antichi), whether Umbrian or Tuscan, anterior to Masaccio; in other words, previous to any acquaintance with or rather study of the works of antient art. Many of the Umbrian painters, and those of Bologna, Arezzo, and Perugia, and therefore also of Pisa, Siena, and Florence, had common masters: and if we compare the dissimilarities of the individual styles of these masters with the dissimilarity of those styles compared with that of Masaccio, we may declare them all to be similar. The only difference between what is termed the early Tuscan and the Umbrian school, is, if any thing, that the latter, with equal simplicity, is somewhat less rigid than the former; and if they did not originate in the same source, they were at least both greatly influenced by the colonies of Greek artists who migrated from Constantinople to Italy, and settled in Venice and Pisa, in the 11th and 12th centuries.

Oderigi of Gubbio, one of the old practitioners of missal-painting, an art which was never quite extinct in Italy, seems to be the most antient painter of this school whose period is ascertained with any degree of certainty; he died about 1300 A.D. Oderigi appears to have been an active reviver of painting, and he was a man of reputation in his day. He is mentioned honourably by Dante, who terms him 'L'onor d' Agobbio, e l'onor di quell' arte.'

There is mention also of three other antient painters of Gubbio: Cecco and Puccio, who were employed in 1321 in painting the dome of Orvieto; and Guido Palmerucci, who was employed about 1324, in the town-hall of his native city.

A still more important name in the early history of the Roman school is that of Pietro Cavallini, who is said to have received instruction from Giotto while at Rome. A Crucifixion by this master, still extant at Assisi, is a remarkable production. The return of the papal government from Avignon to Rome gave a new impulse to the arts; the most skilful artists were sought throughout Italy to decorate the temples and palaces of the luxurious pontiffs of Rome. Of these the principal were Ottaviano Martis, and Gentile da Fabriano, a master of much greater merits. Fabriano was surnamed Magister Magistrorum, and practised his art in many parts of Italy. In 1417 we find him engaged at Orvieto; he resided afterwards at Venice, where he obtained the rank of patrician, and was the master of Giacopo Bellini, whose sons were the founders of the Venetian school. His style, which by Michel Angelo was pronounced to be, like his name, 'Gentile,' somewhat resembled that of Fra Angelico da Fiesole, though it was much inferior to it.

Piero della Francesca, or Piero Borghese, advanced the art still further; he was reckoned one of the best geometricians of his time, and was the first Italian who had any knowledge of the principles of perspective. He introduced immense improvements in the management of draperies, and also greatly enlarged the manner of treating the naked figure. Bramante studied the works of Piero, who was fond of introducing architectural backgrounds in his pictures, which he executed in tolerable perspective. Additional improvements were made by Bartolomeo Corradini of Urbino, called Fra Carnevale, who gave great character to his heads, and was the first to introduce portraits into historical compositions, in which practice he was afterwards followed by Raphael, who paid great attention to the works of this painter at the commencement of his career.

Niccolo Alunno of Foligno and Benedetto Bonfigli complete the list of the considerable artists of this school previous to and contemporary with Pietro Perugino, the master of Raphael, and Giovanni Sanzio of Urbino, his father. Although, through the united efforts of the above masters, painting had attained to many high and pleasing qualities, true taste in design may be said to have totally failed them. They had not yet discovered what was beautiful and what was not, or what belonged to the individual and what to the class. Their art was not truly imitative, nor does it appear that an appearance of reality was an object with these painters; they seem to have considered that their end was sufficiently accomplished in an intelligible indication of whatever they represented. The deficiency of this school could only be supplied through the study of the antique, and to supply it in a great degree was a distinction which fell to the lot of Masaccio, who must be looked upon as the leader of the great painters of the 15th century, or the Quatrocentisti, as the Italians have termed them, among whose works we first perceive any distinctive characteristics of style.

It cannot be denied that Perugino owed his great superiority over his predecessors to his visit to Florence, where, whether he became the pupil of Verocchio or not, which is a matter of dispute, he was at least enabled to study the noble works of Masaccio. His taste was however still dry and mean, his design was meagre and feeble, though often correct, his draperies were stiff and in a little manner, yet his colouring was sometimes exceedingly rich, and for graceful delicacy of attitude and motion, and a softness and simplicity of expression, he surpassed all his contemporaries. But there is a symmetrical repetition and similarity in the disposition of his figures, which betray a total absence of anything like vigour or truth of composition, and which place him at an immeasurable distance from his great scholar. No pupils ever imitated their master so closely as, with the exception of Raphael, did those of Perugino; and many of their works are reputed works of their master. His most celebrated scholars were, Bernardino Pinturicchio; Andrea Luigi of Assisi, called L'Ingegno on account of his great abilities, who became blind when still young; Domenico and his son Orazio di Paris Alfani; Eusebio da S. Giorgio; Giannicola da Perugia; Lo Spagna; Berto di Giovanni; Sinibaldo da Perugia; Adone Doni of Assisi; and Palmerini of Urbino. The works of all these masters were more or less conspicuous for symmetrical composition and a profuse application of gold.

II. We now arrive at the pride of Perugino and the glory of the Roman School, Raffaello Sanzio d'Urbino, the first of painters; for moral force in allegory and history, unrivalled; for fidelity in portrait, unsurpassed; who has never been approached in propriety of invention, composition, or expression; who is almost without a rival in design; and in sublimity and grandeur, inferior to Michel Angelo alone, whose prophets and sibyls in the Capella Sistina are in these respects unquestionably the triumphs of modern art.

It must not be supposed that Raphael attained these great qualities intuitively: they were the result of long and intense application; and in the works of no artist is the progress of improvement so apparent as in those of Raphael. He painted in three styles: his first was that of Perugino. His second was an enlargement of that style in the taste of Fra Bartolomeo, and is termed his Florentine. But this change or improvement in style was not effected through an acquaintance with that great painter alone, but also through the impression made upon Raphael's mind by the works of Masaccio, of Lionardo da Vinci, and also of Michel Angelo, at Florence. His third style, which is the subject we have now more particularly to consider, was peculiarly his own; although those magnificent works the Prophets and Sibyls of Michel Angelo were the principal causes of its ultimate fulness and grandeur. This third style, which is the proper style of Raphael, constitutes the Roman school in its full development, which is the least defective of all the schools of painting.

To allow that the Roman school is principally indebted for its grandeur to the works of the great Florentine on the vault of the Sistine Chapel, is allowing no more than is just. But to venture to the extent of asserting, as Sir Joshua Reynolds has done in his fifteenth discourse, that 'the artists of that age, even Raffaelle himself, seemed to be going on very contentedly in the dry manner of Pietro Perugino, and, if Michel Angelo had never appeared, the art might still have continued in the same style,' is not only doing the highest injustice to Raphael, but also to Lionardo da Vinci and to Fra Bartolomeo, whose styles were essentially developed, and who were themselves considerably advanced in life, especially the former, before Michel Angelo had executed a single great work in painting. When the Cartoon of Pisa was exhibited in 1506, which work cannot in any respect be compared with the vault of the Capella Sistina, Bartolomeo was in his thirty-seventh and Da Vinci in his fifty-fifth year. [TUSCAN SCHOOL.] How much more to the purpose is the remark of Fuseli, who says that Bartolomeo 'was the true master of Raphael, whom his tuition weaned from the meanness of Perugino, and prepared for the mighty style of Michel Angelo.' Whatever effects the Cartoon of Pisa and the works of the Florentine school had upon Raphael's style, must have been evinced in the great picture of Theology, or the Dispute on the Sacrament, as it is also called, in the Camera della Segnatura in the Vatican, which was painted in 1508, and was his first great work in Rome. But the picture of Philosophy, or the School of Athens, which was painted opposite to it immediately afterwards, exhibits a great aggrandizement of style, and in it the characteristics of Raphael's third style are at least essentially if not completely developed. Now this aggrandizement could not have proceeded from the works of Michel Angelo, since the paintings of the vault of the Capella Sistina were not commenced until some time after that great work was executed. It therefore proceeded from other causes, from Raphael's own additional experience, and from the study of the works of antient art in Rome, to which Raphael was, in common with Michael Angelo, principally indebted, and infinitely more so than to the works of that truly great master. Even the Heliodorus (which, although it was painted in the time of Julius II., if not commenced, must at least have been finished after Raphael had seen the vault of the Capella Sistina), does not exhibit any remarkable superiority of style over the School of Athens, although it is decidedly superior; but other causes besides the works of Michael Angelo must have contributed to produce this result. The work of Raphael in which the imitation of the style of Michel Angelo is most apparent, is the Incendio del Borgo, decidedly the worst production of Raphael's maturer years; indeed it is even doubtful whether he had any hand in the execution of that work.

In considering however the respective claims of these two great masters to originality of style, it should be borne in mind that Raphael's great works in the Camera della Segnatura preceded those of Michel Angelo on the vault of the Capella Sistina, and that what has been generally considered to be Michel Angelo's greatest work, the Last Judgment, was first commenced in the pontificate of Paul III., years after the pencil of Raphael had ceased its labours, and was not completed until twenty-one years after the death of that great painter. Therefore these two extraordinary men may be safely said to have been indebted the one to the other.

Raphael has had many critics, but of these perhaps Mengs is the most discerning and the most just, although that painter's extraordinary veneration for the works of antient art must not be forgotten while we consider his critique upon the works and genius of Raphael. The only essential fault, in the opinion of Mengs, in Raphael's style, is a deficiency of the ideal in almost every department. But is it not by reason of this very deficiency, as Mengs views it, that his style distinguishes him from and raises him above all other painters? Raphael was pre-eminently and essentially natural; idealize his style, and you immediately degrade him to the level of Guido.

His forms are neither so ideal, nor, in one sense, so perfect as the Apollo or the Mercury, but they are equally grand, and more natural. Such forms would be incompatible with Raphael's style. They are supposed to represent beings beyond the influence of the common emotions of mankind. His design however is very little inferior if not equal to the Discobolus, the Gladiator, or even the Laocoon; but it must decidedly yield in style to the Torso of Apollonius, and in beauty and elegance to the Antinous.

There is a degree to which the powers of imitation may be combined with those of the imagination, which, when regulated by a just refinement of feeling or taste, constitutes the perfection of painting, and this degree, though not attained, was in the aggregate approximated more nearly by Raphael than by any other painter. He never designed a figure which he did not inspire with appropriate sentiment; the affections of mankind were the sphere of his genius; from the calculating sage to the thoughtless infant, his works are the history of the human heart, and deservedly has he been entitled the 'painter of the passions.' The elements of his style are nowhere more apparent than in the Cartoons at Hampton Court. To particularise amidst so much excellence, and to single out the works in which Raphael has been most eminently successful, is rather a delicate task; yet perhaps the following examples may be instanced as being more decidedly conspicuous for those particular qualities which characterise his style:—for grandeur of design, the Heliodorus; for sublimity of character and conception, the Madonna di San Sisto; for composition and expression, the Cartoons; and perhaps for invention and general technical excellence, the Transfiguration, his last performance. [RAPHAEL.]

The style of Raphael has seldom been found congenial to their taste by the lovers of colour, and certainly those who consider the perfection of painting to consist in splendid colouring must not look for it in the works of the Roman school, but in those of Paul Veronese or of Rubens. Many critics have regretted that Raphael did not colour like Titian; but colour was to Raphael a *means*, and not an *end*, as it was with the majority of the Venetian painters; and its effect is to dazzle and to obscure, rather than to enhance the essential qualities of the grand style. For as the painted face of a player harmonises with the accompanying spectacle and the tone of light around, and would as certainly be ridiculous if exposed to the light of day, so the Venetian colouring, which is in such perfect harmony with the subjects of that school and their general treatment, would as certainly be in utter discordance with those qualities which characterise the style of Raphael. Even Ludovico Caracci, the founder of the Eclectic school of Bologna, discovered that Venetian colouring was inapplicable to the subjects which he chose for his own pencil. And Raphael would not have been the great painter that he proved himself to be, had he chosen any other than the sombre colour for which he is so conspicuous, and which, so far from being a defect in his style, is indeed an additional evidence of his profound genius. These remarks do not refer to the carnations particularly, which should always harmonise with the draperies, but to the composition of colours generally, to their choice and intensity, and also to the stuffs and materials of which the draperies are composed. Raphael rarely if ever painted silks or satins; most of the Venetians seldom painted anything else. [VENETIAN SCHOOL.]

Raphael had many scholars and many imitators; of the former, the principal were Giulio Romano, Gianfrancesco Penni (with Giulio, Raphael's principal heir), and Perino del Vaga: these painters completed, from Raphael's designs, the great works in the Vatican, which he had left unfinished.

Giulio Pippi, called Giulio Romano, certainly the most eminent of all Raphael's scholars and imitators, was conspicuous for the correct and powerful design of his master, but in other respects he never approached him. Although he had great powers of invention, an unpleasing expression and an evident absence of sentiment prevail throughout his works. He is also heavy both in design and colouring; but his particular employment under Raphael, that of dead-colouring and preparing his works in oil, may have greatly contributed to this effect. Giulio left Rome during the pontificate of Clement VII., shortly after the completion of the Constantine series in the Vatican, and, at the invitation of Federigo Gonzaga, repaired to Mantua, where he founded a school and painted his famous works, the Fall of the Giants, and the Loves of Cupid and Psyche. [GIULIO ROMANO.]

Gianfrancesco Penni, with little less vigour than Giulio, was conspicuous for more of the grace of his master. Pierino Buonaccorsi, called Perino del Vaga, displayed nearly equal powers. Other pupils and assistants of Raphael in the stanze and the loggie of the Vatican, were—Giovanni da Udine; Polidoro Caldara da Caravaggio, celebrated for his imitations of antient bassi-rilievi; Pellegrino da Modena; Bartolomeo Ramenghi, called Il Bagnacavallo; Vincenzio di S. Gimignano; Timoteo della Vite; Raffaellino del Colle; Benvenuto Tisi, called Il Garofolo; and many others too numerous to mention here.

III. The accession of Adrian VI. to the papal chair had for a time paralysed the arts, but they were shortly inspired with new vigour by his successor Clement VII., Guilian de' Medici, who continued the works that had been interrupted by Adrian. But a more serious interruption succeeded in the sack of Rome, in 1527, by the soldiers of Bourbon. The vast school of painters formed by Raphael was totally dispersed: it spread however the elements of his style all over Italy, although scarcely a single beauty of the original was to any extent preserved in the copies.

In the pontificate of Paul III., the arts commenced again to revive in Rome. Michel Angelo executed his great work of the Last Judgment, the labour of eight years, by the orders of this pontiff: it was completed in 1541. The effect however of this work was for a time fatal to painting: hosts of copyists and mannerists arose, who, possessed with a mania for representing the naked figure, and sacrificing everything to anatomical display, imagined the perfection of design to consist in violent action and muscular protuberance; and in imitating the *mãnner*, they imagined they had acquired the *art* of Michel Angelo.

This great painter, who in the time of Julius II. had himself been chiefly instrumental in raising painting nearer to perfection than it has ever attained in modern times, lived also to see it degenerate, greatly through his own influence, into a mere handicraft in the time of Pius IV., when a reference to nature was considered as an acknowledgment of a want of genius.

The most distinguished mannerists of this school and period, whose style was a species of compound of those of Raphael and Michel Angelo, without the correctness or purity of the former, and with only the manner of the latter, were Taddeo and Federigo Zuccari. The former died young. The latter executed vast works at Florence, which were, however, remarkable for their vastness alone; and he has left specimens of his pencil in the principal cities of Italy. He succeeded Girolamo Muziano as president of the Academy of St. Luke at Rome, which had been lately founded by Gregory XIII. at the instance of Muziano. Gregory was elected in 1572.

The following exceptions should be mentioned, as being distinguished for their greater propriety of style, from the general host of mannerists:—Girolamo Siciolante of Sermoneta, Marcello Venusti, and Livio Agresti, all scholars of Perino del Vaga; also Scipione Pulzone, called Gaetano, the scholar of Giacopo del Conte, both excellent in portrait.

Guiseppe Cesari d' Arpino succeeded Federigo Zuccaro in public estimation at Rome; but though without a rival in that city until the appearance of Michel Angelo Amerighi, Il Caravaggio, he cannot be said to belong to the Roman school. The heavy and vulgar nature of Caravaggio's style was in direct opposition to the ideal mannerism of Cesari's. They both had their partisans, who were termed respectively naturalisti and idealisti; the latter prevailed. Annibale Caracci also endeavoured in vain to reform taste in Rome; the works of this great master in the Palazzo Farnese had little or no effect upon the style of the Roman painters of that period, and Cesari left a numerous school of imitators. But these noble works, certainly inferior only to those of Michel Angelo and Raphael in Rome, eventually had their effect, and painting was again restored to something approaching its former splendour; and what the painters of Bologna had borrowed from the Romans in the pontificate of Clement VII., the pupils of the Caracci returned with interest in that of Urban VIII.

A better style was adopted by Federigo Baroccio of Urbino, which might boast of a nearer approach to the correctness of form of the great founder of the Roman school, but his colouring was generally artificial, and very different from that of Raphael. Its tone is unpleasant, a cold violet hue prevails throughout, and there is a striking deficiency of yellow in his carnations, which in the lights are pink, in the shadows grey. Baroccio had several imitators, but his influence upon the general character of Roman art was inconsiderable. The Eclectic school of Bologna [Bolognese School] seems to have had the principal share in reforming the art in Rome. During the pontificates of Paul V., Gregory XV., and Urban VIII., the celebrated pupils of the Caracci, Domenichino, Guido, Guercino, and Lanfranco, were much employed by those pontiffs; and the example of these great masters, but more especially of Domenichino, produced many good painters, of whom we may mention the following:—Antonio Ricci, called Barbalunga; Camassei; Giovanni Carbone; Francesco Cozza; Pietro del Po; Canini; Giambatista Passeri; and Luigi Scaramuccia; and there were many others of considerable merit. The school of the Caracci seems to have had a more immediate influence upon portrait painting, truth or fidelity of representation being indispensably requisite to constitute excellence in portraiture. The excessive mannerism of the painters of the period had so generally incapacitated them for executing anything excellent in that department, that it began to be nearly a distinct profession, and the following masters distinguished themselves as excellent portrait painters, though they did not confine themselves quite exclusively to portraits:—Antonio di Monti; Pietro Fachetti; Antonio Scalvati; Grammatica; Ottavio Leoni; and Baldassare Alloisi, called Galanino.

Upon the imitators of Domenichino followed the bold style of Lanfranco, whose most successful scholar was Giacinto Brandi; and contemporary with Lanfranco flourished Albano in Rome. Pier Francesco Mola was an imitator of his style.

From the studio of Albano came Andrea Sacchi, a painter who drew well and coloured admirably, who never bestowed labour upon a trifle, and who was better versed in the theory of art than any of his contemporaries or immediate predecessors. There is a nobility and grandeur about his style, and a truth and breadth in his execution, which distinguish him as one of the noblest disciples of the Roman school, second only to Giulio Romano in invention, and in all other respects inferior to its great founder alone. Raphael was his model of perfection, but he was no servile imitator; he could appreciate also the beauties of Titian and of Correggio; and he had recourse to the same sources through which his great model attained to excellence—nature and the antique, but he availed himself only so far of the antique as it served to regulate his study of nature.

No inconsiderable ornament also of the arts of Rome of this period was Nicholas Poussin, for though a Frenchman by birth, he was essentially a Roman painter; he formed his style from Raphael and the antique. He attended also the academies of Domenichino and of Sacchi, being a great admirer of the works of those masters; he considered Domenichino inferior to Raphael alone. His style was however very peculiar, and had no influence upon the arts in Rome; his works have too much the appearance of painted bassi-rilievi.

Pietro Berrettini, called also Pietro da Cortona, set himself up as the rival of Sacchi in Rome, and if the number of imitators is a criterion of the degree of excellence, Pietro da Cortona was certainly superior to Sacchi. The art of Sacchi was not so easily imitated. The style of Cortona was rich and attractive, but superficial and incorrect, and he takes the lead in that class of painters termed machinists by the Italians.

The scholars of these two masters formed two rival factions of art, which divided Rome: that of Sacchi was headed by Carlo Maratta, supported by Ludovico Garzi; that of Cortona, by Ciro Ferri, supported by Romanelli. Bernini, who during the pontificates of Urban VIII. and Innocent X., in matters of art was all-powerful in Rome, opposed, as was to be expected, that party which was conspicuous for good taste; and for a time the machinists prevailed. But the school of Cortona was predominant only in fresco, for in oil Maratta was unrivalled. In 1689 however Ciro died, and Maratta stood alone; and upon the accession of Innocent XII., in 1691, he was appointed inspector of the stanze of the Vatican, and in 1702, by the orders of Clement XI., he restored the works of Raphael in those apartments, which had considerably suffered through time and neglect. He had restored previously the frescoes of Annibale Caracci in the Palazzo Farnese. He died in 1713. His style was generally considerably less vigorous than that of Sacchi, and both his colouring and his composition were occasionally artificial; his drawing was also sometimes incorrect; his taste was upon the whole very inferior to his master's, though his style has been termed more graceful.

Maratta formed a most numerous school, but its chief characteristics were the studied composition and affected grace which are the blemishes of his own style.

Maratta has been termed the last of the Romans, and perhaps he may be safely termed the last of the Romans who has merited the name of a great painter; for neither Pompeo Batoni nor Mengs can be said to dispute that claim with him, though both are deservedly celebrated names. The former gave too much importance to high finish; the latter was too blindly devoted to the antique. Batoni painted excellent portraits, and Mengs drew correctly, but he was so eager after the ideal, that he lost nature in the search of it; in this respect Batoni has greatly the advantage over Mengs. They were both eminently academic, and for mere technical excellence have not often been equalled; but there is a palpable absence of the 'mens divinior' and moral sentiment in their works, which are more than ordinarily conspicuous for that insipidity and monotony so generally attendant upon the fastidious preciseness of academic art.

(Vasari, *Vite de' Pittori*, &c.; Bellori, *Vite de' Pittori*, &c.; Lanzi, *Storia Pittorica;* and Fiorillo, *Geschichte der Mahlerey*.)

ROMAN WALL. [Britannia.]

ROMANCE originally signified any composition in the Romance language, or dialects which superseded the Latin after the fall of the Western Empire. [Romance Language.] As however, in course of time, the Trouveres of North France composed a number of poems containing fictitious narratives of war and love, and their lays became popular all over France and in the neighbouring countries, the name of Romance was more particularly applied to all compositions, whether in verse or prose, in any language, which treated of marvellous or uncommon incidents, and the name has been retained to this day in several European languages to signify a fictitious narrative. The Italians and French call a novel 'un romanzo,' 'un roman.' But the French call an historical ballad 'une romance,' in the feminine gender. The distinction between romance and the modern novel is shown under Novel. The appellation Romance in a narrower sense is applied to those compositions which refer to the ages of chivalry, either real or supposed. [Chivalry.]

The oldest romances in this latter sense appear to have been legendary stories concerning Arthur and the Knights of the Round Table, and they were of English origin; but the original narratives, if they ever existed in writing, which is doubtful, are lost. The earliest romantic legends which have come down to us are of the twelfth century: Geoffrey of Monmouth's Latin Chronicle of England; Turpin's

Latin Chronicle in France; Wace's 'Le Brut,' a metrical romance concerning the fabulous history of England, in Norman French; 'Le Roman du Rou,' by the same writer, concerning Rollo and his successors; and 'I Reali di Francia,' in Italian prose. To these may be added the Latin romance of Gualtieri, found in the Chronicle of La Novalesa, which relates to the wars of Attila; next in order of date comes Guido della Colonna's 'War of Troy,' and Mathew Paris's account of the Round Table. [GEOFFREY OF MONMOUTH.] The 'Roman de la Rose' was written under St. Louis of France. At that time chivalry was established over all Europe, and the writers of romance introduced the customs and manners of chivalry into their narratives of events, real or supposed, long antecedent to the existence of chivalry.

The vast subject of romantic literature, in its general and more extended sense, may be divided into the following branches:—1, Romantic ballads and traditional songs, which appears to be the oldest form, and which have existed among most nations in their primitive state. The songs of the antient bards, and those concerning Arminius, which are mentioned by Tacitus (*Annal.*, ii. 88, and *German.*, 2); the German Niebelungen; the poems of Antar, and others before the æra of Mohammed; the song of Roland, mentioned by the chroniclers of Charlemagne; and the old Spanish romantic ballads, all belong to this class. M. de Tressan collected several fragments among the mountaineers of the Pyrenees, which seem to belong to Roland's 'Cantilena,' or war song. 2, The narrative romances of chivalry concerning the deeds of Arthur and the peers of the Round Table. 3, The romances concerning the supposed wars of Charlemagne against the Saracens. 4, The Spanish and Portuguese romances concerning the fabulous exploits of Amadis and Palmerin. [AMADIS DE GAULA.] 5, The classic romances concerning Jason, Hercules, Alexander, those heroes having been transformed into knights of chivalry. 6, The epic romances of the Italians in the fifteenth and sixteenth centuries. [PULCI.] 7, The spiritual or religious romances concerning the miracles of saints and the death of martyrs, such as the 'Contes dévots' of the French, the 'Golden Legend,' &c. 8, The pastoral romance, which Cervantes ridiculed, and which afterwards gave rise in the seventeenth century to the interminable and dull romances of La Calprenède, Madame de Scudery, and others, in which perfection of beauty and pure spiritual love are the chief ingredients. 9, The comic romances, which were written chiefly as parodies of the heroic and chivalrous romances. Such were those of Rabelais, Cervantes, Mendoza, and Scarron. 10, The political romances, such as Télémaque, Sethos, &c. 11, Lastly comes the modern novel, which forms a distinct species, as it does not deal in the marvellous and supernatural, but represents men conformably to the manners of the age in which they lived.

The library of romance is extremely numerous; bibliographical catalogues of those of a particular class and nation have been published, such as Count Melzi's 'Bibliografia dei Romanzi e Opere di Cavalleria in Italiano,' Milan, 1838. The Spaniards have several collections of their old romances: 'Poesias escogidas de nuestros Cancioneros y Romanceros antiguos,' Madrid, 1796; Depping, 'Colleccion de los mas celebres Romances antiguos Españoles, historicos y caballerescos,' Londres, 1825; 'Romancero del Cid Ruy Diaz, en lenguage antiguo, recopilado por Juan de Escobar,' Madrid, 1818. Dr. Ferrario has published a good work on the Italian romances of chivalry: 'Storia ed Analisi degli antichi Romanzi di Cavalleria, e dei Poemi Romanzeschi d'Italia, con Dissertazioni sull' Origine, sugl' Istituti, sulle Ceremonie dei Cavalieri, con Figure tratte dai Monumenti dell' Arte,' 4 vols. 8vo., Milan, 1828-9. A notice of Ferrario's work appeared in the 'Foreign Quarterly Review,' No. XII., October, 1830. Panizzi, in the first or introductory volume of his edition of Boiardo, London, 1830, has elaborately investigated the origin and history of the romances of chivalry. Turner, in his 'History of the Anglo-Saxons,' Ritson, in his 'Historical Essay on National Songs,' Dunlop, in his 'History of Romantic Fiction,' and others, have treated of the history of romance in various countries.

ROMANCE LANGUAGE ('Langue Romane' or 'Romande,' in French) is the name given to a kind of bastard Latin, which came into common use in Western Europe after the fall of the Roman Empire, among the populations formerly subject to Rome, while the Northern conquerors, the Goths, Franks, Burgundians, Langobards, &c., spoke their own language or dialects, which are called by chroniclers of the times 'lingua Teutonica' or 'Teutisca.' The conquered people were called by the general name of Romans, from whence came the name of the language, which was also called 'vulgaris.' In course of time however the conquerors adopted the language of the conquered, who, being more instructed, furnished most of the priests and scholars of the age. But the language thus adopted by both the conquering and the conquered races, although essentially formed of Latin elements, differed according to the various localities and the greater or lesser degree of admixture of the northern people with the Roman population. For instance, King Dagobert in the seventh century published a statute, styled 'Lex Alamannorum,' for the use of the German tribes who had crossed the Rhine, the language of which differs from that of the 'Lex Ripuariorum,' which the same king published for the use of the people situated between the Lower Rhine and the Mosa, who were mostly of old Roman extraction. The former employs the *ille* as an article before substantives, in imitation of the articles *sa* and *der* used by the Goths and Franks in their own language; but the Lex Ripuaria does not employ *ille* for the same purpose. In the old charters of Italy and Spain of the eighth and ninth centuries, we find *ille* and *ipse* employed likewise as articles, *ipsa ecclesia*, *illa alia*, *illas casas*, *illa strada*, *illo rio*, &c.; but these charters are not so old by a century or two as the Franco-Latin documents, in which those pronouns are introduced for a similar purpose. The oldest document in the 'España Sagrada' in which the *ille* appears as an article is A.D. 775; and the oldest of those of Italy quoted by Muratori are of the years 713 and 736.

Of the various dialects thus formed, that of the south of France, called afterwards Langue d'Oc, became a refined language sooner than the others, and retained its superiority from the tenth to the thirteenth century, when the Italian, Portuguese, and Spanish languages assumed a regular grammatical and literary form, which they have retained; whilst the Romance of the south of France has gradually fallen into disuse, having given way to the Northern French Langue d'Oil or d'Oui. The latter appears to have originally differed little from the Langue d'Oc, but it gradually changed its terminations, and assumed other peculiarities of form, which have been retained by the modern French. It is demonstrated by Raynouard that the inhabitants of Northern France in the ninth century spoke the same language as those of the south. The text of the oath taken at Strasburg in the year 842, by Louis, called the Germanic, before the French people, would alone be a sufficient proof of this. The text of this curious document is as follows:—'Pro Deo amur et pro Christian poplo, et nostro commun salvament, dist di en avant, in quant Deus savir et podir me dunat, si salvara jeo cist meon fradre Karlo, et in adjudha, et in cadhuna cosa, si cum om per dreit son fradre salvar dist, in o quid il mi altre si fazet, et ab Ludher nul plaid nunquam prindrai, qui meon vol cist meon fradre Karle in damno sit.' (Roquefort, *Glossaire de la Langue Romane*, Paris, 1808, 'Introduction.')

The gradual process by which the corrupt Latin spoken in the provinces of Western and Southern Europe in the sixth, seventh, and eighth centuries was transformed into the Romance languages of the ninth and tenth centuries, is very clearly exhibited by Raynouard, in his 'Elémens de la Grammaire de le Langue Romane avant l'an 1000.' The Latin cases had become neglected or confused, and to supply their place the prepositions *de* served to denote the genitive and *ad* the dative. The next step was to cut off the final syllable of the noun, and so to make it indeclinable. Thus the accusative abbatem became abbat; majestatem, majestat; ardentem, ardent; amantem, amant; and so forth. The accusatives in *ionem* were reduced to *ion*, religionem, religion, &c. When the suppression of the Latin termination left two harsh-sounding consonants at the end of the word, a euphonic vowel was added, 'arbitr-um,' 'arbitr-e.' The pronouns *ille* and *ipse* had been used in the corrupt Latin as auxiliary to substantives: 'Dono illas vineas quomodo ille rivulus currit;' 'Illa medietate de ipsa porcione,' &c. From *ille* so used originated the Romance articles *el*, *lo*, *la*, and from *ipse* the demonstrative pronouns *is*, *so* or *su*, and *sa*, which the Sardinian dialect has retained to this day as an article. These articles were declined with the prepositions *de* and *a* 'Ego Hugo della Roca;' 'Fossatum de la vite;' 'Villam nostram quæ vocatur al la Corbaria,' &c. These and other examples taken from documents of the ninth century show the introduction of articles even in the written language which affected to preserve in some degree the Latin form; the change must have been more rapid and complete in the spoken or popular idiom. Other changes took place in the pronouns and the verbs, for which we refer to Raynouard's *Elémens*. The use of the auxiliary verb *aver*, 'habere,' already existed in the Latin, in a certain form: 'De Cæsare satis hoc tempore dictum habebo' (Cicero, *Philip V.*, 28); 'Si habes jam statutum quod tibi agendum putes' (*Epist. ad Famil.*, iv. 2). The Latin also used the auxiliary 'esse' in some tenses of the passive. The Romance language only made the use of these auxiliaries more general.

After A.D. 1000 the Romance language may be considered as having become fully formed, and the age of the Troubadours began. William, count of Poictiers, is one of the earliest whose works have been preserved. In the twelfth century the institution of the Courts of Love was established. That century was the brilliant age of Romance poetry, and in the same Wace wrote in North or Norman French his 'Roman du Rou.' In the thirteenth century the war and massacre of the Albigenses, and the estáblishment of the Inquisition, frightened away many of the adepts of 'la gaya ciencia;' and afterwards several other events, such as the accession of the house of Anjou or Provence to the throne of Naples, and the encroachments of the northern French, contributed to the decline of the Troubadour poetry, and at the same time of the Romance language. The Italian or Tuscan rose upon its decay. When Dante appeared, the decline had already begun, and it was completed during the first part of the fourteenth century. (Raynouard, *Choix de Poesies Originales des Troubadours*; Professor Diez, *Leben und Werke der Troubadours*, Zwickau, 1829.) In the fifteenth century king René made some attempts at reviving the poetry of the Langue d'Oc, but the race of the Troubadours was now extinct, and the only result of his endeavours was the collecting and compiling the lives of the old Troubadours by the monk of the isles of Hyeres, 'Le Monge des Isles d'Or.' In Eastern Spain also the Inquisition destroyed many MSS. in the Limosin or Valencian language, as being suspected of containing heresy. In 1434 the library of the Marquis de Villena at Barcelona was burnt on suspicion of containing sorcery. (Ferrario, *Storia ed Analisi degli antichi Romanzi*, &c.)

Various political and social circumstances had contributed to give to the Langue d'Oc that early refinement in an age of comparative ignorance and barbarism which is still a matter of surprise to philologists and historical inquirers. The provinces of Southern France had not, like Italy and the northern parts of France, been overrun by a succession of barbarians; they had not been exposed to the ravages of the Sclavonians, the Huns, and the Danes. The Burgundians and the Visigoths, who had settled there nearly about the same time, were more civilised than the other German races; they amalgamated themselves gradually and quietly with the old inhabitants, and they applied to agricultural pursuits, which a fertile soil and a happy climate rendered pleasant and productive. The country suffered no subsequent invasion from the northern tribes, and the victory of Charles Martel in the plains of Tours arrested the advance of the Saracens from the west. Southern France was, it is true, subjugated by the Franks, who had occupied the countries north of the Loire, but the Franks had by that time formed themselves into a regular monarchy under Pepin and Charlemagne, and were no longer unruly barbarians. During the decline and imbecility of the later princes of the Carlovingian dynasty, Southern France became a separate and independent state, of which duke Bozon, an active and vigorous man, became monarch, and the kingdom of Arles or Provence extended over the whole south of France. The descendants of Bozon retained their sovereignty for more than two hundred years; and when the male line ended in 1092, in the person of Count Gillibert, his states became the dowry of his daughters, of whom the elder, Douce, heiress of Provence, was married in the year 1112, to Raymond Berenger, count of Barcelona, and her sister Stephanie married the count of Toulouse. A treaty, concluded in 1125, between the counts of Barcelona and Toulouse, fixed the division of the states of Gillibert between them. Another powerful baron, the count of Poitiers, became duke of Aquitaine or Guyenne, which afterwards came by marriage into the possession of Henry II. of England. These three states, Barcelona, Toulouse, and Guienne included the whole country in which the Langue d'Oc was spoken. The union of Provence with Catalonia introduced into the former country a taste for poetry and chivalry, which was fostered in Spain by the Moors. The maritime towns of Catalonia and Provence carried on a lucrative trade all over the Mediterranean, and Catalonian armaments took an active part in the Eastern wars between the Greeks, the Normans, and the Saracens. All these circumstances contributed to refine the manners of the people as well as their language, and the singular institution of the Courts of Love gave a peculiar turn to their poetry. [TROUBADOURS.]

The Langue d'Oil, or Northern French, also called sometimes Norman French, having become the language of the court and capital of the kingdom of France, gradually encroached upon the Langue d'Oc, as the various provinces south of the Loire became incorporated with the monarchy. From the 13th century downwards, the edicts and ordinances of the French kings being issued in the Langue d'Oil, were forwarded, either in the original or translated into Latin, to the provinces of the south. The writers of Northern France, the Trouvères, refined their own language, and found encouragement at court, which was not extended to the writers in the langue d'Oc. Ronsard, who was a native of the south, in his 'Abregé de l'Art Poetique,' complains of this: 'Now that our France is all subject to one king, we are obliged, if we wish to attain honour or fame, to speak his language, else our works, however honourable and perfect, would be thought little of, or might perhaps be altogether despised and neglected.' With the invention of printing, copies of the works in the Langue d'Oil were speedily multiplied, while those of the Troubadours remained mostly in MSS. confined to a few libraries. In the 16th century it was enacted that all public acts and deeds should be written in French. The Langue d'Oc, being thus restricted to the mere purposes of a domestic idiom, degenerated into various pâtois or dialects. Still there appeared, here and there, in the seventeenth and eighteenth centuries, several native poets who wrote with spirit and humour in their respective patois, such as Lesage, a Languedocian, whose burlesque and frequently licentious poems were published at Montpelier: 'Les Folies de le Sage,' 1650; Ader, 'Lou Gentilhomme Gascoun,' Toulouse, 1610, and 'Lou Catounet Gascon,' 1611; a version of Homer's 'Batrachomyomachia,' in Gascon, 'La Granoul-Batromachio,' Toulouse, 1664; 'La Pastourale (a comedy in 4 acts) deu Paysan que cerque mestié a son hils,' in the dialect of Béarn, by Fondeville de Lescar, Pau, 1767; 'L'Embarras de la Fieiro de Beaucaire,' by Michel, Amsterdam, 1700; 'Actes du Synode de la Sainte Reformation,' Montpellier, 1599, a satire against the Calvinists, by Reboul, a witty but profligate adventurer, who was at last executed at Rome, under Pope Paul V., in September, 1611, in consequence of his undiscriminating satirical propensity; 'Lou Banquet,' par Augié, Gaillard, Paris, 1583; the 'Jardin deys Musos Provençales,' Aix, 1628; &c.

In Spain the Latin language became corrupted, though perhaps less rapidly and at a later date than in Italy and France, which is proved by the fact that during the eighth and ninth centuries masters were procured from the Peninsula to teach that language in Italy. It is another evidence of this, that till the beginning of the 12th century, Latin, though corrupt, was the only language used among the Christian population of the Peninsula, not only in the acts of the cortes and councils, but also in the municipal fueros, the public edicts, diplomas, testaments, and the writings of authors. It was also the language of the tribunals, until San Fernando, about the middle of the 13th century, caused the 'Liber Judicum' to be translated into the vulgar tongue.

The corrupt Latin of Spain gave rise to the Catalonian and Valencian, the old Portuguese or Galician, and the Castilian or modern Spanish. The last two, and especially the Castilian, received a considerable admixture of Arabic words (said to be about 2000 in the Spanish language), from which the Catalonian remained comparatively free. The process of corruption of the Latin into Romance was the same as in France and Italy, and may be traced even in the writings of the clergy, who professed to use the literary language of the country. Elipando, bishop of Toledo, a man of learning for the time, who strongly opposed the introduction into Spain of the tenets of the supremacy and infallibility of the Roman see, writes to Felix, bishop of Urgel, in the following style: 'Domino Felice, sciente vos reddo quia vestro scripto accepi....direxi vobis scriptum parvum de fratre Militane ... ego vero direxi epistolam tuam ad Cordoba,' &c.

It is impossible to fix the epochs of the origin of the various languages of the Spanish Peninsula. The Catalonian and Galician or old Portuguese appear to be the oldest. The Castilian, notwithstanding the assertion of Bouterwek to the contrary, was not formed in the eleventh century; its oldest existing monument, the poem of 'El Cid,' is not older than the year 1200. Previous to the twelfth century the Galician, or old Portuguese, appears to have prevailed in all western Spain. An old MS. Cancioneiro in this dialect, belonging to the library of the Royal College of the Nobles at Lisbon, of which Sir Charles Stuart obtained a copy, which he communicated to Raynouard, speaks of the Galician dialect as being spoken in Galicia and in Portugal, as far south as Coimbra, in the tenth and eleventh centuries, after which the Portuguese grew into a separate and polished dialect, which was much in use for poetry among Galicians and Castilians as well as Portuguese. (Raynouard, *Grammaire Comparée*, 'Discours Préliminaire.')

In the 'Elucidação das Palavras, Termos, e Frases que em Portugal antiguamente se usárao,' 2 vols. fòl., Lisbon, 1798, are other specimens of old Portuguese or Galician compositions. The original text of the 'Amadis de Gaula,' by Vasco de Lobeira, which is lost, was written in the same language.

The Catalonian dialect became early a literary language, and as such subject to fixed grammatical rules; it has its grammars and dictionaries, a great number of printed books, and a still greater number in MS. It had its historians; among others an anonymous historian of Catalonia, mentioned by Zurita in his 'Chronicas de Aragon;' Bernard de Sclot, who lived in the thirteenth century, and wrote a history of the principality of Catalonia and of the Aragonese kings subsequent to the junction of the two states; and King Jayme I. of Aragon, who wrote an account of his own reign, which has been published under the following title: 'Chronica o Commentari del gloriosissim e invictissim Rey Jacme Rey d'Aragó de Mallorques e de Valencia, Compte de Barcelona e de Urgell, e de Muntpellier, escrita per aquell en sa lingua natural, e treita del Archiu del molt magnifich Rational de la insigue Ciutat de Valencia, hon estava custodita,' Valencia, 1557. King Jayme also wrote a book 'de la Saviesa' 'on wisdom,' quoted by Nicolaus Antonio, in his 'Bibliotheca Vetus.' The Catalonian is rich in poetry, which was introduced into the Peninsula by the troubadours of Provence and Languedoc. Alonso II. of Aragon, in the twelfth century, is numbered among its poets, as well as Guillermo de Berguedan, a Catalonian noble, who lived in the following century, and some of whose verses are preserved in a MS. in the Vatican library. Mosen Pero March, Jacme March, Mosen Jorde, Mosen Febler, and Ausias March of Valencia, rank also among the Catalonian, Aragonese, and Valencian troubadours. [TROUBADOURS.]

The languages of Aragon and Valencia, in the time of the Aragonese monarchy, may be considered as one and the same with the Catalonian. It is worthy of remark, that at the end of the 13th century, when the Castilian language had already gained the preponderance in a great part of Spain, we find a controversial conference between the Jews of Granada and some Christian missionaries from Castile, carried on in the Catalonian language, which appears to have been vernacular at Granada. (*Memoirs of the Royal Academy of Barcelona*, i., p. 615.) In the same Memoirs (p. 613) it is stated that the bishop of Orense, having been requested to examine what analogy there might be between the vulgar Galician and the Catalonian, answered, that there were in both, not only nouns, verbs, and other parts of speech quite identical, but also entire phrases. And Terreros (in his 'Paleography') and others have stated, that the language of Asturias is the same as that of Galicia, bating the difference of pronunciation.

The Catalonian, observes Raynouard, is the living language which most resembles the old Romance of the troubadours, and that of the Valdenses of Pignerol in Piedmont is the next. The following are among the shades of difference between the Catalonian and the Romance:—1, The Romance substantives and adjectives ending in *an*, *en*, *in*, and *un*, add in Catalonian the euphonic final vowel *y*; *affan*, *affany*, *estran*, *estrany*, &c. The plural feminine in *as* is changed into *es*. The Catalonian often changes the *s* into an *x*; *axi*, *puix*: it doubles the *l* at the beginning and at the end of words; *aquell*, *lloch*, *lluny*: it sometimes changes the *e* into an *i*, especially of the Romance participles in *ent*; *dormint servint*, *fugint*, *premint*: it adds a final *u* to some inflections of the verbs, &c. The Catalonian has retained the affixes of the Romance, of which the following are specimens taken from the poems of Ausias March, the Valencian troubadour:—

Mottra se la flum de vera esperança,
Be as mustra Deu lo mon que vol finir,
Tot mon parlar als que no es auran vista,
No solament los leigs qui l venen contra.

The popular patois or dialects of the south of France, after being long neglected, have of late years attracted the attention of philologists. Colomb de Batines has given an account of the patois of Dauphiné; Sainte Beuve has inserted a notice in the 'Revue des Deux Mondes,' vol. x., 1837, of the poems of Jasmin, the barber poet of Agen; a 'Recueil de Poésies Béarnoises,' was published at Pau in 1827. (The Bearnese dialect is a Romance and not a Basque dialect, and resembles the Gascon.) The dialect of Gascony has been illustrated by the Viscount de Métivier: 'De l'Agriculture et du Défrichement des Landes,' Bordeaux, 1839; and also by Du Mege: 'Statistique des Départemens des Pyrénées. The Languedocian boasts of two graceful poets brothers: 'Poésius Patouesas de P. A. et Cyr. Rigaud, Mounpeyé, 1806; 'Mêlanges sur les Langues, Dialectes, et Patois,' Paris, 1831; Beronie, 'Dictionnaire Patois,' Tulle, 1820; the poems of Verdié, a self-instructed artisan of Bordeaux, who died in 1820—whose works, full of humour and nature, are unknown beyond the precincts of his native town; an imitation of the fables of Lafontaine, in the dialect of Limousin, by J. Fouçaud, 1835; Brunet, 'Notices et Extraits de quelques ouvrages écrits en Patois du Midi de la France,' Paris, 1840; Millin, 'Essai sur la Langue et la Littérature Provençale,' Paris, 1811; J. Champollion Figeac, 'Nouvelles Recherches sur les Patois ou Idiomes vulgaires de la France, et en particulier sur ceux du Département de l'Isère, suivies d'un Essai sur la Littérature Dauphinoise, et d'un Appendix contenant des pièces en vers et en prose peu connues, et un Vocabulaire,' Paris, 1809; Grinet, 'Vocabulaire Limousin,' a dialect which resembles those of Franche Comté and Western Switzerland.

With regard to the antient Langue d'Oc, or Langue Romane, the most refined of all the southern dialects, but which may be considered now as a dead language, it was illustrated in the last century, in Italy, by Bastero, 'La Crusca Provenzale;' and in France, by L'Abbé Millot, 'Histoire Littéraire des Troubadours,' who compiled his work from the voluminous MS. folios of M. de Sainte Palaye. In the present century, Raynouard has been the most industrious and most successful investigator of the Romance language and literature.

In Italy, the dialect of the valleys of Pignerol, or of the Valdenses, has most affinity to the old Romance. [VALDENSES.] The Piedmontese, which is a written language, and is spoken by all classes of people, bears also considerable affinity to the modern Romance dialects of Southern France, and we have heard it stated that natives of Languedoc can understand those of Piedmont with ease [PIEDMONT.] Dr. Pipino published a Piedmontese grammar, Turin, 1783; and Ponza published, in 1827-8, a Dictionary, Piedmontese and Italian. The language of Nice is also a corrupt dialect of the Langue d'Oc. [NICE.]

With regard to the other North Italian or Lombard dialects, they differ more or less from the old Romance language, though they had a common and perhaps coeval origin with it, and resemble it more than the Italian or Tuscan. The Langue d'Oc, having been formed chiefly from a corrupt and provincial Latin, as well as the dialects of Italy, reduced its materials to a regular form sooner than they; and having become a polished and literary language, the Italians in their turn borrowed at second-hand from it. Raynouard, in his 'Grammaire Comparée,' observes that the dialect of Ferrara is one of those which has retained more completely the forms of the Romance with the least admixture. That of Bergamo comes perhaps the next in affinity: it often changes the *e* into *o*; for example, instead of *el*, *del* (Romance), it has made *ol*, *dol*. The dialects of Bologna and Mantua abound with contractions and aphæreses, which render them very harsh; they have taken away the *t* of the Romance terminations in *at*, *it*, *ut*. The Milanese has a broad pronunciation, and many double vowels, changing into *aa*, *ii*, and *uu*, the Romance terminations in *at*, *it* and *ut*; *veritaa*, *servii*, *avuu*, &c.: it also changes *re* into *er*; *noster*, *sepolcher*, for the Romance *nostre*, *sepolchre*.

The dialects of the Venetian territory, with the exception of that of Friuli, are more remote from the Romance in their formation, as are likewise still more so the dialects south of the Apennines, or of Southern Italy. We cannot here enlarge upon the multifarious subject of the Italian dialects, but must refer the inquisitive reader to their grammars, vocabularies, and other works, and also to an article in the *Quarterly Journal of Education*, No. x., in which are given specimens of composition in each; and also to an article in the *Foreign Quarterly Review*, No. ix., 1829, on the dialects of Southern Italy.

The dialects of Western Switzerland, Vaud, Neuchâtel, Geneva, part of Freyburg, and Lower Valais, and also of Savoy, have retained to this day the name of patois Romand, or Langue Romande. Western Switzerland, as far as the Aar, was occupied in the decline of the Roman empire by the Burgundians, a less rude tribe than the Alemanni, who settled in Eastern Switzerland. The Burgundians shared the land with the native population of Roman, Helvetian, or Allobrogic race; they applied themselves to agriculture, and soon constituted themselves into a well regulated and orderly monarchy. They gradually adopted the provincial Latin which they found in use in the country, and from the corruption of which several Romance dialects were formed, which resembled those of the South of France that were formed through a similar process. Some of the dialects of Western Switzerland approximate in their inflexions to the Northern French, or Langue d'Oil, whilst others, like that of Gruyère in the canton of Freyburg, bear more affinity to the Romance of the south, and consequently to the Italian. Specimens of both are contained in Stalder's 'Dialektologie,' and also in the collection of Ranz des Vaches, both in German and Romance, 'Sammlung von Schweizer Kuhreihen und Volksliedern,' Bern, 1818. To this day, Switzerland is divided, by language, races, and habits, into German and Romande, and the Germans call the latter by the general name of Wälschland.

In the country of the Grisons, or antient Rhæti, one half of the people speak a language called Rumonsch, which is an Italian dialect of very antient formation, supposed by some to be derived from the language of the Etruscans, who emigrated to those valleys about 600 years B.C.; but this is a mere conjecture. The Rumonsch is a written language, and books have been published in it. MSS. eight or nine centuries old existed at the end of the last century, and perhaps some still exist in the convent of Disentis. The dialect of the Engadina, or valley of the Inn, is called Ladin: it has still greater affinity to the Italian or Lombard dialects. Specimens of Rumonsch and Ladin are found in the Appendix to Vieusseux's 'History of Switzerland,' published by the Society for the Diffusion of Useful Knowledge. Raynouard observes that the Rumonsch has the affixes and other essential forms of the Romance language, though it is disfigured by an admixture of Northern or Teutonic orthography and pronunciation. It often adds a *g* to the end of words; *filg, volg, haig, testamaing*, for the Romance *fil, vol, hai, testament*.

If we take the appellation of Romance language in its most extended sense, all the languages and dialects of Western Europe, that is to say, of Italy, Western Switzerland, the Grisons, France, and Spain, may be called Romance, being derived essentially from the Roman or Latin, and having been formed after the fall of the Western Empire. The Basque and the Armorican or language of Lower Britanny belong to a different family. The Walloon of Liège and the Valachian are also Romance languages. The Valachian resembles the others, though less perhaps in its grammatical forms than in the etymology of the words. Raynouard shows the analogy existing between them all in their grammatical construction and etymology in his 'Grammaire Comparée des Langues de l'Europe Latine.' But if we take the word Romance in its more restricted sense, as having been especially applied to the language of the troubadours, or Langue d'Oc, we must consider it as confined to the south of France, and the eastern provinces of Spain as far as Murcia; and it is there that we find its legitimate offspring in the languages of Catalonia, Valencia, and Majorca, and in the Languedocian, Provencal, and Valdenses dialects.

Raynouard, at the conclusion of his 'Grammaire Comparée' of the languages of Latin or Roman Europe, enumerates twenty-three special characteristics in the construction of the Romance language, most of which occur also in the other languages and dialects of Western and Southern Europe, which he styles 'Neo-Latin.' 1, The use of articles to determine the cases, instead of their being designated by the termination of the word as in Latin. This characteristic is found in all the modern languages derived from the Latin. 2 and 3 relate to the terminations of words, especially nouns, of which Raynouard gives comparative tables in the various languages. 4 is peculiar to the old Romance, but existed also in the Northern French till the fourteenth century. It consists in placing an *s* at the end of substantives in the singular, when they stand as subjects; the absence of the *s* shows they were used in the objective case. In the plural it was the reverse, the absence of the *s* designated the nominative. The Northern French dropped the *s* generally in the singular, and gave it to the plural without distinction. 5 refers to other terminations employed by the old Romance, especially in proper names, to distinguish the subject from the object. 6 concerns the gender of the adjectives. 7 concerns the degrees of comparison. 8 is on the Romance affixes representing personal pronouns, *ous, os, m, x*, which are also met with in the old French and old Spanish, and also in some rustic dialects of France, in the Catalonian, and in some north Italian dialects. 9, The pronoun *altre* as an expletive added to the personal pronoun. This has been adopted by all the Neo-Latin languages of Europe; *vous autres, vos otros, vos outros, voi altri*, &c. 10, Relative pronouns *qui, que, lo qual*. 11, The indefinite pronoun *om*, derived from the Latin *homo*, which the French has retained in *on*. The Spanish and Portuguese, which formerly employed *ome* in the same sense, have since substituted *se*, and the Italians *si*. 12 concerns the use in the conjugations of the auxiliary verbs *aver, ester*, and *estar*, which have been adopted, with some modifications, by all the other Romance languages. 13 and 14 concern the formation of the future and the conditional. 15 concerns the participles in *ut*, of which the French has made *u*. 16 concerns the double formation of participles of the same verb, such as *rot* and *romput, defet* and *defendut, eleit* and *elegit*, &c. 17, the compound passive formed of the auxiliary *esser* and the participle past, which has been substituted in all cases for the Latin simple passive form. 18 concerns the verbs used impersonally. 19, The infinitive with the negative, used as an imperative. The Italian has retained it: 'Non parlare:' speak not. 20, The various uses of the conjunction *que*. 21, Formation of adverbs from the feminine adjective by adding the affix *ment*, which has been adopted by all the other languages derived from the Latin. 22, The expletives *pas, mica, gaire*, &c., added to the negative particle to give it greater emphasis. This form is retained by the French in *pas*, and by the Italians in *mica* and *guari*. 23 concerns the appellations *Romans, Romance, Roumonch, Romanza*, which were used by the old French, Italian, Spanish, and Portuguese writers to designate their respective idioms; an appellation which serves to show their common origin.

The following specimens of the Lord's Prayer, in the various dialects which are nearest to the old Romance, may convey some notion of their respective shades of variation as well as of their common origin:—

Old Provençal, from 'L'Arbre d'Amor,' A.D. 1288.

Paire nostre que iest el Cels;
Ton nom tia sanctificat;
A nos venga lo teu regnat;
En la terra facha sia,
Quo el Cel, voluntat tia.
La Pa nostre cotidia
Huei nos dona, Dieus, de ta ma;
Remet so que nos te deuem,
Que nos als autres remetem;
De temptacio nos deffen;
Ens delivra de mal.

Modern Provençal, from a Collection of Dialects published at Paris, as quoted by Adelung.

Nouastre Paire que sias oou Ciele; que vouastre noum siegue santificat; que vouastre rouyaoume nous arribe; que voustre voulountà siegue facho su la terro, coumo di lou Ciele: dounas nou encui noustre pan de cade jou; pardounas noue noustrei ooufensos, coumo leï pardounan a n'aqueleï que nous an ooufensas; e nou leïssez pa sucoumbe a la tentation; mai delivra nous doou maou.

Languedocian, from Adelung's 'Mithridates.'

Nostre Pero que tes au ciel, que vostre nôum siegue santifiat, que vostre reyno nous arribe; que vostra voluntat siegue facha, tant sur la terra que din lou Ciel; donna nous aujourd' ivi nostre pan quotidian; perdonna nous nostras ouffenças, couma naoutres las perdounan on d'aquelles que nous an ouffençat. Nous lesses pas sucoumba a la tentation; me delivra nous de maou.

Catalonian, from Bern. Aldrete,' Del Origen de la Lengua Castellana.'

Pare nostro que estau en lo Cel, sanctificat sen el vostre sant nom; vinga en nos altres el vostre sant reine; fasas la vostra voluntat axi en la terra como se fa en lo Cel. El pa nostre de cada die da nous lo gui: i perdonau nos nostres culpes, axi com nos altres perdonam a nostres deudores; i no permetau que nos altres caigam en la tentacio; aus desllibra nos de qualsevol mal.

Balearic of Mallorca, from Adelung.

Pare nostro que estau en los Cels; sia santificat lo vostro sant nom; vingue a nos altres el vostro sant regne; fases, Señor, la vostra voluntad aixi en la terra com se fa en lo Cel. El nostro pa de cada dia daunolos, Señor, en lo dia de vuy; y perdonaunos nostras culpas, aixi com nos altres perdonam a nostros deudors, y dellivraunos, Señor, de tot mal.

Valencian, from Hervas's Collection in Adelung.

Pare nostre que estas en lo Cel; santificad siga el teu nom; venga a nos el teu reine; fagas la teua voluntad aicsi en la terra com en el Cel. El pa nostre de cada die daunoste gui. Y perdonaunos les nostres deudes aicsi com nos otros perdonam a nostres deudores; y no nos deicses caure en la tentacio; mes lliuranos de mal.

Sardinian of Cagliari and other Towns, from Adelung.

Pare nostru qui istas in sos Quelos; Siat sanctificadu su Nomen teu; vengat a nois su regnu teu; fasase sa voluntat tua axi comen su quelu gasi in terra. Lo pa nostru de dognia die da nos hoe; i dexia a nos altres sos deppitos nostros comente nosateros dexiam als deppitores nostros; i no nos induescas in sa tentatio; ma livra nos de male.

Sardinian Rustic.

Babbu nostra sughale ses in sos Chelus, santufiada su nomine tuo; bengiad su rennu tuo; faciadsi sa voluntade tua, comenti in Chelo gasi in terra. Su pane nostru de ognie die da nos lu hoe; et lassa a nos ateros is deppidos nostrus gasi comente nos ateros lassaos a sos deppitores nostros; e non nos portis in sa tentassione; impero libera nos de su male.

Gallego or Galician, from Hervas's Collection, No. 295.

Padre nostro que estas no Ceo; Santificado sea o tea nome; venja a nos outros o teu renjo; fagase a tua voluntade asi na terra come no Ceo. O pan nostro de cada dia danolo oje; e perdonainos as nostras deudas, asi come nos outros perdonaimos aos nostros deudores; e non nos deixes cair na tentazon; mas libra nos de male.

Portuguese.

Padre nosso que stas nos Ceos, Sanctificado seja o teu nome; venha a nos o teu reino; sea feita a tua vontade assi nos Ceos come na terra. O pao nosso de cada dia da nos oje; e perdoa a nos, Senhor, a nossas dividas assi como nos perdoamos aos nossos dividores; e nao nos dexes cahir in tentaçao; mas libra nos do mal.

Valdenses of the year 1100, *from Leger.*

O tu lo noste Payre, local sies en li Cel; lo tio Nom sia sanctifica; lo tio regne venga; la toa voluntà sia fayta en ayma illi es fayta al Cel, sia fayta en la terra; dona nos la nostre pan quotidian enchoy; pardonna a nos li nostre debit e peccà, coma nos perdonnen a li nostre debitors u offendadors; non nos amenar en tentation; ma delivra nos del mal.

Modern Piedmontese. (This dialect has adopted in a great degree the pronunciation of the northern or modern French.)

Padre nöst, ch't ses in Ciel; Santificà sia l' tö nom; vegna a noi l' tö regn; s' fassa la tua volontà com in Ciel cosi in terra; dane encüe l' nöst pan di tut i di'; perdona a noi i nöst debit com noi perdonoma ai nöst debitor; lasne nen casché en t' la tentasion; ma librene dal mal.

Rumontsch of the Grisons.

Bap nos chi est n' ils tschels; fat sangt vegna teis nom; teis reginom vegna nan proa; tia voellga dvants a son in tschel, usché eir in terra; nos paun d' minchiadi da a nus hoz, e perdunains nos debitts sco eir nus ils perdunain als noss debittadurs; en 'nus manar in provamaint; mos spendra ons dal mal

ROMA'NO, GIU'LIO. [GIULIO ROMANO.]

ROMANS, a town in the south of France, in the department of Drôme, 10 miles north-east of Valence, on a cross road from that town to Grenoble, and 362 miles from Paris by Lyon, Vienne, and Valence. The town owes its origin to a monastery founded by St. Bernard, A.D. 837: in the sixteenth century it was the centre of a considerable trade in woollen cloth, which was exported even into Asia; but the religious wars of that period combined with the ravages of pestilence to diminish its prosperity. It is still however a place of considerable trade, and the activity which prevails in it contrasts strongly with the dulness of the neighbouring town of Valence. Romans is in a flat district on the right or north bank of the Isère, by which it is separated from the little town of Le Péage du Pizançon, now called Le Bourg-du-Péage, which is virtually a suburb of Romans, and is joined to it by a handsome bridge. Romans is surrounded with an antient wall flanked with towers and defended by a ditch: it is an ill-built town, destitute of any remarkable edifices, except the parish church, which was antiently the church of the monastery founded by St. Bernard. The population in 1831 was 7677 for the town, or 9285 for the whole commune; that of Le Bourg-du-Péage was 3095 for the town, or 3577 for the commune, making 10,772 for the two towns, or 12,862 for the commune. The manufactures of Romans are silks, woollen cloths, serges, and other woollen fabrics, worsted hose, and leather: there are oil-presses for walnut-oil, and lime and plaster kilns. The trade of the place comprehends wool, tow, hides, silk, nut-oil, liqueurs which are made in the district, excellent truffles, and wine. There are three fairs in the year. Hats and silk goods are made at Péage; where also are dye-houses for cotton and silk, tanyards, ropewalks, and cartwrights' shops. Péage has four fairs in the year. Romans has a high school and a tribunal of commerce. It was the native place of the unfortunate General Lalley. [PONDICHERRY.] The celebrated Hermitage wines are grown near Romans.

ROMANS, EPISTLE TO THE. The Epistle to the Romans has been almost universally admitted to be the work of St. Paul. The only sects which have disputed its genuineness are the Ebionites, the Encratites, and the Cerinthians, and these purely on doctrinal grounds, inasmuch as the doctrines of this Epistle were adverse to their own opinions. (Stuart's *Commen. on the Epis.*, p. 42.) Some modern commentators however have supposed that the Epistle properly ends with the fifteenth chapter, a supposition which may seem plausible from the want of connection between the last chapter and the rest of the Epistle. But this want of connection may be accounted for easily enough, without any such hypothesis. (Stuart, *Introd.*, p. 49.)

The verses 25-27 inclusive of this last chapter are in some MSS., as in the Codex Alexandrinus, made to follow ver. 23 of cap. xiv., and Griesbach and others give them this arrangement. But a doxology of so sublime a character as is contained in these verses does not seem a fit conclusion for a discussion about eating meats or abstaining from them, and accordingly Hug and others agree with the received text in placing them at the close of the Epistle. Some few MSS. omit them altogether. The words *I, Tertius*, &c., xvi. 22, imply that this chapter formed the end of the Epistle, and that the Epistle is *one*. There are however indications in the last chapter that the Epistle received several unimportant additions or insertions after it was in the main completed, according as any afterthoughts occurred to the writer, before it was finally dispatched.

With respect to the date of the Epistle, various years have been assigned to it, from A.D. 55 to A.D. 58. According to the most probable opinion, it was written towards the end of 57 or in the beginning of 58, when St. Paul was at Corinth, and on the point of setting out to Jerusalem with the 'contribution made by them of Macedonia and Achaia for the poor saints which were at Jerusalem' and in Judæa. (Cap. xv., ver. 25, 26.)

The Epistle was dictated in Greek by the Apostle to Tertius, his amanuensis (xvi. 22), and conveyed to the church at Rome by Phœbe (xvi. 1), a servant or deaconess of the church at Cenchreæ, a place not far from Corinth

Another proof of the Epistle having been written from Corinth is given in xvi. 23, where St. Paul sends salutations from Gaius, his host, and Erastus, the chamberlain of the city of Corinth. (Comp. 2 *Timoth.*, iv. 20, and 1 *Cor.*, i. 14.) The position of this Epistle in the New Testament does not depend upon its date, for it is the seventh in order of time, and is placed first, either from being the 'longest and most comprehensive' of the Epistles of St. Paul, or from the importance of the church to which it was addressed. (Horne's *Introduct.*, vol. iv.) With respect to the origin of this church, we have no certain information in the Scriptures. They do not tell us when or by whom it was founded. The opinion that it was founded by St. Peter does not appear to rest on any satisfactory evidence: the chief authorities for it are, Irenæus (*Adv. Hær.*, iii. 1) and Eusebius (*Chron. an.* 2 *Claud.*); but if he had indeed preached the Gospel at Rome, such a circumstance would probably have been noticed in the *Acts of the Apostles*, nor is it likely that St. Paul would have made no allusion to it in this Epistle. Perhaps the most reasonable opinion on the subject is, that the Gospel was first preached at Rome by 'the strangers from that city, the Jews and proselytes,' who were converted by Peter's preaching at Jerusalem on the day of Pentecost (*Acts*, ii. 10); so that, like many other churches, that at Rome was at first composed of Jews, and gradually increased by the admixture of Gentiles, till the whole Christian community there became so large and important, 'that their faith was spoken of through the world.' The fact of this combination and co-existence of Jews and Gentiles as parts of one Christian church sufficiently explains to a careful reader the occasion and object of the Epistle. Prejudices and pretensions on one side would be met with disdain or opposition on the other. (cap. ii. and xi.) The Jews were attached to the Mosaic institutes and the Levitical rites and distinctions between clean and unclean. They were impatient of subordination to or equality with the Gentiles, and wished to impose upon them a conformity to many points of the Mosaic ritual, especially that of circumcision, before they were admitted to a participation in the privileges of the Gospel. The Gentiles, on the other hand, disregarded (perhaps too contemptuously) the prejudices of the Jews, and were of course offended at their pretensions to superiority, for which their fallen position afforded in the eye of the Gentiles no justification. They might not reflect with fairness on what the Jews conceived themselves to have lost by the publication of the Gospel. Such a position of parties, and such a state of feeling between them, would naturally give rise to the divisions and offences which occasioned some of the admonitions and cautions contained in the hortatory portion of the Epistle, and the existence of it can scarcely fail to be observed by a careful reader.

The argument of the Epistle is mainly directed against the two great prejudices of the Jews, viz. (1), their trust in the works of the law, and particularly in the rite of circumcision, as if by these they were already justified, *i.e.* accounted righteous in the sight of God; an idea which led them to reject the offers of the Gospel: (2), a trust in their privilege, as the chosen seed of Abraham, which led them to consider themselves as God's peculiar people, and to look down upon the Gentiles as aliens.

The point which the Apostle endeavoured to establish in the Epistle is briefly laid down in cap. i., ver. 10, where he affirms, in opposition to the prejudices and pretensions of the Jews, that 'the Gospel is the power of God unto salvation to every one that believeth: to the Jew first, and also to the Greek.'

Here two things, as Mr. Young remarks, are contained in this affirmation:—

1st. The perfect efficacy of the Gospel to salvation, for it is the power of God unto salvation, *i. e.* the means whereby God brings about the salvation of men; which indeed implies the *inefficacy* of the law for that purpose, whether that of Moses or that of nature, by which the Gentiles were 'a law to themselves.' (i., 19; ii., 14.)

2ndly. The *universal* extent of this saving power is included in the words, 'to every one that believeth: to the Jew first, and also to the Greek.'

The Apostle therefore in this Epistle does mainly these four things:—

1. He shows the *inefficacy* of the law of Moses to salvation. (iii., 26.)
2. He shows the perfect *efficacy* of the Gospel to the same. (iii., 28.)
3. He destroys the *exclusive* claims of the Jew to the benefits of this salvation. (iii., 29.)
4. He establishes the claims of the Gentiles to justification, or acceptance with God, without their being under any obligation to perform the law of Moses.

These four points are the chief topics of the three first chapters, but the Epistle (or rather, the argumentative portion of it) may further be broken up into three great divisions:—

1. Concerning justification: the first five chapters.
2. Concerning sanctification; or the helps afforded under the Christian dispensation to purity of heart and holiness of life. (chapters 6, 7, and 8.)
3. Concerning the rejection of the Jews: the 9th, 10th, and 11th chapters.

The remainder of the Epistle is chiefly taken up with exhortations and precepts on various subjects.

The preceding arrangement and division is in accordance with Young's 'Synopsis of the Argument of St. Paul's Epistle to the Romans;' but perhaps the best idea of its general character is given by Paley, who observes that the 'principal object of the argumentative part of it is to place the Gentile convert upon a par with the Jewish, in respect of his religious condition and rank in the divine favour. The Epistle supports this point by a variety of arguments, such as that no man of either description was justified by the works of the law, inasmuch as no man had performed them; and it became therefore necessary to appoint another medium or condition of justification, in which the Jewish peculiarity was merged and lost: that Abraham's own justification was antecedent to the law and independent of it: that the Jewish converts were to consider the law as now dead, and themselves as married to another: that what the law could not do, in that it was weak through the flesh, God had done by sending his Son: that God had rejected the unbelieving Jews, and had substituted in their place a society of believers in Christ, collected indifferently from Jews and Gentiles.' A doctrine of this sort was not however likely to be acceptable to the Jewish members of the Christian church; and accordingly we find that St. Paul makes every attempt to reconcile them to it; and whenever he says anything disparaging of them, invariably qualifies or softens it by a subsequent observation. Instances of this occur very frequently, and especially in the tenth and eleventh chapters.

(Young; Horne; Townshend; and Stuart. For examples of undesigned coincidence between this Epistle and the *Acts of the Apostles*, the reader is referred to Paley.)

ROMA'NUS I., an Armenian by birth, served with distinction under Leo the Philosopher and his son Constantine Porphyrogennetus, who made him great admiral. Romanus gave his daughter Helena in marriage to the emperor, who made him his colleague in the empire, A.D. 919. Romanus became in fact the real emperor, the weak character of Constantine not being equal to the cares of the state. His own sons however, whom he had named Cæsars, conspired against him, and having seized him, they confined him to a convent (A.D. 945), where he died in the year 948. His two sons did not reap the fruit of their unnatural treachery; they were seized by order of Constantine, and banished to a convent.

ROMA'NUS II., son of Constantine Porphyrogennetus, and grandson, by his mother's side, of Romanus I., poisoned his father, and succeeded him, A.D. 959. He showed himself as incapable as he was unworthy of the throne. After a reign of little more than four years, he died in 963, it is said by some of poison administered by his wife Theophana. His widow became regent and guardian of her infant children, and she soon after married NICEPHORUS PHOCAS.

ROMA'NUS III., of a patrician family and senator of Constantinople, was chosen his successor by Constantine IX., and the emperor gave him in marriage his daughter Zoe. He succeeded Constantine, A.D. 1028. The beginning of his reign was favourable, but he afterwards met with reverses, his armies having been defeated by the Saracens, and he became stern, avaricious, and unpopular. His wife Zoe, much younger than himself, having formed a guilty connection with an obscure individual called Michael of Paphlagonia, caused her husband to be murdered in the year 1034, upon which she married Michael, and placed him on the throne.

ROMA'NUS IV., DIOGENES, of a noble family, was a soldier under the reign of Constantine Ducas, and after that emperor's death was chosen by his widow Eudocia for her husband and her partner on the throne, A.D. 1068. [EUDOCIA.] He passed with an army into Asia, and carried on a successful war against the Turks, whom he drove beyond the Euphrates. Having afterwards entered Armenia, he was defeated by Alp Arslan, sultan of the Turks, and taken prisoner. He was kindly treated by his conqueror, and obtained his liberty by paying a heavy ransom. In the meantime a revolution had taken place at Constantinople, where Michael, son of Constantine Ducas, had risen against his mother, and shut her up in a convent. Romanus on his way homewards was seized by order of Michael, was deprived of his sight, and banished to the island of Prinkipos, in the Sea of Marmara, where he soon after died, A.D. 1071.

ROMANZOFF, or ROMANZOW. [CATHARINE II.]

ROMANZOFF, NICHOLAUS, COUNT, was the son of the field-marshal Romanzoff who became celebrated by his victories over the Turks under the reign of Catherine II. He was born in 1753, and appointed Russian minister at Frankfort on the Main in 1785. Under the emperor Alexander he was nominated minister of commerce. He introduced many liberal measures into his department, and it was owing to his exertions that the first Russian expedition round the world, under Krusenstern and Lisianski, was sent out in 1803. In 1807 he was appointed minister for foreign affairs, and soon afterwards chancellor of the empire.[*] He accompanied the emperor Alexander to the interview with Napoleon at Erfurt in 1808, concluded the treaty of peace with Sweden in 1809, and that of peace and alliance with Spain in 1812, by which Russia formally acknowledged the constitution of the Cortes of Cadiz. In 1814 he left public life, and devoted his time and fortune to the promotion of literature, science, and education in his own country. Many important works were published at his expense, as for instance the diplomatic code of Russia at Moscow; the history of the Byzantine writer Leo Diaconus, edited by Professor Hase at Paris, and a Russian translation at St. Petersburg; the history of the Mongols and Tatars by Abulghazi, which was printed for the first time in the original Tatar at Kazan, 1825; and many other important publications relating not only to the political history of Russia, but also to that of its manners, customs, literature, and art. The scientific expedition round the world by Captain Kotzebue in the years 1815-18 was undertaken and the account of it was published at the expense of Romanzoff. He established on his estate of Homel in the government of Mohiloff, under the direction of an Englishman, Mr. Heard, the first Lancasterian and industrial schools in Russia. This patriotic individual died in 1826. He had never been married.

The Russian mode of writing his name is Rumiancoff, pronounced Roomiantzoff, but the form Romanzoff has been adopted in all foreign works.

ROMBOUTS, THEODORE, a painter, was born at Antwerp in 1597, and studied under Abraham Jansens until he was twenty years of age, when he went to Rome, and was soon known as one of the most promising young artists of his time. He obtained from a nobleman in that city a commission to execute a series of twelve pictures of subjects from the Old Testament, which, when completed, added greatly to his reputation. After residing at Rome a few years, and gaining constant employment, he was invited to Florence by the grand-duke of Tuscany, and executed for that prince several large historical works for the palace. After an absence of eight years, Rombouts returned to Flanders, and established himself in his native city in 1625. He was soon engaged to paint in the churches, and his pictures excited universal admiration. He was thus induced to believe that he could rival if not surpass Rubens, who was then in the full exercise of his astonishing powers. Rombouts made the trial, and though he did not succeed, his failure was unattended by disgrace. If his works do not possess the magnificence of his great competitor in their conception, nor his splendour and breadth of effect in their execution, they must be admitted to show a readiness of invention, a correctness of design, an animation of expression, a warmth and brilliancy of colouring, and a surprising facility of touch, which would have placed him, at another time and under other circumstances, at the head of his profession The works which he executed in competition with Rubens were, St. Francis receiving the Stigmata; the Sacrifice of Abraham in the Church of the Recolets; and Themis with the Attributes of Justice, in the town-house of Ghent. The Taking Down from the Cross, in the cathedral of the same city, is a composition which proves that Rombouts possessed most of the qualities of a great master. In order to gain money, he did not hesitate to paint familiar subjects, such as concerts, assemblies, and merry-makings, which, though executed with taste and freedom, are far inferior to his other works. He also painted decorations for theatres. Having amassed a considerable fortune, he commenced building a handsome mansion, but had not proceeded far when he found his means to be inadequate, and he pretended that the grand-duke of Tuscany required his attendance at Florence, as an excuse for not proceeding with the edifice. The mortification of this disappointment is supposed to have hastened his death, which took place at Antwerp in 1637, according to Houbraken, and according to Weyermans in 1640.

(*Biographie Universelle*; Bryan's *Dictionary of Painters and Engravers.*)

ROME, ROMA, the head town of the Papal State, and formerly the capital of the whole Western world, is situated in the wide plain of the Campagna, on the banks of the Tiber, 15 miles from the sea-coast, in 41° 54′ N. lat. and 12° 28′ E. long. The Campagna about Rome is not a plain, like the flats of Apulia or Lombardy; it is a kind of table-land with a very undulating surface, crossed by groups and ridges of low hills, and it slopes towards the south-west with a rapid descent to the alluvial marshy tract of the Maremma, which extends along the coast of the Mediterranean. [CAMPAGNA DI ROMA; MAREMMA.] The descent from the dry table-land of the Campagna to the maritime plain occurs, as we follow the right bank of the Tiber, about ten miles below Rome, and two miles and a half above Capo due Rami, or the bifurcation of the Tiber. At that point the table-land is from 100 to 120 feet above the sea. On the left or southern bank the descent is nearer the bifurcation, above the Marsh of Ostia. [OSTIA.] Farther south-east, the villages of Pratica (the antient Lavinium) and Ardea stand on the edge of the slope.

The basin of the Lower Tiber, after the river emerges from the Sabine Hills on one side and Mount Soracte on the other, and enters the Campagna, partakes of the character both of the lowlands and the table-land, the immediate banks of the river being considerably lower than the surrounding country. The site of Rome consists partly of several strips of low land on both banks of the Tiber, the ordinary level of the river being there about 35 feet above that of the sea, and partly of the table-land of the Campagna, which rises on both sides from 150 to 200 feet above the river. The projections of this table-land which advance towards the river have been, perhaps improperly, called hills; and hence, the name of the Seven Hills. After the enlargement of the city walls by Aurelian, these hills or projections were considerably more than seven. On the right bank of the river, the Vatican and the Janiculus, which are within the modern city, are a continuation of the ridge of Monte Mario, which is outside of the walls to the north, and is 450 feet above the sea, and of Monte Verde to the south. On the left or eastern bank, the table-land of the Campagna extends, within the walls of Rome, in a semicircular shape, forming several projections to the west towards the river. The low grounds between these projections and the river constitute the Campus Martius, on which the greater part of the modern town is built. Beginning from the north, the first projection of high lands within the town is that called Monte Pincio (the antient Collis Hortulorum); farther east, and partly separated from it by a depression or ravine, is the Quirinal, and still farther south-east the Esquiline. In a kind of recess between the Quirinal and the Esquiline is a smaller projection, which has received the name of Mount Viminalis, but which is now hardly distinguishable from the other two. It rises above and north of the church of San Lorenzo Panisperna. The Quirinal, Viminal, and Esquiline are joined on the east, within the walls of Rome, by an extensive plateau, which is about 150 feet above the ordinary level of the Tiber, and which slopes gently towards the country outside of the walls of Rome. The highest points of the Esquiline and the Quirinal are nearly 200 feet above the Tiber. South of the Esquiline, and separated from it by a depression or valley, is Mount Cælius, which seems to be more insulated than the other hills already mentioned, as it slopes eastwards towards the country outside of Porta S. Giovanni, and is also divided on the south from the Aventine by the valley of the Aqua Crabra or Marrana. Within the space that is enclosed between the table-land and the Tiber, and in the middle of the antient city, there are three small insulated hills, the Palatine, the Aventine proper, and the Capitol, of which the Aventine is the most southern and the Capitol the most northern. The Capitol rises between the south-west extremity of the Quirinal and the left bank of the Tiber, and nearly fills up the intermediate space. The antient city of Rome, before the time of Aurelian, lay south and east of the Capitol, and along the Palatine, Aventine, Cœlian, Esquiline, and Quirinal hills: the main bulk of modern Rome lies north of the Capitol.

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[*] The chancellorship is the highest civil rank in Russia, and the place is for life. It has nothing in common with its synonymous dignity in England; the chancellor of Russia is the head of the foreign department.

The Tiber, on approaching Rome from the north, makes a sweep to the east towards the base of Monte Pincio, receding from Monte Mario and the Vatican hill on its right bank; but on reaching Ripetta within the city, the river makes a bend to the westward, and flows along the north-eastern base of Mount Janiculus, after which it turns again to the east as far as the base of the Capitol. It then turns again to the south-west, sweeping past the base of the Aventine, and along the southern extremity of the Janiculus. It then assumes a course south by east. The level space between the Vatican Mount, the north end of the Janiculus, and the right bank of the river, is the Vatican field, which is about a mile long from east to west. It contains the Borgo or suburb of Rome, enclosed by the popes, and St. Peter's church, the Vatican palace, and their appurtenances. The space between the long ridge of Mount Janiculus and the right bank of the Tiber constitutes the district of Transtevere, which is another suburb of Rome. The space on the left bank running north and south, and between the great westward bend of the river and the eastern hills, is the site of the modern city of Rome, properly speaking, which extends also along the slope of the Pincian, Quirinal, part of the Esquiline, and the Capitol, forming a kind of triangle, of which the apex is to the north, at the Porta del Popolo, and the base extends from Santa Maria Maggiore on the east, to the Tiberine island on the west, a distance of about a mile and a quarter, whilst from the Porta del Popolo to the foot of the Palatine opposite Ponte Rotto, the farthest southern point of modern Rome, the distance is rather more than a mile and a half. All to the south and east of these limits, forming about two-thirds of the area within the walls, is desolate, consisting of ruins, gardens, and fields, with some churches, convents, and other scattered habitations.

The present line of walls of Rome proper on the left bank of the river is generally understood to be that traced by Aurelian, restored by Honorius, and afterwards by Belisarius, and since repeatedly renewed by several popes. It describes an irregular polygon, of which the longest diameter is three miles in length from north-west to south-east, from the Porta del Popolo to the Porta S. Sebastiano on the Appian road. The whole circuit of the present walls, including those of Transtevere and of the Borgo or Vatican, is between fourteen and fifteen miles. The wall is made of brick mixed with stones and rubbish, and has been often repaired. It varies in height, but in most places does not exceed 15 feet. It has no ditch, but is flanked by towers and bastions, which were last repaired by Pope Benedict XIV. Rome has sixteen gates, some of which however are walled up. Beginning from the north is: 1. Porta del Popolo, on the Flaminian way, or high northern road, which divides at a short distance from Rome, one branch leading to Florence and the other to Ancona. 2. Farther east, the next gate is Porta Pinciana. 3. Porta Salara or Salaria, on the road to Rieti. 4. Porta Pia, on the north-east, formerly Nomentana, the road from which joins the Via Salaria. 5. Porta S. Lorenzo, facing the east, and leading to Tivoli. 6. Porta Maggiore, leading to Palestrina: this is the handsomest of the gates of Rome, being originally part of the aqueduct of Claudius restored by Vespasian and Titus, which is attested by the triple inscription over it. It consists of a fine arch which crosses the high road, built of Travertino or Tiburtine stone. 7. Porta S. Giovanni, which looks to the south-east on the modern road to Albano and Naples. 8. Porta Latina, the road from which joins the Naples road. 9. Porta S. Sebastiano, on the antient Via Appia. 10. Porta S. Paolo, on the road to Ostia. Crossing the Tiber, we find, 11. Porta Portese, which leads to Fiumicino, the present port of Rome. 12. Porta S. Pancrazio, on the summit of Mount Janiculus, which is nearly 300 feet above the Tiber. Outside of this gate is the Villa Pamfili, with its shady walks, its waterworks, and beautiful groves of lofty umbrella pines. 13. Porta Cavalleggieri, south-west of St. Peter's; it leads towards Civita Vecchia. 14. Porta Fabbrica, on the same side, is now walled up. 15. Port' Angelica, on the opposite or northern side of St. Peter's, on the road leading to Monte Mario. 16. Porta Castello, which opened from the Castle of S. Angelo northwards into the country, and is now walled up. Besides these, there are two internal gates, one called S. Spirito, leading from the Borgo to the Lungara, and the other Porta Settimiana, leading from the Lungara to Transtevere. These districts, Borgo and Lungara, have been consecutively annexed to the modern city.

The course of the Tiber within Rome, including its windings, is about three miles; the banks are not built up with quays or walks, but in most places the river is bordered by the backs of houses generally of an inferior sort; in other places there is a slip of sand or gravelly ground between the houses and the river, which is frequently overflowed. There are only two places where there is a sort of quay or landing-place; one in the northern part of the town, on the left bank, above the bridge of S. Angelo, called Ripetta, where the boats from the inland provinces on the upper Tiber land wine, charcoal, and provisions; and the other at the southern extremity of the town, on the right bank near Porta Portese, called Ripa Grande, where sea-vessels land their cargoes, and where there is a line of warehouses and a custom-house. There are three bridges across the Tiber within Rome; the northernmost is Ponte Sant'Angelo, the Pons Ælius, built by Hadrian, and restored by several popes, and lastly by Clement IX., by whose order Bernini constructed the present balustrade and the statues with which it is decorated. It is about 300 feet long, but the width of the bed of the river is not more than 200 feet The Ponte Sisto, formerly Pons Janiculensis, built originally by Marcus Aurelius, and rebuilt by Sixtus IV., is about 300 feet long, the bed of the river being 230 feet wide. About half-a-mile lower down is the island of San Bartolomeo, the antient Insula Tiberina. This island is of an oblong shape, something like a ship, being about 1000 feet long, and 300 feet wide in the middle of its length. It is joined to the mainland by two bridges; one to the left bank called Ponte San Bartolomeo; and the other to the right bank, called Ponte Quattro Capi, from a head of Janus Quadrifrons which once decorated it. The two arms of the river together form a bed of about 200 feet in width. There are also within Rome the remains of three antient bridges: the Triumphalis, called also Vaticanus, just below Sant' Angelo, of which the piers have fallen into the bed of the river and occasion a rapid; the Pons Palatinus, now called Ponte Rotto, of which three arches remain on the Transtevere side; and lastly, the Pons Sublicius, at the foot of the Aventine, the first bridge built by the Romans, of which there are very few vestiges.

Rome is divided into fourteen districts, called Rioni, which however do not correspond in their boundaries to the Regiones of the antient city. The modern Rioni are of very unequal extent, their boundaries being determined with reference to the population included within them. Thus the inhabited part of the city contains eleven Rioni, namely: 1, Campo Marzo, near Porta del Popolo; 2, Colonna; and 3, Trevi, along the slope of the Pincian and Quirinal; 4, Sant' Eustachio; and 5, Pigna, in the middle of the lower town, 6, Ponte; 7, Parione; and 8, Regola, near the left bank of the Tiber; 9, Sant' Angelo in Pescheria, between the Capitol and the Tiber; and 10, Transtevere; and 11, Borgo, on the right bank of the river. The whole of the antient or southern city is comprised within three extensive Rioni namely: 12, Monti, on the north-east; 13, Campitelli, south east; and 14, Ripa, south-west.

The modern town of Rome may be conveniently divided, for the sake of topographical description, into three great divisions: 1, the lower part of the town between the eastern hills, the Tiber, and the Capitol; 2, the upper town, which extends along the eastern hills; 3, the part of the town which is on the right bank of the Tiber.

The lower town, which occupies the site of the ancient Campus Martius and Campus Tiberinus, is the seat of all the bustle and trade. It is crossed in its central part from north by west to south by east by the street Del Corso, which is about one mile in length from the Piazza del Popolo, or great northern entrance of Rome, a handsome open place with an obelisk in the middle, to the palace of Venice, near the foot of the Capitol. Two other streets branch out from the Piazza del Popolo, on the right and left of the Corso, and at an acute angle with it. One leads south-east to the fine open place called Piazza di Spagna, the great resort of foreigners, at the foot of the Pincian Mount, after crossing which, it continues in the same direction to the College of Propaganda at the foot of the Quirinal. The other street, called Ripetta, runs in a south direction, parallel to the bank of the Tiber, and then, following the bend of the river, leads, under a different name, to the bridge of Sant' Angelo.

About the middle of the Corso is a square, called Piazza Colonna, from the antient pillar which stands in the middle of it. [ANTONINE COLUMN.] Immediately to the west of the Piazza Colonna is an irregular square, which crowns a slight eminence called Monte Citorio, or Citatorio, a small hill which rises in the middle of the Campus Martius. It contains a fine building, called Curia Innocenziana, in which the courts of justice sit: a handsome obelisk stands in front of it. Returning to the Corso, and following it southwards, we meet with a street on the left, which leads to the Fontana di Trevi, the handsomest fountain in Rome, and then we come to another street, leading to the ascent of the Quirinal, or Monte Cavallo. Farther up the Corso, on the right, is a wide street, called Strada del Gesù, which leads to the splendid church and convent of that name, the head-quarters of the Order of the Jesuits, from whence, turning to the left, is a street that leads to the foot of the Capitol. The whole of this part of the city, in the neighbourhood of the Corso, consists chiefly of regular and substantial buildings. The most remarkable are: 1. the Palazzo Borghese, near Ripetta, one of the largest and finest in Rome; it contains a choice collection of paintings, by Titian, Domenichino, Albano, Annibale Caracci, Caravaggio, Parmigiano, and other great masters. 2. Further north the old mausoleum of Augustus has been transformed into an amphitheatre, called Correa, for bull-fights, fireworks, and other popular diversions. 3. Palazzo Ruspoli, on the Corso, in a good style of architecture, by Ammanato, has a much-admired staircase, constructed by Martino Longhi, consisting of 115 steps, each of a single block of white marble. The extensive ground-floor of the palace has been converted into a coffee-house, which is the largest in Rome, and consists of various rooms, where several 'crocchi,' or clubs of lawyers, merchants, and other persons assemble, that of the contributors to the 'Giornale Arcadico,' the literary review of Rome, among the rest. The club of the artists is held at the Caffé del Greco, in the Piazza di Spagna; that of the antiquarians at the caffé of Fontana di Trevi; the club of professors and other men of letters meets at the Caffé di Monte Citorio. 4. Palazzo Ghigi, which forms the north side of the Piazza Colonna, contains some choice paintings, and a fine library rich in curious MSS., among others an inedited chronicle of the monastery of Mount Soracte; a copy of Dionysius of Halicarnassus, written in the eleventh century; several letters of Melancthon; one of Henry VIII. of England, concerning Luther; about twenty volumes of original documents relative to the treaty of Westphalia; a handsome parchment volume, in folio, containing French and Flemish music of the fifteenth century, &c. 5. Palazzo Piombino, on the opposite or south side of the square. 6. Palazzo Sciarra Colonna, on the Corso, has a rich collection of paintings and a handsome Doric marble gate. 7. Palazzo Doria, a vast building, designed by Borromino, also contains a gallery of choice paintings. 8. The Palazzo Torlonia, formerly Odescalchi, or Bracciano, on the Piazza S. Apostoli, has a splendid marble gallery fitted up in the modern taste, and some good modern paintings. 9. On the opposite side, next to the church of S. Apostoli, is the Palazzo Colonna, with a handsome court and gardens behind, which extend up the slope of the Quirinal, and a gallery of paintings with some splendid portraits by Titian, Veronese, and Giorgione. 10. The huge Palazzo di Venezia, so called because it once belonged to that proud republic, is now occupied by the Austrian ambassador; it looks like an old castle, with its massive walls and battlements. 11. Opposite the church of the Gesù is the Palazzo Altieri. All these palaces are in the immediate neighbourhood of the Corso. The principal churches in the same district are: 1. Santa Maria del Popolo, which, like most churches at Rome, contains some good paintings, several remarkable sepulchral monuments, and a handsome chapel belonging to the Ghigi family. 2. San Carlo al Corso. 3. S. Lorenzo in Lucina, raised on the ruins of an antient temple. 4. S. Ignazio, which is rich in ornaments, adjoins the Gregorian or Roman College. 5. The handsome church del Gesù contains some good and some indifferent paintings, the splendid chapel of S. Ignatius, enriched with lapis lazuli, silver, and gold, and the mausoleum of Bellarmino, by Bernini. 6. Santi Apostoli, with the fine mausoleum of Pope Ganganelli, the work of Canova when only twenty-five years old (which has been so graphically described by Milizia in his letters), and a cenotaph, by the same illustrious artist, to the memory of his friend the engraver Volpato. In the adjoining cloisters is the tomb of Cardinal Bessarion. 7. S. Marcello contains the sepulchral monument of Cardinal Consalvi. 8. Santa Maria in Vialata, &c.

West of the Corso, and between it and the Tiber, is a dense mass of irregular streets, a busy part of the town, containing market-places, shops, and inferior dwellings, with here and there a fine building. Towards the centre of this district is the fine oval place called Piazza Navona (the antient Circus Agonalis), one of the largest in Rome, with its fountains, by Bernini, its three churches, and the modern palace Braschi at one extremity of it. The university called La Sapienza is in the neighbourhood. Between it and the Corso is the Rotunda [PANTHEON], next to which is the Palazzo Giustiniani, and on the other side of it is the large church and Dominican convent of La Minerva. Nearer to the river are: 1. the Palazzo della Cancelleria, by Bramante. 2. The Palazzo Farnese, the best-built in Rome, with a square before it, ornamented by two handsome fountains; some of the apartments are painted by Caracci, Zuccari, Vasari, and others. Next to the Piazza Farnese is another square, called Campo di Fiore. 3. The Palazzo Spada, with a collection of antient sculptures, among others the supposed statue of Pompey, and some very fine basso-relievos, found at Santa Agnese without the walls. 4. The handsome church of Santa Maria in Vallicella, belonging to the brothers of S. Filippo Neri, or Congregation of the Oratoire [NERI, FILIPPO; ORATORIO], a most gentlemanly, unassuming, and useful body of clergymen. The library contains many valuable MSS., historical and ecclesiastical. 5. The church Santa Maria dell'Anima has some good paintings, and the monuments of Pope Adrian VI. and of Lucas Holstenius, a Protestant converted to Catholicism, who died librarian of the Vatican. Holstenius was succeeded in his office by Allatius, a native of Chios, and Allatius was succeeded by J. Simonius Assemani, a Maronite. This heterogeneous succession of librarians gave occasion to the following distich, in the caustic humour of modern Rome:—

> 'Præfuit hæreticus; post hunc schismaticus; at nunc
> Turca præest: Petri bibliotheca, vale.'

Near the left bank of the Tiber, and parallel to it, runs a handsome regular street, called Strada Giulia, about three-quarters of a mile long, from Ponte Sisto to Ponte S. Angelo. This district, though well built, is dull, when compared with the Corso and the adjoining streets.

South of Ponte Sisto, along the left bank of the Tiber, and extending round the western base of the Capitol to the foot of the Palatine, is the lowest, meanest, and dirtiest part of modern Rome. It is partly occupied by the Jews, who are cooped up to the number of 4000, in several narrow filthy alleys, in rows of tall old houses, near the river side, between Ponte Sisto and Ponte S. Bartolomeo. They are not allowed to live outside of their district, called Ghetto, which is separated by a wall from the rest of the town. They are not otherwise molested. They have their Rabbis and a synagogue, a sort of municipal council, their schools, support their own poor, and follow their customary occupation of buying and selling. The lower sort are seen about the streets of Rome, with their dingy bags, crying 'robi vecchi,' old clothes. Some of the higher class carry on trade with foreign countries, and are regular merchants. It has been observed that this district, low and dirty as it is, is remarkably healthy. Facing the Ghetto is the island of San Bartolomeo, with the church of that name, and an hospital, kept by the philanthropic congregation commonly called the Ben Fratelli, from their motto, 'Fate bene, Fratelli' ('brethren, do good' to your fellow-men), which was founded in Spain, about 1538, by S. Juan de Dios: the brethren devote themselves to attend on and nurse gratuitously the sick poor. Proceeding farther south, along the left bank of the river, is a succession of narrow streets, extending to the foot of the Palatine, with some of the most antient churches in Rome, especially Santa Maria in Cosmedin, built in the third century of our æra, it is said, on the ruins of a temple, or rather sacellum, dedicated to Pudicitia Plebeia by Virginia, daughter of the patrician Aulus, who, having married the plebeian consul Volumnius, was excluded from the sacellum of Pudicitia Patricia. The conduct of Virginia on this occasion, as represented by Livy (x. 23), is full of interest. The church of Santa Maria in Cosmedin is adorned with two rows of fine antient columns. It is also called Bocca della Verità, from a large stone mask with a large mouth which is seen in the portico of the church, and the use of which is unknown. In the same neighbourhood are the churches of S. Giorgio in Velabro, Santa Anastasia, Santa Maria Egiziaca, and of S. Teodoro, said to be on the site of the temple of Romulus, on the Palatine, at the southern extremity of the inhabited part of modern Rome, on the left bank of the Tiber. Beyond it, the Aventine, Palatine, and Cælian hills stretch to the south and south-east. They are occupied with fields and gardens, and contain several churches, convents, and scattered ruins.. The most remarkable churches are: Santa Sabina and S. Alessio, on the Aventine, and S. Bonaventura and its adjoining solitary convent and garden, on the Palatine. The Cælian, an extensive hill, has some interesting churches: 1. S. Gregorio, a fine building on the west slope of the hill, has splendid frescoes by Domenichino and Guido, representing the martyrdom of St. Andrew; a painting of Pope St. Gregory by Annibale Caracci; and a statue of the same pope. Imperia, a kind of modern Aspasia, rich, accomplished, and well informed, who lived in the age of Leo X., and was the friend of Beroaldo, Sadoleto, Campani, and other learned men of that period, was buried in this church, where her epitaph was still seen in the last century, but has been since removed, in consequence of repairs. 2. S. Stefano Rotondo is an antient circular building, transformed into a church in the fifth century, and is remarkable as exhibiting the various changes in the history of the arts through the dark ages. 3. S. Giovanni e Paolo, belonging to the Order of Barnabites, in a fine situation, commanding a view of the Palatine and Aventine, is much resorted to by persons religiously inclined, who retire thither for a time, and board in the convent, where they employ themselves in pious exercises, and in quiet meditation, which the solitude of the spot and the view of the majestic ruins before them are well calculated to assist. A solitary palm-tree rises in the garden of the convent; there is another in the garden of S. Bonaventura, on the Palatine. No one has better described the scenery of this part of Rome and the impression which it produces, than Madame de Staël, in her 'Corinne.' The Villa Mattei occupies a considerable space on the Cælian hill. The group of buildings connected with the Basilica of S. Giovanni, at the eastern end of the Cælian, is described under LATERAN. The Colosseum, triumphal arches, and other antient remains are noticed hereafter. Between the Lateran and the Colosseum is the remarkable antient church of S. Clemente.

South of the Aventine, and between it, the Tiber, and the walls, is a large space of low ground laid out in fields, part of which are common, and go by the name of 'Prati del Popolo Romano.' An artificial hill, called Mount Testaccio, rises on one side of them: it is formed of a quantity of broken earthenware (testæ) and other rubbish which has been thrown and has accumulated here from antient times, and over which a green turf has formed. The modern Romans have excavated cellars in the side of the hill, where they keep their wine cool, and the place is resorted to on holidays by the people of Rome, especially the lower orders, something like the tea-gardens outside of London. On the other side, by the gate of S. Paolo, is the Protestant burying-ground, and near it is the pyramid of Caius Cestius.

The upper town, or eastern part of modern Rome, stretches up the slope of the Pincian and Quirinal hills, and occupies also part of the plateau which unites all the eastern hills of Rome. This part is not so densely built as the lower town: it consists in great measure of palaces and villas, of churches, convents, and other large buildings, with spacious courts and gardens, and is intersected by two fine long streets, which cross each other at right angles on the summit of the Quirinal, forming there a small circus, with a fountain at each bifurcation, from which the place has received the name of 'Le Quattro Fontane.' We shall briefly describe this part of the town, beginning from the north.

On the terrace or plateau of the Pincian Mount there is the fine new promenade or public walk, laid out during the French occupation. Next to it is the villa Medici, now the Academy of French pensionary artists; and the church of La Trinità de' Monti, and the esplanade with the obelisk in front of it, from which there is a splendid view of modern Rome. From this esplanade a good street, called Via Sistina, leads in a south-east direction to the Piazza Barberini, which lies in the depression between the Pincian and the Quirinal. The Palazzo Barberini, one of the largest in Rome, is at the east end of the Piazza. It contains a good collection of paintings, among others, the celebrated portrait of La Cenci painted by Guido, who had seen her on the scaffold at her execution. The library of the Barberini palace has about 50,000 printed volumes, and many valuable MSS., autograph letters, and other documents. [BARBERINI.] At the north end of the Piazza Barberini is the church and convent of the Capuchins, with its garden, which is kept in excellent condition, like all the gardens of the convents of that order; and adjoining them is the vast and splendid patrician villa Piombino, called also Ludovisi, from Cardinal Luigi Ludovisi, nephew of Gregory XIV. It has beautiful walks, and in the apartments of the principal casino is a valuable collection of antient sculptures, and also the fresco of Aurora by Guercino.

South of the Piazza Barberini rises the Quirinal Mount, which bears on its summit the extensive pontifical palace and gardens. At Rome it is commonly called Monte Cavallo, from the two colossal statues of Castor and Pollux, with their horses, which stand in the square before the palace. On the east side of the square is the Palazzo della Consulta, and next to it the Palazzo Rospigliosi, which occupies an extensive area. In a detached gallery or summer-house of the latter is the celebrated Aurora of Guido, which is considered the masterpiece of that great painter. A fine street, about a mile in length, leads from the square of the pontifical palace along the plateau of the Quirinal to Porta Pia, passing near the Thermæ of Diocletian. It is crossed at the Quattro Fontane by another street, leading from the Piazza Barberini to Santa Maria Maggiore, from whence several streets lead to Porta Maggiore, Porta S. Lorenzo, and Porta S. Giovanni. The magnificent church of Santa Maria Maggiore on the Esquiline hill, which here joins the Quirinal, is the eastern extremity of modern Rome. Beyond it, north, east, and south, the whole expanse of the Esquiline is occupied by gardens, villas, and fields, with some solitary churches. The more interesting of these churches are: 1, S. Pietro in Vincoli, built first by Eudoxia, wife of Valentinian III., and rebuilt by Pope Adrian I.: it contains the mausoleum of Julius II., with the statue of Moses by Michel Angelo. 2nd, The handsome church of S. Martino ai Monti, with its antient oratory and vaults, its modern embellishments, and the frescoes by Poussin, is worthy of notice.

Between the west slope of the Esquiline and the south slope of the Quirinal are several streets inhabited chiefly by the lower orders, which extend to the Campo Vaccino. Farther north, at the foot of the Quirinal, and in the gap between it and the Capitoline Mount, is the piazza which contains Trajan's column.

The Capitoline Mount and its buildings are described under CAPITOL.

The third great division of modern Rome, which lies on the right bank of the Tiber, consists of two distinct parts: Il Borgo, or Vatican, and Transtevere, properly so called, which are divided from one another by an inner wall. The Borgo, or Città Leonina, extends from the bridge of St. Angelo to the Place of St. Peter's. The group of buildings constituting St. Peter's and the Vatican palace are described under VATICAN. The other remarkable building in the Borgo is the great charitable establishment of Santo Spirito, the largest in Rome, situated close to the right bank of the Tiber. It comprises an hospital for the sick, which in the summer months contains from 1000 to 1200 patients at a time, a foundling hospital, and a lunatic asylum.

The castle Sant' Angelo (of which the massive circular tower was built by Hadrian for his mausoleum, and the fortifications around it, consisting of ramparts, ditches, and bastions mounted with cannon, were begun by Pope Boni face IX. and continued by successive popes) is the citadel of Rome, but it is not capable of a regular defence. It serves as a state prison and also as a house of correction.

The district called Transtevere lies south of the Borgo and between the Janiculus and the Tiber, and communicates with the Borgo by the handsome gate of S. Spirito. The Janiculûs is a long straight ridge about a mile and a half long from north to south, and it rises nearly 300 feet above the level of the river. In the northern half of its length it rises almost immediately from the bank of Tiber, leaving however sufficient level ground for a street, which from its length is called La Lungara. This street contains some fine buildings, the Palazzo Salviati, the Palazzo Corsini, one of the handsomest in Rome, once the residence of Christina of Sweden, with a gallery of paintings, a library, and delightful gardens which extend up the slope of the Janiculus, and from which there is a splendid view of Rome; and lastly, La Farnesina, a house and gardens built by the wealthy banker Ghigi in the time of Leo X., with some fine frescoes by Raphael. On the slope of the Janiculus is the Villa Lante, the casino of which was painted by Giulio Romano. The church and convent of S. Onofrio, likewise on the Janiculus, above La Lungara, is worthy of notice, as having been the last asylum of Tasso, where he died and was buried. Another Italian poet, Guidi, is also buried at S. Onofrio.

Towards the southern end of the Lungara the hill recedes farther from the banks of the river, which here makes a bend to the east, and it is within this bend that the great bulk of the district called Transtevere is situated. Some of the streets run up the Janiculus to the gate of S. Pancrazio, but the higher part of the hill is chiefly unbuilt, though it is enclosed within the walls. The villa Spada is in this part, near the gate, outside of which is the villa Pamfili, a favourite promenade of the youth of Rome, with shady walks, waterworks, and clusters of lofty umbrella pines. Among the most remarkable buildings of Transtevere is the church of S. Pietro in Montorio, which contains some fine paintings, and in the cloisters an elegant circular temple by Bramante. Above S. Pietro in Montorio, in a commanding situation, is the fountain of L'Acqua Paola, the largest in Rome, which appears at a distance like a triple triumphal arch with streams of water rushing through: it was constructed by Paul V. with the marble taken from a temple of Minerva. Lower down, at the foot of the hill, is the collegiate church of Santa Maria in Transtevere, a vast and handsome structure, with granite and porphyry columns, rich marbles, some good paintings, and an old mosaic of the twelfth century. Near to it is the fine Benedictine convent of S. Calisto, in the library of which is a splendid Latin Bible of the ninth century, which is supposed to have belonged to Charlemagne, but from the illuminations it appears more probable that it was written for his grandson Charles the Bald. A long street leads from S. Calisto to the church and convent of S. Francesco a Ripa, once inhabited by St. Francis of Assisi. The church is ornamented with paintings, sculptures, and rich marbles, and has a chapel with vaults belonging to the the Pallavicini family. Not far from S. Francesco is the large building of S. Michele a Ripa, near the Tiber, facing the Aventine hill, which rises on the opposite bank. S. Michele is one of the most useful and best conducted charitable establishments of Rome, and is inhabited by above seven hundred persons. It consists of a work-house or house of industry for poor boys and girls, of a school of the fine arts for those boys who have a taste for them, of an asylum for the old and infirm of both sexes, and of a house of correction for juvenile offenders. Tournon, Valéry, and other recent writers agree in praising the arrangement, and regulation of this important establishment. Along one side of this vast building is the handsome quay and landing-place of Ripa Grande, where the vessels which ascend the Tiber from the sea land their goods, and annexed to which are warehouses. Below it is the Porta Portese, or gate leading to Fiumicino, which is the southern extremity of Rome on the right bank of the Tiber.

There are above three hundred churches in Rome, most of which are worthy of notice, either for their architecture or for their paintings and other ornaments. We have mentioned a few of the most interesting, and we refer to Vasi, Fea, and the other guide-books for further information. The churches constitute one of the principal attractions of modern Rome.

The palaces of the nobility form another class of interesting objects. It has been said sneeringly, that every house at Rome that has a 'porte cochère,' or carriage-gate, is called a palace: this may seem very witty, but it is nevertheless true that Rome contains many real palaces, buildings of princely magnitude and imposing style, containing vast courts and long ranges of spacious apartments, and it can boast of a greater number of these than any other capital in the world. In point however of interior comfort, neatness, or splendour, most of them are sadly deficient. The walls are of Travertino or Tiburtine stone, the pillars and staircases are frequently of marble and other costly materials; but the furniture is old, clumsy, and scanty; the floor of the apartment is often of unvarnished brick, and the curtains and tapestry are dingy, and a general want of cleanliness is frequently observable. The men-servants are often numerous in the hall, but they are dirty, lazy, and ill-paid. Passing through the long suites of vast and lofty apartments, you see here and there marble tables, fine paintings, and heavy gilt chairs, but nothing resembling the Parisian salon or boudoir, or the English drawing-room. The ground-floor is either let as shops or used for coach-houses, stables, kitchens or other menial offices, and the windows are guarded with a strong iron grating, without glass behind it, which gives to the lower part of the building the appearance of a prison. Several of the Roman palaces are partly let to lodgers, and the owners occupy only one floor or part of a floor; the building being too large for any single family to live in, except such as a baronial family of the feudal times with its numerous dependants. The higher and wealthier Roman nobles however, the Borghese, Colonna, Doria, Rospigliosi, and others, still retain something of that feudal state, although they have lost their feudal jurisdiction.

The villas of the Roman nobility are more pleasant than their palaces. 'The modern villas, those splendid residences of the modern Romans, are like a connecting link between them and their proud predecessors of the classical times. The modern Roman palace differs greatly from the antient Roman house, but the villa resembles much what we read of the country-houses of the wealthy Romans of old. There is in both the same taste of magnificent retirement. The mansions of these villas have generally their front towards Rome, whose splendid horizon harmonises with the pomp of their architecture, and with the display of rich marble, statues, pillars, and vases and fountains with which they are decorated. The gardens are mostly regularly laid out, though not monotonous; they are not made, like the English parks, for the effect of scenery within, but to afford quiet walks from which to enjoy the splendid scenery without. Even in its solitary and often-neglected state, the Roman villa retains its antient classical character, and its melancholy appearance seems to add to its grandeur.' (Valéry, *Voyages en Italie*, xv. 1.) Several of the villas are within the walls of Rome, such as Medici, Piombino, Mattei, Corsini, and others which have been mentioned; others are outside of the walls, such as the Villa Pamfili, on the Janiculus; Villa Patrizi, outside of Porta Pia; and the Villa Madama, upon Monte Mario, so called from Margaret of Austria, a natural daughter of Charles V., who was married to Ottavio Farnese, duke of Parma. The house was designed by Raphael, and executed by Giulio Romano, who painted the loggia as a hall. The Villa Albani, although shamefully plundered by the French republicans in 1798, on the plea that its then possessor was, naturally enough, their political enemy, has still retained or recovered so much of its inexhaustible treasures as to be reckoned the third museum of antiquities in Rome, and next to the Vatican and the Capitol. In the time of its full splendour it was Winckelman's great study, which he illustrated in his 'Storia dell' Arte' and his 'Monumenti Inediti.' The great boast of the Albani museum is that its collection is all choice, while most other collections contain a great deal that is bad. Cardinal Alessandro Albani, who created this noble villa and its still nobler museum towards the middle of the last century, made it the business of his life; he was a man of taste and an enthusiast for antiquity and the fine arts. Among the finest sculptures are, the rilievo of Antinous, the Thetis found in the villa of Antoninus Pius at Lanuvium, the Minerva, the Jupiter, the Apollo Sauroctonos, Diogenes in his tub, the two Caryatides representing Grecian basket-bearers, the bassi-rilievi of the triumph of M. Aurelius, and others.

The Villa Borghese, on the Pincian Mount, outside of the walls, is well known for its gardens, which are laid out in the English style, its laurel and myrtle groves, its fine sheet of water, its temple, and hippodrome. The fine museum of antient sculptures was sold or given up for a consideration by the late prince to Napoleon, his brother-in-law; but it has been partly replaced by new acquisitions. Of all the enormous quantity of works of art carried away by the French from Rome, only a small part has been restored; much was purloined by private individuals and sold, much was irreparably damaged in the removal. The Borghese collection has remained in the Louvre, being a purchase; and a splendid collection of coins and gems, taken from Rome, was entirely exempted from the claim of restitution by the treaty of Paris.

The numerous handsome fountains form another peculiar ornament of modern Rome as works of art, independent of their utility. Rome is better supplied with good water than most continental towns, and was much more abundantly supplied in antient times. Of the antient aqueducts, three still continue to carry water into the town, having been repaired by the popes. The first is that of the Acqua Vergine, the best in quality, which comes from near the antient Collatia, fourteen miles north of Rome: it supplies a great part of the lower town, and feeds thirteen public fountains, of which those of Trevi, of La Barcaccia in Piazza di Spagna, of Piazza Navona, and Farnese, are the principal. The second is the Acqua Felice, the antient Aqua Marcia and Claudia, restored by Pope Sixtus V. (Felice da Montalto): it comes from the east, and supplies the upper or eastern part of the town, and feeds twenty-seven public fountains, of which that of Moses, near Porta Pia, that of Triton in the Piazza Barberini, and that of Monte Cavallo, are the principal. The third aqueduct, called Acqua Paola, the antient Alsietina, enters Rome by Mount Janiculus, and supplies both Transtevere and the Vatican, feeding the Fontana Paolina, and the splendid fountains before St. Peter's: passing the Ponte Sisto by conduits, it supplies the adjoining fountain and the neighbouring district of Strada Giulia. Tournon observes that the supply of water thus carried into Rome is much greater than that carried by the Canal de l'Ourcq into Paris for the supply of a population six times as large as that of Rome.

The obelisks which adorn most of the squares of Rome are another peculiar feature of this city. An account of them is given under **Obelisk**.

The streets of Rome are generally narrow, like those of most old cities, but many of them are straight and regular, and the great number of open spaces, such as squares, places, gardens, large courts, &c., render the town generally airy. The pavement of the streets is made of selci, or small cubes of basaltic stone, not very agreeable to pedestrians, especially as there are no footpaths except along the Corso. The streets are lighted at night with oil lamps. Rome possesses a great advantage over many continental towns, in being provided with a regular system of sewers, partly antient and partly modern. [Cloacæ.]

The lower town is subject to occasional inundations from the Tiber, which sometimes rises, in seasons of extraordinary rains, from 25 to 30 feet above its ordinary level, whilst a considerable part of the town is hardly 20 feet above the level. In 1530 the river rose above 40 feet, and the destruction which it caused is described by Baldi, in his poem 'La Nautica.'

The climate of the city of Rome has been of late years the subject of much discussion. In the time of the republic Rome was considered healthy when compared with the surrounding country. Parts of Latium were unhealthy in Cicero's time, and probably long before him; and the unhealthiness was greatly increased by the depopulation of the country, the consequence first of the wars between Rome and its immediate neighbours, and afterwards of the civil wars in the last century of the republic. Tillage cultivation was abandoned, and the country became divided among a few large proprietors, who turned fields into pasture-grounds. 'Propter avaritiam ex segetibus fecit prata,' says Varro, speaking of one of these proprietors; and Pliny observes that 'Latifundia perdidere Italiam.' Now it is proved that tillage cultivation and a dense population check the increase and spread of the malaria. The dense population of antient Rome and the elevated position of the old city, with the plentiful supply of wholesome water, the convenience of sewers, and other circumstances contributed to maintain a tolerable state of salubrity within the walls.

Cicero remarks the good choice of those who built Rome in the most favourable spot in the midst of a generally unhealthy region. (*De Republ.*, ii. 6.) Horace however (*Epist.* i. 7) complains of the fevers which prevailed in the month of August. The improvements made by Augustus, and the reconstruction of the town after the great fire in Nero's time, seem to have had a good effect on the salubriousness of the city, and Frontinus (i. 18) observes that the increased supply of water by means of additional aqueducts had contributed to render the atmosphere purer than it was in the old times. After the fall of the Empire, and the ravages committed by the barbarians, we read of the complete desolation of the Campagna during the dark ages, and of the abandonment of Porto, Ostia, Ardea, and other neighbouring towns in consequence of the malaria. At the same time a gradual removal was taking place within the walls; the population, which was much diminished, was leaving the southern part of the city for the northern, the hills for the plain of the Campus Martius.

As the southern hills, the Cœlian, Aventine, Palatine, and Esquiline, became abandoned, they became also unhealthy, for populousness and salubrity go together in the whole Maremma region. In the eleventh century Petrus Damianus (*Epist.*, xix., 'Ad Nicolaum II., Pontificem'), draws a fearful picture of the epidemic fevers to which Rome was subject. But still the unhealthiness of the old city was, and is, much less in degree than that of the country without the walls, and especially of the lowlands towards the sea-coast. There are families and whole religious communities that live all the year round on the desolate hills of old Rome without any remarkable inconvenience, though no one would venture to spend the summer months, at least from choice, outside of the walls between Rome and the sea. The miasmata which produce the malaria, emanate from the volcanic soil of the Campagna acted upon by the rays of a burning sun; they seem to be of a dense heavy nature, seldom rising very high above the ground, unless wafted by the winds. Walls appear to stop their advance, fire dispels them, house foundations and pavements prevent their emanation. For an investigation of this curious subject see Brocchi, 'Stato fisico del Suolo di Roma;' Tournon, 'Etudes Statistiques sur Rome,' and an article on Tournon's book, in the 'Foreign Quarterly Review,' xxi., January, 1833, and the article **Campagna di Roma** in this work.

It seems now proved that whenever the population has decreased within Rome, from political and other causes, the air has become less wholesome, and that the thinly inhabited districts are, independently of their situation, unwholesome in summer, when compared with the more populous parts of the town. Thus the neighbourhood of the Corso and the lower town in general, and even the low filthy quarter of the Jews, are salubrious, whilst the eastern part of the fine street of Porta Pia, the neighbourhood of Santa Maria Maggiore, and that of the Lateran are considered unhealthy in summer, although they are on comparatively high ground. The parts of the Quirinal and the Pincian which are built upon are the most desirable situations in modern Rome for fresh air and health. On the other side of the river, the thinly-built district of La Lungara and the Vatican are considered unhealthy in summer, whilst the densely peopled part of Transtevere is less complained of.

It has been stated by some writers, but not upon sufficient grounds, that the malaria is encroaching upon the inhabited part of Rome, so as to threaten in course of time the depopulation of the whole city. Châteauvieux, who, we believe, was the first to start this theory, mistook the effect for the cause. He visited Rome at two different periods; first in 1791, when 'the city contained 166,000 inhabitants, the streets were thronged with sumptuous equipages and liveries, and the splendid palaces were open to the gaze of strangers—everything in short had an appearance of opulence and splendour.' But a few years afterwards came the French invasion of 1798, with its wholesale spoliations, forced contributions, and oppression of every sort, which no one has more honestly condemned and deplored than Count Tournon, after which the Papal State was reduced to one half, and the poorer half, of its territory. After a few years more of a precarious existence, the Papal Government was again upset by Napoleon in 1809, and the cardinal prelates, the foreign ministers, and a number of noblemen and other persons were driven away from Rome; numerous families were deprived of their accustomed means of support, and the whole social system was violently overturned. The population then dwindled apace, and in 1810 it was 123,000, of which no less than 30,000 were on the poor-lists made out by the rectors of the respective parishes. (Tournon, vol. ii., p. 136.) It was under these circumstances that Châteauvieux visited Rome a second time in 1813. 'I entered the city by the same road as before (by the Corso), but instead of equipages, I saw it filled with droves of cattle, goats, and half-wild horses, driven along by a number of Tartar-looking herdsmen armed with long spears and covered with dark capotes. The population is now reduced to 100,000, and of this number one-tenth part are vine-dressers, herdsmen, or gardeners. The city presents everywhere the appearance of ruin. As there are more houses than inhabitants (he means families), the houses are not repaired; when they get out of order, the occupiers remove to others. A multitude of convents have assumed the appearance of ruins; a number of palaces, no longer inhabited, are left without even a porter to take care of them.' (*Lettres écrites d'Italie.*) And yet, though he had the recent history of the country before his eyes, Châteauvieux attributed this depopulation and decay to the advance of the malaria. The fact is, that wherever the population gets thin and miserable, the malaria will gain ground; it will take possession of houses and gardens from which the warmth of the blazing hearth, and the cheering breath of human life, and the cares of domestic industry have disappeared. (See on this subject an article 'On modern Books of Travels in Italy,' in No. VIII. of the 'Quarterly Journal of Education.') The population of Rome has rapidly increased since the peace of 1814; by the census of Easter, 1838, it amounted to 148,903 inhabitants, exclusive of 4500 Jews. (Serristori, *Statistica d'Italia.*) An account of its distribution, social occupations, habits, and other moral features comes under another head of this article.

The temperature of Rome is generally mild and genial; frosts occur in January; but the thermometer seldom descends lower than 26° of Fahrenheit, and the midday sun generally produces a thaw. The tramontana, or north wind, sometimes however blows cold and piercing for days together. Snow falls at times, but it seldom remains on the ground for more than a day. Orange-trees thrive in the open air, but lemon-trees require covering during the winter months. Rains are frequent and heavy in November and December, but fogs are rare. In the summer months the heat is at times oppressive, especially when the scirocco, or south wind, blows. The hour which follows sunset is considered the most unwholesome in summer, and people avoid exposure to the open air.

The sky of Rome has been admired by most travellers for its soft transparent light, its ultramarine blue tinge, and the splendid colours of the sunset, which Claude has so well rendered. The general scenery of the country, the purple hue of the mountains, and the long waving lines of the plain of the Campagna, are noticed under ALBA LONGA. Within the walls of Rome there are many fine points of view. From the tower of the Senatorial Palace on the Capitol, there is a good panorama of Rome, embracing both the old and new towns; from the terrace of La Trinitá de' Monti is a fine western view of modern Rome; there is another view from the Janiculus, in an opposite or eastern direction; and lastly, from the gallery above St. Peter's dome is a splendid and extensive panorama, embracing the whole town, the Campagna, the distant mountains, and the long line of the blue sea.

For the better understanding of the topography of Rome, the large map of Nolli, the atlas which accompanies Bunsen's 'Beschreibung der Stadt Rom,' or the small map by the Society for the Diffusion of Useful Knowledge, may be consulted. The map in Brocchi's work above mentioned gives a good idea of the surface of the ground.

TABLE OF SOME OF THE MORE REMARKABLE MODERN BUILDINGS IN ROME.

[The dates are to be considered only as approximations to the time when the respective structures were either commenced or in progress.]

Date.	Building.	Architect.
1375	Santa Maria sopra la Minerva, the only Gothic church in Rome	
1400	Santa Maria dell' Anima	
	Castel S. Angelo, restored	
1432	Church of Spirito Santo	
1440	S. Stefano Rotondo restored	
1450	S. Francesco	L. B. Alberti.
1460	Palazzo di Venezia	Giul. di Majano
	Santa Maria del Popolo	Baccio Pintelli.
	S. Pietro in Montorio	
	S. Pietro Rotonda in do.	Bramante.
	Hospital S. Spirito	
	Cloister SS. Apostoli	
1468	S. Marco	Giul. di Majano.
1494	Cancelleria	Bramante.
	Cloister Santa Maria della Pace	Bramante.
1500	S. Pietro in Vincoli restored	
1505	Palazzo Sora	Bramante.
1506	St. Peter's begun	Bramante.
	Palazzo Giraud	Bramante.
	Palazzo Chigi	Bald. Peruzzi.
	Palazzo Palma	Ant. Sangallo.
	Santa Maria di Loreto	Ant. Sangallo.
	Farnesina	Bald. Peruzzi.
1513	Palazzo Caffarelli	Raphael.
	Palazzo Linotti	Bald. Peruzzi.
	Villa Madama	Giul. Romano.
	Palazzo Strozzi	
1526	Palazzo Massimi begun	Bald. Peruzzi.
	Palazzo Cicciaporci	Giul. Romano.
	Palazzo Cenci	Giul. Romano.
	Palazzo Lanti	Giul. Romano.
	Madonna dell' Orto	Giul. Romano.
	Palazzo Serlupi	Giac. della Porta.
	Palazzo Niccolini	Ditto.
	S. Spirito, façade	Mascherino.
	Palazzo Farnese	Ant. Sangallo. M. A. Buonarroti
1550	Villa Giulia begun	Vasari. Vignola.
1556	Palazzo Ruspoli.	Ammanati.
	Il Campidoglio	M. A. Buonarroti.
1560	Palazzo Lancellotti	Pirro Ligorio.
	Palazzo Nari	Vignola.
1564	Palazzo Spada	Mazzoni.
	Palazzo Negroni	Ammanati.
	Palazzo Mattei	Ammanati.
	Santa Caterina de' Funari	Giac. della Porta.
	Collegio Romano	B. Ammanati.
1576	Collegio della Sapienza	Giac. della Porta.
	Villa Pia	P. Ligorio.
1580	Villa Negroni	Dom. Fontana.
	Capella Sestina, in Santa Maria Maggiore	Dom. Fontana.
	Palazzo Altemps	M. Lunghi.
	Palazzo Giustiniani	Giov. Fontana.
1586	Obelisk in front of St. Peter's erected by	Dom. Fontana.
1595	S. Andrea della Valle.	Olivieri.
1595	San Michele in Sassia.	
1602	SS. Apostoli rebuilt	Rainaldi.
1603	Collegio Mattei	
	Palazzo Rospigliosi	
	Villa Borghese	Bernini.
	Palazzo Sciarra	Ponzio.
1608	Capella Borghese (Sta. Maria Maggiore)	Ponzio.
1612	Aqua Paolina	
1614	St. Peter's façade completed.	C. Maderno.
	Palazzo Verospi	Onorio Lunghi.
	Palazzo Propag. Fide	Dom. Fontana.
1618	Palazzo Altieri	Rossi.
	Villa Ludovisi	Bernini.
	San Carlo	Onor. Lunghi.
	Collegio Nazareno	
	S. Andrea del Noviziato	Bernini.
	S. Francesco di Paola	
1640	Palazzo Barberini	Maderno. Bernini. Borromini.
	Palazzo Mattei	Borromini.
1642	Palazzo Madama (di Governo)	Maroscelli.
	Palazzo Pamfili	G. Rainaldi.
	Santa Agnese	G. Rainaldi.
	Curia Innocenziana	Bernini. Carlo Fontana.

Date.	Building.	Architect.
1650	Santa Maria, Via Lata	P. da Cortona.
	Palazzo Doria	
1667	Colonnades of Piazza San Pietro finished	Bernini.
1668	Palazzo Altieri	Rossi.
	Palazzo Odelscalchi	Bernini.
1725	S. Giov. de' Fiorentini	A. Galilei.
1729	Capella Corsini	A. Galilei.
	Palazzo Corsini	Fuga.
1730	Pal. Consulta (now barracks)	Fuga.
	Teatro Argentina	Marq. Teodoli.
1734	Lateran Church, façade	A. Galilei.
	Fontana Trevi	N. Salvi.
	Palazzo Corsini restored	Fuga.
1741	Santa Maria Maggiore, façade	Fuga.
1743	Hospital S. Spirito enlarged	Fuga.
	Villa Albani	
	Palazzo Petronj	Fuga.
1740	Convent S. Agostino	Vanvitelli.
1775	New Sacristy St. Peter's begun	Carlo Marchionni.
	Palazzo Braschi	
1780	Museo Pio Clementino	M. A. Simonetti.
1801	Excavations of the Forum commenced	
1805	Arch of Constantine excavated	
1812	Temple of Venus and Roma excavated	
1813	The Pillar of Phocas discovered	
1823	Basilica San Paolo fuor delle Mura burnt, restored by	Belli.
1825	New Buildings of the Piazza del Popolo	Gius. Valadier.
1826	S. Andrea delle Fratte, façade	
	Palazzo Ceccopiero	Luigi Poletti.
1838	Post-office, Piazza Colonna	
	Museo Gregoriano, Vatican, opened	

The principal Antient Roman Buildings of which there are Remains.

Baths.

Baths of Titus, hastily constructed near the Flavian Amphitheatre, about A.D. 80, on the site of the gardens of the golden house of Nero. The ruins stand now in a vineyard called in Nolli's map Sinibaldi, on a spot circumscribed by the modern street of the Polveriera and the street of the Colosseum; they occupied a space of about 400 feet by 600. The baths of Titus were however absorbed in those of Trajan.

Baths of Trajan, partly on the same site, and adjoining those of Titus, were commenced by Domitian and finished by Trajan; they were more extensive than those of Titus, and extended towards the church of S. Pietro in Vincoli, which they almost touched. They appear, from an inscription, to have been embellished by Julius Felix Campanianus, præfect of Rome. These are the baths of which Vasari mentions the circumstance, in the Life of Giovanni da Udine, of excavations being made near S. Pietro, and the discovery of the pictures and stuccoes, which so much pleased both Giovanni and Raphael that they imitated them in the arabesques of the Vatican. Palladio made a plan of these baths. The plan of the baths of Trajan resembles very much those of Diocletian: it occupies an area of about 1100 feet by 800.

One of the great hemicycles near the northern angle still remains. On the shorter sides, near the eastern and southern angles, are the remains of two hemicycles with niches for statues. The long side opposite the Colosseum contains in the centre the remains of a great semicircular theatre.

There are few, and those few are unintelligible, remains of the internal part of the building. Part of the golden house of Nero remains under the baths of Trajan. In the passages and chambers of this house there are still some elegant arabesque decorations, the colours of which in many parts are still very vivid.

Baths of Constantine, were, according to Victor, in the fourth region, or in that of the Quirinal. The remains, which were extensive, appear to have stood on the boundary of the Quirinal, on the ground now occupied by the palaces of the Consulta and Rospigliosi. Buffalini, in his map (1551), places them near the church of S. Silvestro, on the Monte Cavallo. Some slight traces of these baths still exist in the Villa Aldobrandini. They were erected probably about A.D. 326, and were repaired in the middle of the fifth century by Petronius Perpenna and Magnus Quadratianus. In 1519 some of the ruins were still in existence, but they disappeared about 1527.

Palladio restored the plan, and in the reign of Clement XII. an excavation was made on their site, when a magnificent portico, with an ornamented ceiling, and walls painted with historical subjects, were discovered.

Baths of Diocletian, situated on the Viminal, and erected by Diocletian about A.D. 302. They were of vast dimensions. The extensive and capacious ruins were adapted to the purposes of a monastery, and M. Angelo transformed the antient tepidarium, the caldarium, and a part of the frigidarium into a church with its dependencies. The church is called Santa Maria degli Angeli. The rest of the ruins consist of large brick masses with arches of enormous span: some of these masses still support parts of the vaulted ceiling. On a part of the site of the baths M. Angelo constructed a spacious and elegant cloister.

Baths of Agrippa, were enclosed within the space circumscribed by the square of the Rotunda or Pantheon, the street of the theatre called Valle, the street of the Stimmate, and that of Gesù. They occupied a space about 500 feet from east to west, and 700 from north to south. According to Dion Cassius, they were constructed A.U.C. 729. The temple called the Pantheon has been sometimes considered a part of these baths.

Baths of Nero, situated on the ground which stretches from east to west between the square of the Pantheon and the square called Madama, and from north to south between the church of S. Eustachio and the street of the Coppelle. Eusebius fixes the date of their construction, A.D. 65. They appear therefore to have been commenced in the year of the great fire of Rome in the reign of Nero, and during the consulate of Quintus or Caius Lecanius Bassus and Marcus Licinius Crassus Frugi. One hemicycle alone of these baths exists in the inn of the Piazza Rondanini.

Baths of Alexander. An anonymous author quoted by Mabillon states that these baths stood between the Piazza Navona, the church of S. Eustachio, and the Pantheon. They were therefore contiguous to the baths of Agrippa. The baths of Alexander were built, according to Eusebius, in the year 229, and, according to Cassiodorus, in 227. They appear to have been an extension of the baths of Nero, as those of Nero probably were an extension of those of Agrippa.

Baths of Caracalla. Commenced about A.D. 212, and continued by Elagabalus and Alexander Severus. They are situated on a prolongation of the Aventine, not far from the gate of S. Sebastian. They are perhaps the most extensive ruins in Rome; but being stripped of their marbles, columns, stuccoes, and paintings, they consist only of vast and lofty walls, corbels, and niches of brick and tile, and for the ordinary spectator possess in this dilapidated state little interest. [BATHS.] At the extremity of the great platform the constructions are still tolerably perfect, as well as part of the castellum in a neighbouring vineyard. The ruins stand in three separate vineyards.

Temples.

Temple of Romulus. Erected by Maxentius to the memory of his son Romulus. These ruins, which are vulgarly called the stables of the Circus of Caracalla, are situated in a large quadrilateral enclosure forming part of the villa of Maxentius on the Appian way, and about one mile from the gate of S. Sebastian. From two medals of Romulus we see this building as it appeared at two separate periods: one medal represents the building with a dome, and without a portico; the other with the addition of a portico. It may have served both for a temple and a tomb. The lower part or basement is purely sepulchral, with niches for the sepulchral urns. The ceiling is vaulted, and supported by a huge central pier.

Temple of Bacchus. At what time first constructed is uncertain. The tetrastyle portico of four Corinthian white marble columns is an addition, taken from some other edifice, probably about the time of the Antonines. These columns have been walled up, and form part of the modern church to which the cella has been adapted. In the reign of Urban VIII. a circular altar with a Greek inscription was found in the subterranean part of this edifice, to the left on entering. The internal part of the cell is adorned with a stucco frieze representing military trophies; the vaulting is adorned with sunk octagonal pannels; slight traces of a bas-relief remain in the centre of the ceiling. These ornaments are in a good style.

Temple, called that of the *Divus Rediculus.* Built in commemoration of Hannibal's retreat from Rome, and situated in the same valley as the Nymphæum of Egeria, about a mile from Rome, and close to the little brook called Almone. At what time it was constructed is unknown, and the name of the temple of Redicolo is probably founded in error, as the temple of this name stood two miles from Rome on the Via Appia, and to the left on leaving the city.

It is a most beautiful construction of brick, elegantly designed, and executed with great skill. The walls of the cella externally are of yellow brick, the basement and pilasters of red, and the moulded parts are carved, and the cornice is enriched with modillions. On the southern side the pilasters are changed for octagonal columns set in a sort of niche. It appears that on this side there was a road, which was the cause of a greater richness and of variation in the design. The portico had originally four peperino columns, of which however only part of one on the ground near the temple remains. The interior was adorned with stuccoed ornaments.

Temple of Vesta.—One of the temples to Vesta, situated in the Forum Boarium near the banks of the Tiber. Nibby thinks that it was constructed in the time of the Antonines. It is of a pure Greek style, and may have been rebuilt by Vespasian, who probably commemorated it by striking a coin, on the reverse of which this temple is represented. Twenty Corinthian columns, of which nineteen remain, surrounded the circular cella, which was formed of masonry in the Greek taste. These columns are of Parian marble, and fluted; they are raised on a series of steps, most of which have been destroyed or removed. The antient entablature and roof are wanting, and the latter is supplied by an ugly tile covering.

Temple of Ceres and Proserpine.—Rebuilt by Tiberius, and now forming part of the church of Santa Maria in Cosmedin, called also the Bocca della Verità, is situated almost opposite the circular temple of Vesta. A part of the cell constructed with large masses of travertine, and eight columns of the peristyle, remain partly walled up in the church. The fluted white marble columns are in a good style, and of the Composite order.

Temple of Fortuna Virilis.—Originally built by Servius Tullius on the banks of the Tiber. It was burnt and rebuilt in the time of the republic. It is of an oblong figure, constructed of travertine stone and tufa, and stuccoed with a fine and hard marble stucco. The hexastyle portico of the Ionic order has been walled up between the columns, and an engaged intercolumniation is continued on the walls of the cella. The temple is placed on a high moulded basement, and was ascended by a flight of steps. The columns support an entablature, the cornice is bold, and the frieze is decorated with festoons supported by infantine figures, and intermixed with skulls of oxen and candelabra. These are however ill preserved. The style of the architecture is heavy; still the basement is a grand feature.

Temple of Fortune, according to Nibby, but, in the opinion of Bunsen, the temple of the *Vespasiani*, is situated in the Forum Romanum, on the Clivus Capitolinus. On the entablature is the following inscription:—

SENATVS POPVLVSQVE ROMANVS
INCENDIO CONSVMPTVM RESTITVIT.

The edifice now consists of a rude Ionic hexastyle portico of granite columns, two of which are returned on the flank, and so badly restored from the ruins of the former temple, that in one instance part of the shaft from the base is placed under a capital. The bases, capitals, and the entablature are of white marble. The internal part of the frieze is ornamented, but this appears to have been some of the old masonry used in the rebuilding. The portico and temple were placed on a high basement of travertine, which was covered with a veneer of marble, and in front there was a flight of steps

Temple of Jupiter Tonans, according to Nibby; Bunsen calls it the *Temple of Saturn.* It is situated on the Clivus Capitolinus. It was built by Augustus, and is supposed to have been restored by Sept. Severus and Caracalla. On a fragment of an inscription on the entablature over the three columns of the angle, is read . . . ESTITVER. The portico was hexastyle, of the Corinthian order, and of white Luna marble. The columns are deeply fluted. In order to gain space, the steps are constructed between the columns in the basement which supports them. The basement was lined with marble, and divided at intervals by small pilasters. Upon the frieze are carved instruments of sacrifice, and the decorations which remain indicate that the building was highly ornamented. Between this temple and that called the Temple of Concord, are the ruins of a small ædicula, in which was discovered a votive altar sacred to Faustina the Younger. To the left of this temple are some chambers, in front of which was a portico of cipollino marble columns, of the Corinthian order; the capitals are however adorned with victories and trophies. From an inscription on the entablature of the portico, these chambers appear to have contained the statues of the Dii Consentes, replaced by Vettius Agorius, præfect of Rome, A.D. 368. Nibby considers this building to have been originally constructed by Hadrian. It was burnt in the reign of Commodus, and restored by Septimius Severus. Bunsen calls it 'Porticus Clivi et Schola Xantha.' (See the *Plan of the Forum*, by Bunsen.)

Temple of Concord. The site only of this temple remains near the temple of Jupiter Tonans. Of this famous building there remain only the ruins of the cella, which was originally covered with giallo antico and pavonazzetto. The pavement was formed of slabs of the same material, and numerous fragments discovered in the late excavations prove that it was profusely enriched with ornamental carvings and statues, and that it was also destroyed by fire. Owing to the narrow site on which it was placed, the cella was wider than the portico.

Temple of Antoninus Pius is in the Forum of Antoninus, now the Piazza della Pietra, and at a short distance from the Column of M. Aurelius Antoninus. Eleven large Corinthian columns, which are much injured, remain on the north side, and support a white marble architrave; the rest of the entablature, being much ruined, was restored with stucco. The columns have been walled together, and form the front of the present Custom-house, in the court of which there are several fragments of vaulting adorned with sunk pannels. A representation of the portico with a pediment, belonging probably to this temple, appears on a large bronze coin, from which it appears to have been decastyle. An octastyle portico with a pediment appears on silver and brass coins of the same emperor, and most probably represents another temple belonging to the Antonine Forum.

Temple of Antoninus and Faustina. Erected by the senate to the emperor and his wife in the Forum Romanum. The two sides of the cella of Peperino, once clothed with marble, remain, as well as the magnificent marble entablature over them. The hexastyle portico, with the return columns of the Corinthian order, each of one single piece of Carystian or cipollino marble, still supports a considerable part of the entablature. In the frieze are griffins, candelabra, and other ornaments, in a fine style of art. The ascent to this temple was antiently by a flight of twenty-one steps; and on the entablature of the portico is cut the dedicatory inscription to Antoninus and Faustina. The columns, which were once partly buried, have been cleared of the surrounding earth. On the ruins of the cella has been erected the church of San Lorenzo in Miranda. A representation of this temple, with its steps, statues, and pediment, is given in a coin, published in Bunsen's 'Forum Romanum.'

Temple of Romulus and Remus, called by Bunsen, 'Ædes Penatium.' A circular temple in the Forum Romanum, near the temple of Antoninus and Faustina, erected, according to Nibby, at a period when art was in its decline. It is however probable that the circular building belongs to an earlier period than he would assign to it. In the year 527, this building was used as a vestibule to the church of SS Cosmo and Damiano, erected by Felix IV. Urban VIII. applied the present Etruscan bronze door, found at Perugia, and placed the two antique porphyry columns, with their entablatures, in their present situations. This piece of architecture stood originally a little to the left of the present entrance. Bunsen takes no notice in his plan of two cipollino columns, half buried, and standing near the Ædes Penatium; one is without a capital, and the other has a capital and part of an entablature showing a return, as if they were decorative columns of an enclosure, like that of the temple of Minerva in the Forum of Nerva.

Temple of Peace, called also the Basilica of Constantine, was built by Maxentius, on the antient site of the Horrea Piperatoria, and after his death dedicated by Constantine. This edifice, which consisted of three naves, has the northernmost still in good preservation, and divided into three great arches, embracing the whole length of the nave. The centre arch, at a later period, was altered into the form of a tribune. The vaultings of all three are decorated with enormous sunk pannels and stuccoed ornaments, and the walls with niches. The southernmost nave was similar, but without a tribune. All except the indications of the piers have disappeared, as well as the great centre nave, at the extremity of which was the principal tribune, of which there are only a few fragments of the vaulted ceiling on the ground. High up in the piers there are still some fragments of the great marble cornice, which was supported by eight marble columns, one of which, still standing in the time of Paul V., was removed to the piazza of Santa Maria Maggiore. It is of white marble, of the Corinthian order, and fluted, eighteen Roman feet in circumferance and forty-eight high. Winding brick staircases led up to the roof; one is still almost entire. The building was 300 feet long and 220 feet wide. The principal façade faced the Colosseum, and part of an external arcade remains in this direction. The pavement was of giallo antico, pavonazzetto, and cipollino. At a later period this building was converted into a Christian church, at which time an entrance was formed towards the Palatine, on the Via Sacra.

Temple of Venus and Rome. Designed and built by the emperor Hadrian, who personally directed the construction. It suffered from fire, and was restored by Maxentius. Of this vast building the substructions of the surrounding colonnade and the great niches at the division of the cella, with some fragments of granite columns, are all that remain. [ROMAN ARCHITECTURE.]

Temple of Venus and Cupid, so called, stands in what is supposed to be the antient Horti Variani, and close to the church of Santa Croce in Gerusalemme. All that remains of this large edifice consists of an immense niche and two lateral walls of brick, belonging perhaps either to a great hall or basilica. Near these ruins is a fragment of the Claudian aqueduct.

Temple called Minerva Medica. A circular domed temple of brick, erected probably about the time of Diocletian. It is thought by Nibby to have been a large hall, erected in the Licinian gardens, which he places here. The circumference has nine niches for statues, seven of which have been found among the ruins at different times. It appears to have been lined with marble and painted with stucco, though only a part of its bare walls and dome, with the buttresses to secure it against a lateral thrust, now remain. In 1828, a large portion of the dome, which had been propped up with a wooden scaffolding, fell down.

Temple of Nerva, situated in the forum of Nerva, was consecrated by Trajan to the memory of Nerva; it was one of the most sumptuous edifices in Rome. Only three columns and a pilaster, partly buried in the ground, on the south side, now remain. The ornaments were in the finest style, and the proportions of the order form a correct model for the moderns. (See Bunsen's plan for the general design.)

Temple of the Sun, on the terrace of the Colonna gardens on the Quirinal hill. This temple, said to have been erected by Elagabalus, was of gigantic dimensions, of noble masses of masonry, and highly enriched, if we may judge from the two great masses that are left—a part of an architrave and frieze, and the angle of the pediment. The temple was probably Corinthian, and the style, though not decidedly bad, shows plainly that art was on the decline. Many fragments of sculpture dug up in the gardens have been fixed in walls at the back of these two masses. The site was eminently calculated for a colossal temple, as the entire height of the building would have been visible from most parts of Rome.

Temple of Janus no longer exists, but the site is placed, with every appearance of probability, by Bunsen, at the junction of the four great forums, in the immediate vicinity of the Mamertine prison, the arch of Septimius Severus, and the Basilica Pauli.

A temple for a long time called the *Temple of Jupiter Stator*, afterwards the *Græcostasis*, and lately by Bunsen, first the *Temple of Castor and Pollux*, and afterwards the *Temple of Minerva Chalcidica*. It is situated in the Forum Romanum, next to the site of a temple of Castor and Pollux. The ruin consists of three marble Corinthian fluted columns on an isolated basement of travertine; the columns support a part of the highly enriched entablature, which is in tolerable preservation. The proportions and execution of this fragment are the very finest, and, since the restoration of true architecture, it has served as the great model of the Corinthian order.

Pantheon. [PANTHEON.]

Gates.

Porta Asinaria stands near the Porta S. Giovanni, which was built in its place by Gregory XIII., and to the left of it on going out of the city. The antient gate is closed, and forms, with the walls, a picturesque brick ruin.

Porta Nomentana led formerly to Nomentum, now Lamentana; it stands near the more modern gate called Porta Pia. It was built by Honorius.

Porta Salaria, built by Honorius in his new walls, and substituted for the Porta Collina of Servius, called Salaria from the road to which it leads. Through this gate Alaric entered Rome, A.D. 409.

Porta Capena stands at an angle of the Cœlian hill, below the Villa Mattei, within the antient walls of Servius Tullius, and at a short distance from the Porta Latina. The walls of Honorius make a bend inwards towards this gate.

Porta Latina, now closed, stands between the Porta Capena and the gate of San Sebastian. The present gate was constructed by Honorius, A.D. 402, and repaired under Justinian, A.D. 550.

Porta Appia, or S. Sebastiano, situated on the Appian way, and built by Honorius in his extension of the Roman walls. This gate supplied the place of the antient Porta Capena, which was then closed. The fine semicircular brick towers were constructed either by Belisarius or Narses.

Porta Portese, on the banks of the Tiber, in Transtevere, built by Urban VIII., and substituted for the antient *P. Portuensis.*

Porta Pinciana, situated on the Pincian, and now closed; originally built by Honorius, and rebuilt by Belisarius.

Porta Pia, substituted by Pius IV., for that built by Honorius, and called Nomentana, from leading to the Via Nomentana.

Porta S. Lorenzo, built by Honorius, A.D. 402, called also Tiburtina from its leading to Tivoli; it also opened out on the Via Collatina. This gate is attached to the monument at the junction of the three aqueducts, the Aqua Marcia, Tepula, and Julia, which bears an inscription alluding to the repairs made by Caracalla. The aqueduct called Marcia is commemorated by a coin of the Marcii, which possibly may represent the original monument.

Porta Maggiore, situated at a spot called the 'Spes Vetus.' Here are the antient gates of the Via Labicana and Via Prænestina, formed by the monument of the Claudian aqueduct. The Porta Labicana was disfigured by Honorius, but his barbarous construction has been lately removed, on which occasion the tomb of Eurysaces was discovered in Biviis formed by the Labican and Praenestine roads; and at the same time there were uncovered, towards the open country, the magnificent Praenestine and Labican gateways, as they stood before the additions of Honorius disfigured them. The magnificence of these gateways was owing, in a great measure perhaps, to the circumstance of the Claudian aqueduct passing over them. The three great inscriptions on the attic above the gateways show, first, that Tiberius Claudius, the emperor, brought to Rome, the Claudian waters composed of the Cærulean and Curtian streams, and also the Aniene Nova. The second indicates the restoration by Vespasian; and the third, that by Titus. This magnificent façade consists of two great archways, and three piers, each decorated with two rusticated columns of the Corinthian order, placed on a rustic basement, and supporting an entablature and pediment. Above these is the lofty attic in which are the two water-channels. This attic is surmounted with a cornice. Severe in character, this structure is one of the best preserved, and one of the most imposing architectural masses in Rome. From this gate may be seen the four aqueducts, Julia, Tepula, Marcia, and Aniene Vetus.

Porta S. Giovanni, substituted by Gregory XIII. for the antient Porta Asinaria.

Porta S. Paolo, substituted by Honorius for the antient gates of Servius called *Trigemina*, *Minucia*, *Navalis*, and *Lavernalis*. Being built on the Via Ostiensis, it was called also *Ostiensis*. The present gate was rebuilt by Belisarius, who constructed it on a new level, the antient being 26 palms lower. The internal gate is older than the time of Belisarius, and is formed with a double arch.

Porta del Popolo, the chief entrance into Rome, the Flaminian Gate, was built by Honorius on a site a little higher up than the present gate, towards the Pincian hill, on a slight elevation; it was removed between the sixth and eighth centuries to its present situation. The name of Porta del Popolo was given to it in the fifteenth century. Aided by Vignola, Pius IV. decorated the external front, after the design of M. Angelo; notwithstanding these great names, the façade is neither very striking nor in very good taste. The internal decoration of this gateway is by Bernini.

Porta Cavalleggieri and *Angelica*, one on each side of the Vatican, are of modern construction. The former is considered to be of the architecture of San Gallo; the latter was built by Pius IV.

Tombs.

Sepulchre of Eurysaces the Baker.—The exact date of the construction of this monument is doubtful; it was most probably erected betweeen 580 and 803 A.U.C. It is situated at the junction in Biviis of the Via Labicana and the Via Praenestina, close to the monument of the Claudian aqueduct, which formed the majestic entrance into Rome from these two roads.

This singular monument was imbedded in the rude construction of the gate built by Honorius in front of the Claudian monument; and the upper part of the tomb was injured by the new constructions. The plan of this building is an irregular trapezoid, formed by the roads and the contracted site. The elevation is divided into three parts: the lower, or basement, of Alban masonry, is divided from the second by a band, on which is formed the second division. The second division is constructed with the circular stone-mortars (*mortaria*) for kneading the bread, which are placed in a perpendicular position, with flat-face piers at the angles; above these is a continuous band, on each of the four faces of which is repeated the inscription,

EST HOC MONIMENTVM MARCEI VERGILEI EURYSACIS
PISTORIS REDEMTORIS APPARET.

On this is the third story, in which three rows of mortars are placed horizontally, with their circular mouths towards the spectator, having had originally a ball of stone carved in them to represent the dough. This story is bounded by pilasters at the angles with a capital in the Greek style. The pilasters support a frieze, and there was a cornice with a blocking course all round, and a pulvinus on two sides: above and between the extremities of the pulvinus was a band carved with a representation of circular loaves; from this band sprang a pyramidal roof, terminated with the representation of a wicker-basket used to carry bread in. In the principal front was a marble bas-relief representing Eurysaces and his wife Atistia, and underneath a sarcophagus with the inscription,

FVIT ATISTIA VXOR MIHEI
FEMINA OPITVMA VEIXSIT
QVOIVS CORPORIS RELIQVIAE
QVOD SVPERANT SVNT IN
HOC PANARIO.

Within this scarcophagus was a representation of a panarium, or wicker-basket, in which the ashes were deposited. Such part of the frieze of this singular monument as remains has the daily employment of the baker and the business of the bakehouse sculptured upon it.

Tomb of C. Poblicius Bibulus, stood originally without the walls of Servius Tullius, at the angle formed by two streets close to the antient Porta Ratumena.

This ruin, which is small, is of two stories, but the lower is buried by the accumulation of soil. It stands now at the extremity of the Corso and forms part of the external wall of a house in the Via Marforio, and at present appears to consist of the upper story only, decorated with four diminishing pilasters, two of which are imperfect, and part of the architrave and enriched frieze. Two tablets without inscriptions are placed in the wall between the pilasters, and in the centre is an antient opening similar to a doorway with moulded architraves. The material is travertine.

The style of this monument is simple, the masonry massive, and it appears to have been erected prior to the Augustan age.

Tomb of the Claudii, a mass of shapeless rubble, stands in the Via Marforio almost opposite the tomb of Bibulus.

Tomb of St. Constantia, erected, on the Via Nomentana, probably by Constantine the Great, to contain the body of either his sister or his daughter, whose remains were placed in a magnificent sarcophagus of porphyry, now in the museum of the Vatican. This edifice was turned into a church by Alexander IV., when it no doubt underwent many changes from its original appearance. It is not a pure specimen of architecture, and is rather remarkable for its arrangement of double Corinthian columns supporting a dome, and for its mosaics, than for any purity of design.

Pyramid of Caius Cestius, constructed in the reign of Augustus, for the ashes of C. Cestius, and situated near the Porta S. Paolo, on the Viae Laurentina and Ostiensis. It has the following inscription, from which it appears to have been erected in the space of 330 days:

C. CESTIVS, L.F. POP. EPVLO PR. TR. PL.
VII. VIR. EPVLONVM
OPVS ABSOLVTVM EX TESTAMENTO
DIEBVS CCCXXX. ARBITRATV
PONTI P.F. CLA. MELAE. HEREDIS
ET POTHI. L.

This almost solid pyramidal mass of masonry is covered with slabs of white marble, and is erected on a basement of travertine. The walls are 36 Roman palms thick. In the centre is a small vaulted sepulchral chamber, decorated with arabesques, of which some brilliantly coloured portions remain. At the angles are two Doric fluted columns of white marble placed on pedestals, and on one of two bases which have been discovered, was a bronze foot, which, from an inscription on the base, appears to have belonged to a statue of C. Cestius. The present entrance is in the centre of the side, which is between the two columns. The earth, now excavated, had been considerably raised round the base of this building. From a fragment of mosaic found in 1824 near the tomb, it is possible that the area on which it stood was paved in that style.

Tomb of Scipio is situated on a cross-road connecting the Via Appia and the Via Latina. The chambers are irregularly excavated in the tufa rock, and appear to have been turned into a tomb, having been originally formed for the purpose of procuring building materials. The antient entrance consists of a rude arch upon peperino imposts, and appears to have been partly covered with stucco and painted. Over the arch is a stout moulding, upon which there was antiently a second story. Several slabs of marble with inscriptions are attached to the sides of the passages and chambers cut in the tufa. An elegant sarcophagus of peperino with a bust of the same material were found in one of these chambers, and have been placed in the Vatican.

Tomb of Caecilia Metella, constructed on an eminence on the side of the Appian way, a little beyond the Circus of Romulus, and dedicated to the memory of Cæcilia Metella, daughter of Quintus Metellus, and wife of Crassus. The inscription, which is on a margined pannel, is—

CAECILIAE
Q. CRETICI, F
METELLE CRASSI.

Round in form, and placed on a square basement, it is constructed with magnificent blocks of travertine. It is surmounted with a beautiful decorated frieze and an elegant cornice, from which most probably rose a dome or a conical-formed roof, now destroyed. In its place there is a battlemented wall, built A.D. 1300, which indicates its change from a sepulchre to a fortress. The interior was lined and probably domed with brick. In the time of Paul III. a sarcophagus was found here, which was placed in the cortile of the Farnese palace in Rome.

In the decorated frieze of this monument, just over the inscription, is a bas-relief representing a trophy and a part of a figure of Victory in the act of writing upon a shield, as if to communicate the deeds of the father and the husband. The Victory on the other side of the bas-relief is wanting both of the figures of Victory had slaves bound underneath them.

Mausoleum of Augustus, constructed by Augustus, between the Via Flaminia and the banks of the Tiber, during his sixth consulate. When it first became ruined is unknown, but being turned into a fortress, and becoming eventually the property of the Colonna family, it was destroyed in 1167 in a popular tumult, and became a shapeless ruin.

The building was of a circular form, 220 ancient Roman feet in diameter, and was probably domed. Round the inner circumference were thirteen sepulchral chambers and an ample chamber in the centre, of which there only remains the basement of reticulated work in tufa. In the latter part of the last century the remains of this edifice were turned into an amphitheatre for bull-fights and fire-works.

Two obelisks without hieroglyphics, which formerly stood at the entrance of the Mausoleum, now adorn the piazza of Santa Maria Maggiore and the Quirinal.

Mausoleum of Hadrian, now called *Castle of S. Angelo*, erected by Hadrian on the right bank of the Tiber, within the gardens of Domitia. This building consists of a circular tower whose present diameter is 188 feet, placed on a quadrilateral basement, each side of which is 253 feet. It was once highly decorated, but no vestiges of the decorative part remain. Procopius, who described it in the sixth century, before it was injured, says it was built of Parian marble, and adorned with statues, both of men and horses, of the same material. (*Goth.*, lib. i.) Between the time of the rebuilding of the walls of Rome by Honorius and the Gothic war, it appears to have been already turned into a fortress, but without injury to the decorations. During the wars with the Goths, the Romans, being shut up in the building, were reduced to the necessity of throwing down the statues on their besiegers. In the tenth century it was fortified by a certain Crescenzio, and afterwards increased in extent and strengthened by the popes Nicholas V., Alexander VI., and Urban VIII., the last assisted by Bernini. The antient doorway, recently opened, is situated immediately in front of the bridge; at the same time the antient spiral-way which led to the sepulchral chambers was discovered. This rose with a gentle inclination to the summit of the building; part of the white mosaic floor with which the way was paved is still remaining.

Columbaria.

Between the temple of Minerva Medica and the Porta Maggiore are two columbaria, or tombs. The first, to the memory of Lucius Arruntius, consul under Augustus (A.D. 7), consists of two small chambers, in one of which are some small cinerary urns; and in the other, some pictures on the ceiling, and some small figures and ornaments of stucco. The second consists of one chamber.

Columbarium in the Villa Doria Pamfili. This columbarium, the general plan of which was tolerably well preserved in 1829, consisted of several small chambers irregularly disposed. It has however been lately destroyed. The plan measured by W. B. Clarke, architect, was published in the 'Library of Entertaining Knowledge—Townley Marbles.'

Columbarium of Cneius Pomponius Hylas and of Pomponia Vitalina stands in the same vineyard which contains the tomb of Scipio. The small urns and tablets in their several niches appear to belong to a period from the age of Augustus to the time of the Antonines. This columbarium is filled with niches with their ollae and lapidary inscriptions, and is partially decorated with arabesques.

Tomb in the Vigna di Luzzano, at a short distance from the Porta Pia, and without the walls. The date is uncertain. The square chamber of fine travertine masonry surmounted with a cornice is in high preservation, and also the three marble sarcophagi of the interior, which are highly enriched with bas reliefs, and contain skeletons. The upper part, which was probably circular, has entirely disappeared, and the preservation of its base was entirely owing to its having been buried.

Bridges.

Pons Aelius, now Ponte S. Angelo, crosses the Tiber immediately opposite the Mausoleum of Hadrian, now the Castle of S. Angelo. It was constructed by Hadrian as an entrance to his mausoleum and the gardens of Domitia, which were much frequented by him, and in which he also built his circus. The whole of this bridge is ancient except the parapets, some trifling restorations of masonry, and a small arch on the side of the Castle of S. Angelo. The bridge consists of three large arches and two small arches with buttresses attached to the piers and starlings projecting beyond them. It was restored by Nicholas V. in 1450, and the Clements VII. and IX. decorated it with modern statues. Clement IX. added the parapet.

Pons Milvius, now *Ponte Molle*, on the Flaminian way, rather more than a mile from the city. It was antiently called not only Milvius, but Mulvius and Molvius. The construction is attributed to Æmilius Scaurus, about the middle of the seventh century of Rome. According to Livy (xxvii., c. 51), there must have been a bridge here at least a century earlier. A part only of the bridge is antient; Nicholas V. restored it in the middle of the fifteenth century up to which period the extremities consisted of wooden drawbridges.

Pons Sublicius, or Sublician Bridge, first erected by Ancus Marcius, of wood, was destroyed by an inundation in the time of Augustus, and rebuilt of stone by M. Æmilius Lepidus, the censor, an event which is commemorated in a coin of the Æmilii. From this circumstance it took the name of Æmilian. It was restored by Antoninus Pius, and in little more than six centuries after was destroyed by a great inundation of the Tiber during the reign of Pope Adrian I. What remained of it after this was removed, in 1454, to make cannon balls, and nothing but the rubble basements of the piers are visible when the water is low. From the coin it appears to have consisted of three arches, and was adorned with an equestrian statue of the censor.

Pons Fabricius, built by Fabricius, the Curator Viarum, A.U.C. 690; connects the city with the *Isola Tiburtina*, and is the best preserved of the antient Roman bridges.

Pons Gratianus is a continuation of the Pons Fabricius, connecting the Isola Tiburtina with Transtevere. It was constructed about A.D. 367, during the reigns of the emperors Valentinian and Gratian, from whom it derives its name.

Pons Janiculensis, now *Ponte Sisto*, connecting Transtevere with the city above the Fabrician bridge. It appears to have been called Janiculensis under the emperors, and to have been restored by one of them. It was ruined in the middle ages, and reconstructed under Sixtus IV. in 1774 by Baccio Pintelli.

Pons Palatinus or *Senatorius*, now called Ponte Rotto, was below the Fabrician and Gratian bridges, and above the Sublician; only three arches of it remain, on the Transtevere side. It was first built by P. Cornelius Scipio Africanus, and was repaired by Augustus. It was a very handsome bridge, and had a roof supported by marble columns. Being carried off by a great flood, it was rebuilt by Pope Pius III., and again by Gregory XIII. in 1575; after which it broke down, and has not been repaired since.

Pons Triumphalis, called also *Pons Vaticanus*, was constructed in a bend of the river near the Vatican. It is conjectured to have been built by Caligula or Nero as a means of easy access to their gardens on the Vatican. It appears to have been ruined about the fifth century: some remains of the rubble piers of this bridge may be seen when the water is low.

Theatres and Amphitheatres.

Theatre of Pompey, built by and named after Pompey the Great, occupied the space circumscribed by the palace called Pio, the Campo di Fiore, and the streets called Chiavari and Giupponari. Under the palace there are some ruins of this edifice.

Theatre of Marcellus, built by Augustus, and dedicated to Marcellus, son of Octavia, his sister, in honour of whom he named the portico attached to this theatre. This was the second solid theatre constructed in Rome, and consisted of three orders, the upper of which is entirely lost. The remains of this building are in the Piazza Montanara, and a small part near the entrance to the Palazzo Orsini. A small portion of the curved part of the theatre shows the remains of two orders of architecture, the Doric and Ionic, both in a bad state of preservation. The highest order above the Ionic is supplied by the upper story of the modern dwellings, which are formed in the antient curved front of the theatre. The style of the architecture is much superior to that of the Colosseum, and was the Palladian model of the Roman Doric and Ionic orders.

Flavian Amphitheatre, or Colosseum, commenced by Vespasian, in the last year of his life, on the site of the great pond formed by Nero within the extent of his *Domus Aurea*. [AMPHITHEATRE.]

Amphitheatre called Castrensis, a small brick amphitheatre, at what time erected is unknown, but probably, if we may judge from the style of brickwork, in the first century of the Christian æra. It originally stood without the walls of Servius Tullius, but during the reign of Honorius it was employed to form part of the new enclosure, and the arches were filled up. On the inside the form of a semi-ellipse on its greatest axis is all that can be discerned; but externally the engaged Corinthian columns of the lower order, with their brick capitals, are well preserved; of the upper order there only remain a pilaster and part of an arch. During some excavations made here, an Egyptian statue, and some pieces of marble with which the amphitheatre was decorated, were discovered.

Arches.

Arch of Titus stands near the ruins of the temple of Venus and Rome. On the side facing the Colosseum is a finely cut inscription on the attic:

SENATVS . POPVLVSQVE ROMANVS.
DIVO . TITO . DIVI . VESPASIANI . F
VESPASIANO . AVG.

Erected by Domitian, in honour of Titus, and to commemorate the great event of the conquest of Jerusalem. It is of Pentelic marble, and of an elegant design, but with only one arch. On each side were fluted columns of the composite order, of which only two on each side, and these imperfect, are antique; the rest of the arch was restored by Pius VII. On the sides of the piers under the arch, which is highly decorated, are two very fine bas-reliefs, illustrating the victory of Titus over the Jews. In one of them is represented the golden table, the trumpets and horns of silver, and the golden candlestick with its branches. The triumph of Titus is represented also on the frieze on the outside of the arch.

Arch of Septimius Severus, erected A.D. 205, by the senate and Roman people, in honour of Septimius Severus, and his sons Caracalla and Geta, for their victories over the Parthians, the Arabs, the Adiabeni, and other oriental nations. In the long inscription on the attic may be recognised the erasure made by Caracalla when he changed the expression, ET . P . SEPTIMIO . L . F . GÆTÆ . NOB . CÆSARI, for P . P . OPTIMIS . FORTISSIMIS . QVE . PRINCIPIBVS. The arch is of Pentelic marble, with archways and transverse archways through the piers of the centre arch. Each front is decorated with four fluted columns, and a series of bas-reliefs, which, though not of a high order, are highly interesting as a picture of the modes of warfare and the commissariat of a Roman army. From a medal of Severus and Caracalla, it appears that the attic of the arch was decorated with a chariot drawn by six horses, and in the chariot was placed the emperor between his two sons: on each side of the car was a soldier on foot and a soldier on horseback. The whole of the mouldings and the vaulting are highly enriched with carved ornaments. An accumulation of earth had half buried this monument when it was first excavated by Pius VII., and afterwards by Leo XII., Pius VII., and Gregory XIV.

Arch of Constantine, erected in commemoration of his great victory over Maxentius, stands near the Meta Sudans, and fronting the Colosseum. Formed with three archways, adorned with four beautiful columns of giallo antico on each side, and enriched with many fine bas-reliefs and statues, as well as with specimens of art of indifferent workmanship, it shows the decline of art at that period. The fine parts are supposed to have been taken from a triumphal arch erected to Trajan, the situation of which is unknown. It is also possible that some might have been taken from the forum of Trajan. The statues of the Dacian prisoners are probably taken from an arch of Trajan. Above the attic was a triumphal quadriga. The arch remained partially buried until it was excavated by Pius VII., who enclosed the basement within a circular wall. During the reigns of his successors the whole of the surrounding earth has been removed, so that the roadway now passes under it.

Arch of Dolabella. This single arch of travertine was constructed A.D. 10, by the consuls Publius Cornelius Dolabella and Caius Junius Silanus. It stands near the church of S. Giovanni and Paolo, and is thought to have been the entrance to the Campus Martialis, where the Equiria, or equestrian games in honour of Mars, were celebrated, when the Campus Martius was inundated by the Tiber. This campus stands immediately to the left after passing the opening. It is flanked on the west by a magnificent substruction of large niches belonging to the Nymphæum of Nero and Temple of Claudius. Nero took advantage of the arch of Dolabella, and passed his aqueduct over it, the arch of which is still extant.

Arch of Gallienus, upon the site of the Esquiline gate, dedicated to Gallienus and Salonina, by Marcus Aurelius Victor. The gate is formed of a single arch, adorned with four pilasters, and flanked with two buttresses, a part of one of which remains on the side towards the church of Santa Maria Maggiore. The structure is formed of large blocks of travertine, and is of a plain and simple but not a bad style of architecture.

Arch of Drusus, erected across the Appian way, close to the gate of St. Sebastian, by the senate, to Claudius Nero Drusus, father of the emperor Claudius. It consists of one arch only, adorned on each side with two marble columns of the composite order; above the entablature are the remains of a pediment, and there was also an attic. Caracalla used the arch as part of the line of his aqueduct for his Thermæ. An extant coin gives a faithful representation of this arch when perfect. Excavations have lately been made round this building. The arch appears to have been veneered with marble; but the cornices were formed of solid blocks of that material.

Arch of Janus Quadrifrons, situated in the Velabrum; the exact date of its erection is unknown, but from its debased style and want of simplicity, it may be attributed to a period after Septimius Severus. The form is square, 105 palms on each face, with a large arch in each front, forming an open vaulted space. In each of the piers supporting the arch are twelve niches in two rows, between which were small columns as a decoration forming a double order. The construction is formed of large blocks of white marble. The upper part is ruined, and it was held by the Frangipani as a fortress during the civil wars.

Arch of Septimius Severus, commonly called the Arch of the Goldsmiths, is situated also in the Velabrum, and close to the arch of Janus. This small structure, in a style which shows the decadence of art, is highly enriched, and consists of a single opening, square in form, and supported on broad pilasters filled with ornament. The following inscription shows it to have been erected by the bankers and dealers of the Forum Boarium, in honour of Septimius Severus, Julia Domna, his wife, and Caracalla:—

IMP. CAES. L. SEPTIMIO . SEVERO . PIO . PERTINACI. AVG. ARABIC. ADIABENIC. PARTHIC. MAX. FORTISSIMO . FELICISSIMO.
PONT. MAX. TRIB. POTEST. XII. IMP. XI. COS. III. PATRI. PATRIAE . ET.
IMP. CAES. M. AVRELIO . ANTONINO . PIO . FELICI . AVG. TRIB. POTEST. VII. COS. III.
FORTISSIMO . FELICISSIMOQUE . PRINCIPI . P. P. PROCOS. ET. IVLIAE. AVG. MATRI. AVG. N. ET. CASTRORVM . ET . SENATVS . ET . PATRIAE . ET . IMP. CAES.
M. AVRELII . ANTONINI . PII . FELICIS . AVG
PARTHICI. MAXIMI. BRITANNICI. MAXIMI.
ARGENTARII . ET . NEGOTIANTES . BOARII . HVIVS . LOCI . QVI. INVEHENT . DEVOTI . NVMINI . EORVM.

The name of Geta was originally in the dedication, but his name was erased after his death.

Columns.

Column of M. Aurelius Antoninus, in the Piazza Colonna. [ANTONINE COLUMN.]

Column of Antoninus Pius was discovered on the Monte Citorio, in the house of the Mission, in 1709. It was of a single piece of red granite, and had a white marble pedestal, now in the Vatican, representing alto-reliefs, with the inscription:

DIVO ANTONINO AVGVSTO PIO
ANTONINVS AVGVSTVS ET
VERVS AVGVSTVS FILII.

The shaft was 68 Roman palms long, and was used to restore the obelisks erected by Pius VI. This column, which is represented on the coins of Antoninus Pius, was enclosed with a fence, and most probably stood within the forum of Antoninus Pius, adjoining that of Aurelius, as did also the temple called the Temple of Antoninus Pius.

Column of Trajan, formed of 34 pieces of white marble, situated in the forum of Trajan, and erected by that emperor as a decoration to his great forum. The height represents the height of the Quirinal cut away and removed for the level site of his forum, and is stated in the following inscription:—

SENATVS . POPVLVSQVE ROMANVS.
IMP. CAESARI . DIVI . NERVAE . F NERVAE
TRAJANO . AVG. GERM. DACICO PONTIF.
MAXIMO. TRIB. POT. XVII. IMP VI. COS. VI. PP.
AD . DECLARANDVM . QVANTAE . ALTITVDINIS.
MONS. ET . LOCVS . TANTIS OPERIBVS
SIT EGESTVS.

This column, admirable both for its proportion and for the design and execution of the bas-reliefs and ornaments, which are in the best taste, was the receptacle for the ashes of Trajan. The spiral bas-reliefs do not destroy the line of the shaft by their projection, as in the column of Marcus Aurelius, called the Antonine column. The Trajan column is, with few exceptions, in a high state of preservation. A statue of St. Peter is placed on the pedestal at its summit, and it is ascended by a spiral staircase.

Column of Phocas, erected in the Forum Romanum by the Exarch Smaragdus to the emperor Phocas, A.D. 608, according to an inscription on the pedestal.

The erasure of the name of Phocas, made by Heraclius, is discernible on the pedestal of the fluted Corinthian column, which is of a much earlier date, probably of the time of the Antonines. On the top of the capital there was a gilt statue of the emperor. The pedestal is placed on a flight of steps of a bad construction, from which it is evident that the column was taken from some other structure.

Forums.

Forum of Nerva, situated near the Forum Romanum, commenced by Domitian, and dedicated to Pallas. It was however terminated by Nerva. It received the names of Transitorium and Pervium, from its being a passage-way to other fora. Two fluted columns of the Corinthian order, half buried in the ground, with a rich entablature and attic over them, adorned with a bas-relief of Pallas or Rome, formed part of the internal decoration of the inclosure of the temple of Minerva. A large part of an irregular line of wall belonging to this forum is remarkable for its height and massive masonry of Travertino, set without cement. It is highly probable that the wall is much more antient than the date of the formation of the forum by Domitian and Nerva. Through this wall there is an antient archway with the masonry cut diagonally. See the Plan of the Forum, by Bunsen, for the extent and position of this forum.

Forum of Trajan, adjoining the forum of Nerva. (See Bunsen's Plan.) Of this extensive forum only the Cochlide column and part of the Basilica Ulpia can be seen; the rest of the site is buried under the adjacent streets and houses. The earth round the pedestal of the column was excavated in 1590, during the pontificate of Sixtus V.; and Pius VII. in 1812 and 1813 caused the present area to be formed by the removal of the houses and excavation of the site of part of the Basilica. The columns are of grey granite, and have been replaced in their respective situations. The site of the steps and pedestals at their entrance may be distinguished, and numerous fragments of marble capitals, entablatures, and ornaments are ranged round the area.

Miscellaneous.

Mamertine and Tullian Prisons, situated near the Capitol, close to the forum, built prior to the reign of Servius Tullius, and enlarged by him. Part of the front, forty-five feet long and eighteen high, is constructed with large blocks of tufa without cement; a part is also buried in the earth. C. VIBIVS. C. F. RVFINVS M. COCCEIVS .... NERVA. COS. EX. S. C. repaired this edifice in the reign of Tiberius, A.D. 22. The prison was divided into two floors, and the round hole through which criminals were dropped into the lower prison still exists.

Tabularium and Ærarium Sanctius, place for the public archives and treasure, constructed on the side of the Capitol, by Quintus Lutatius Catulus. The inscription referred to by Nardini after Poggio is:—

Q. LVTATIVS . Q. F. Q. N. CATVLVS . COS.
SVBSTRVCTIONEM . ET . TABVLARIVM . S. S.
FACIENDVM . COERAVIT.

(See *Plan of Rome*, by Bunsen.)

Septisolium, commonly called the Sette Sale, is near the baths of Titus, enlarged by Trajan. It is a large brick ruin, and may be classed among the Piscinæ, or reservoirs. It is thought to be older than the time of Titus, though it was applied to the use of his baths. It consists of two floors, the lower of which is buried in the ground; the upper is divided into nine chambers, with the opening from one to the other in a diagonal line. The construction is very solid.

Cloaca Maxima, said to have been constructed by Tarquinius Priscus. Two parts of this cloaca only are visible, one near the arch of Janus Quadrifrons, and the other on the Tiber near the temple of Vesta. [CLOACA.]

Praetorian Camp, built by Sejanus, in the reign of Tiberius, without the walls of Servius, to the north-east of Rome, and dismantled by Constantine the Great. Three sides of the walled enclosure of a rectangular figure were joined by Honorius to his new walls, and form a large rectangled recess on the plan of Rome. The appearance of the leading features of the camp may be collected from a gold coin of Claudius.

Meta Sudans, a fountain placed at the point of junction of four antient regions, the second, third, sixth, and tenth, and within a short distance of the Colosseum. It appears to have been at least as old as the time of Nero, and was reconstructed by Domitian in the form of a cone, in the centre of a circular basin 80 Roman feet in diameter. This brick rim has been entirely divested of its marble covering and ornaments; the water came out in a jet from the top; a representation of it appears on the coins bearing the impress of the Flavian amphitheatre. In the coin there are two large figures: one may probably represent the colossal statue removed here first by Vespasian and afterwards removed by Hadrian. The gladiators of the amphitheatre are said to have washed themselves at this fountain.

Portico of Octavia, built by Augustus, near the theatre of Marcellus, as a place of refuge for the spectators in the theatre from a storm. The portico, which was burnt, probably in the reign of Titus, was restored by the emperors Septimius Severus and Caracalla.

The ruin consists of one of the principal entrances only, which had two fronts similar in design and proportion; each front was adorned with four fluted Corinthian columns of white marble and two pilasters, supporting an entablature and pediment. Several columns of Cipolino and Carystian marble are walled into the houses of the fish-market, which is its present destination.

The restoration by Septimius Severus may easily be distinguished. A large brick arch and brick piers have been constructed to support the entablature ruined by the fire; some other remains of brick arches clearly indicate, from the difference in construction, the restoration. The style of the original building is bold, simple, and worthy of the Augustan age. A part of the portico is now used as a church.

Palace of the Cæsars, commenced by Augustus Cæsar, on the site of the house of Hortensius, the orator, and of Catiline. Augustus added to the original dwelling of Hortensius a temple dedicated to Apollo, with a portico of Numidian columns, and also a library. This palace, with its posterior additions, was distinguished by the name of 'Domus Augustana.' It was extended by Tiberius, towards the Velabrum, to the extremity of the hill. This part, in contradistinction to the Domus Augustana, was called 'Domus Tiberiana.' It was increased towards the forum by Caligula, and united to the Capitol by a bridge, which was afterwards destroyed by Claudius. The Palatine not being sufficient for Nero, he extended the palace of the Cæsars over the whole of the plain between it, the Cælius, and the Esquiline, and a part even of the Esquiline itself, thus uniting the palace with the gardens of Mæcenas. This extensive palace having been destroyed by the great fire of Rome in the reign of Nero, it was rebuilt by him in a sumptuous style, and called the Domus Aurea. After having suffered many changes and mutilations during the reigns of successive emperors, it was much injured at the sacking of Rome by the Vandals. Yet Heraclius inhabited it in the seventh century, and in the time of Pope Constantine, in the beginning of the eighth century, the greater part of it was standing. Extensive remains of the substructions and some of the corridors still exist, especially towards the Circus Maximus. A rude coloured drawing in the print-room of the British Museum, among the folios of original drawings, represents a portion of a triple-storied colonnade, as it stood in the seventeenth century. The ruins of the palace of the Cæsars stood in what is now called the Orti Farnesiani, and here may be recognised the position of a part of the palace of Augustus, of that of Tiberius, of Caligula, and of Nero. The most extensive parts of the ruins are the foundations and basements which sustained the external porticos, and the basements of the other parts of the palace, which from time to time was enlarged. On the higher part of the hill may be seen considerable re mains of the famous Palatine library, built by Augustus, and the magnificent temple of Apollo connected with it, and built after the victory of Actium. Towards the Circus Maximus are the foundations of the theatre built by Caligula, in the palace which he joined on to the front of the house of Augustus. Near the temple of Apollo, but below it, there are two small chambers, called the baths of Livia, which are very well preserved, and the painting and gilding are in good taste.

Villa of the Quintilii, extensive ruins, at the distance of five miles from Rome, on the Via Latina, hitherto called 'Ruins of the Pagus Lemonius.' This villa was built by the Quintilii, who were destroyed by Commodus. The inscription on the leaden pipes dug up in the villa contains the name of the Quintilii. Among the ruins, which appear to have been enlarged or restored about the close of the third or beginning of the fourth century, may be distinguished an amphitheatre, two magnificent bathing-halls, an aqueduct, and a fountain.

Fountain of Egeria, erroneously so called, is a chamber, situated in a valley about a mile from the Porta Latina, and at a short distance from the Via Latina. It appears from its construction to be a combination of reticulated with lateral work, and to be about the age of Vespasian. It is a chamber which contains eleven niches. The pavement was of serpentine; the lower part of the walls was once adorned with verde antique, and the niches were lined with white marble, with margins of rosso antico. All these embellishments are gone, and there is only a mutilated recumbent statue at the extremity of the chamber. A small spring of water still oozes from this building.

Curia Hostilia, on the southern side of the Forum. Three walls only of this building remain; they were originally covered with marble, and the façade was probably decorated with columns.

Milliarium Aureum, close to the arch of Septimius Severus, in the Forum Romanum. On the left, looking towards the Capitol, is a circular terminal, placed on a circular basement lined with marble.

Circus Maximus, situated in the valley at the south side of the Palatine hill, was founded by Tarquinius Priscus, and restored and enlarged by Julius Cæsar. Augustus erected the obelisk of the spina. It was burnt in the great fire of Rome under Nero. Vespasian restored and perhaps enlarged it. Trajan embellished it, and under Constantine the Great it was again repaired and beautified, and his son Constantius erected the second obelisk. Of this vast edifice the general form only is distinguishable in the vineyard in which it now stands.

Circus of Romulus, commonly called the circus of Caracalla [CIRCUS], is adjoining to the temple of Romulus, and is of the same style of brick construction. This circus was consecrated by Maxentius, A.D. 311, according to the inscription upon it.

TOPOGRAPHY OF ANTIENT ROME.

It is universally admitted that the part of Rome which was said to have been built by Romulus, occupied the Palatine hill on the eastern side of the Tiber. This town on the hill was, according to the custom of the Latins (Göttling, *Geschichte der Röm. Staatsverfassung*, p. 17), built in a square form, whence it is called *Roma Quadrata* (Fest., s. v.; Dionys. Hal., i. 88): it was intersected by two main streets, one running from north to south, the other from east to west. The point at which these streets intersected each other was called *gruma*, or *groma* (from which perhaps the name Roma was formed), and sometimes *mundus*. This spot, which itself formed a square, existed till a very late period, and was surrounded by a wall. This original Roma is generally supposed to have had three gates: 1, Porta Mucionis, or Mugonia, at the northern extremity of the hill, which looked towards the northern part of the Forum Romanum; 2, Porta Romanula, or Romana; and 3, the Porta Janualis. The Pomerium, that is, the precincts within which auguria could be taken, ran, according to Gellius (xiii. 14, 2) round the foot of the hill; but it seems to have been extended even before the union of Rome with any of the neighbouring places, for, according to the description of Tacitus (*Annal.*, xii. 24), the Pomerium embraced not only the sides of the hill, but a considerable portion of the adjoining plain. It ran from the Forum Boarium through the valley of the Circus Maximus, including the Ara Maxima, to the Ara Consi, along the foot of the Palatine as far as the Curiæ Veteres, subsequently the Thermæ Trajani. From thence it proceeded along the top of the Velia to the chapel of the Lares, subsequently the Arch of Titus; it then crossed the valley between the Cælius, the Carinæ, and the Velia. The space from this last-mentioned place to the point from which it commenced, subsequently the Forum Romanum, through which no line is mentioned, was then a lake or swamp. (Niebuhr, *Hist. of Rome*, i. 288.) The town itself, which had about the same extent as the Pomerium, was probably surrounded by a wall and a narrow ditch. Towards the Capitoline and the Aventine respectively it was surrounded by swamps and ponds. Between the Palatine and Cælius the valley was not so deep, and it contained a long tract of elevated ground called the Velia, on which side the town, being easy of access, required fortifications.

As early as the time of Romulus, Etruscan settlements existed on the Cælian hill, and extended over Mons Cispius and Oppius, which are parts of the Esquiline. Whether these Etruscans lived in open villages or fortified places is unknown; but we learn from Varro that they were compelled by the Romans to abandon their seats on the hills, and to descend into the plains between the Cælius and the Esquiline, whence the Vicus Tuscus in that district derived its name. The principal of these Etruscan settlements was, according to the well-known hypothesis of Niebuhr, called Lucerum.

The three hills north of the Palatine, that is, the Quirinal, Viminal, and Capitoline, were occupied by Sabines, and the last of these hills was their citadel. Their town on the Quirinal was, according to Niebuhr, called Quirium. When the Latin and Sabine towns became united, the valleys between the hills must have been drained, and the cloacæ by which this was effected belong to the earliest architectural remains of Rome. (Niebuhr, i. 391, et seq.) The valley between the Palatine and Capitoline was set apart as the place of meeting for the two nations (Comitium and Forum Romanum), and the boundary between the territories of the two towns was probably marked by the Via Sacra, which came down from the top of the Velia, ran between the Quirinal and the Palatine, and then making a bend proceeded between the latter hill and the Capitoline, as far as the temple of Vesta, whence it turned right across the Comitium towards the gate of the Palatine.

The Seven Hills inhabited by these three different nations were united into one town, and surrounded by a wall by king Servius Tullius. The Pomerium had been extended with the increase of the city, but the Aventine, though included in the new wall, did not lie within the Pomerium, and it continued to be chiefly inhabited by plebeians. Hence it is not mentioned among the districts of the city by Varro, who calls them Palatium, Velia, Cermalus, Cælius, Fagutal, Oppius, and Cispius. All these were within the new Pomerium. Cermalus was the spot at the foot of the Palatine, where the Lupercal and the Ficus Ruminalis were, and where in early times, when the waters were high, the ground was flooded from the Velabrum. The Fagutal was, according to Niebuhr, the wide plain between the Palatine and the Cælius-Septizonium and the Colosseum. The new fortification consisted in some places of a wall, probably with towers at certain intervals: in other places the steep sides of the hills rendered artificial fortifications unnecessary, for instance, on the western side of the Capitoline. The north-eastern part from the Colline to the Esquiline gate, seven-eighths of a mile in length, was fortified by a wall, or rather mound. From the border of a moat 100 feet broad and 30 feet deep, was raised a wall 50 feet wide and above 60 high, faced towards the moat with flagstones, and flanked with towers. (Niebuhr, i., p. 394, &c.) Traces of this gigantic work are still visible. From the Colline gate the wall ran in a south-west direction along the skirts of the Quirinal, then turned off to the western side of the Capitoline, and proceeded along this hill through the low grounds between the Palatine and the river towards the northern point of the Aventine. It then ran along the western and southern sides of the Aventine, crossed the valley between this hill and Monte San Balbina, part of which was enclosed towards the southern skirts of Caelius, and after running along them, it proceeded in a northern direction towards the Esquiline gate at the southern extremity of the great mound. The gates of this wall, as far as they can be ascertained, were:—1, Porta Salutaris. 2, Porta Sanqualis: both led from the Campus Martius to the Quirinal. On the same side lay probably—3, Porta Fontinalis, from which, in the time of the Republic, an arcade led to the altar of Mars in the Campus Martius. 4, Porta Ratumena, probably on the northern side of the Capitoline, and likewise leading to the Campus Martius. 5, Porta Carmentalis, on the southern side of the Capitoline, and near the present Vicolo della Bufala. This gate, together with the—6, Porta Triumphalis, and 7, Porta Flumentana, lay in the line of the wall which ran across the low ground from the Capitoline to the Aventine, and not, as has generally been supposed, in a straight line from the southern end of the Capitoline to the river, which supposition has suggested an entirely false direction of the wall of Servius in this part. The Porta Flumentana was near to or on the spot of the Janus Quadrifrons, and the Porta Triumphalis at the north-western entrance of the Circus Maximus. Near this gate, or perhaps connected with it, were the so-called—8, Duodecim Portæ, which Pliny reckons as one gate. 9, Porta Trigemina, a little below the Clivus Sublicius, leading up the Aventine from the Forum Boarium. On the steep side of this hill towards the river there was no gate. The next was the—10, Porta Navalis, which, in early times, probably led to Ostia. The district before it was called Regio Navalis; it was the ship-wharf and maritime arsenal of the city, and a great number of magazines were built in this plain. Between the Porta Navalis and the Porta Capena, on the Cælius, we have three gates—11, Porta Naevia; 12, Porta Raudusculana; and—13, Porta Lavernalis. The first of these three lay probably in the valley between the Aventine and Monte San Balbina; the second on the hill of San Balbina, and the third in the valley between this hill and the Cælius, that is, south of the Porta Capena. The Porta Raudusculana must have been the point at which the road to Ardea commenced. 14, Porta Capena was probably at the foot of the Cælian hill. The exact course of the wall from this gate towards the east, and then north towards the Esquiline gate, cannot be clearly ascertained, though we know that the Lateran was not included. 15, Porta Cælimontana must have been towards the Esquiline. 16, Porta Esquilina was at the southern end of the great north-eastern wall, near the arch of Gallienus; from it issued the Via Prænestina and Labicana. 17, Porta Querculana was probably in the valley between the Cælius and Esquiline. The great wall commencing at the Esquiline gate, in its whole extent from south to north, had two gates besides the Esquiline, viz. 18, Porta Viminalis, which lay about the middle of the wall; and 19, Porta Collina, which must have been on the spot where the Via Salaria and Nomentana meet. The sites of the Porta Catularia and Piacularis are entirely unknown.

The whole circumference of the walls of Servius Tullius was about six miles. They included considerable tracts of land which were not occupied by buildings, but were either pasture-grounds or covered with wood or thickets, such as great parts of the Esquiline and Viminal. Accordingly in times of war the people of the surrounding districts took refuge within the walls of the city, where they found sufficient space and food for their cattle. It was however principally the inner space near the wall itself which was not occupied by buildings until a very late period. Servius Tullius divided the whole city within the walls into four regions, which coincided with the four city tribes into which he divided the commonalty. The Capitoline, which was the city of the gods, and the town on the Aventine, were not included in these regions. Their names were: 1, *Regio Suburana*, comprehending the Cælius, the Carinæ, and the valley between them (afterwards the site of the Colosseum), the Via Sacra, and the Subura; 2, *Regio Esquilina*, comprising the whole of the Esquiliæ, as far as they were included within the wall; 3, *Regio Collina*, extending over the Viminal and Quirinal; and 4, *Regio Palatina*, which comprehended the whole of the Palatine.

Each of these regions was again subdivided into six districts, which derived their names from the Sacella Argeorum, which probably stood wherever two streets crossed each other, so that these subdivisions appear to have been compact masses of houses, such as were subsequently called vicus. Their number is stated by Varro to have been twenty-seven: twenty-four belonging to the four regions, and the three remaining ones probably to the Capitoline.

Many great buildings were erected at Rome during the kingly period. The great temple of Jupiter was on the Capitol. The prison of Tullius, called Carcer Tullianus, or Mamertinus, was at the eastern foot of the Capitoline. It is uncertain whether the remains are genuine which are generally considered to belong to this prison. The Circus Maximus was between the Palatine and Aventine, of which there are probably no remains. The Forum Romanum was between the Palatine and Capitoline. The Cloaca Maxima carried the waters of the Velabrum and the Forum Romanum into the Tiber, and was a stupendous work. The wall of the elder Tarquin formed an embankment on the east side of the river: the remains are still visible to some extent. Of the wall of Servius Tullius few traces remain; but it existed in the eighth century of Rome, as appears from the description of Pliny (iii. 5), and from Dionysius of Halicarnassus (ix., p. 624).

During the early part of the Republic, we find no mention of such great architectural works as those which were built during the period of the kings; but, with the increase of the population, many of the uncultivated and uninhabited districts must have gradually become covered with houses. About 120 years after the establishment of the republic, when the city was taken by the Gauls, the whole was consumed by fire, with the exception of the Capitol, a few houses on the Palatine, and some of the works above enumerated, the magnitude of which saved them from destruction. The hasty mode in which the city was rebuilt explains the fact that down to the time of Nero the streets of Rome were narrow, irregular, and crooked, and, in point of beauty and regularity, Rome was far inferior to most of the other great towns in Italy. After this restoration, a long time probably passed before any new ground was built upon. Down to the fifth century of the city, private houses were generally covered with shingles, and there continued to be a number of groves within the walls of the city. But towards the end of the period which is comprised between the Gallic conflagration and the end of the second Punic war, Rome began to be embellished with temples, which however, both as to material and architecture, were far inferior to the temples of Greece. High roads and aqueducts also began to be built. The streets of the city itself were not paved, though we have no reason to suppose that they were neglected. At a somewhat later period we find public places, streets, and walks under the porticos, commonly paved with large square blocks of tuffo or of travertino. In the year 176 B.C., the censors ordered the streets of the city to be paved with blocks of basalt, which were laid on a stratum of gravel, such as is still visible in a part of the Via Appia. At the time of the war with Hannibal, the district near the river, between the Capitoline and Aventine, was almost entirely covered with buildings, and it was called Extra Portam Flumentanam.

The private houses had from the earliest times been very simple in structure; but after the conquest of Greece, and more especially of Asia, individuals began to build their dwellings in a magnificent style, and the taste for splendid mansions and palaces increased so rapidly, that a house like that of Crassus, which at first was universally admired for its splendour and magnificence, in the course of a few years was lost among superior buildings. Public edifices however still remained the chief objects of the pride of the Romans. Theatres, a class of buildings which had once been scarcely tolerated, were erected in several parts of Rome during the last century of the republic, especially after the time of Sulla. During the civil wars between Marius and Sulla we find that the number of houses had increased to such a degree, that the walls of Servius Tullius in several parts lay within the city itself, and Niebuhr thinks it not improbable that at this time a suburb already existed in the plain west of the Tiber, which was afterwards called the Regio Transtiberina. At the beginning of the eighth century of the city, another suburb is mentioned In Æmilianis, between the Circus Flaminius and the Quirinal. A third arose south of the Cælius, a mile from the Porta Capena, and was called Ad Martis.

Of all the splendid buildings which were raised during the latter part of the republic, scarcely any traces exist, and the only remains which can with any probability be reckoned among them, are the substructions of three antient temples below the church of San Nicola in Carcere; the so-called temple of Fortuna Virilis, not far from the theatre of Marcellus; and perhaps also the three columns of the so-called temple of Castor and Pollux, near the Forum.

Augustus might well say that he had changed Rome from a city of bricks into one of marble, for the roads, aqueducts, and public buildings of every description, temples, arcades and theatres, which were raised during his long and peaceful reign, were almost innumerable. The whole plain between the Quirinal and the river became a new town, which in splendour and magnificence far surpassed the city of the hills: this new town was one mass of temples, arcades, theatres, and public places of amusement, not interrupted by any private habitations. Aqueducts for the purpose of supplying the city with water had been built as early as the year 313 B.C., and the first (*Aqua Claudia*) was begun by Appius Claudius. It ran almost entirely under ground, and conveyed the water from a distance of about eight miles in the direction of the Porta Capena into the city. Other aqueducts (*Anio vetus*, 273 B.C.; *Aqua Marcia*, 145 B.C.; *Tepula*, 127 B.C.; *Julia*, 35 B.C.) were constructed, but it was not until the Imperial period that this kind of architecture reached perfection, and most of the remains which are still extant belong to the period of the Empire. They were mostly built upon arches, which had an easy inclination, so that the water ran gently from its source towards the city. Augustus built two new aqueducts (*Aqua Alsietina* or *Augusta*, and *Aqua Virga*), and increased the Marcia. Subsequent emperors added the *Aqua Claudia*, *Anio novus* (both in A.D. 50); *Aqua Trajana*, A.D. 111); *Antoniniana* (A.D. 212); *Alexandrina* (A.D. 230); and *Jovia* (A.D. 300). (Frontinus, *De Aquæductibus Urbis Romæ*; Platner, *Beschreibung der Stadt Rom*, i., p. 195, &c.) The division into four regions, made by Servius Tullius, had remained unaltered; but Augustus, for the convenience of administration, divided the whole city, both within and without the walls of Servius, into fourteen new regions, a division which continued to the eighth century, when it began gradually to give way to the Ecclesiastical division into seven regions. Each of the Augustan regions, according to a survey taken in the reign of Vespasian, contained nineteen, or, according to a later account, twenty-two vici, with as many sacella in places where two streets crossed each other (in compitis). Each vicus seems, on an average, to have contained about 230 dwelling-houses, so that every region contained rather more than 3000. About one twenty-fifth part of this number of houses were *domus*, that is, habitations of the rich (palazzi), with a portico in front and an extensive inner court (atrium). The remaining twenty-four twenty-fifths consisted of *insulæ*, that is, habitations for citizens of the middle and lower classes; they had no portico in front, but mostly an open space which served as a shop or workshop. In the interior they may have had a court, but of smaller extent than the atrium of a domus. The number of these insulæ was about 44,000. All Roman houses were very high. Augustus fixed 70, and Trajan 60 feet as the height, above which none were allowed to be built; and the upper story was generally of wood. It was a law of the Twelve Tables which also occurs in the Roman legislation of later times, that no two houses, whether domus or insulæ, should be built closely together; but that an open space of five feet should be left between them. The fourteen regions of Augustus are:—1, Porta Capena, to the south of the gate of this name. 2, Cælimontium, which embraced the whole of the Cælian hill. 3, Isis et Serapis, the valley between the Caelius, Palatine, and Esquiline. 4, Via Sacra, or Templum Pacis. 5, Regio Esquilina. 6, Alta Semita. 7, Via Lata. 8, Forum Romanum. 9, Circus Flaminius. 10, Palatium. 11, Circus Maximus. 12, Piscina Publica. 13, Aventinus. 14, Regio Transtiberina.

Tiberius, besides completing many of the buildings of his predecessor, began the Prætorian camp on the north-east side of the city, in the Campus Viminalis, and surrounded it with high walls. The wealthy Romans at this time had their palaces principally in the district from the Porta Collina to the Porta Cælimontana; they did however not form streets, but lay in gardens within the fields between the high roads which issued from the city; and hence they are generally called Horti, as Horti Mæcenatis, Pallantiani, Epaphroditi, &c. All that had been done for the embellishment of the city previous to the reign of Nero was eclipsed by the magnificent buildings of this emperor; but the greater part of these works, together with those of former days, perished in the conflagration which took place in his reign. His plan of restoring Rome was gigantic, and proved to be impracticable: he proposed to make Rome a port, and to connect it with the sea by long walls from the Capitol to Ostia. But all that he could do, notwithstanding his profusion, was to restore those parts of the city which had been destroyed. The face of the new city however assumed a totally different aspect. On the ruins of the temples and the imperial palace on the Palatine rose the so-called Golden House of Nero, which occupied a space equal to a large town. The greatest care was taken to make the new streets wide and straight, and that the buildings should not exceed a reasonable height. In order to render possible the execution of the regular plan, the several quarters of the city were measured, and the heaps of ruins were removed and conveyed in ships to Ostia to fill up the marshes in its vicinity. All the new buildings were massive, and constructed of the fire-proof peperino, without the old wooden upper story. The width of the new streets rendered it necessary to extend the city beyond its former limits. Some time afterwards, in the reign of Vespasian, a measurement of the circumference of Rome was taken, according to which it amounted to 13¼ Roman miles. The subsequent emperors continued to increase and embellish the city; but under Commodus a great part was again consumed by a fire, which destroyed all the buildings on the Palatine. Septimius Severus exerted himself to restore the parts which had been burnt, and to ornament the city, and some of his buildings are still extant. But the grandeur and magnificence of the thermæ of Caracalla, south of the Porta Capena, surpassed all the works of his predecessors. Almost all the great buildings, or their remains, which still exist at Rome, belong to the period between Nero and Constantine.

The most extensive work of this latter period is the immense wall, with its numerous towers, with which Aurelian surrounded the city. The work, which was completed in the reign of Probus (A.D. 276), does not however enable us to form a correct estimate of the real extent of the city, as the objects of the fortification may have rendered it necessary to enclose parts which were not covered with buildings. The Janiculus, which seems to have been fortified from the earliest times of the republic, was now for the first time included within the city walls, together with the Regio Transtiberina. On the north it embraced the whole of the Campus Martius, together with a considerable part of the Collis Hortulorum, or Mons Pincius; and on the south, the Mons Testaceus and a considerable portion of the Via Appia and Latina. On the eastern side it enclosed the Amphitheatrum Castrense, and then proceeded northward to the Prætorian camp. Most of the gates in this new wall were determined by and named after the great roads which commenced at the gates in the Servian wall. The walls of modern Rome, as well as the gates, differ in many parts from those built by Aurelian. The names of the gates of the Aurelian wall, beginning on the north and proceeding to the east and south, are: Porta Flaminia, Pinciana, Salaria, Nomentana, Tiburtina, Collatina, Prænestina, Labicana, Asinaria, Metronia, Latina, Appia, and Ostiensis. Seven bridges connected the eastern and western sides of the river. The whole circumference of these new fortifications was about 21 miles. In the time of Honorius some parts of this wall were decayed, and others had become useless on account of the great quantity of rubbish which had accumulated near them; but they were restored by this emperor. (Platner, *Beschreibung der Stadt Rom*, i., p. 618.) Though the present walls, as already observed (p. 87), do not much exceed the height of fifteen or twenty feet on the inside, owing to the accumulation of rubbish, they are in many places as much as fifty feet high on the outside.

The Prætorian camp, south of the Porta Nomentana, intersected the Aurelian wall; but Constantine destroyed the western side of the camp, which faced the city, and made the three remaining sides serve as continuations of the Aurelian wall. Some remains of these fortifications are still visible.

After the time of Constantine, when the emperors and the Roman nobles had adopted the Christian religion, the decay and destruction of the antient edifices commenced. The building of numerous churches was the immediate cause of this destruction. Neither the court nor private individuals possessed sufficient wealth to raise buildings equal in form or material to those of their ancestors, and as heathen temples could not always be converted into Christian churches, they were generally pulled down and the materials used for other purposes. Numerous columns were thus moved from their places, and the remaining parts of the edifices were carried away and used by any person who chose to take them. During the fifth century of our æra great calamities were inflicted upon Rome by the ravages of the northern barbarians, though it is a mistake to suppose that the buildings of Rome suffered much injury from the invaders, for they could have no interest in destroying anything, and all historians agree in stating that it was their principal object to carry away gold, silver, and other costly things. The few buildings which were destroyed at the capture of the city by Alaric (410) were near the Porta Salaria, where the enemy entered. There are in this part still some remains of the house of Sallust which was destroyed on that occasion. A harder fate befell the city in 455, when it was taken by the Vandals, though even then, and notwithstanding the sack of fourteen days, the buildings seem to have suffered little; the precious metals were the main object of the cupidity of the barbarians. Theodoric and his immediate successors not only took the greatest care to preserve what remained, but even exerted themselves to restore the public buildings which had suffered or were beginning to decay. The population however rapidly decreased during the fifth century, and became impoverished, so that towards the end of the century the suburbs around Rome seem to have no longer existed, with the exception of that which had arisen between the northern extremity of the Janiculus and the Vatican. Rome was thus confined to the walls of Aurelian and their restoration by Honorius, and even within its precincts extensive districts were uninhabited. The most remarkable buildings of former days indeed still existed, but after the reign of Deodatus they were entirely neglected, and thus one after another they fell into decay and ruin.

The antient writers who furnish information respecting the topography of antient Rome are: Varro, Livy, Pliny, Festus, two little works commonly ascribed to Aurelius Victor and Rufus, the 'Notitia,' the 'Curiosum Urbis Romae,' Strabo, Dionysius, and Dion Cassius. The principal modern works on the topography of Rome are: Flavius Blondus, 'Roma Instaurata,' Florentiæ, 1742. The author of this work lived about the middle of the fifteenth century. Bartholomæus Marlianus, 'Urbis Romae Topographia,' Rome, 1534, reprinted in 1588, though the author had published an improved edition in 1544, fol. Onuphrius Panvinius, 'Commentariorum Rei publicae Romanae,' libb. iii.; the first book contains, 'Antiquae Urbis Imago,' Venice, 1558, 8vo. Guido Pancirollus, " Urbis Romae Descriptio et de XIV Urbis Regionibus Commentarius,' Venice, 1593, fol. Georgius Fabricius, 'Romanarum Antiquitatum Libri Duo, ex aere, marmoribus, saxis, membranis veteribus collecti.' The first edition appeared at Basel, without date, in 8vo.; a second appeared in 1567. It is reprinted with the work of Panvinius and others in the 4th vol. of 'Graevii Thesaurus.' Alexander Donatus, 'Roma Vetus ac Recens,' Rome, 1638, 4to. This work has often been reprinted. Famiano Nardini, 'Roma Antica, cum Figuris,' Rome, 1666, 4to. This work, which gained very great celebrity, has often been reprinted, and was translated into Latin by Jac. Tollius (in the Thesaurus of Graevius). An improved edition, with numerous additions, maps, plans, &c., appeared in 1818 at Rome, by Nibby, in 4 vols. 8vo.

Olaus Borrhichius, 'De Antiqua Urbis Romae Facie,' Hafniæ, 1687. T. P. Bellorius, 'Fragmenta Vestigii veteris Romae ex Lapidibus Farnesianis, nunc primum in lucem edita, cum notis,' Rome, 1673, fol. A new edition of this work, with notes, and plates of the Capitol, was made by Joh. Christoph. Amaduzzi, Rome, 1764, fol. Antoine Desgodetz, 'Les Edifices Antiques de Rome, mesurés et dessinés.' Paris, 1682, fol. J. Chr. Adler, 'Ausführliche Beschreibung der Stadt Rom, mit Kupfern,' Altona, 1781, 4to. Ridolfino Venuti, 'Accurata e succinta Descrizione topografica delle Antichità di Roma,' Rome, 1763. This work has been edited by F. A. Visconti, in 1803, and by Stef. Piale in 1824, 2 vols. 4to. Gius. Antonio Guattani, 'Roma descritta ed illustrata,' 2nd edition, Rome, 1806, 2 vols. 4to. D. Carlo Fea, 'Descrizione di Roma,' Rome, 1822, 3 vols. Anton. Nibby, 'Viaggio antiquario ne' Contorni di Roma,' in 2 vols., with plates, Rome, 1819. Burton's 'Antiquities of Rome,' have been translated into German and greatly improved by F. C. L. Sickler, Weimar, 1823, 8vo. The last and most important work on the topography and antiquities of Rome is, 'Beschreibung der Stadt Rom,' by Platner, Bunsen, Gerhard, and Röstell, 3 vols. 8vo., with numerous maps and plans, Stuttgart and Tübingen, 1830. The preface to this work (p. xiii-lvi.) contains a critical account of the whole literature of Roman topography.

History of Antient Rome.

We shall confine ourselves in this article to a brief outline of the external history of Rome, and endeavour to trace the gradual development of the Roman constitution, so far as this has not already been done in other articles. Taking moreover for granted that the reader is acquainted with the legends of the early history of Rome, we shall only give the results of the latest investigations on the subject, and refer our readers for further information to the best modern works, of which we subjoin a list. Each of the Roman kings and emperors is treated of in a separate article, and a chronological list of their names is given here.

Period I.:—From the building of the city to the establishment of the Republic, from 753-510 B.C.—Romulus, 753-714; Numa Pompilius, 715-673; Tullus Hostilius, 673-641; Ancus Marcius, 641-616; L. Tarquinius Priscus, 616-578; Servius Tullius, 578-534; Tarquinius Superbus, 534-510.

Rome, or at least that portion of the city which ultimately gave its name to the whole, was a Latin colony from Alba Longa, established on the Palatine hill, on the left bank of the river Tiber. Alba, which for several centuries before and at the time of the foundation of Rome was at the head of the confederacy of Latin cities, was now, like the other Latin towns, governed by an annual dictator, who however was probably under the control of a senate. Alba had previously been governed by kings. The legends of Romulus seem to suggest that in his time Alba was distracted by internal dissensions, which, in all probability, induced a number of the citizens, who were discontented with the form of government, to seek a home elsewhere and thus led to the foundation of Rome. The time of this event is involved in great obscurity, for all the chronological statements which we possess are founded upon calculations made at a time when most of the authentic documents had perished in the capture of the city by the Gauls, and upon such numerical combinations as seemed best to agree with certain symbolical theories which were familiar to the Romans. But for the sake of expediency we shall follow the Varronian æra, which has been adopted by most modern writers, according to which the foundation of Rome is referred to the year 753 B.C. Tradition had even handed down the day on which Rome was founded, and in commemoration of the event the festival of the Palilia was celebrated on the 21st of April. If, according to our supposition, Rome was founded by a portion of the Alban population who left their home because they were dissatisfied with the dictatorial government, we see why the colony adopted the old kingly rule, which, though abolished in the metropolis, continued to exist in the colony for nearly two centuries and a half. It is another proof that the colony was not founded under ordinary circumstances, but by a secession, that until the time of the third king we do not read of any intermarriages having taken place between the colony and the other Latin towns; and hence the legend of the rape of the Sabine women.

The constitution of the colony on the Palatine was a limited monarchy, for in the reign of Romulus, whom the legends call the first king of Rome, it is said that there existed a senate consisting of one hundred members, which, like that of the Latin towns, had criminal jurisdiction, and the preparation of new measures, which were to be laid before the assembly of the people, who might either accept or reject them. How long this Latin colony stood alone and unconnected with any of the towns on the neighbouring hills, cannot be historically ascertained. There existed on the Cælius and the Esquiline an Etruscan settlement, which was said to have been founded by Cælius Vibenna, who seems to have come with a band of malcontents from Vulsinii, and who is said to have joined his forces to those of Romulus in the war against the Sabines. This seems to show that the Etruscan settlement in these parts was older than that of the Sabines. The Etruscan town, which Niebuhr calls Lucerum, seems to have fallen into a state of dependence upon the town on the Palatine (Roma), as may be inferred from the story that the Etruscans were compelled to leave their fortified places on the hills, and to descend into the plain. (Vicus Tuscus; Varro, *De Ling. Lat.*, iv., p. 14, ed. Bip.) The Etruscan colony seems from time to time to have received new settlers from the mother-country, and the last accession of this kind may have been those Etruscans who, after the war with Porsenna, remained behind and inhabited the Vicus Tuscus.

The Latins on the Palatine had made the Capitoline hill their citadel (Acropolis), but a band of Sabines, led by T. Tatius, who settled on the Quirinal and Viminal (this settlement is called Quirium by Niebuhr), appear to have been hostile to the Latin colony, and to have taken from them the Capitoline. A short time afterwards however the three different cities or tribes appear reconciled to one another, and united into one state, with a new pomerium, which included the three original cities. The Latin and Sabine parts of the new state enjoyed equal rights, and each of them was at first governed by its own king and senate of one hundred members. The gods of these two were the Dii Majorum Gentium. The Etruscans, on the other hand, were in a state of dependence, had no king of their own, and did not obtain equality of rights until the time of Tarquinius Priscus. Their gods were the Dii Minorum Gentium.

Rome was thus, in its origin, a state consisting of three distinct elements, which together formed the Populus Romanus, and each of which exercised a certain influence upon the whole, an influence which is discernible in various ways down to the end of the republic. Each of them also seems in some particular departments to have given the tone to the rest. The Latins appear to have had the superiority in political wisdom, and accordingly their influence in this respect prevailed over the two other tribes, while all those political institutions, the introduction of which is ascribed to the Etruscans, consist of little more than mere ceremonies and formalities. As regards religion, each of the three tribes retained its own peculiar worship and rites, though the influence of the Sabines seems to have prevailed in many points. In all matters relating to the military constitution, the influence of the Etruscans and Sabines appears to have predominated; and the Roman armies, down to the time of Camillus, were drawn up in the Etruscan manner. This original diversity however was, in the course of time, effaced by the overwhelming influence of the Latins, and the various elements of the Roman state appear united into one organised body, the constitution and vital energy of which have attracted the attention of political inquirers in all ages and countries.

After the death of T. Tatius, the king of the Sabines, Romulus governed alone, and it was determined that in future there should only be one king, chosen alternately from the Latins and Sabines. Romulus is said to have now divided each of the three tribes, Ramnes (the Latins), Tities (the Sabines), and Luceres (the Etruscans), into ten curiæ, and each curia into ten decuries, so that each tribe contained 100 decuries, whence they were sometimes also called centuriæ. The decuries were not identical with the gentes, but were a subdivision made for the purpose of representing the curiæ, as each decury in early times had to appoint one senator and one eques. (Gottling, p. 62, &c.; Liv., i. 36; Festus, v. *Centuriata Comitia.*) Tribunes, curiones, and decuriones were at the head of these respective divisions, which they represented in political, religious, and military affairs. Each tribe also consisted of 100 gentes or houses, so that on the whole there were 300 gentes. These gentes did not necessarily indeed consist of families connected by blood, but their relation was such that the members of each gens had one common name, generally ending in *ius* (nomen gentilicium), had the right to inherit the property of a gentilis who died without agnati, and had their common sacred rites (sacra gentilicia) and sacred places (sacella). Each gens contained a number of families. To belong to a gens was a characteristic inseparable from a Roman citizen. Hence every citizen had, besides his personal name, another which was derived from that of his gens, of which Caius Julius Cæsar is an example, Caius being the name of the individual, and Julius that of his gens.

Besides the Roman citizens, or burghers, contained in the tribes, curiæ, and gentes, we find from the earliest times a class of dependents called clients (clientes), who were under the patronage of the burghers. What they originally were is not quite certain, though it seems probable that they partly consisted of poor emigrants who had accompanied the first settlers on these hills, and partly of other poor and oppressed strangers who flocked to Rome as an asylum from various neighbouring places, and settled there under the protection of the established colonies. In subsequent times their number was increased by freedmen, who, on being manumitted, had a relation to their former masters similar to that of the clients. The relation of clients to their patrons is one of the noblest features in the history of the Romans. The clients were indeed citizens, but they could not vote in the comitia curiata, or receive the honores; they either tilled the lands or tended the flocks of their patrons, or followed the various trades which the burghers were not allowed to carry on. Numa Pompilius is said to have divided the clients into two classes, those of the city and those of the country. The former were again subdivided into nine colleges or crafts, while the latter were subdivided into pagi as husbandmen. Servius Tullius gave to some clients the right of voting in the comitia centuriata, and incorporated them into his four city tribes (tribus urbanæ), though they continued in the same relation to their patrons as before. By the legislation of the Decemvirs the clientela was legally abolished, and the clients appear almost on a footing of equality with the plebeians, and consequently they voted in the comitia tributa. But practically the clientela continued to exist.

A new element was introduced into the population of Rome by the third king, Tullus Hostilius, which was enlarged by his successor Ancus Marcius. This was the class of plebeians. Under Tullus Hostilius, Alba Longa was destroyed by the Romans, and the greater part of the inhabitants were transplanted to Rome, where they settled on the Cælius, as far as this hill was not occupied by the Luceres. In the reign of Ancus Marcius many other Latin towns were conquered, and the inhabitants, being removed to Rome, had the Aventine and the valley between it and the Palatine assigned for their residence. (Göttling, *Gesch. d. Röm. Staatsverf*, p. 221, &c.) Some of these new settlers were probably incorporated into the existing tribes, but the bulk of them formed the class which is henceforth called Plebes, and which in numbers far exceeded the Romans included in the tribes, who are from this time distinguished by the name of patricians (patricii or patres). As the plebeians were not included either in the tribes, curiæ, or gentes, they did not enjoy the full rights of citizens (non optimo jure cives). They had also no connubium with the patricians, that is, a marriage between patricians and plebeians was not a legal Roman marriage, and consequently the children of such marriage had not the privileges of those children who were sprung from persons who could contract a legal Roman marriage, or, to use the legal phrase, had connubium. It was a consequence of a marriage where there was connubium that the children were in the power of their father, and were Roman citizens. This restriction as to marriage was subsequently sanctioned by the laws of the Twelve Tables, and was strictly observed till the year 445 B.C., when it was done away with by the Lex Canuleia. The plebeians differed from the clients, inasmuch as they had their own sacra, which were regulated by the pontiffs, their own auspicia, some also their own gentes, the independent possession of landed property, and did not require the protection of a patron. The old burghers, in contradistinction to the plebeians, and in their relations to them, formed a real aristocracy, or body of nobiles, a character which they had not possessed before, unless we apply that name to the relation in which they stood to their clients. In the armies the plebeians formed a distinct body, and in the infantry they always formed the majority. Hence Tullus Hostilius increased the original number of three centuries of equites, each decury having formerly appointed one eques, to six, so that each century now appointed two equites instead of one. The two orders, patricians and plebeians, stood opposed to each other, without their mutual relations being accurately defined; nor do the plebeians themselves appear to have formed a compact body with a regular internal organization. This was an evil, which Tarquinius Priscus first endeavoured to remedy in some measure by admitting the noblest plebeian families into the old tribes, each of which thus consisted of a majority of the old burghers and a number of noble plebeians (*maiores gentes*, and *minores gentes*: Cic., *De Rep.*, ii. 20). The number of the equestrian centuries was now again doubled, and the six new centuries were formed of the gentes minores, so that out of the 1200 equites, 600 were called *secundi* or *posteriores*, to distinguish them from the 600 old patrician equites. (Göttling, l. c., p. 229.) It was probably owing to the opposition of the patrician gentes that Tarquinius Priscus did not place the plebeians on a footing of equality with the patricians, at least in the main points, and it was reserved to his successor, Servius Tullius, to organise the body of the plebeians and to fix their relations to the patricians. This king divided the plebes into thirty local tribes, four for the city (tribus urbanæ), and twenty-six for the country (tribus rusticæ). For further particulars respecting his new constitution see the article Servius Tullius. His successor, Tarquinius Superbus, the last king of Rome, not only undid what his predecessor had done for the plebeians, but his oppression was equally felt by both orders. This led, in 510 B.C., to the abolition of the kingly power and the establishment of the Republic.

The constitution of Rome during the kingly period was an elective monarchy, with a king, a senate, and an assembly of the people (populus). At the head of it was the king, as chief magistrate, high-priest, and commander of the army. On the demise of a king, the assembly of the curiæ (comitia curiata) for the election of a successor was held under the presidency of an interrex. The king received the potestas as well as the imperium from the populus, and was inaugurated by the augurs or the college of pontiffs. All other officers were appointed either by the particular bodies or divisions of the people, whose affairs they managed, or by the king, but always from among those in whom the people themselves had already shown their confidence. The populus thus in reality possessed the supreme power, and even if it be true, as stated by Livy (i. 8), that the king had the power of electing senators from the tribes and curiae, still they were always elected from those who were equites, or had held one of the great offices to which they had been appointed by the populus.

The senate of the Ramnes on the Palatine consisted of one hundred members. This number was increased by a hundred members when the Sabine tribe became united with the Latin; and when at last the Etruscans also obtained equal rights, the senate was increased to the number of three hundred, each tribe being represented by one hundred. This number seems to have remained unaltered down to the time of the Gracchi. (Dionys., v. 55, 60; Liv., *Epit.*, lib. 60.) The senate was convoked by the king, who also proposed the subjects for discussion. The majority of votes, which was either ascertained by counting or by a division (secessio), was decisive (Senatus auctoritas, decretum, or consultum). But the decrees of the senate did not become law until they obtained the sanction of the populus (jussum or scitum populi). [Senatus.]

The assembly (comitiatus or comitia curiata) consisted of the burghers only. These assemblies met either to decide on matters concerning the gentes, or concerning public affairs. In the former the pontiffs presided. The latter related either to matters connected with the constitution, or to religion, or to military affairs. They were assembled by the king or his vicegerent. In these assemblies the chief magistrates were elected, and the measures prepared by the senate were laid before the populus, who might either accept or reject them. In the former case the measure became law, lex regia, or tribunitia, according as it had been passed under the presidency of the king or of the tribunus celerum. The decision as to war or peace, after the subject had been proposed by the senate, was likewise made by the assembled populus. By virtue of the Imperium, which the populus in its assembly gave to the king, he became the supreme judge, but he was allowed to transfer this power to deputies (quæstores, or the assembly of the populus), but there was no appeal from his sentence. In the constitution of Servius Tullius, the plebeians, being contained in his five classes, were admitted to the national assemblies of the centuries, which were distinct from the comitia of the curiae, which still continued to be held. [Servius Tullius.] The plebeians did not obtain the privilege of meeting as a body independent of and unconnected with the patricians before the year 491 B.C. (comitia tributa).

At the close of the kingly period we find Rome mistress of nearly all the tribes of Latium and of a part of the Sabine territory. In the territory of the Volsci, the first two Roman colonies, Signia and Circeii, were founded, though Ostia, founded by Ancus Marcius, is also sometimes called a Roman colony. On the Etruscan side of the Tiber, Rome was in possession of the Janiculus, which was probably fortified, as a contest with Etruria was to be expected sooner or later. From the first treaty of Rome with Carthage, which was concluded in the first year of the republic, we must conclude that the Romans had already formed important mercantile connections with foreign nations. (Polyb., iii. 22.)

Period II:—From the establishment of the Republic to the Dictatorship of Sulla, from 510 *to* 82 B.C.—The abolition of the kingly power and the establishment of the republic did not produce any other material change in the constitution of Rome. The plebeians derived scarcely any benefit from it, but the patricians extended their power, inasmuch as they appointed, in the place of a king, two magistrates, originally called Praetors and afterwards Consuls, who were proposed by the senate and appointed in the comitia centuriata. Patricians only were eligible to this and the other great offices of the state. With the exception of the office of high-priest (pontifex maximus), which was transferred to the rex sacrificulus, the consuls possessed all the rights and privileges as well as most of the insignia of the former kings; but their office was only annual, and upon its expiration they might be called to account for their conduct. On the termination of their office, they returned indeed to a private station, but as members of the senate they still retained some influence in the administration of the republic. The number of senators, which had been greatly diminished by the last king, was completed to 300 by admitting some plebeian equites into the senate (Dionys., v. 13; Festus, v., *qui patres, qui conscripti*), and these new plebeian senators were called conscripti or adlecti, and hence the phrase *patres conscripti, i.e. patres et conscripti.* Valerius Publicola, to whom this completion of the senate is ascribed, and who according to some accounts was the successor of Tarquinius Collatinus, gave to the new republic a somewhat more definite and regulated constitution, by a series of laws called Leges Valeriae. [Publicola.]

The banishment of the Tarquins involved the Romans in a war with the Etruscans, in which the Romans, and especially the plebeian order, suffered very severely; but the Romans soon recovered their strength. [Porsena.] The patricians gained a considerable addition to their power when the Sabine Claudii with their 5000 clients emigrated to Rome, and were received among the patricii, of which body they subsequently formed a distinguished gens. The plebeians, who had never recovered some of the rights conferred upon them by the constitution of Servius Tullius, began to show their discontent; but the patricians, who had gained new strength by the accession of the haughty Claudii, endeavoured to quell the aspiring spirit of the plebeians. Accordingly in 500 B.C., when the plebeians refused to take up arms against the revolted Latin towns, Titus Lartius was made dictator (*prætor maximus*, or *magister populi*) with unlimited power both within and without the city, so that during his rule the Valerian laws, by which the plebeians were in some degree protected, were suspended. The war with the Latins lasted till 496 B.C. and the battle of the Lake Regillus, when the Romans again became masters of Latium. This successful event emboldened the patricians still more, and they no longer feared the plebeians. The latter had by their service in the armies been obliged to neglect the cultivation of their fields, and in the war against Porsena they had lost a considerable portion of their lands. Receiving no compensation for their losses, they had been compelled through want to become the debtors of the patricians, who, when the time of payment came, exacted their money with the most merciless cruelty, and in cases of insolvency made their debtors their prisoners, and, in a certain sense, their slaves (*addicti, nexi*; see Niebuhr, *Hist. of Rome*, i., p. 571, &c.; Göttling, p. 283, &c.). The most conspicuous among the oppressors was the Sabine Appius Claudius, who in 495 B.C. was consul with P. Servilius Priscus. The indignation of the plebeians now rose to such a height, that when a war against the Volscians broke out, they again refused to bear arms. But a promise that their condition should be considered and their wishes satisfied, induced them to follow their patrician general. The Volscian city of Suessa Pometia was taken, but the plebeian debtors on their return from the campaign were again thrown into the dungeons of the rich. This incensed the plebeians to such a degree, that nothing could prevent an insurrection but the iron rule of a dictator, M. Valerius, who, with an army of 40,000 plebeians, defeated the Volscians, Aequians, and Sabines. Being again deceived, the plebeians seceded from Rome, and took up a fortified and threatening position on a neighbouring hill (Mons Sacer). The senate in great alarm granted the demands of the plebeians, the exact nature of which is unknown. Some important advantages however were gained: two, or, according to others, five plebeian tribunes (tribuni plebei) were created to protect their order, and two other plebeian magistrates, called aediles. The most important concession however was that which the plebeians shortly afterwards obtained, the right of summoning before their own comitia (comitia tributa) any one who violated the rights of their order. (Göttling, p. 300.)

The year after the secession of the plebeians to the Mons Sacer (493 B.C.), the consul Spurius Cassius renewed the offensive and defensive alliance with the Latins, by which both nations seem to have been placed on a footing of equality: conquered lands were to be divided, the chief commander of the allied army was to be alternately a Roman and a Latin, and the laws made on the days of meeting were to be binding on both states. Rome however gradually became more assuming and arrogant, until, in 388 B.C., the Latin league was dissolved. But soon after the renewal of the alliance with the Latins (489 B.C.), both nations had hard struggles with the Volscians and Aequians, who probably took possession of some of the Latin towns. [CORIOLANUS.] In 486 B.C. the Romans admitted the Hernicans as a third party to the Latin league, in order to strengthen themselves. In the same year the first attempt was made by Sp. Cassius Viscellinus to assign to the plebeians in full ownership a portion of the public lands [AGRARIAN LAWS]; but the attempt cost him his life.

For a series of years (485-479 B.C.) one of the consuls was always a member of the Fabian house, a circumstance which at last raised a suspicion that the Fabii secretly aimed at subverting the republican institutions. The Fabii emigrated with 4000 clients to Etruria, where a few years afterwards they were all cut to pieces by the Etruscans.

The three allied nations, the Romans, Latins, and Hernicans, now carried on a series of wars against the Etruscans, Volscians, and Aequians, in which the allies, especially the Romans, were often near the verge of destruction. The Etruscans made peace in 474 B.C., while the Volscians and Aequians continued their hostilities, and would in the end have probably destroyed the whole Roman army, if the dictator L. Quinctius Cincinnatus had not delivered the consul L. Minucius and his forces at the moment when they were surrounded by the enemy (458 B.C.). The Aequians however still continued to infest the Roman and Latin territories, until 446 B.C., when they were defeated near Corbio, and remained quiet for a long time.

Until the year 472 B.C. the plebeian magistrates, the tribunes, and the plebeian aediles had been elected by the comitia tributa and confirmed by the curiae; but in the year 471 B.C. the tribune Publilius Volero succeeded in procuring for the plebeians the right to elect their own magistrates without any interference on the part of the patricians, to deliberate and make laws in their own comitia (plebiscita), which indeed were not binding as leges, but still must have had a considerable influence, being the declared will of the commonalty. From this time the Roman republic was divided into two opposite classes or parties. On the one hand there were purely patrician assemblies (comitia curiata), in which all the patrician magistrates and certain classes of priests were appointed, and which were the supreme court of justice for the patrician order; the comitia tributa on the other hand were purely plebeian assemblies, with the right of appointing the plebeian magistrates, of making plebiscita, and of summoning before their tribunal those who infringed the rights of the plebeians. The tribunes and the senate were in a kind of opposition to one another, similar to that of the patricians and plebeians. The comitia centuriata, in which both orders met, were a feeble bond of union. This anomalous condition of the state, and the constant disturbances arising from it, necessarily produced a conviction that a reform in the constitution could not be avoided. The tribune C. Terentillus Arsa therefore, in 462 B.C., proposed that ten men should be appointed to make a code of laws, by which it was chiefly intended to limit the power of the consuls. But this proposal met with the strongest opposition from the patricians, and it was not carried into effect for a number of years, during which the commonalty continually gained strength, especially by the increase of the number of tribunes to ten, 457 B.C., and by the assignment of the Aventine to the plebeians (456 B.C.). At length preparations for a new code of laws were made, and in 451 B.C. ten patricians were appointed for the purpose; all other magistrates were suspended until the business should be completed. The result was that in the first year ten tables were produced, with which both parties were satisfied. In the second year, when the patricians had secured the decemviral power to themselves, two other tables were added. When the task was completed, the decemvirs were unwilling to lay down their power, to which however they were at last compelled by the people. The usual magistrates were now again elected, both orders became reconciled, and in 449 B.C. the laws of Valerius and Horatius declared that plebiscita should be leges and binding on the whole nation (Liv., iii. 55); and that there should be no magistrate from whose sentence an appeal might not be made to the people. Various other measures were at the same time taken to secure the plebeians in the possession of their newly acquired rights. But they still continued to be a separate body, for the whole administration remained in the hands of the patricians, and no connubium yet existed between the two estates. The connubium however was obtained in 445 B.C., by the tribune Canuleius (*rogationes Canuleii*), who also made an attempt to divide the consulship between the two estates. But the latter of these rogations was evaded by the patricians, who agreed that, instead of two consuls, six military tribunes with consular power should be elected indifferently from both orders. (Niebuhr, ii., p. 398, &c.; Göttling, p. 326, &c.) This evasive concession was made because the patricians were determined not to give to the plebeians the censorial power with which the consuls had been invested; and in order to retain this, the patricians created two censors, a new curule dignity, which belonged to their order exclusively, until the year 351 B.C., when the plebeians participated in this dignity also.

After these arrangements, though frequently violated by the patricians, Rome enjoyed a short period of internal tranquillity; but abroad her arms were kept in constant activity by the wars with Fidenae, which was destroyed in 426 B.C., with the Aequians, who were defeated, in 418 B.C., at the foot of Mount Algidus, by the dictator A. Servilius Priscus, and with the Veii. The war with Veii lasted for several years, and in 396 B.C. this wealthy city was taken by M. Furius Camillus. Two years after, the Faliscans surrendered to Rome. This success of the Roman arms was partly owing to the invasion of Etruria by the Gauls, who however, in 390 B.C., completely defeated a Roman army on the small river Allia. The Gauls then advanced towards Rome, took and burned the city, and laid siege to the Capitol. The whole narrative of this event in the antient historians is distorted by fictions. The simple truth is related by Polybius (ii. 18), who says that after the Gauls had taken possession of Rome, they were induced, by an inroad of the Veneti into their own territory, to quit Rome and return home; though the city was indeed soon rebuilt, its weakness encouraged the Aequians, Volscians, and Etruscans to renew their hostilities; but they were conquered by Camillus, and two Roman colonies, Sutrium and Nepete, were founded in Etruria, as a barrier against the enemies. The Hernicans and Latins also endeavoured to shake off the yoke of their alliance with Rome, and renewed the contest for their liberty. The former, after a series of campaigns and reverses, were completely subdued in 306 B.C.; while the Latins, induced by the repeated incursions of the Gauls, soon renewed their alliance with Rome.

The oppression of the patricians, together with the numerous and wearisome campaigns, and the invasion of the Gauls, had reduced the plebeians to a condition which was little better than it was before the first secession. Two noble plebeians, L. Licinius Stolo and L. Sextius, now determined to keep the oligarchical party in bounds, and to procure for their own order a share in the consulship. In 376 B.C. both of them were tribunes, and in this capacity proposed four rogations to the following effect:—1, That no more consular tribunes should be appointed, but two consuls instead, one of whom should always be a plebeian; 2, that no citizen should possess above 500 jugera of the public domain, and should not keep above a certain number of cattle upon them; 3, that the amount of interest paid by debtors to that day, should be deducted from the capital, which was to be paid off in three annual instalments; 4, that instead of the duumvirs who kept the Sibylline books, decemvirs should be elected, five of whom should be plebeians. The ensuing contest was carried on with the greatest determination and bitterness. The patricians contrived to get the veto of the other tribunes, but Licinius and Sextius prevented the elections of the higher magistrates, so that from 375 till 371 B.C. Rome was in a state of complete anarchy. The two tribunes Licinius and Sextius however retained their office from year to year; and in their tenth tribuneship, they first carried their fourth rogation, and soon after the senate felt obliged to agree to the others

The excitement at Rome had been tremendous, and the mediation of Camillus, who had just returned from a victory over the Gauls, was necessary to allay the fury of party-spirit. Lucius Sextius Lateranus was the first plebeian consul, 366 B.C., and a temple was erected to Concordia as a monument of the happy reconciliation of the two orders. But in sharing the consulate with the plebeians the patricians, being determined to retain all that they could, curtailed the consular dignity of one important part of its rights, and reserved to themselves exclusively the jurisdictio, or judicial (in the modern sense) authority. Accordingly they created the offices of praetor and of curule ædiles. However, it was a consequence of the advantages now gained by the plebeians, that all the other great civil and religious offices were gradually thrown open to them; first the dictatorship in 356 B.C.; the censorship in 351 B.C.; the prætorship in 336 B.C.; and at last, in 300 B.C., by the Ogulnian law, the offices of pontiff and augur. The old distinction between patricians and plebeians thus gradually disappeared in all matters of real importance, and Rome, internally strengthened, united, and consolidated, seemed now enabled to direct her whole energy against external enemies. But this internal harmony was at first more apparent than real, for the patricians made many attempts to evade the Licinian laws, and they contrived for a number of years to keep the consulship to themselves, or at least they kept the plebeians away from it by electing either a dictator or an interrex. The law respecting the interest of money was likewise not always observed, and the rigorous manner of exacting payment of debts gave rise in many cases to complaint. The beneficial working of the new constitution did not fully manifest itself until after the year 339 B.C.

The first plebeian dictator, C. Marcius Rutilus, carried on a war against the Faliscans and Tarquinienses (365 B.C.), which was terminated by a peace. Caere obtained a truce for one hundred years by giving up to Rome half of its territory (353 B.C.). The last war against the Gauls, who had at intervals renewed their attacks on the Romans, was successfully terminated (349 B.C.) by L. Furius Camillus. The treaty with Carthage was renewed in 348 B.C., probably on account of the Greek pirates, who about this time infested the coasts of Latium, and against whom the Romans were unable to protect themselves. (Livy, vii. 27.) The great power which the Romans had gradually acquired and shown in the various contests with their immediate neighbours, now began to be displayed in the war against the Samnites, which soon brought them into contact with all the nations of Italy. This war however was preceded by a victory over the Volscians and Aurunci, which opened to the Romans the way into Campania. The Samnite war lasted from 343 to 341 B.C., and ended in a treaty with Rome, whose power now began to raise apprehension throughout Italy. [SAMNITES.] The Latins were the first who showed this feeling, and they demanded to be put on an equality with Rome, that one of the consuls and half of the senators should be Latins. The consequence was a war with the Latins, and a continuation of that against Samnium, for which the Latins had interceded. The Romans were successful against both, and in 338 B.C. all Latium was subdued. Some of the towns retained the Roman franchise with or without the suffragium, others lost their fortifications and part of their territories; the Latin confederacy was dissolved, and the commercium and connubium, which hitherto existed among many of the Latin states, was abolished.

The establishment of a Roman colony at Fregellae and its fortification led to a second war with the Samnites, who were allied with Palaeopolis and Neapolis, two Greek colonies, which, relying upon this alliance, ventured to insult the Romans. A Roman army marched into Campania, and Palaeopolis fell, in 326 B.C., by treason. Neapolis opened its gates to the enemy. In the year following, the war with the Samnites commenced, and lasted till 315 B.C. Appulia submitted to Rome in 318 B.C. The Etruscans, Umbrians, and Gauls now rose successively against Rome, and the Marsians, Pelignians, Aequians, and Hernicans made common cause with them. But as these enemies did not rise at the same time, and as they were not all actuated by the same spirit, the Romans subdued them all, and the Aequians were annihilated. The Samnites in the meanwhile entered into an alliance with the Etruscans, Umbrians, and Gauls, against Rome, and thus commenced their third war, which lasted from 295 to 290 B.C., when they were compelled by M. Curius Dentatus to make peace. All Latium, Etruria, Campania, Samnium, a great part of Appulia, and several other Italian nations now submitted to the overwhelming power of Rome.

The internal state of the republic during these wars was tolerably quiet, as the plebeians had gradually acquired the same rights as the patricians. Appius Claudius Cæcus distributed, in 312 B.C., the libertini (freedmen), who as aerarii were not included in the tribes or classes, among all the tribes; but this arrangement lasted only till 304 B.C., when Fabius Rullianus threw all the libertini into the four city tribes. The last secession of the plebeians, 286 B.C., arose from a renewal of the attacks on the personal liberty of a debtor; but the law of the dictator Hortensius pacified them by securing to the plebeians their rights, and by giving to the plebiscita the full effect of leges.

In 284 B.C. the Tarentines in southern Italy secretly induced the Etruscans and Boians to revolt; the Samnites also again took up arms, and the Lucanians and Bruttians laid siege to Thurii, where they were defeated by the consul Fabricius Luscinus, who left a Roman garrison at Thurii. The Gauls destroyed one Roman army, but the Boians were defeated in 283 B.C. The Tarentines insulted a Roman fleet which had been driven into their port by a storm, and at the same time took Thurii, drove away the Roman garrison, and plundered the town. But being pressed by a Roman army under Aemilius Barbula, Tarentum sought and obtained the aid of Pyrrhus. [PYRRHUS.] The war with Pyrrhus and the Tarentines lasted from 281 to 275 B.C., and three years afterwards Tarentum surrendered to the Romans, and Rhegium also soon fell into their hands. The war with Tarentum made the Romans masters of the whole of the southern peninsula; and all Italy, from the Sicilian Straits to the river Macra in the north of Etruria, now recognised the supremacy of Rome (265 B.C.). Colonies, chiefly Latin, that is, colonies which had inferior rights to the Roman colonies, were established in various parts to ensure the submission of the conquered nations, and the Italian states and towns either received new constitutions or retained their old ones, modified according to the circumstances under which they had submitted to Rome. Some towns however, such as Capua, seem to have remained almost independent states.

The Roman constitution had now gained its perfection, and out of an exclusive aristocracy a moderate democracy had gradually been developed, in which all classes exercised their proper influence with the power to counterbalance each other. This constitution lasted without any important change for a considerable time, and Polybius, who saw it in operation towards the end of the Punic wars, looked upon it with high admiration. (Polyb., iv. 2.)

Two conquering republics cannot easily exist as peaceful neighbours. After the conquest of Italy, Rome was as desirous to take Sicily, as Carthage was jealous of the gigantic strides which Rome had made. The immediate causes which led to the first Punic war, together with its progress from 264 till 241 B.C., are described in the article PUNIC WARS. The result of this war was that Rome gained possession of Sicily and the adjacent islands; and Sicily became the first Roman province. [PROVINCIA.] Syracuse however, Panormus, Segesta, and some other Sicilian towns retained their independence. The immense loss of men which Rome had sustained was scarcely felt, and the way for new conquests was prepared. . In 238 B.C. the Romans took possession of Sardinia, where the rebellious Carthaginian mercenaries sought the protection of Rome against the natives. Notwithstanding the hard struggles of the Sardinians as well as the Corsicans for their independence, the Romans in the end made themselves masters of both islands, and the Carthaginians, who, after the conclusion of a war against the mercenaries in their own country, attempted to reduce their armies in Sardinia and Corsica to obedience, were compelled to evacuate the islands and to pay to Rome 1200 talents. In the meantime a war broke out with the Ligurians (238 B.C.), who were probably instigated by the injured Carthaginians. The Insubrians also formed extensive connections with other Gallic tribes, and when, in 232 B.C., C. Flaminius carried a plebiscitum to the effect that the country of the Senones, between Sena Gallica and the Rubicon, should be assigned to the plebeians, the Boians, who had most to fear, united with many of the neighbouring tribes, and even with some of the Transalpine Gauls, and marched southward as far as Clusium, where they were completely defeated by the consuls L. Aemilius and C. Atilius (225 B.C.). The Romans now advanced towards the north, gained a second victory over the Gauls at Clastidium, and took possession of Mediolanum (222 B.C.). The Gauls in Gallia Cisalpina, despairing of success, submitted to Rome, which strengthened its power in these parts by two new colonies, Cremona and Placentia. A year after this event Istria was added to the Roman republic. While the Gallic war was carried on, Illyrian pirates gave rise to the first war with Illyricum, which lasted from 230 till 228 B.C. The Illyrian queen Teuta was compelled to give a part of her dominions to Rome, to pay tribute, and to stop the piracy of her subjects; some Greek towns, which had been subject to her, were declared free. The Romans thus came in contact with Greece. (Polyb. ap. Zonaras, viii. 9.) A second war with the Illyrians, in 219 B.C., made the Romans masters of the whole coast of Illyricum.

While Rome was thus engaged, the second Punic war was caused by the operations of the Carthaginians in Spain. It lasted from 218 till 202 B.C. [PUNIC WARS.] Great as the sufferings were to which Italy was exposed during the presence of the Carthaginian armies, and although the majority of the Italians had sided with the enemy, still the Romans soon recovered their losses, and established their power more firmly by new colonies in Italy. Spain was added to their former possessions, and when the navy of Carthage was destroyed, Rome was mistress of the sea. But the republic had gone beyond its natural limits, and with their extensive conquests the Romans lost the simple and manly character for which their forefathers had been distinguished: demoralization and corruption began to manifest themselves in their public as well as in their private life.

Philip III., king of Macedonia, after the battle of Cannae, had concluded a treaty with Hannibal. The Romans, into whose hands the treaty fell, sent a fleet to Illyricum, which compelled the king to a shameful flight. This was the prelude to the first Macedonian war, which lasted from 214 till 205 B.C., and was carried on with little vigour. A peace was at last concluded, which was not honestly meant by either party. Accordingly, five years later, when Athens implored the assistance of Rome against Philip and the Acarnanians, a second war with Macedonia commenced, which lasted from 200 till 197 B.C., and was terminated by the battle of Cynoscephalae, gained by Quinctius Flamininus, by which the power of Macedonia was broken. Philip was confined to his own kingdom, and became a vassal of Rome. Flamininus proclaimed the liberty of Greece, but nevertheless he remained several years in Peloponnesus to watch the movements of Antiochus the Great and the Aetolians, to arrange the affairs of Greece, and to foster dissension among the Greeks. There were many occasions on which the Romans might have attacked Antiochus, but their wars in Spain and the north of Italy caused the outbreak of the war to be deferred until 192 B.C. Antiochus, invited by the Aetolians, landed in Greece. The Aetolians obtained a truce for themselves, but the war against Antiochus, who fled to Asia, was continued; the battle of Magnesia decided the victory, and the power of Syria was broken. Eumenes of Pergamus and the Rhodians were richly rewarded for their servility towards Rome, and acted the same part towards Antiochus as Massinissa acted towards Carthage. The Aetolians afterwards concluded a peace with Rome, but on very hard conditions. The Galatians in Asia, and Ariarathes, both allies of Antiochus, sued for peace and obtained it. Asia was now reduced to such a state that it only required one more blow to effect its complete submission.

But the Romans had to contend in northern Italy, from 200 till 191 B.C., and in Spain from 197 B.C., with more determined enemies. In Spain, peace was not restored until 179 B.C., when Tib. Sempronius Gracchus, the father of the celebrated tribunes, by his humanity conciliated the Celtiberians. The Istrians, Sardinians, and Corsicans likewise made a fruitless attempt to shake off the Roman yoke. The corruption of the Romans, after they had become acquainted with the luxuries of Greece and Asia, had rapidly increased. As one instance out of many, we many mention the manner in which the Bacchanalia were celebrated at Rome. (Livy, xxxix. 8-17.)

Perseus, the successor of Philip III. in Macedonia, who had inherited his father's hatred of the Romans, declared war against them in 171 B.C. This war was at first very unfortunate for the Romans, but in 168 B.C. L. Aemilius Paulus decided the fate of Macedonia in the battle of Pydna. Gentius, king of the Illyrians, had been the ally of Perseus, and this circumstance led to the third Illyric war, which ended in a division of the country, like that of Macedonia. In Epirus, Aemilius Paulus and his soldiers behaved with a cruelty which has perhaps never been equalled in the history of the Roman republic. (Liv., xlv. 34.) Eumenes and the Rhodians, who had drawn upon themselves the suspicions of the Romans in the war against Perseus, were now humbled. Others, such as the servile Prusias of Bithynia, Massinissa in Numidia, Seleucus Philopator of Syria, and the kings of Egypt acknowledged the supremacy of Rome, which by cunning and fraud gradually acquired the means of completely reducing them whenever inclination prompted.

The first blow was directed against Carthage, which had long endured the insults of Massinissa, the ally of the Romans; and when at last she attempted to maintain her rights, the Romans razed Carthage to the ground (146 B.C.), and her territory became a Roman province under the name of Africa. [PUNIC WARS.] In Macedonia two pretenders had risen against Rome, the consequence of which was that Macedonia was reduced to the form of a province. The same was the fate of Greece after the fall of Corinth (146 B.C.).

Some years before these events (153 B.C.) a new war had broken out in Spain, as the inhabitants of Segeda did not strictly observe the conditions on which peace had been granted to them. The war was carried on for many years with varying success, and the cruelty of the Romans only contributed to make the exasperation of the Spaniards more general. Viriathus [VIRIATHUS], who had placed himself at their head, carried on the war from 148 till 140 B.C. After his death, Brutus penetrated indeed as far as the western coast, and in 132 B.C. returned to Rome in triumph; but the natives nevertheless did not submit. Numantia offered the most determined resistance, and was totally destroyed, 133 B.C. After these bloody wars, Spain was apparently quiet, and Roman commissioners arranged the affairs of the country.

During this period Italy appears to have enjoyed perfect tranquillity, and its wealth and population increased (Val. Max., iv. 1, 11), but a formidable insurrection broke out in Sicily. In this island the extensive estates of wealthy Romans were cultivated by numerous slaves, who, being ill-treated by their masters, rose under Eunus and Cleon, and spread destruction all over the island. In 131 B.C., they were defeated by P. Rupilius at Enna. Attalus, the last king of Pergamus, left, in 133 B.C., his kingdom as an inheritance to Rome; the disputes arising out of this gift led to the reduction of Asia into the form of a province (129 B.C.). Phrygia was given to Mithridates V. as a reward for his assistance to the Romans.

How completely the old distinction between patricians and plebeians had now disappeared, may be inferred from the fact, that in 172 B.C. both consuls, and in 131 B.C. both censors, were plebeians. Ever since the wars of Hannibal, the number of plebeian senators had exceeded that of the patricians. The only distinction which now had any value was that between *nobiles* or *illustres*, and *obscuri*. The laws which were made during this period had little or no relation to the constitution, but were for the most part intended to counteract the growing love of luxuries (*leges sumtuariæ*), to fix the age at which persons might attain the different offices of the state (*leges annales*), to prevent the extortion of the governors of provinces (*de pecuniis repetundis*), &c. After the reduction of Macedonia (168 B.C.), the treasury (aerarium) of the Roman republic was so well stocked, that the head-tax (tributum) which the Roman citizens had hitherto paid, was abolished. But during this apparent indifference in regard to constitutional matters, a state of things had gradually been developed, which broke out like a volcano, and gave the first example of civil war. An active and thriving middle class did not exist at Rome. The citizens were either exorbitantly rich or in absolute poverty. The illustrious families had almost monopolised the lucrative offices of the republic, and the small landowners, on account of the constant wars, had been compelled to neglect their fields, and in numerous cases had sold them to the nobles. Such reduced persons wandered about homeless, with their wives and children, and lived in extreme poverty. (Plut., *Tib. Gracchus*, c. 9.) The only remedy was to provide this multitude of destitute citizens with lands, and to raise them to the station of an independent middle class. This was undertaken by the two brothers, Tiberius and Caius Gracchus. Who they were, what measures they proposed, and how they ended, is related in the articles GRACCHUS and AGRARIAN LAWS. The aristocratic party gained the victory in this contest, but it was gained by crime and bloodshed. Several regulations of the agrarian law were abolished, the nobles left off paying the rent which was due for the public domain that they occupied, extended (as before) their possessions by purchasing the smaller portions of the poor, and expelled the impoverished peasantry from their paternal roof. (Appian., *Civil.*, i. 27.)

A frightful example of the demoralised condition of all classes of Roman citizens was exhibited in the war against the usurper Jugurtha [JUGURTHA; METELLUS, Q. CÆCILIUS; MARIUS, C.; SULLA], who, in 106 B.C., was brought to Rome in triumph. During this war there appeared on the northern frontiers of Italy hosts of barbarians, Cimbri and Teutones (113 B.C.). Several Roman armies which were sent against them were defeated; but C. Marius, in 102 B.C., annihilated the whole body of the Teutones near Aquæ Sextiæ, and in the following year the Cimbri in the Campi Raudii. The few barbarians who survived were made slaves or fled into Gaul, where Cæsar saw the remnants of them. (*Bell. Gall.*, ii. 29.)

In Italy several petty rebellions of the slaves in Campania showed what might be expected, and Sicily became the scene of a second insurrection of the slaves, who carried on a fearful and destructive war with Rome (103-99 B.C.). The proconsul M. Aquilius succeeded in subduing the insurgents, after their last leader Athenion had fallen. In 96 B.C. the kingdom of Cyrenaica was given to the Romans by the will of the last king.

At Rome, where peace had only been restored by violence, a fresh attempt was made to introduce an Agrarian law, but the mover, L. Apuleius Saturninus, a man of no principle, who acted merely from selfish motives, was put to death with his associates (99 B.C.). (See Cic. *pro Rabir.*, c. 9.) It was about this time that two other important subjects began to attract general attention: first, the Judicia, which were in the hands of the equites, and grossly abused. In 91 B.C. the tribune Livius Drusus endeavoured to remedy the evil by adding 300 equites to the senate of 300, and by giving to this new senate of 600 all judicial powers in matters affecting a person's caput or civil condition. This attempt however had not the desired effect. The second question was, whether the Roman franchise should be given to the Italian subjects and allies of Rome. Many sensible Romans saw the necessity of such a measure; but the powerful party at Rome could not prevail on themselves to come to any definite conclusion. The Italians however persisted in their demand, which, in 91 B.C., led to the bloody and destructive Social or Marsian war. The Italians, seeing that there was no hope of gaining their object, intended nothing less than to destroy Rome, to establish a new Italian republic, with a senate of 500 members and two consuls, and to make Corfinium, under the name of Italica, its centre and capital. The Latins and Umbrians remained faithful to Rome, and obtained, together with some other places in Etruria, the Roman franchise by a Lex Julia. (Göttling, p. 448, &c.) In the first campaign the Romans were unsuccessful, but Cn. Pompeius Strabo defeated the Italian allies at Asculum, which he took and destroyed (89 B.C.). The Italians gradually submitted, and received the franchise, and thus the great mass of the inhabitants of the peninsula became Roman citizens. The dangerous designs of Marius and Sulla induced the senate to promise the franchise to all those who were still in arms, on condition that they should lay them down. But the Samnites resolutely continued the war, and in the ensuing civil contest they joined the party of Marius. The new citizens were, according to some writers, divided into 15 new tribes; according to others, into 10; and according to Velleius Paterculus, they were distributed into 8 of the old tribes. This last account is the most probable. But Italy had lost the flower of her population, and many once flourishing towns had been destroyed and razed to the ground. The number of tribes which, at the time of the war with Porsena, had been considerably reduced, was afterwards gradually increased to 35, a number which remained till the latest times. The province of Gallia Transpadana received in the same year, by the Lex Pompeia, the Jus Latii, that is, those political rights which the Latins had possessed previous to receiving the full franchise, and which were expressed by the term commercium. In the dictatorship of Julius Cæsar the Transpadani were placed on an equality with the rest of Italy, and obtained the Roman franchise. The circumstance of Rome giving the franchise to all the Italians without altering its constitution accordingly, was a great mistake, and the first step towards the dissolution of the republic.

For the war against Mithridates, which now followed, and the civil war between Marius and Sulla, see the articles MITHRIDATES, SULLA, and MARIUS. The first Mithridatic war lasted from 87 till 84 B.C. After its conclusion, Sulla returned to Italy, forced his way to Rome, and after having been made perpetual dictator (82 B.C.), he endeavoured to restore peace and save the republic by a new but ill-judged constitution [SULLA], according to which the aristocracy were to form the basis of the republic, just as the Gracchi had endeavoured to base it on an independent middle class.

Period III:—From the Constitution of Sulla to Augustus, from 81 *till* 30 B.C.—In the year 83 B.C. the second Mithridatic war broke out, in which the Romans were defeated, and, in 81 B.C., they concluded a peace with him. After the death of Sulla, in 78 B.C., M. Æmilius Lepidus attempted to repeal all the leges of Sulla, but he was defeated in a battle by Lutatius Catulus, and fled to Sardinia, where he died. The tribunes also exerted their utmost power to recover the position which they had lost by the constitution of Sulla. After many fruitless attempts, their object was attained in 70 B.C., in the consulship of Pompey and Crassus, when, by the Lex Aurelia, the senate was deprived of the exclusive possession of the Judicia, which Sulla had given to it. The judicial power was now divided among the senate, the equites, and the tribuni aerarii. Thus the constitution of Sulla was abolished after it had been in force for about ten years.

The history of Rome from this time forward is little more than the history of the leading men. See the articles POMPEY, CÆSAR, CICERO, SERTORIUS, ANTONY, &c. In 74 B.C. Mithridates commenced the third war against the Romans, which led to the complete subjugation of all Asia Minor, Syria, and Phœnicia. Other Roman generals in the mean time advanced into Mœsia as far as the Danube, and on the northern coast of the Euxine as far as the river Don and the Palus Maeotis or Sea of Azof. In 63 B.C. Rome was saved by the watchful care of Cicero from the destruction with which the conspiracy of Catiline threatened it. [CICERO; CATILINE.] The suppression of this conspiracy could not prevent the republic from hastening towards its ruin. Between the years 58 and 50 B.C., Cæsar completed the conquest of Gaul; and in 56 B.C., by the treaty of Lucca, the Roman world was divided among Cæsar, Crassus, and Pompey (first triumvirate); and when Pompey, as sole consul, B.C. 52, placed himself at the head of the republic, the civil war between him and Cæsar broke out, which was decided, in 48 B.C., by the battle of Pharsalus. Cæsar, who had now become dictator, defeated the remains of the Pompeian party, and then endeavoured to restore order in Italy; but he was assassinated in 44 B.C. His opponents, whose republican spirit had survived the republic, were unable to restore it; and in the following year a second triumvirate was formed by Octavian, Antony, and Lepidus, whose object was the total destruction of the republican party. This object they pursued by proscriptions and a series of despotic and cruel measures, until they began to quarrel with one another. Their quarrels led to a new civil war, which ended in the battle of Actium, and placed Octavian (Augustus) at the head of the Roman world. Thus ended the Roman republic.

From the time when the constitution of Sulla was abolished, no thorough reform of the republic was attempted. All that we read of are isolated measures, some of which were calculated to promote the democratical interests, such as the laws of Clodius, by which the power of the magistrates was limited; while others, more in an aristocratical spirit, were intended to introduce gradual improvement, and to preserve as much of the old forms as possible. The numerous innovations of Cæsar, in all departments of administration, are the most important changes that were wrought during this period. Most of them were useful, but they paved the way to the monarchical government, to which the republic submitted the more readily, as for many years it had been accustomed to the almost absolute rule of individuals, who, being only concerned about their own aggrandizement, had brought indescribable sufferings upon the nation. One man at the head of the state, without a rival, was the only remedy for the public evils. A longer continuation of that state of affairs which had existed for the last 50 years, would probably have broken up the Roman empire, and made Italy a scene of bloodshed and misery.

The Roman republic, at the time of its dissolution, comprehended the following countries, which were for the most part administered as Roman provinces:—Italy and all the islands by which it was surrounded; all Gaul as far as the Rhine, nearly all Spain, Illyricum, Pannonia, Dalmatia, Greece with all the islands of the Ægean, Thrace, Mœsia (the Danube here formed the boundary); in Asia all the countries between the Caspian Sea, the Parthian empire, the Persian and Arabian gulfs, the Mediterranean and the Caucasus, that is, Colchis, Iberia, Armenia, Syria, Palestine, Phœnicia, nearly the whole of Asia Minor, the whole of the northern coast of Africa, Mauritania, Numidia, the territory of Carthage, Cyrenaica, and Egypt. In some of these countries however the power of Rome was not firmly established until the Imperial period.

Period IV.:—The Empire to its Downfall, from 30 B.C. *till* 476 A.D.—The spirit of antient Rome and its moral greatness were gone, and freedom, which can only be based on virtue, had perished. The wise therefore, as well as the many who loved peace as the means of securing sensual enjoyments, and who were unconcerned about the consequences to future generations, preferred the mild rule of one man to the late turbulent and convulsed condition of the republic.

As the history of all the Roman emperors is given in separate articles, we shall only make a few general observations on the administration of the empire, and subjoin a chronological list of the Roman emperors down to the time of Justinian.

Augustus gradually concentrated in his own person all the great offices of the republic, though the officers themselves, mere shadows of former days, still continued to be appointed. He thus in effect acquired the sovereign power, being free from all responsibility. He had the right to raise armies, to impose taxes, to decide on peace and war; he had the command of all the legions, and the power of life and death over all Roman citizens, both within and without the city. The senate, after the removal of those whom Augustus had reason to fear, was filled up with individuals who were his mere creatures. Tiberius indeed restored to the senate part of its former power, but the more the influence of the soldiers increased, the more that of the senate declined, which body, as a compensation for this loss, was made a high court of justice, which took cognizance of offences committed by senators, crimes against the state or the person of the emperor, and of the maladministration of provincial magistrates. The relation between the emperors and the senate was very indefinite, and it varied according to the more or less despotic disposition of the head of the state. No provision was made for a regular succession; the first five emperors all belonged to the Julian and Claudian families. (Tacit., *Hist.*, i. 17.) The succession depended upon the will of the actual imperator, who appointed his successor, either by adoption, or by giving him one of the titles, Cæsar, and Princeps Juventutis; or by making him his colleague in the quality of tribune or proconsul. In cases where no person was designated, the senate exercised the right of election. But this privilege was soon assumed by the soldiers, who proclaimed the emperors, and the sanction of the senate became a mere form. The numerous body-guards of the emperors (prætorians), who, in their stronghold (prætorian camp) formed as it were a new Capitol, in effect possessed the sovereign power; and on some occasions they sold the empire to the best bidder. The numerous legions in the provinces however soon became acquainted with this secret of despotism, and availed themselves of it.

The election of magistrates was restored to the people by Augustus, but in most cases he recommended or even elected the candidates. Tiberius invested the senate with the power of election, still reserving a preference to those candidates who were recommended by himself, and the comitia merely received information of the election when it had taken place. In the third century however we find that the emperor alone exercised the right of election. The aerarium was at first nominally under the control of the senate. Augustus formed a separate aerarium for military purposes. The fiscus was the name for the property of the emperor as such, which must be distinguished both from the aerarium and the private property of the emperor. But gradually the emperors took the whole administration of the finances to themselves, and the term fiscus then became equivalent to aerarium in the republican period. In order to keep the magistrates both of the city and the provinces in better subordination, they were paid by salaries.

With respect to legislation, we find that in the reign of Augustus various leges were passed (Lex Julia et Papia Poppaea, De Adulteriis, &c.), but after his death we scarcely hear of any leges, and senatus consulta were now made upon the proposition or the recommendation of the emperor. The Edicta of the prætors gradually lost their importance, and their place was supplied by the Constitutiones principum. The emperor himself of course possessed supreme jurisdiction, and for the decision of extraordinary matters, as in cases of appeal, he appointed an especial council, which seems to have been distinct from his privy council for the administration of the empire. (Spart. Hadr., 18.)

The Judicia Publica were usually held by the senate, but civil causes were, as before, tried by judices whom the praetor appointed. The administration of the city engaged a great deal of the attention of Augustus and his successors, as the monarchy depended much more on the peace and order of the capital than the republic. Respecting the division and administration of the provinces, see the article PROVINCIA. In the reign of Caracalla all subjects of the empire were made Roman citizens by a constitution of that emperor.

In this state the government of the Roman empire remained, with a few and not very important alterations, down to the time of Diocletian. The measures of this emperor and Constantine produced a complete change in the form of government. [DIOCLETIAN; CONSTANTINE.] The despotism of the prætorian soldiers ceased, and to it succeeded the government of the court, with its ministers and innumerable officers. The maintenance of these functionaries and of the numerous armies rendered heavy taxes necessary, and the misery, wretchedness, and degradation of the nations subject to the empire, which had been increasing during the last two centuries previous to its overthrow, at last reached a pitch which it is almost impossible to describe.

The Roman empire, notwithstanding its vast extent at the end of the republic, still continued to increase. Vindelicia, Rhætia, Noricum, Pannonia, and Mœsia were completely subdued and made parts of the empire. The Danube was made the boundary in these parts, to secure the empire against the incursions of the barbarians. The subjugation of Spain was completed by the submission of the warlike Cantabrians. In Germany conquests were also made, but more with a view to secure Gaul than to acquire any new possessions in that country, and the Rhine may be considered as the frontier on that side of the empire. In the reign of Trajan the empire attained its greatest extent; Dacia, Assyria, Mesopotamia, Armenia, and Arabia were made Roman provinces; but some of these conquests were soon given up, and the Danube and the Euphrates became the boundaries of the empire. Britain and the southern part of Scotland had been made a province in the reign of Nero. But the internal weakness, resulting from the imperfect union of so many countries and nations, rendered it impossible to repel the incursions of the barbarians by whom the empire was harassed from about the close of the fourth century. During this period one country was lost after another, and Italy itself was invaded by the Huns under Attila (452 A.D.). In the year 476 A.D. Odoacer, chief of the Scyrri and Heruli, at the head of a number of Germanic tribes, invaded Italy, dethroned the last emperor Romulus Augustulus, and was saluted by his army king of Rome. The Roman senate implored his protection, and Zeno, the emperor of the East, raised him to the rank of a Roman patricius. Thus ended the Roman empire in the West.

Long before this event the necessity of dividing the unwieldy mass of the empire had been felt, and, since the time of Diocletian, had frequently been made for the purpose of facilitating the administration. Constantinople had become the capital of the Eastern part of the empire, but it was not until after the death of the elder Theodosius (395 A.D.) that the division into the Eastern and Western empires became permanent: the two parts however were intended to form one whole. The line of demarcation between the two empires was the Danube, from a little above Pesth, down to where it receives the Drau, then the small river Drinus (Drino), and a line drawn past the town of Scutari towards the great Syrtis, near the coast of Cyrenaica. All the countries east of this line belonged to the Eastern empire, and those west of it to the Western empire. The capitals, Rome and Constantinople, had each its senate, with equal privileges; but the bond of union between the two empires was weakened by the course of events, and they soon began to feel jealous of each other. The emperors of the East contrived to avert the invasions of the barbarians, and to turn their attention to the West, which, being also more exposed to such invasions, was destined to fall first; the Eastern empire, which had the advantage of a more favourable position for its capital, and had also greater means and better armies, prolonged its existence for many centuries. And even after it had lost all its provinces, and was confined to a very narrow space, it nevertheless maintained itself in this wretched condition until the year 1453 A.D., when Constantinople was taken by the Turks under Mohammed II.

A Chronological List of the Roman Emperors.

Augustus . . . from	30 B.C. to	14 A.D.
Tiberius	14 A.D. to	37 A.D.
Caligula	38	41
Tib. Claudius . . .	41	54
Nero	54	68
Galba, Otho, Vitellius .	68	70
Vespasian . . .	70	79
Titus	79	81
Domitian . . .	81	96
Nerva	96	98
Trajan	98	117
Hadrian	117	138
Antoninus Pius . .	138	161
Marcus Antoninus . .	161	180
Commodus . . .	180	192
Pertinax	193	
Julianus	193	
L. Septimus Severus . .	193	211
Caracalla	211	217
Opil. Macrinus		
Elagabalus . . .	218	222
Alexander Severus . .	222	235
C. Julius Maximinus .	235	238
Gordianus . . .	238	243
Philippus . . .	243	249
C. Messius Decius . .	249	251
Trebonianus Gallus . .	251	253
P. Licinius Valerianus and Gallienus . . .	253	260
Gallienus (Macrianus, Valens, Calpurnius Piso, Aureolus) and Odenathus .	261	268
M. Aurelius Claudius .	268	270
L. Domitius Aurelianus .	270	275
M. Claudius Tacitus . .	275	276
M. Annius Florianus .	276	
M. Aurelius Probus . .	276	282
Carus (Carinus and Numerianus) . . .	282	284
Diocletian and Maximianus	284	305
Constantius (Galerius) .	305	306
Constantine (Galerius, Severus, Licinius, or Maximinus, Maxentius, Maximianus, Constantinus, Constantius, Constans, Dalmatius, Annibalianus from 335)	306	337
Constantius (Constantinus, Constans, Magnentius) .	337	361
Julianus . . .	361	363
Flav. Jovianus . . .	363	364
Flav. Valentinianus, Valens (Procopius), Gratianus, and Valentinianus the Younger	364	378
Theodosius (Gratianus till 383, Valentinianus the Younger till 392, Magnus Clemens Maximus, Arcadius from 383) . .	378	395

Western Empire.

	A.D.		A.D.
Honorius . . .	395	to	423
Joannes . . .	424		425
Valentinianus .	425		455
Maximus . . .	455		
Avitus . . .	455		456
Majorianus . .	457		461
Libius Severus .	461		465
Procopius Anthemius . .	467		472
Glycerius . . .	473		474
Nepos	474		475
Romulus Augustulus . . .	475		476

Eastern Empire.

	A.D.		A.D.
Arcadius . . .	395	to	408
Theodosius II. .	408		450
Pulcheria and Marcianus .	450		457
Leo I.	457		47
Leo the Younger	474		
Zeno	474		49
Anastasius I. .	491		51
Justinus I. . .	518		527
Justinian I. . .	527		565

The following is a list of the most important works on Roman History:—

The antient authorities on which the history of Rome is chiefly based are the works of Livy (with Freinsheim's 'Supplements'), Dionysius of Halicarnassus, Polybius, Diodorus Siculus, Appian, Dion Cassius, Varro, Cicero, Sallust, Cæsar, Velleius, Tacitus, Plutarch, Suetonius, Florus, Eutropius, Aurelius Victor, Corn. Nepos, Orosius, 'Scriptores Hist. Augustæ,' Ammianus Marcellinus, Procopius, Zonaras, Xiphilinus, Laurentius Lydus, and many other antient authors, who, though not professing to write the history of Rome, yet incidentally furnish much valuable information.

Among the modern works on the history and constitution of Rome, we may first mention the valuable monographs of Sigonius (contained in Graevii 'Thesaurus Antiquitatum Romanarum,' Ludg. Bat., 1694, &c., 12 vols. fol.), namely, 'De Antiquo Jure Civium Romanorum;' 'De Antiquo Jure Italiæ;' 'De Jure Antiquo Provinciarum:' of Perizonius, 'Animadversiones Historicæ'; Wolfg. Laz., 'Reip. Rom. in exteris Provinciis bello Constitutæ Comment. Libri XII.,' Basel, 1551, and Frankfort 1598; Cuspinianus, 'De Consulibus Romanorum Commentarii,' Basel, 1553, 'Genealogicum Rom. de Familiis Præcipuis Regum, Principum, Cæsarum Rom.,' Frankfort, 1589; and others. Pighius, 'Annales Romanorum, rec. auxit et illustr. A. Schotus,' Antwerp, 1615, 3 vols. fol.; P. Relandus, 'Fasti Consulares,' Traject. Bat., 1715; Ch. Rollin, 'Histoire Romaine, depuis la Fondation de Rome jusqu' à la Bataille d'Actium,' Paris, 1738, 16 vols. 12mo., or 8 vols. 4to. This work has often been reprinted, and has been continued and completed, in Rollin's spirit, by J. B. L. Crevier, 'Histoire des Empereurs Romains, depuis Auguste jusqu' à Constantin,' 12 vols., Paris, 1749. This work of Crevier has likewise often been reprinted. L. de Beaufort, 'La République Romaine, ou Plan Général de l'Ancien Gouvernement de Rome,' La Haye, 1766, 2 vols. 4to.; by the same author, 'Sur l'Incertitude des Cinq Prémiers Siècles de l'Histoire Romaine,' Utrecht, 1738, reprinted at La Haye, 1750, 2 vols. 8vo.; Montesquieu, 'Considérations sur les Causes da la Grandeur des Romains et de leur Décadence,' Paris, 1734, often reprinted; Adam Ferguson, 'The History of the Progress and Termination of the Roman Republic,' London, 1783, 3 vols.; Hook, 'History of Rome,' London; P. Ch. Levesque, 'Histoire Critique de la République Romaine,' Paris, 1807, 3 vols. 8vo.; 'Die Geschichte der Römer zur Erklärung ihrer classischen Schriftsteller,' 2 vols., Leipzig, 1787-90; G. A. Ruperti, 'Grundriss der Geschichte, Erd- und Alterthumskunde, Literatur und Kunst der Römer,' Göttingen, 1794; a second edition appeared in 1811; Chr. F. Schulze, 'Kampf der Demokratie und Aristokratie in Rom,' &c., Altenburg und Erfurt, 1802; Micali, 'Italia avanti il Dominio de' Romani,' Firenze, 1810, 4 vols. 8vo., with an atlas; B. G. Niebuhr, 'Römische Geschichte,' 2 vols., Berlin, 1811. The first volume of the second edition, which was much altered, appeared at Berlin, 1827; and a third edition of the same volume in 1828; the second edition of the second volume appeared in 1831; the third volume was edited, after Niebuhr's death, by Dr. Classen, Berlin, 1832. The whole work only brings the history down to the end of the first Punic war. The first two volumes have been translated into English by J. C. Hare and C. Thirlwall. The whole work has been translated into French by P. A. de Golbery, Paris, 1829-1840. Compare the reviews of the first edition of Niebuhr's work by A. W. von Schlegel, in the 'Heidelberger Jahrbücher. 1817, and by W. Wachsmuth, in his 'Die ältere Geschichte des Römischen Staates,' Halle, 1819; Fr. Buchholz, 'Phi losophische Untersuchungen über die Römer,' 3 vols., Berlin, 1819; K. L. Blum, 'Einleitung in Roms alte Geschichte,' Berlin, 1828; Eisendecher, 'Ueber die Entstehung, Entwickelung, und Ausbildung des Bürgerrechts im alten Rom,' Hamburg, 1829; K. D. Hüllmann, 'Römische Grundverfassung,' Bonn, 1832; and by the same author, 'Ursprünge der Römischen Verfassung, durch Vergleichungen erläutert,' Bonn, 1835; W. Drumann, 'Geschichte Roms in seinem Uebergange von der Republikanischen zur Monarchischen Verfassung,' &c., 4 vols. 8vo., Königsberg, 1834-38; H. Malden, 'History of Rome,' vol. i., London, 1830; H. C. Reiff, 'Geschichte der Röm. Bürgerkriege,' &c., Berlin, 1825, 4 vols. 8vo.; Dr. Th. Arnold, 'History of Rome,' 2 vols., London, 1838-1840; J. Rubino, 'Untersuchungen über Römische Verfassung und Geschichte,' vol. i., Cassel, 1839; Dr. Fr. Fiedler, 'Geschichte des Römischen Staates und Volkes,' Leipzig, 1839; C. Göttling, 'Geschichte der Römischen Staats verfassung,' Halle, 1840.

The history of the Empire has been written by Tillemont, 'Histoire des Empereurs et des autres Princes qui ont regné dans les Six Premiers Siècles de l'Eglise,' Paris, 1700, 4 vols. 4to., reprinted at Brussels, in 1707, 5 vols. 8vo.; Crevier's continuation of Rollin, mentioned above; 'Les Femmes de Douze Césars, avec des Notes Hist. et Crit.,' par M. de Servies, Amsterdam, 1722, 2 vols. 8vo.; Gibbon, 'The History of the Decline and Fall of the Roman Empire,' London, 1776-82, 4 vols. 4to.; this masterly work has often been reprinted. D. G. H. Hübler, 'Geschichte der Römer unter den Imperatoren, wie auch der Gleichzeitigen Völker,' 2 vols., Freiberg, 1803.

The 'Thesauri' of Graevius and Sallengre contain many good works on Roman antiquities; but, besides these, we may mention, Joh. Rosini, 'Romanarum Antiquitatum Corpus absolutissimum, cum Notis Dempsteri,' Traject. ad Rhen., 1701; Samuel Pitiscus, 'Lexicon Antiquitatum Romanarum,' 2 vols. fol., Leovardiae, 1713; Dr. A. Adams, 'Roman Antiquities,' London, 1791, often reprinted; Friedr. Creuzer, 'Abriss der Römischen Antiquitäten,' Leipzig und Darmstadt, 1824.

The private life and manners of the Romans are described in C. Meiners, 'Geschichte des Verfalls der Sitten und der Staatsverfassung der Römer,' Leipzig, 1782; J. H. L. Meierotto, 'Ueber Sitten und Lebensart der Römer in verschiedenen Zeiten der Republik,' second edition, Berlin, 1802, 2 vols. 8vo.; W. A. Becker, 'Gallus, oder Römische Scenen aus der Zeit des Augustus,' Leipzig, 1838, 2 vols. 8vo.; Otto von Mirbach, 'Römische Briefe aus den letzten Zeiten der Republik,' 2 vols., Mitau, 1835; M. Roulez, 'Observations sur divers points obscurs de l'Histoire de la Civilisation de Ancienne Rome,' Bruxelles, 1836.

Works on the Roman finances: P. Burmann, 'Vectigalia populi Romani,' Lugd. Bat., 1734, 4to.; D. H. Hegewisch, 'Versuch über die Römischen Finanzen,' Altona, 1804, 8vo.; R. Bosse, 'Grundzüge des Finanzwesens im Römischen Staat,' Braunschweig, 1803, 2 vols. 8vo.

Works on military affairs: Guischard, 'Mémoires Militaires des Grecs et des Romains,' La Haye, 1758, 2 vols. 4to., and Rast, 'Römische Kriegsalterthümer.'

As chronological tables of the history of Rome: C. J. Zumpt, 'Annales veterum Regnorum et Populorum, inprimis Romanorum,' Berolini, 1819, 4to.; a second edition appeared in 1838. Zander, 'Tabellen der Römischen Geschichte,' second edition, Göttingen, 1829, 4to.; F. Fiedler, 'Zeittafeln der Römisch. Gesch.,' &c., Wesel, 1827, 4to.; Fischer, 'Griechische und Römische Zeittafeln,' Altona, 1840, 4to.; Clinton's 'Fasti Hellenici.'

The works on particular points of the Roman constitution or particular events in Roman history, are too numerous to be mentioned here.

Roman Language and Literature.

It is intended in the following paragraphs to present merely an outline of the history of the language and literature of antient Rome, as a separate notice is given in this work to every writer of importance.

The language of the Romans is usually called Latin; for though Rome and Latium were originally distinct communities, their language appears to have been always the same. Any inquiry into the origin of the Latin language must involve an inquiry into the languages spoken by the antient inhabitants of Italy; and our information on this subject, notwithstanding the investigations of Micali, Grotefend, K. O Müller, and other distinguished scholars, is at present very imperfect. So much however appears certain, that the Latin language was different from the Etruscan and Oscan, of which the former was spoken by the inhabitants of the northern and the latter by those of the central and southern parts of Italy. The Latins appear to have originally formed part of that great race which overspread both Greece and Italy under the name of Pelasgians. Their language formed a branch of that extensive family of languages which are known to modern scholars by the name of Indo-Germanic; and it is probable that the Pelasgians who settled in Italy originally spoke the same language as the Pelasgians who settled in Greece. There is consequently a great resemblance between the Latin and Greek languages; though each possesses an element which the other does not. Not only does the Latin language possess many words which it has not in common with the Greek, but also in some parts of its grammatical inflection, as for instance in that of the passive voice it differs considerably from the Greek language. It therefore becomes a question, what that element is, which the Latin language has not in common with the Greek; and here we must attain some further knowledge of the languages of antient Italy before we can answer this question satisfactorily. The Etruscan, so far as our imperfect knowledge of it will enable us to form an opinion on the subject, appears to have exercised little influence upon the formation of the Latin language; but the Oscan or Opican language, on the contrary, seems to have united with the Pelasgian in forming the Latin language. Niebuhr (*Hist. of Rome*, vol. i., p. 82) has remarked that the words which relate to agriculture and domestic life agree in Greek and Latin, as domus, ager, aratrum, vinum, oleum, lac, bos, sus, ovis, &c.; while those relating to arms and war, as duellum, ensis, hasta, sagitta, &c., are different from the Greek. But this remark is to be taken with considerable limitations, for there are many exceptions both ways; indeed so many as to render the position itself at least doubtful, and all inferences derived from it consequently inconclusive. The words relating to arms and war may have been Oscan; and it has therefore been supposed by Dr. Arnold (*Hist. of Rome*, vol. i., p. 22) not only that the Latins were a mixed people, partly Pelasgian and partly Oscan, but also that they arose out of a conquest of the Pelasgians by the Oscans; so that the latter were the ruling class of the united nation, and the former its subjects.

We have very few specimens of the Latin language previous to the time of Ennius and Plautus, when it had become nearly developed and was substantially the same as in the later times of the republic. The specimens of the antient language which have come down to us principally consist of fragments of antient laws preserved by Festus, Cicero, and other writers, and of a few inscriptions. The former, as might have been expected, appear to have been considerably altered; and the latter are unfortunately too few to give us much assistance in tracing the rise and progress of the language. Of these however one of the most important was the antient song of the Fratres Arvales, which was discovered in the year 1777, and which appears to have been the same as was sung in the most early times, though the inscription was not cut till A.D. 218. We subjoin a copy of it with a few remarks on some of the antient forms which it contains:—

1. E nos, Lases, juvate.
2. Neve luerve, Marmar, sins incurrere in pleoris:
3. Satur furere, Mars, limen sali, sta berber:
4. Semunis alternei advocapit conctos.
5. E nos, Marmor, juvato:
6. Triumpe, triumpe, triumpe, triumpe, triumpe.

1. *Lases* is instead of *Lares*. All Latin words which are now written with *r*, had an *s* originally. Thus Quintilian says (*Inst. Orat.*, i. 4, § 13) that *Valerius*, *Furius*, *arbor*, *labor*, *vapor*, *clamor*, and *lares* were originally written *Valesius*, *Fusius*, *arbos*, *vapos*, *clamos*, and *lases*. According to Pomponius the letter *r* was invented by Appius Claudius. (*Dig.*, i., tit. 2, s. 2, § 36.)

2. *Luerve* is instead of *luervem* or *luerem*, which is equivalent to *luem*. The omission of *m* at the end of words is common in Latin. Thus all the adverbs ending in *o* seem to have lost an *m*, as *quo*, *eo*, &c. [See the article M.] M is also omitted in the same way in the accusative singular of most nouns of the third declension in Greek, and does not appear, if we may judge from the elision in poetry of all syllables ending in *m* before words beginning with a vowel, to have been usually pronounced in Latin. *Luervem* or *luerem* instead of *luem* corresponds to the antient forms of *nucerem*, *boverem*, *suerem*, instead of *nucem*, *bovem*, *suem*, and also to the common accusative *cinerem* from *cinis*.

Marmar is a name of Mars, who was called *Mamers* in the Oscan language. *Sins* is instead of *sinas*. *Pleoris* is the older form of *plures*. The root of this word is *ple*, as we see in *ple-mus* and *im-ple-o;* and the comparative is formed by adding *ior* or *or*. *Pleores* afterwards became *plures*, in the same way as *reversus* or *reorsus* was shortened into *rursus*.

3. *Satur furere* is to be understood in the same sense as the *longo satiate ludo* of Horace (*Carm.*, i. 2, 37), and *limen sali* in the sense of *pede pulsa limen*. *Sta* appears here to signify *cease*. *Berber* is an old form of *fervere*, *b* being interchangeable with *f*, in the same way as *βρίμειν* and *fremere*, *rubeo* and *rufus*, &c.

4. *Semunis* is instead of *Semones*. The Oscan language has frequently *a* where *o* is found in common Latin, as *pust* for *post*, *Vetlune* for *Vettona*, &c. *Advocapit* instead of *advocabite*, the *e* being omitted as in *dic*, *duc*, *fuc*, *fer*. The future is here used in the sense of an imperative. *P* was frequently used in the old language where *b* occurs in the later forms, as *poplicus*, *Poplicola*, *scapres* (*scabies*), and the Oscan *pruhipid*, *pruhipust*, which are connected with *prohibere*.

Two of the earliest specimens of Latinity which have come down to us are the inscription on the Columna Rostrata, erected in the Forum to commemorate the victory of C. Duilius over the Carthaginians, B.C. 260 (Plin., *Hist. Nat.*, xxxiv. 11), and the *Senatus-Consultum de Bacchanalibus*, which was passed B.C. 186. (See Orelli, *Corpus Inscrip.*, No. 549; Drakenborch's Livy, vol. vii., p. 97, &c.) In both of these, many of the grammatical forms differ widely from those which were afterwards in use, and approximate closely to the specimens of the Oscan which are still extant. Thus all the ablative cases in these inscriptions end in *ed* or *d*, as *præsent-ed*, *dictator-ed*, *navale-d*, *præda-d*, *in alto-d mari-d*, *senatu-d*, &c., which correspond to the Oscan *factu-d*, *dolu-d*, *malu-d*, *cum preivatu-d*, *touta-d*, *præsenti-d*, &c. A similar resemblance is seen in the third person singular of the imperative mood: where, instead of *esto*, we find in old Latin *estod*, and in Oscan *estud*. The Latinity of the Senatus-Consultum de Bacchanalibus differs in so many respects from that of Plautus, who lived at the time at which this measure was passed, as to make it probable that many of the ancient forms in Plautus must have been altered in subsequent times.

The history of Latin literature may be divided into three periods: the first extending from the time of Livius Andronicus, B.C. 240, to the death of Augustus, A.D. 14; the second from the death of Augustus to the death of Marcus Aurelius, A.D. 180; and the third from the death of Marcus Aurelius to the time of Cassiodorus, A.D. 539.

First Period.—From the time of Livius Andronicus, B.C. 240, *to the death of Augustus*, A.D. 14.—The Romans may be said to have possessed no literature for upwards of 500 years from the foundation of the city; and when they at length began to pay some attention to it, they did little more than translate or imitate the works of the Greeks. The tragedies and comedies of Livius Andronicus, who was the first writer of whom we have any account, appear to have been taken entirely from the Greek; and the same was the case with Cn. Nævius, who was contemporary with Livius Andronicus. The first prose writers were Quintus Fabius Pictor and Lucius Cincius Alimentus, who lived in the time of the second Punic war, and wrote the history of Rome from its foundation to their own times, in imitation of the pontifical annals. Cincius however appears to have written his history in Greek; but both his history and that of Fabius, as well as those of the succeeding annalists, appear, like the pontifical annals which they imitated, to have been very meagre, containing only memorials of the times, of men, of places and events, without any ornament; and provided that their meaning was intelligible, they thought, says Cicero (*De Orat.*, ii. 12), that the only excellence of style was brevity.

Ennius however, who was born B.C. 239, may be regarded as the founder of Latin literature. Though a Greek by birth, he was the first who taught the Romans to write their own language with ease and elegance, and he was chiefly instrumental in introducing among the Romans a love of literature. He lived on intimate terms with some of the most eminent members of the Roman aristocracy, who began at length to study the Greek language. Cato himself learnt Greek from Ennius; and Scipio Africanus, his son Scipio Nasica, and M. Fulvius Nobilior delighted in his society. At the same time, the later comedy of the Athenians was most successfully imitated by Plautus, whose comedies must have had some influence in improving the taste of the people and even of the aristocracy, though the latter do not appear to have shown him any patronage.

In the year B.C. 155, the study of the Greek philosophy was introduced among the Romans, by the embassy which the Athenians sent to Rome, consisting of three of the most eminent philosophers of the age, namely, Carneades of the Academy, Diogenes the Stoic, and Critolaus the Peripatetic; and though the study was condemned by Cato and many of the old school, it soon made great progress among the Roman nobles. The study of the Greek language and literature was still further promoted by the conquest of Achæa, and by the influence of the distinguished Achæan prisoners, who were distributed among the towns of Italy. Among these was Polybius, who attracted the attention of Paullus Æmilius, and was appointed by him instructor of his two sons, Fabius and Scipio. Though Polybius did not write in Latin, he produced a great influence upon Roman literature. He showed the Romans how the history of their own state ought to be treated; and by his intimacy with Scipio and the most distinguished Romans of the time, he produced a great impression upon the literary character of the age. From this time it became the fashion for all well educated Romans to read, speak, and even write the Greek language; and Greek rhetoricians and philosophers found abundant employment in Rome. Literature however was chiefly prosecuted by the great and noble; the body of the people appear to have remained uneducated.

From the preceding account it will be seen that Roman literature only arose and spread in connection with the study of the Greek literature; and the consequence was not only that the Roman writers made the Greeks their models, but that they rarely attempted any original work. One exception however must be made in favour of the Roman satire, which was essentially home-born, and had nothing similar to it in the Greek language. This species of composition appears to have arisen from the practice, which has prevailed in Italy from the earliest times to the present day, of the country-people making rude extempore verses in ridicule of one another. Lucilius, who was the contemporary of Scipio Africanus and of Lælius, with whom he lived on the most intimate terms of friendship, was the first writer who constructed Roman satires on those principles of art which were considered in the time of Horace as essential requisites in a satiric poem. (Hor., *Sat.*, ii. 1, 61.)

The first century before the Christian æra was the most brilliant epoch of Roman literature. The various writings of Cicero had brought the Roman language to perfection; and almost every species of literature was cultivated with success. In didactic poetry, Lucretius rivalled, and we may say surpassed, all the Greek didactic poets, in his great philosophical poem, which, for vigour of conception and splendour of diction, will bear comparison with the best efforts of the poets of any age and country. In lyric poetry, Catullus and Horace made the first attempts to introduce this species of composition among the Romans; while Tibullus, Propertius, and Ovid produced the most beautiful elegiac poems. During this period also, the epic poem of Virgil appeared; but there was no great dramatic poet. In prose, we possess the histories of Sallust, Cæsar, and Livy; the agricultural and antiquarian treatises of Varro; and the orations, letters, and philosophical and historical works of Cicero. The chief characteristic of the literature of this age originated in the leading feature of the Roman character. The Romans were a practical and not a speculative people; and consequently pure speculation found little favour and encouragement among them. No new system of philosophy sprung up amongst them; they received the different systems of Grecian philosophy without any modification or alteration; and even those who, like Cicero, studied this subject most successfully, appear only to have regarded it in a practical point of view, as a solace in adversity, or as an important auxiliary to the study of oratory. The latter subject, at least under the republic, was more studied than any other branch of literature, since it opened the way to the highest dignities in the state; and the influence of this study may be traced in almost all the works of the writers of this period. We especially see it in the 'Æneid' of Virgil, and in the histories of Sallust and Livy.

Second Period:—From the death of Augustus to the death of Marcus Aurelius, A.D. 180.—In this period the decay of the Latin literature commenced. By the overthrow of the republic, oratory was confined almost entirely to private causes, and soon degenerated into the art of the rhetorician. Quintilian made a noble but unsuccessful attempt to recall his contemporaries from the empty declamations of the schools to the true subjects of oratory; but a false taste had already vitiated the great bulk of the community. Oratory however still continued to form, as it had done under the republic, the chief study in the education of the higher classes; and consequently the false principles of taste on which it was taught may be traced in all the writings of that period. We see it in the works of Seneca, the younger Pliny, Velleius Paterculus, and even to some extent in those of Tacitus. In the poems of Lucan, Valerius Flaccus, and Silius Italicus, the art of the rhetorician is still more conspicuous; they abandoned the study of nature, and were constantly striving after effect; in addition to which, they were all close imitators of the 'Æneid,' which, from its deficiency in truth to nature, must have produced a most injurious effect upon subsequent poets, who made it their model. Under the Antonines the deterioration in the character of the literature became still more apparent, as we see in the writings of Solinus, Petronius, and Appuleius, though even during this period Gaius and other jurists continued to write Latin worthy of the age of Cicero.

Third Period:—From the death of Marcus Aurelius to the time of Cassiodorus, A.D. 539.—The civil commotions which prevailed during the early part of this period, and the subsequent removal of the seat of empire to Constantinople, almost extinguished all literary pursuits. The great mass of the Roman people had never been able to enjoy or appreciate the works of their countrymen; and when the patronage of the great and the wealthy was withdrawn, there was no encouragement to any literary exertions. The poets of this age, with the exception of Claudian, who was superior to most of the poets of the preceding period, were mere versifiers, as Olympius Nemesianus and Julius Calpurnius; the historians, if they may be dignified with the title, only composed the most barren epitomes of Roman history, or of the reigns of the emperors. All kinds of barbarisms and corruptions began to creep into the language; but even at the commencement of this period the jurists Ulpian, Papinian, Paullus, and Modestinus still continued to write in pure Latin, which forms a striking contrast with that of their contemporaries. The only literature of this age, besides the juristical, which deserves special mention, is that of the Christian church; in which the works of Lactantius are particularly distinguished by the purity of their style and the elegance of their diction.

The following is a list of the Latin writers, with their several epochs, as nearly as they can be ascertained:—

A.U.C.	B.C.	
514	240	Livius Andronicus.
521	235	Cn. Nævius.
535	219	Q. Fabius Pictor.
550	204	L. Cincius Alimentus.
554	200	M. Porcius Cato.
		Q. Ennius.
		M. Accius Plautus.
568	186	Cæcilius Statius.
588	166	M. Pacuvius.
		P. Terentius.
600	154	A. Postumius Albinus.
620	134	L. Attius.
		L. Calpurnius Piso Frugi.
		C. Fannius.
		C. Cœlius Antipater.
		Sempronius Asellio.
		C. Lucilius.
631	123	S. Turpilius.
640	114	L. Licinius Crassus.
656	98	M. Antonius.
		L. Ælius Stilo.
		Claudius Quadrigarius.
		Valerius Antias.
		L. Cornelius Siscnna.
663	91	L. Pomponius Bononiensis.
664	90	P. Rutilius.
		T. Quintius Atta.
666	88	Plotius Gallus.
673	81	Valerius Cato.
676	78	L. Cornelius Sulla.
		T. Lucretius Carus
690	64	Q. Hortensius.
694	60	M. Tullius Cicero.
		M. Terentius Varro.
		T. Pomponius Atticus.
		Q. Ælius Tubero.
		L. Lucceius.
700	54	C. Julius Cæsar.
		Atteius Philologus.
		C. Valerius Catullus.
		D. Laberius.
710	44	Cornelius Nepos.
		C. Asinius Pollio.
		A. Hirtius.
		C. Sallustius Crispus.
726	28	C. Cæsar Octavianus Augustus.
		M. Agrippa.
		C. Cilnius Mæcenas.
		C. Trebatius Testa.
		Q. Horatius Flaccus.
		P. Virgilius Maro.
		Cornelius Gallus.
		Albius Tibullus.
		M. Valerius Messalla Corvinus.
730-767	24	S. Aurelius Propertius.
	A.D.	
767	14	Domitius Marsus.
		C. Pedo Albinovanus.
		M. Porcius Latro.
		Verrius Flaccus.
		Titus Livius.
		Trogus Pompeius.
		Q. Antistius Labeo.
		C. Ateius Capito.
		P. Ovidius Naso.
		Æmilius Macer.
		C. Rabirius.
		Cornelius Severus.
		Gratius Faliscus.
767-790	14-37	Phædrus.
		Manilius?
		C. Asinius Gallus.
		Massurius Sabinus.
		Cocceius Nerva.
		C. Velleius Paterculus.
		Valerius Maximus.
		M. Annæus Seneca.
		Arellius Fuscus.
		Albucius Silus.
		Cestius Pius.
		Q. Haterius.
		L. Arruntius.
		Rutilius Lupus.
794-807	41-54	Crispus Passienus.
		Domitius Afer.
		Julius Africanus.
		A. Cornelius Celsus.
		Pomponius Mela.
		L. Junius Moderatus Columella.
		Scribonius Largus.
		Q. Asconius Pedianus.
807-821	54-68	Nero.
		L. Annæus Seneca.
		M. Annæus Lucanus.
		Annæus Cornutus.
		A. Persius Flaccus.
		C. Silius Italicus.
		Aufidius Bassus.
		Valerius Probus.
822-832	69-79	C. Plinius Secundus (the elder).
		V. Messalla.
		Fabius Rusticus.
		Vibius Priscus.
		Julius Secundus.
		Salcius Bassus.
		C. Valerius Flaccus.
834-849	81-96	M. Fabius Quintilianus.
		M. Valerius Martialis.
		Sulpicia.
		P. Papinius Statius.

A.U.C.	A.D.	
851-870	98-117	C. Cornelius Tacitus.
		C. Plinius Secundus Cæcilius.
		S. Julius Frontinus.
		Javolenus.
		C. Suetonius Tranquillus.
		L. Annæus Florus.
		Julius Obsequens.
		Velius Longus.
		Terentianus Maurus.
		D. Junius Juvenalis.
884	131	Salvius Julianus.
		Cæcilius Africanus.
891-914	138-161	S. Pomponius.
		Gaius.
		Volusius Mæcianus.
		Cervidius Scævola.
		Ulpius Marcellus.
		Aulus Gellius.
		Calpurnius Flaccus.
		Justinus.
		Q. Curtius?
914-933	161-180	M. Aurelius Antoninus (Greek).
		Cornelius Fronto.
		L. Appuleius.
		Julius Solinus.
		Nonius Marcellus.
		Tertullianus.
		Petronius.
		Dionysius Cato.
953-983	200-250	Papinianus.
		Ulpianus.
		Paulus.
		Modestinus.
		Gargilius Martialis.
		Apicius.
		Censorinus.
		Minucius Felix.
1037	284	M. Aurelius Olympius Nemesianus.
		Julius Calpurnius.
		Marius Maximus.
		Cæcilius Cyprianus.
		Trebellius Pollio.
		Julius Capitolinus.
		Flavius Vopiscus.
1059	306	Julius Rufinianus.
		Arnobius.
		Lactantius.
		Firmicus Maternus.
1113	360	Ælius Donatus.
		Victorinus.
		Aurelius Victor.
		Mamertinus.
		Eutropius.
		Rufus.
		L. Ampelius.
1123	370	Hieronymus.
		Ambrosius.
		Anicius Paulinus.
		Ausonius.
		Ammianus Marcellinus.
		Vegetius.
		Priscianus.
		Marcellus Empiricus.
		Faltonia Proba.
1148	395	Aurelius Symmachus.
		Claudianus.
		Pompeius Festus.
		Servius Maurus.
		Æmilius Probus.
		Augustinus.
		Aurelius Prudentius.
		Sulpicius Severus.
1163	410	Macrobius.
		Claudius Rutilius Numatianus.
		Rufus Festus Avienus.
		Charisius.
		Diomedes.
		Cœlius Aurelianus.
		Paulus Orosius.
1203	450	Salvianus.
		Apollinaris Sidonius.
		Capella.
		Arusianus Messius.
1253-1292	500-539	Boethius.
		Priscianus.
		Fulgentius.
		Tribonianus.
		Cassiodorus.

In the preceding list the principal Roman jurists are inserted, but a complete list of them, with the relative proportions, which they have contributed to the 'Digest,' is given under JUSTINIAN'S LEGISLATION, p. 164.

Works on the Roman Language and Literature.—The following list of works, though far from complete, may be useful to those who are studying the language and literature of antient Rome. It is hardly necessary to premise that the works here enumerated have very different degrees of merit, and that some are merely mentioned as the best or only works of the kind, or as the best known to the writer.

Literature.—Fabricius, 'Bibliotheca Latina,' edited by Ernesti, 3 vols. 8vo., Lips., 1773-1774; Harles, 'Introductio in Notit. Litt. Romanæ,' 2 vols. 8vo., Norimb., 1794; 'Brevior Notitia Litt. Romanæ,' with supplements, 5 vols. 8vo., 1789-1819; Dunlop, 'History of Roman Literature,' 3 vols. 8vo., Lond.; Bähr, 'Geschichte der Römischen Literatur,' 8vo., Carls., 1832, &c.; 'Abriss der Römischen Literaturgeschichte,' 8vo., Heidelb., 1833; Bernhardy, 'Grundriss der Römischen Literatur,' 8vo., Halle, 1830, a useful work; F. A. Wolf, 'Vorlesungen über die Geschichte der Römischen Literatur,' 8vo., Leipz., 1831; F. Passow, 'Uebersicht der Römischen und Griechischen Literatur, 4to., Berlin, 1815; 'Grundzüge der Griech. und Röm. Litteratur und Kunstgeschichte,' 4to., Berlin, 1829; Gyraldus, 'Historia Poetarum tam Græcorum quam Latinorum,' Basel, 1545; Crinitus, 'De Poetis Latinis,' Flor., 1505; Vossius, 'De Vet. Poetarum Temporibus,' Amst., 1654; Crusius, 'Lives of the Latin Poets,' Lond., 1726; Rambach, 'De Poetarum Lyricorum inter Romanos Paucitate,' 4to., Quedlinb., 1769; Lévée, 'Théâtre complet des Latins,' Paris, 1822, &c.; Donatus, 'De Tragœdia et Comœdia;' J. C. Scaliger, 'De Comœdia et Tragœdia,' in Gronovius's 'Thesaurus Ant. Gr.,' vol. viii.; Sagittarius, 'De Vita et Scriptis Livii Andronici, Nævii, Ennii, Cæcilii, Statii, Pacuvii, &c.' 8vo., Altenb., 1672; A. W. Schlegel, 'Vorlesungen über Dramatische Kunst und Litteratur,' 3 vols. 8vo., Heidelb., 1817, translated into French, 3 vols. 8vo., Paris, 1814, and into English, 2 vols. 8vo.; the article DRAMA in this work; Casaubon, 'De Satyrica Graec. Poesi et Romanorum Satira,' Par., 1605, Hal., 1774, ed. Rambach; König, 'De Satira Romana,' Oldenb., 8vo., 1796; Manso, 'Ueber die Römischen Satiriker,' in Sulzer's 'Allgem. Theorie der Schönen Künste,' vol. 4; Ruperti, 'De Satira Romanorum et de Satiricis Romanorum Poetis,' prefixed to his edition of Juvenal; Vossius, 'De Historicis Latinis,' Lugd. Bat., 1651.

A list of the principal editions of the Latin writers, with the best modern works upon each writer, is given in Wagner's 'Grundriss der Classichen Bibliographie,' Breslau, 1840.

Language.—Folieta, 'De Ling. Lat. Usu et Præstantia,' ed. Mosheim, Hamb., 1723, 8vo.; Facciolati, 'De Ortu, Interitu, et Instauratione Linguæ Latinæ,' reprinted at Lips., 1725; Tursellinus, 'De Particulis Latinæ Orationis,' often reprinted; Allen, 'Doctrina Copularum Linguæ Latinæ,' 12mo., Lond., 1830, with a notice of the same work in the 'Journal of Education,' No. 8; Döderlein, 'Lateinische Synonyme und Etymologieen,' 6 vols. 8vo., Leipz., 1826-1838; Struve, 'Ueber die Lateinische Declination und Conjugation,' 8vo., Königs., 1823; Schneider, 'Elementarlehre der Lateinischen Sprache,' and 'Formenlehre der Lateinischen Sprache,' Berlin, 1819, 1821, a valuable work for the archæology of the language; Allen, 'Etymological Analysis of Latin Verbs,' 12mo. Lond., 1836; Scheller, 'Ausfürhliche Lateinische Sprachlehre,' 8vo., Leipz., 1803, translated into English by Walker; Grotefend, 'Ausfürhliche Grammatik der Lateinischen Sprache,' 2 vols. 8vo., Hannov., 1829-30; Zumpt, 'Lateinische Grammatik,' 8vo., Berlin, 6th edition, 1828, and frequently reprinted, translated into English by Kenrick, with a notice of the same work in the 'Quarterly Journal of Education,' No. 1: this grammar is far superior in the syntactical part to any other. The student will also derive considerable information from those works which treat of the comparative grammar of the Indo-Germanic Languages, as Bopp's 'Vergleichende Grammatik des Sanskrit, Zend, Griechischen, Lateinischen, &c.,' of which the first part was published at Berlin, 1833, with a notice of the same work in the 'Journal of Education,' No. 16, by the late Dr. Rosen; and Pott's 'Etymologische Forschungen auf dem Gebiete der Indo-Germanichen Sprachen,' 2 vols. 8vo., Lemgo, 1833-36, with two notices of the same in the 'Journal of Education,' Nos. 18, 20, also by Dr. Rosen

Dictionaries.—Stephani, 'Thesaurus Linguæ Latinæ;' Facciolati and Forcellini, 'Totius Latinitatis Lexicon,' 4 vols. fol., Padua, 1771, which is superior to all other Latin dictionaries, and the recent edition of the same work enlarged by Furlanetto, 4 vols. 4to., Padua; Adam, 'Dictionary of the Latin Tongue,' 8vo., Edinburgh, 1814, 2nd edition, a superior work to that of Ainsworth; Scheller, 'Ausführliches und Möglichst Vollständiges Lateinisch-Deutsches und Deutsch-Lateinisches Lexicon,' 5 vols. 8vo., Leipz., 1804-6, translated into English by Riddle, who has also published a Latin dictionary in one volume, 8vo.; Freund, 'Wörterbuch der Lateinischen Sprache,' which is to be completed in 4 vols. 8vo., but three only have yet appeared; Schwenck, 'Etymologisches Wörterbuch der Latein. Sprache mit Vergleichung der Griechischen und Deutschen,' 8vo., Francf., 1827; Nizolii, 'Lexicon Ciceronianum,' edited by Facciolati, reprinted in London, 3 vols. 8vo., 1820.

ROMAN LAW.

The historical origin of the Roman Law is unknown, and its fundamental principles, some of which even survived the legislation of Justinian, are older than the oldest records of Italian history. The foundation of the strict rules of the Roman law as to familia, agnatio, marriage, testaments, succession to intestates, and ownership, was no doubt custom, which, being recognised by the sovereign power, became law. As in many other states of antiquity, the connection of the civil with the ecclesiastical or sacred law was most intimate; or rather, we may consider the law of religion as originally comprehending all other law, and its interpretation as belonging to the priests and the king exclusively. There was however direct legislation even in the period of the kings. These laws, which are mentioned under the name of Leges Regiae, were propsed by the king, with the approbation of the senate, and, confirmed by the populus in the Comitia Curiata, and, after the constitution of Servius Tullius, in the Comitia Centuriata. That there were remains of this antient legislation existing even in the Imperial period, is certain, as appears from the notice of the Jus Civile Papirianum or Papisianum, which the Pontifex Maximus Papirius is said to have compiled from these sources, about or immediately after the expulsion of Tarquinius Superbus (*Dig.*, i., tit. 2), and from the distinct references to these Leges made by late writers. Still there is great uncertainty as to the exact date of the compilation of Papirius, and its real character. Even his name is not quite certain, as he is variously called Caius, Sextus, and Publius. (Dion. Hal., iii. 36; *Dig.*, i., tit. 2.)

But the earliest legislation of which we have any important remains is the compilation of the code called the Twelve Tables. The original bronze tables indeed are said to have perished in the conflagration of the city after its capture by the Gauls, but they were satisfactorily restored from copies and from memory, for no antient writer who cites them ever expresses a doubt as to the genuineness of their contents. It is the tradition that a commission was sent to Athens and the Greek states of Italy, for the purpose of examining into and collecting what was most useful in their codes; and it is also said that Hermodorus of Ephesus, then an exile in Rome, gave his assistance in the compilation of the code. There is nothing improbable in this story, and yet it is undeniable that the laws of the Tables were based on Roman and not on Greek or Athenian law. Their object was to confirm and define perhaps rather than to enlarge or alter the Roman law, and it is probable that the laws of Solon and those of other Greek states, if they had any effect on the legislation of the Decemviri, served rather as models of form than as sources of positive rules.

Ten tables were completed and made public by the Decemviri, in B.C. 451, and in the following year two other tables were added. This compilation is quoted by the antient writers by various titles: Lex XII. Tabularum, Leges XII., sometimes XII. simply (Cic., *Legg.*, ii. 23), Lex Decemviralis and others. The rules contained in these tables long continued to be the foundation of Roman law, and they were never formally repealed. The laws themselves were considered as a text-book, and they were commented on by the Jurists as late as the age of the Antonines, when Gaius wrote a commentary on them in six books ('Ad Legem XII. Tabularum'). The actions of the old Roman law, called Legitimae, or Legis Actiones, were founded on the provisions of the Twelve Tables, and the demand of the complainant could only be made in the precise terms which were used in the Tables. (Gaius, iv. 11.) The rights of action were consequently very limited, and they were only subsequently extended by the Edicts of the Praetors. The brevity and obscurity of this antient legislation rendered interpretation necessary in order to give the laws any application; and both the interpretation of the laws and the framing of the proper forms of action belonged to the College of Pontifices, who yearly appointed a member of their own body to decide in all doubtful cases. The civil law was thus still inseparably connected with that of religion (Jus Pontificium), and its interpretation and the knowledge of the forms of procedure were still the exclusive possession of the patricians.

The scanty fragments of the Twelve Tables hardly enable us to form a judgment of their character or a proper estimate of the commendation bestowed on them by Cicero (*De Or.*, i. 43). It seems to have been the object of the compilers to make a complete set of rules both as to religious and civil matters; and they did not confine themselves to what the Romans called private law, but they comprised also public law. ('Fons publici privatique juris,' Liv., iii. 34.) They contained provisions as to testaments, successions to intestates, the care of persons of unsound mind, theft, homicide, interments, &c.

They also comprised enactments which affected a man's status, as for instance the law contained in one of the two last Tables, which did not allow to a marriage contracted between a patrician and a plebeian the character of a legal Roman marriage, or, in other words, declared that between patricians and plebeians there could be no Connubium. Though great changes were made in the Jus Publicum by the various enactments which gave to the plebeians the same rights as the patricians, and by those which concerned public administration, the fundamental principles of the Jus Privatum, which were contained in the Tables, remained unchanged, and are referred to by jurists as late as the time of Ulpian.

The old Leges Regiae, which were collected into one body by Papirius, were commented on by Granius Flaccus in the time of Julius Cæsar (*Dig.*, 50, tit. 16, s. 144), and thus they were probably preserved. The fragments of these laws have been often collected, but the best essay upon them is by Dirksen, 'Versuchen zur Kritik und Auslegung der Quellen des Römischen Rechts,' Leipzig, 1823. The fragments of the Twelve Tables also have been often collected. The best work on the subject is that by James Godefroy (Jac. Gothofredus), which, with the more recent work of Dirksen, 'Uebersicht der bisherigen Versuche zur Kritik und Herstellung des Textes der Zwölf-Tafel-Fragmente,' Leipzig, 1824, seems to have exhausted the subject.

For about one hundred years after the Legislation of the Decemviri, the patricians retained their exclusive possession of the forms of procedure. Appius Claudius Cæcus drew up a book of the forms of actions, which it is said that his clerk Cnaeus Flavius stole and published; the fact of the theft may be doubted, though that of the publication of the forms of procedure, and of a list of the Dies Fasti and Nefasti, rests on sufficient evidence. The book thus made public by Flavius was called Jus Civile Flavianum; but like that of Papirius it was only a compilation. The publication of these forms must have had a great effect on the practice of the law: it was in reality equivalent to an extension of the privileges of the plebeians. Subsequently Sextus Aelius published another work, called 'Jus Aelianum,' which was more complete than that of Flavius. This work, which was extant in the time of Pomponius (*Dig.*, i., tit. 2 s. 2, § 39), was also called 'Tripertita,' from the circumstance of its containing the laws of the Twelve Tables, a commentary upon them (interpretatio), and the Legis Actiones. This work of Aelius appears to have been considered in later times as one of the chief sources of the civil law (veluti cunabula juris); and he received from his contemporary Ennius the name of 'wise:'

> 'Egregie Cordatus homo Catus Aelius Sextus.'

Sextus Aelius was Curule Aedile, B.C. 200, and Consul, B.C. 198.

In the Republican period new laws (leges) were enacted both in the Comitia Centuriata and in the Comitia Tributa. The Leges Curiatae, which were enacted by the curiae, were limited to cases of adrogation and the conferring of the imperium. The Comitia Centuriata were made independent of the senate by the Lex Publilia (Liv., viii. 12), which declared that the leges passed in these Comitia should not require the confirmation of the senate. The leges passed in the Comitia Tributa were properly called Leges Tributae or Plebiscita, and originally they were merely proposals for a law which were laid before the senate and confirmed by the curiae. But the Lex Publilia (B.C. 336), and subsequently the Lex Hortensia (B.C. 286), gave to the Plebiscita the full force of leges without the consent of the senate (Liv., viii. 12; Gaius, i. 3; Gell., xv. 27); and a Plebiscitum was accordingly sometimes called a lex. The leges generally took their name from the gentile name of the magistrate who proposed them (rogavit), or, if he was a consul, from the name of both consuls, as Lex Aelia or Aelia Sentia, Papia or Papia Poppaea. If the proposer of the law was a dictator, praetor, or tribune, the Lex, or Plebiscitum, as the case might be, took its name from the proposer only, as Lex Hortensia. Sometimes the object of the lex was indicated by a descriptive term, as Lex Cincia de donis et muneribus.

The Senatus Consulta also formed a source of law under the republic. That a senatus consultum in the time of Gaius (i. 4) should have the force of law (vicem legis optinet), may be easily admitted; but Gaius in this passage appears to be referring not only to such senatus consulta as had been passed under the empire, but to the senatus consulta generally as a source of law. It appears that the senate gradually came to be considered as the representative of the curiae, and that its consulta, in many matters relating to administration, the care of religion, the aerarium, and the administration of the provinces, had the full effect of laws. It does not seem as if the Romans themselves had a very clear notion of the way in which the senate came to exercise the power of legislation; but they imagined that it arose of necessity with the increasing population of the state and the increase of public business. The senate thus became an active administrating body, and, as an easy consequence, that which it enacted (constituit) was observed, and this new source of law was termed Senatus Consultum (*Dig.*, i., tit. 2). It seems probable that the senate began to exercise the power of making senatus consulta after the passing of the Hortensia Lex, though it is not pretended that the Hortensia Lex or any other Lex gave this power to the senate. No senatus consulta are recorded as designated by the names of magistrates, till the time of Augustus, a circumstance which seems to show that whatever binding authority senatus consulta might have acquired under the Republic, they were not then viewed as laws properly so called, or as having the full effect of leges. But from the time of Augustus, the titles of senatus consulta frequently occur; their names, like those of the leges, were derived from the consuls, as S. C. Velleianum, Pegasianum, Trebellianum, &c., or of the emperor who proposed them, as S. C. Claudianum, Neronianum, &c., or they were said to be made 'auctore Principe,' or 'ex auctoritate Principis.' The expression applied to the senate, so enacting, was 'censere.' (Gaius, i. 47.) Special consulta were sometimes passed for the purpose of explaining or rendering effectual previous leges.

A new source of law was supplied by the Edicta of those magistrates who had the Jus Edicendi, but mainly by the praetors, the praetor urbanus and the praetor peregrinus. The edicts of the praetor urbanus were the most important. The body of law which was formed by the Edicta is accordingly sometimes called Jus Praetorium, which term however might be limited to the Edicta of the praetors, as opposed to those of the curule aediles, the tribunes, censors, and pontifices. The name Jus Honorarium, as opposed to Jus Civile, comprehends the whole body of edictal law; and the name Honorarium was given to it, apparently because the Jus Edicendi was exercised only by those magistratus who had the Honores. Jus Civile in its larger sense comprehended all the law of any given nation; but the Jus Civile Romanorum, as opposed to the Honorarium, consisted of Leges, Plebiscita, Senatus Consulta, to which, under the empire, were added the Decreta Principum and the Auctoritas Prudentium. The Honorarium Jus was introduced for the purpose of aiding, supplying, and correcting the defects of the Jus Civile Romanorum in its limited sense. (*Dig.*, i., tit. 1, s. 7.)

The historical origin of the edictal power is not known, but in the time of Cicero it had been so long exercised, and the Edicta had been so far formed into a regular system, that the study of the edictal law was a main part of the systematic study of the Roman law, and had taken the place of the Twelve Tables as an elementary branch of instruction. (Cic., *Legg.*, ii. 4, 23; i. 5.) Servius Sulpicius, a distinguished jurist and a friend of Cicero, wrote two small books on the Edict, which were followed by a work of Ofilius, also on the Edict. Though the history of the edictal law, as already observed, cannot be traced, it thus appears that it had assumed a systematic form in the time of Cicero.

An Edictum was a rule promulgated by a magistratus when he entered on his office. It was committed to writing and put up in a public place. Its object was to declare by what rules the praetor would be governed in the administration of justice during the year of his office; and hence the Edictum was sometimes called Perpetuum or Annua Lex. An Edictum Repentinum applied only to the particular occasion on which it was made. All offices being annual, the rules of one magistratus were not binding on his successor, but his successor might adopt them into his own Edictum, and such adopted Edictum then became an Edictum Tralatitium. In this way numerous Edicta were adopted by one magistratus from the Edicta of his predecessors, and thus gradually a body of rules was formed and established, which experience had proved to be useful. Those Edicta which were of great importance are often referred to under the name of the magistratus who promulgated them, as the Edictum Carbonianum and others.

The general character of the Edict has been already stated. It is described in other words as 'viva vox juris civilis,' as a mode by which the rigid rules of the civil law were altered and extended to suit the altered circumstances of the times. The changes introduced by positive enactments into the Jus Privatum of the Roman law seem to have been very unimportant. It was not consistent with Roman notions to alter or change fundamental principles, and most of the legislation of the republican period had reference to the disputes between the two estates of the patricians and plebeians, and to other parts of the Jus Publicum. Accordingly it was left to the magistratus gradually to introduce the necessary changes into the Jus Privatum; but the process of doing this was in strict conformity to the principles of the old law. The Edict did not affect to make new law, but to adopt as law what custom had sanctioned, provided it was not against the Jus Civile; to give an action when a bonâ fide right existed, if the old law gave none; to protect a man in bonâ fide possession of property, without affecting to give him ownership, which the law alone could give him by virtue of usucapion; to aid parties by fictions, which however were always of such a kind that the thing which the fiction supposed, was that which would have given a strictly legal right. A great part of the efficacy of the Edict consisted in extending the remedies by action; and after the abolition of the Legis Actiones (with the exception of the Actio Damni Infecti, and of matters which belonged to the cognizance of the Centumviri) by the Lex Aebutia and two Leges Juliae, the mode of proceeding in actions was settled by the formulæ of the Edicta. Still even here it seems probable that the praetors followed the analogy of the Legis Actiones and framed their formulæ accordingly. The Actiones given by the Edict were named after their author, as Publiciana, &c. The commentators on the Edicts were numerous under the early emperors. Labeo wrote at least four books on the Edictum of the Prætor Urbanus. Cœlius Sabinus commented on the Edict of the Curule Aediles. In the time of Hadrian, Salvius Julianus, who had himself been prætor, compiled a work on the Edict, which was called Edictum Perpetuum. Nothing is known of the detail of this work, but it appears probable that it was designed to be a systematic exhibition of the whole body of edictal law, and as such it must have had considerable influence on the subsequent condition of jurisprudence. At what time the Edicta ceased to be made by the magistratus is a disputed point. The edictal power certainly existed under the empire, and even after the compilation of the Edictum Perpetuum of Julianus, but it must have been comparatively little exercised, as the practice of making new laws by Senatus Consulta prevailed under the Cæsars after the time of Augustus, and the Imperial Constitutions are mentioned as one of the recognised sources of law in the time of the Antonines. (Gaius, i. 5.)

With the establishment of the Imperial Constitution begins a new epoch in the Roman law. The leges of Augustus and those of his predecessor had some influence on the Jus Privatum, though they did not affect the fundamental principles of the Roman law. A Lex Julia came into operation, B.C. 13, but it is better known as the Lex Julia et Papia Poppaea, owing to the circumstance of another lex of the same import, but less severe in its provisions, being passed as a kind of supplement to it in the consulship of M. Papius Mutilus and Q. Poppaeus Secundus, A.D. 9. This law had for its object the encouragement of marriage, but it contained a great variety of provisions: it is not known whether it was passed at the Comitia Centuriata or Tributa. A Lex Julia de Adulteriis, which also contained a chapter on the dos, is of uncertain date, but was probably passed before the former Lex Julia came into operation. Several Leges Juliae Judiciariae are also mentioned, which related both to Judicia Publica and Privata, and some of which may probably belong to the time of the dictator Cæsar.

The development of the Roman law in the Imperial period was little affected by direct legislation. New laws were made by Senatus Consulta, and subsequently by the Constitutiones Principum; but that which gives to this period its striking characteristic is the effect produced by the Responsa and the writings of the Roman jurists.

So long as the law of religion or the Jus Pontificium was blended with the Jus Civile, and the knowledge of both was confined to the patricians, jurisprudence was not a profession. But with the gradual separation of the Jus Civile and Pontificium, which was partly owing to the political changes by which the estate of the plebeians was put on a level with that of the patricians, there arose a class of persons who are designated as Jurisperiti, Jurisconsulti, Prudentes, and by other equivalent names. Of these jurisconsulti the earliest on record is Tiberius Coruncanius, a plebeian pontifex maximus, and consul B.C. 281: he is said to have been the first who professed to expound the law to any person who wanted his assistance (publice profiteri); he left no writings, but many of his Responsa were recorded. Tiberius Coruncanius had a long series of successors who cultivated the law, and whose responsa and writings were acknowledged and received as a part of the Jus Civile. The opinions of the jurisconsulti, whether given upon questions referred to them at their own houses, or with reference to matters in litigation, were accepted as the safest rule by which a judex or an arbiter could be guided. Accordingly, the mode of proceeding, as it is described by Pomponius, is perfectly simple; the judices in difficult cases took the opinion of the jurisconsulti, who gave it either orally or in writing. Augustus, it is said, gave the responsa of the jurists a different character. Before his time, their responsa, as such, could have no binding force, and they only indirectly obtained the character of law by being adopted by those who were empowered to pronounce a sentence. Augustus gave to certain jurists the respondendi jus, and declared that they should give their responsa 'ex ejus auctoritate.' In the time of Gaius (i., 7) the Responsa Prudentium had become a recognised source of law; but he observes that the responsa of those only were to be so considered who had received permission to make law (jura condere); and he adds that if they all agreed, their opinion was to be considered as law; if they disagreed, the judex might follow which opinion he pleased. The matter is thus left in some obscurity, and, for want of more precise information, we can only conjecture what was the precise way in which these licensed jurists under the empire were empowered to declare the law. It is however clear, both from the nature of the case and the statement of Gaius, that their functions were limited to exposition, or to the declaration of what was law in a given case, and that they had no power to make new rules of law as such; further, the licensed jurists must have formed a body or college, for otherwise it is not possible to conceive how the opinions of the majority could be ascertained on any given occasion.

The commencement of a more systematic exposition of law under the empire is indicated by the fact of the existence of two distinct sects or schools (scholae) of jurists. These schools originated under Augustus, and the heads of each were respectively two distinguished jurists, Antistius Labeo and Ateius Capito. But the schools took their names from other jurists. The followers of Capito's school, called Sabiniani, derived their name from Massurius Sabinus, a pupil of Capito, who lived under Tiberius and as late as the time of Nero: sometimes they were called Cassiani, from C. Cassius Longinus, another distinguished pupil of Capito. The other school was called Proculiani, from Proculus, a follower of Labeo. If we may take the authority of Pomponius, the characteristic difference of the two schools was this: Capito adhered to what was transmitted, that is, he looked out for positive rules sanctioned by time; Labeo had more learning and a greater variety of knowledge, and accordingly he was ready to make innovations, for he had more confidence in himself; in other words, he was a philosophical more than an historical jurist. Gaius, who was himself a Sabinian, often refers to discrepancy of opinion between the two schools, but it is not easy to collect from the instances which he mentions, what ought to be considered as their characteristic differences.

The jurisprudentes were not only authorised expounders of law, but they were most voluminous writers. Massurius Sabinus wrote three books Juris Civilis, which formed the model of subsequent writers. The commentators on the Edict were also very numerous, and among them are the names of Pomponius, Gaius, Ulpian, and Paulus. Gaius wrote an elementary work, which furnished the model of the Institutes of Justinian. Commentaries were also written on various Leges, and on the Senatus Consulta of the Imperial period; and finally, the writings of the earlier jurists themselves were commented on by their successors. The long series of writers to whom the name of classical jurists has been given, ends, about the time of Alexander Severus with Modestinus, who was a pupil of Ulpian. Some idea may be formed of the vast mass of their writings from the titles of their works as preserved in the 'Digest,' and from the 'Index Florentinus;' but with the exception of the fragments which were selected by the compilers of that work, this great mass of juristical literature is nearly lost. [JUSTINIAN.]

Among the sources of law in the Imperial period are the Imperial Constitutiones. A Constitutio Principis is defined by Gaius (i. 5) to be 'that which the imperator has constituted by Decretum, Edictum, or Epistola; nor has it ever been doubted that such constitutio has the force of law.' As the emperor ultimately possessed all the sovereign power, he became the sole source of law. Under Augustus some Leges were passed, as already observed; and under his successors there were numerous Senatus Consulta. In the time of the Antonines there were both Senatus Consulta and Imperial constitutions, and the latter are referred to by Gaius as being of equally binding force with Senatus Consulta. After the time of Gaius, Constitutiones became more common, and few Senatus Consulta were passed. The Decretum of the emperor was a decision made in a matter of dispute which came before him either originally or by way of appeal. The Edict, or Leges Edictales, were formed by analogy to the Edicta of the magistrates, and were in effect Leges. Rescriptum was a general term which comprehended Epistolae and Subscriptiones. The Rescripta were the answers of the emperor, made either to public functionaries or to individuals who consulted him. Sometimes Constitutio and Rescriptum are used as equivalent. (Gaius, ii. 120, 121.) Decreta and Rescripta, being decisions in particular cases, could not by their form have the force of leges; though when the determination made in a particular case was capable of a general application, it gradually obtained the force of law.

With the decline of Roman jurisprudence began the period of compilations, or codes, as they were termed. The earliest were the Codex Gregorianus and Hermogenianus, which are only known from fragments. The Codex Gregorianus, so far as we know it, began with constitutions of Sept. Severus, and ended with those of Diocletian and Maximian. The Codex Hermogenianus, so far as it is known, contained constitutions also of Diocletian and Maximian, and perhaps some of a later date. Though these codes were mere private collections, they apparently came to be considered as authority, and the codes of Theodosius and Justinian were formed on their model.

The code of Theodosius was compiled under the authority of Theodosius II., emperor of the East. It was promulgated as law in the Eastern empire, A.D. 438; and in the same year it was confirmed as law in the Western empire by

Valentinian III. and the Roman senate. This code consists of sixteen books, the greater part of which, as well as of the Novellæ, subsequently promulgated by Theodosius II., are extant in their original form. The commission who compiled it were instructed to collect all the Edicta and Leges Generales from the time of Constantine, and to follow the Codex Gregorianus and Hermogenianus as their model. Though the arrangement of the subsequent code of Justinian differs considerably from that of Theodosius, it is clear from a comparison of them that the compilers of Justinian's code were greatly aided by that of his Imperial predecessor. The valuable edition of the Theodosian Code, by J. Gothofredus (6 vols. fol., Lugd., 1665), re-edited by Ritter, Leipzig, 1736-1745, contains the first five books and the beginning of the sixth, only as they are epitomized in the Breviarium; and this is also the case with the edition of the 'Jus Civile Antejustinianeum,' published at Berlin in 1815. But recent discoveries have greatly contributed to improve the first five books. The most recent edition of the 'Jus Civile Antejustinaneum' is that of Bonn, 1835 and 1837.

The legislation of Justinian is treated of under Justinian's Legislation.

There are numerous works on the history of the Roman law, but it will be sufficient to mention a few of the more recent, as they contain references to all the earlier works: *Lehrbuch der Geschichte des Römischen Rechts*, by Hugo, of which there are numerous editions; *Geschichte des Römischen Privatrechts*, by Zimmern; *Geschichte des Römischen Rechts*, by F. Walter, 1840; and for the later history of the Roman law, *Geschichte des Römischen Rechts im Mittelalter*, by Savigny.

History of Modern Rome.

Period I.:—Rome under the Gothic Kings.—After the death of Valentinian III., A.D. 455, the foreign mercenary guards disposed of the crown of the West. A rapid succession of puppet emperors followed each other on the slippery throne. At last Odoacer, an officer of the Imperial guards, of Gothic birth, some say of the tribe of the Heruli, revolted against Orestes, another barbarian officer who had assumed the supreme power in the name of his son Romulus, a mere youth, whose mother was a Roman by birth, and whom he caused to be proclaimed Augustus. The appellation of Romulus Augustulus was given him in derision. Odoacer defeated Orestes, took him prisoner, and put him to death. Romulus was deposed, and banished to Campania or Apulia, with a suitable allowance for his support, A.D. 476. Odoacer fixed his residence at Ravenna, as his predecessors had done. He styled himself 'Patrician,' and professed to govern Italy in the name of Zeno, emperor of the East. He did not assume the purple or other imperial insignia, although historians style him 'Rex.' There are no coins struck in his name; nor did he make any new constitutions or enactments. The form of administration continued as before. Rome had its senate, its præfectus prætorio, and præfectus urbi. The consuls had been appointed, ever since the time of Arcadius and Honorius, separately, one in the East and the other in the West. In the first year after Odoacer's assumption of power, there was no consul named for the West. Zeno refused to appoint one, in order that he might not countenance the usurpation of Odoacer; and Odoacer did not appoint one himself, not wishing to irritate Zeno. At last, in the year 480, on the representation of the senate, Odoacer named Basilius, junior, consul for the West, and he continued to appoint a consul every following year. In the year 483, Simplicius, bishop of Rome, having died, the clergy assembled to elect his successor, in the presence of the præfect of the prætorium, who signified to the assembly, in the name of Odoacer, that no election of the bishop of Rome should be made in future without the sanction of the præfect. Felix was then declared to be elected. In the same year Theodoric, a chief of the Ostrogoths, of the tribe of the Amali, from which circumstance he is called Theodoric Amalus, to distinguish him from another Theodoric, his contemporary, made peace with the emperor Zeno, who appointed him general of his guards, bestowed upon him part of Dacia and Mœsia, and named him consul for the East for the following year. In the year 487 Odoacer defeated and took prisoner Fava or Feba, a chief of the Rugi, who had possessed himself of part of Noricum. Frederic, son of Fava, appealed to Theodoric, who was residing at Novæ in Mœsia, and who was related to him, and this was the origin or the pretext of the quarrel between Theodoric and Odoacer. It appears that Zeno had entered into a secret agreement with Theodoric to the effect that Theodoric should take Italy from Odoacer, probably however on the condition of acknowledging the emperor of the East as his suzerain. In the year 489 Theodoric moved towards Italy with the whole tribe of Ostrogoths, his subjects carrying along with them in carts their wives, children, cattle, corn, and other provisions, and even their hand-mills. Odoacer met the invaders on the banks of the Isonzo; but being defeated, he retreated to Verona; and after a second defeat he shut himself up in Ravenna. Theodoric advanced to Milan and Pavia; but having met with some reverses, he was obliged to keep himself within Pavia. In the following year, 490, Odoacer advanced against him, assisted by some troops sent him by Alaric, king of the Visigoths of Gaul and Spain. A battle took place, in which Odoacer being again defeated, he withdrew to Ravenna, whither Theodoric followed him, and fixed his camp in the neighbouring pineta, or pine-forest. The siege lasted more than two years, during which all the rest of Italy submitted to Theodoric. At last Odoacer surrendered through famine, in February, 493. Theodoric made his entrance into Ravenna, and was received by the archbishop at the head of his clergy. At first he treated Odoacer with kindness, but he afterwards caused him to be put to death.

Theodoric sent to Constantinople Festus, princeps or president of the Roman senate, to request of the emperor Anastasius, who had succeeded Zeno, the royal robe, or, in other words, the investiture of the kingdom of Italy, which Anastasius granted, and Theodoric assumed the title of king. He fixed his residence at Ravenna, and did not visit Rome for several years after his accession. In the year 498 Anastasius II., bishop of Rome, having died, great disturbances took place on the occasion of electing his successor. The majority of the clergy elected Symmachus, but another party named a certain Laurentius. The two parties came to blows, many persons were killed, and anarchy prevailed in Rome for a long time. Theodoric, who was an Arian, did not, perhaps through policy, interfere in the quarrel. At last, both parties, being tired of dissension and disorder, appealed to him, when he summoned the two claimants to Ravenna, and declared Symmachus to be duly elected by a majority of votes. In the year 500 Theodoric visited Rome, where he was received by Symmachus, and by the senate and the people, with great pomp. He visited the Vatican Basilica and the Senate-hall; and lastly he addressed the people in a place called Palma, promising to maintain the existing constitutions enacted by the former emperors. An old chronicler quoted by Muratori, who has written the life of St. Fulgentius, and who was present at the ceremony, speaks in high terms of the decorum, splendour, and order which prevailed, and of the applauses of the people. Theodoric gave public games in the Circus for the amusement of the people, and an annual donation of twenty thousand measures of corn. He assigned also two hundred pounds of gold annually out of the revenue of the duty on wine for repairing the imperial palace and the city walls. He named Liberius prefect of the prætorium; and after having published several edicts, and caused the solemn promise that he had made to the people to be engraved on a brass tablet, which was fixed up in a public place, he returned to Ravenna.

The long reign of Theodoric was for Rome and all Italy a period of peace and prosperity. He himself carried on war in Gaul and in Spain, and added part of those countries to his dominions. He gave in marriage his only legitimate child Amalasonta to Eutaric, a noble Goth, who was appointed consul and colleague of the emperor Justinus in the consulship, A.D. 519. Justinus himself sent to Eutaric the consular toga. Eutaric made his solemn entrance into Rome on the first day of the year, and was received with great pomp by the senate amidst the applause of the people. The usual gifts were distributed among the people, both Romans and Goths; public games were given, among others fights of wild beasts, which had not been seen for a long time; the beasts were sent from Africa as a present by Trasmund, king of the Vandals. The magnificence displayed by the Romans on this occasion is said to have surprised even the ambassador from the emperor Justinus, who had come to treat of a reconciliation between the Eastern and Western churches, after the schism occasioned by Acacius. The report of this ambassador, on his return to Constantinople, of what he had seen at Rome, seems to have excited the jealousy and emulation of the Eastern court, and when, two years after (A.D. 521), Justinian was made consul in the East, he strove to rival Eutaric in the splendour of the public games, and the sums which he distributed among the people of Constantinople.

Under THEODORIC more particulars are given of his long and important reign; here we confine ourselves to those which concern more especially the city of Rome. That prudent king strove to win the affection of the people of Rome by his liberality, his respect for their municipal customs and privileges, his deference towards the senate, which was the supreme court of justice in his dominions, and his protection of the Roman church and clergy. The works of Cassiodorus, and the panegyric of Theodoric by Ennodius, bishop of Pavia, are evidence of this. Illiterate himself, Theodoric encouraged literature and science, and it appears, from one of the letters written in his name by Cassiodorus, that a great number of students from distant countries repaired to Rome. Theodoric enacted that the students should not leave Rome till they had completed a certain course of studies according to their respective pursuits, which was probably ascertained by an examination, and this may have led, in course of time, to the establishment of academical degrees. Towards the end of his life Theodoric became suspicious, because he perceived, that notwithstanding all he had done for Italy, there was still in the hearts of the native Italians a dislike of foreign domination. It was then that the patrician Severinus Boethius, being accused of treason, was tried and condemned to death by the senate of Rome, a sentence which was at first commuted by Theodoric into perpetual imprisonment, but after a time Boethius was put to death, and shortly after Theodoric put to death also the patrician Symmachus, the father-in-law of Boethius. John I., bishop of Rome, on his return from Constantinople, whither Theodoric had sent him on a mission to Justinus, was imprisoned by his order, probably on suspicion of treasonable intelligence with the Byzantine court, and he died in prison at Ravenna, A.D. 526. The clergy of Rome having assembled to elect a successor, dissensions arose which threatened a renewal of the disorders that had taken place at the former election of Symmachus. Theodoric wrote to the senate of Rome suggesting Felix, a man of great merit, as a fit candidate, and his suggestion, which was like a command, was complied with. This was one of the last acts of Theodoric. He died at Ravenna, of a violent dysentery, in August of the same year. Before he died, he sent for his grandson Athalaric, then 10 years of age (Eutharic had died before him), and causing his chief officers, both civil and military, to swear allegiance to him, he exhorted them to maintain a good understanding with the emperor of the East, and to cherish the Roman senate and the Roman people.

One of the first acts of Athalaric, or rather of his mother, Amalasonta, and her minister Cassiodorus in his name, was to signify his accession to the senate and the people of Rome. A letter was afterwards written to the senate expressing satisfaction that in choosing Felix for their bishop the Romans had conformed to the desire of his grandfather, which had been expressed with a view to the public good by recommending to them a person well deserving of the pastoral dignity. Some years after, when Boniface II. died, he indicated in his will a certain Vigilius as his successor in the see of Rome. This however was resented by the clergy and people as an improper interference, and being set aside, John II. was elected, A.D. 532. But as much bribery and corruption had been employed by the rival parties at the election, the senate passed a consultum forbidding under severe penalties any bribe or promise for the purpose of obtaining a see, which was declared to be a sacrilegious offence. All such promises were also declared to be void. Election disputes were to be decided by the senate or other judicial courts, but the expenses of the suit were not to exceed the sum of three thousand solidi, if it concerned the see of Rome, and of two thousand if it concerned other metropolitan sees. This decree, with the sanction of Athalaric, was engraved on marble and placed in the front of the Vatican Basilica. Athalaric left to the clergy and the people of Rome the right of electing their bishop, but reserved to himself that of confirming the election.

Amalasonta had begun her regency with great wisdom; she had been carefully brought up, by her father's directions, and she caused her son to be educated, after the manner of the Romans, in the liberal arts. It seems however that the Gothic officers, who had not received a Roman education, and rather despised it as tending, as they thought, to make youth weak and effeminate, remonstrated with the queen, saying that they wanted a warlike king and not a clerk; that Theodoric, who could not write, had governed his states with glory, and that instead of surrounding Athalaric with pedants, he ought to keep company with young men of his age and exercise himself in manly sports. Amalasonta was obliged to give way, and the consequence was that Athalaric gave himself up to drinking and debauchery, of which he died, A.D. 434 or 435. Amalasonta named as her colleague Theodatus, a nephew of Theodoric, with the title of king. Theodatus had been guilty of extortion in Tuscany, for which he had been tried at Ravenna and condemned to refund his ill-acquired riches. But he was the last remnant of the family of Theodoric, and Amalasonta had no choice. He showed himself ungrateful, joined a party against Amalasonta, arrested her, and confined her in an island in the lake of Bolsena, where she was soon after strangled. Theodatus did not long enjoy the fruits of his guilt. Justinian, seeing a favourable opportunity for recovering Italy to the empire, ordered Belisarius to occupy Sicily, sent other troops to occupy Dalmatia, and concluded an alliance with the Franks against the Goths. Belisarius, having taken possession of Sicily, landed at Rhegium in Southern Italy, and advanced towards Naples. Theodatus at first made secret proposals to Justinian to give up the kingdom for a pension, but he afterwards altered his mind, and sent Vitiges, one of the veteran officers of Theodoric, into Campania to oppose Belisarius. The Gothic troops, who despised Theodatus, proclaimed Vitiges their king, A.D. 536. Theodatus was put to death, and Vitiges married Matasunta, daughter of Amalasonta, and was acknowledged king by the Goths.

In the mean time Belisarius attacked Naples, took it by surprise, and gave it up to indiscriminate plunder; he then advanced towards Rome. [BELISARIUS.] The Gothic garrison consisted of only 4000 men, and the citizens, alarmed at the fate of Naples, offered to surrender. The Gothic troops, unable to prevent this, evacuated the city, which Belisarius entered. He quickly set about repairing the walls, dug a ditch round, and made every preparation for defence. Vitiges, who was at Ravenna, collected a large army, with which he marched against Rome in the following year. The Goths battered the walls with engines in various places, but they could not, says Procopius, completely surround the city, owing to its vast circuit. They cut off the aqueducts and stopped the mills outside of the walls; but they allowed divine service to be performed as usual in the churches of St. Peter and St. Paul outside the gates. Scarcity being felt within Rome, Belisarius embarked the women, children, and other helpless persons on the Tiber, and sent them to Naples and Sicily, without any impediment being offered by the besiegers, as it appears. Belisarius committed an act of violence against Sylverius, bishop of Rome, whom he arrested on pretence of a conspiracy, stripped him of his episcopal robes, and banished him to Patara in Lycia. This was done at the desire of the empress Theodora, who favoured the patriarch of Constantinople, Anthemus, and others who had been condemned as heretics by Sylverius. Belisarius convoked the council of the clergy of Rome for the purpose of electing a new bishop, and suggested the deacon Vigilius, who had been intriguing at the court of Constantinople, as a proper person. This suggestion was equivalent to a command, and Vigilius was elected in November of that year. Such an act of violence had not been perpetrated before, although the Gothic kings were Arians. The siege of Rome still continued, and the citizens were afflicted both by famine and pestilence; but reinforcements being on their way to join Belisarius, Vitiges thought it prudent to conclude a truce. A supply of provisions came up the Tiber to Rome, together with a reinforcement of a few thousand men. In the following year, 538, Justinian ordered Sylverius to be sent back to Rome, and his case to undergo a fresh investigation. But Theodora and Vigilius prevailed upon Belisarius to banish him again to the island of Pontia, some say Palmarola, where he died of starvation in June of that year. Vigilius was now universally acknowledged bishop of Rome. A lieutenant of Belisarius having effected a diversion against the Goths in Picenum, and taken Ariminum and other places, Vitiges raised the siege of Rome, and moved to the north of Italy, where the war was carried on for some time longer. Milan, having revolted against the Goths, was retaken by Uraia, the nephew of Vitiges, and given up to indiscriminate pillage and slaughter A.D. 539. In the year 540, Vitiges, disheartened by the disaffection of his troops, surrendered himself at Ravenna to Belisarius, and was sent to Constantinople, where he was treated with considerable leniency. The Goths however chose another king in the person of Totila, a brave officer, who soon recovered the greater part of Italy, while Belisarius was absent in the East. Rome and Ravenna however remained in the possession of the imperial forces. In 545 Belisarius returned to Italy, but with an insufficient force. Totila laid siege to Rome, and in the following year entered it by the treachery of some Isaurian sentries, who opened the Porta Asinaria to him in the night. He exerted himself to save the inhabitants, of whom comparatively few were killed by his soldiers. He then went to visit St. Peter's church, where he was received by the deacon Pelagius, who pleaded the cause of his countrymen. Totila, having assembled the senate, reproached them with their ingratitude for the protection and kindness that they had experienced at the hands of Theodoric and Athalaric, whom they had deserted for the Greeks, who had treated them much worse than the Goths. He however forgave them, and lived with the Romans, so say Anastasius and the writer of the 'Historia Miscella,' 'as a father in the midst of his children.' Some reverses which his troops sustained in Lucania inducing him to quit Rome, he partly destroyed the walls, but he spared the public buildings. Taking along with him the senators and other principal citizens, he proceeded towards Campania; and Belisarius, re-entering Rome, immediately set about repairing the walls as well as he could, in the expectation of Totila returning, as he did in the following year, 547, but was repulsed before the city. In 548 Belisarius was again recalled, and in 549 Totila laid siege to Rome, which he again entered through the treachery of some Isaurian sentries, who opened the Porta Capena. The Greek garrison were taken prisoners, except 400 men, who shut themselves up in the Mausoleum of Hadrian, determined to sell their lives dear; but Totila having offered them honourable terms, they accepted his conditions, and most of them entered his service.

Totila recalled the senators and other principal citizens from Campania, treated them kindly, and gave them the amusement of the equestrian games. He fortified the Mausoleum of Hadrian, and made a kind of citadel of it, as the city was too large to be effectually defended.

In 552 Narses was sent to Italy by Justinian. Totila advanced from Rome to meet him, and a battle was fought at Tagina in Umbria, in which Totila was defeated and killed. Next to Theodoric, he was the bravest, ablest, and most humane of the Gothic kings of Italy. Narses entered Rome without difficulty, and the garrison of the citadel surrendered. The Goths now elected at Pavia one of their generals, named Teias, for their king. Teias collected an army and marched to the south. The Roman hostages who had been taken by Totila along with him, were put to death by Teias, to the number of 300; but those Roman citizens who had settled in Campania returned home, and Rome, which had become nearly deserted, began to fill again with inhabitants. Narses having attacked Cumæ, then a strong fortress, in which Totila had placed his treasure, Teias marched to its relief. The two armies engaged near Nocera in Campania, and Teias fell in the battle. With him ended the kingdom of the Goths in Italy. [NARSES.] Under the wise administration of Narses, Rome recovered from the long calamities that it had suffered during the Gothic war. Narses, though not constantly resident in Rome, often visited the city. Rome escaped the devastating incursion of a large party of Franks and Alamanni, who overran Italy to its southern extremity, but were defeated with great slaughter by Narses on the banks of the river Volturnus, after which Narses returned in triumph to Rome with an immense booty. It appears however that the Romans complained of the avarice of Narses to Justinus II., the successor of Justinianus, and that this contributed to the deposition of Narses from his governorship, in which he was superseded by Longinus, who was named Exarch of Italy. The Romans seem to have felt some compunction for their ingratitude towards the veteran commander, who had retired to Naples, and sent their bishop John to invite him back to Rome. Narses accepted the invitation, and died quietly at Rome, A.D. 568, being then above ninety years of age.

Period II.:—Rome under the Exarchs.—The Exarchs, having fixed their residence at Ravenna, made a considerable change in the administration of Italy. The annual consulship, an institution which, though greatly shorn of its former honours and authority, had been perpetuated, at least in form, with some few interruptions, from the time of the antient republic, fell into disuse after the year 541. During the Gothic war, Basilius was the last consul appointed. Still it was customary at Rome, in Italy, and in the West in general, to date the years from the consulship of Basilius, junior, and this custom prevailed till nearly the end of the 6th century, as is proved by the epitaph of a noble matron called Cesaria, who died at Arles, A.D. 587, preserved by Baronius, in which it is said that she died in the forty-sixth year after the consulship of Basilius junior, and the twelfth of king Childebert. But the distribution and the names of the provinces had remained the same as under Constantine, and they were administered by consulares and præsides. Longinus however abolished these magistrates, and instead of them sent an officer called Dux to each town or district, who was changed every year. Rome was not in this respect more privileged than the rest; it had its duke, or patrician, as he is sometimes called, who was sent from Ravenna. Hence the name of Duchy of Rome, which is often mentioned in the chronicles, but the limits of which are not closely ascertained, and perhaps varied at different times in the dark ages. We find Amelia, Orta, Sutri, and Bleda mentioned as belonging to it. Rome however retained its internal municipal administration and laws, and the clergy and bishop of Rome began to exercise a greater influence in temporal matters than they had done under the Gothic kings. Every new bishop of Rome was elected by the joint votes of the clergy, the senate, and the people, but was not consecrated till he received the approbation of the Exarch, or, through him, of the Eastern emperor. [PAPAL STATE—*Modern History*.]

The Longobards occupied a great part of Italy, but they never took Rome, although they threatened and besieged it several times during the two centuries that their power lasted. This remarkable fact may be partly explained by the circumstance of Rome being doubly protected by the presence of her bishop, who was highly venerated in all the West, and by the temporal jurisdiction exercised over it by the Greek emperor. The Longobards never formed a compact kingdom; they did not possess all Italy, as the Goths had; the Eastern emperors retained a considerable part of the country, and their power, though distant, was still considered formidable. [LONGOBARDS.]

The Romans however did not always live on the best terms with the Byzantine Exarchs and their delegated dukes, for we read of several instances in which the dukes committed acts of violence against the clergy, and even against the bishop of Rome [MARTIN I.]; we read of revolts in Rome against the Exarch, sometimes encouraged by the Byzantine delegates; we, find in the year 638, the treasury of the Basilica, or church of the Lateran, broken into by the imperial garrison, and the contents partly used for the payment of the troops and partly remitted to the emperor at Constantinople, an act of violence which, Muratori observes, the Longobards never perpetrated in the countries subject to them. The removal of the treasures, it is said, took eight days. The emperor Constans II. visited Rome about A.D. 660, and was received with great honours by pope Vitalianus, but on his departure he took away a quantity of bronzes and other valuable ornaments, among the rest the bronze plates which covered the roof of the Pantheon. (Paulus Diaconus, v. 11.) Occasional disputes between the see of Rome and that of Constantinople, about points of dogma or discipline, served to alienate the Romans still more from their allegiance to the emperors. Lastly came, in the early part of the eighth century, the great schism of the Iconomachi, or Iconoclasts, which led to the total separation of Rome from the Eastern empire. [LEO. III., *Isauricus*.]

The people of Rome, those of Ravenna, of the Venetia, and of Italy in general, refused to obey the orders sent by the emperor Leo to remove the images from the churches. Pope Gregory II. condemned the Iconomachi as heretics. Leo, being irritated, laid a capitation tax upon his Italian subjects, but the pope opposed this measure. Duke Basilius, Marinus Spatharius, military commandant, Jordanus Carthularius, treasurer, and other imperial officers at Rome, conspired against the life of the pope, being encouraged, it is said, by the Exarch Paulus; but the people of Rome rose in defence of their pontiff, killed Jordanus and another of the conspirators, and obliged Basilius to become a monk in order to save his life. The Exarch sent troops from Ravenna against Rome, but they were met on their way by the Longobards of the duchy of Spoleto, and obliged to retire. Luitprand, king of the Longobards, thought of availing himself of these dissensions to extend his own dominion and drive the Byzantines from Italy, and he took the part of the pope. The pope however does not seem, as Theophanes (*Byzant. Hist.*) has insinuated, to have encouraged any open revolt against the emperor, and he is said even to have prevented the imperial troops, which were stationed at Ravenna and in the Venetia, from proclaiming another emperor. (Paulus Diaconus, vi. 49.) Luitprand however besieged Ravenna, and took it, but it was soon after retaken by the Byzantines, with the assistance of a Venetian squadron (A.D. 729). Peace being concluded between Luitprand and the Exarch Eutychius, they both proceeded to Rome, in order to restore that city and duchy, which were in a state of revolt, to the imperial allegiance, which was effected without much opposition, the pope acting as mediator.

Gregory III., who succeeded Gregory II. in 731, continued to maintain the use of images, in opposition to the emperor, who seems not to have had the means of enforcing his orders in Italy, as he had done in the East. The dispute therefore became merely one of words, and Rome remained quiet, and owned, at least nominally, the emperor as her sovereign. About the year 739, Trasimund, duke of Spoleto, having revolted against king Luitprand, the latter marched to Spoleto, and Trasimund escaped to Rome. Luitprand demanded the person of the fugitive, but the pope and the imperial governor, according to Anastasius, in his 'Historia Ecclesiastica,' refused to give him up, and, some time after, Trasimund, with the assistance of the duke of Benevento and of the Romans, recovered his duchy. This brought on a rupture between Luitprand and the Romans, and the devastation by the Longobards of part of the Roman duchy, which induced pope Gregory to think of applying for support to Charles Martel, whose fame was great in the West, especially after his defeat of the Saracens at Poictiers. Gregory sent an embassy to Charles Martel, about the year 740, with presents and the keys of the sepulchre of St. Peter, and with an offer of transferring the allegiance of the duchy of Rome from the emperor to him, provided Charles would protect Rome against the Longobards. It does not appear that Charles interfered actively in this business, but he sent an embassy to the pope with rich presents. This however was the beginning of the connection of the popes with the kings of France. On the death of Gregory, his successor, Zacharias, adopted a different course of policy, and, instead of applying for assistance from beyond the Alps, sent an embassy to king Luitprand, to beg of him to let the duchy of Rome have peace, and to propose at the same time to unite the forces of the Romans with his against the duke of Spoleto. It appears that the citizens of Rome, independently of the imperial garrison sent from Ravenna, had their own militia, which must have been of some importance, as we hear repeatedly of its acting in the field, either against or with both Longobards and Greeks. Much confusion however arises through Paulus Diaconus and other old chroniclers applying indiscriminately the word Romans to all the subjects of the emperor in Italy, as well as to his soldiers, for the Eastern empire was still called Roman. Thus we hear of the Romans defeating the soldiers of Luitprand near Ariminum and Fanum, which probably refers to the imperial troops under the exarchs of Ravenna. Luitprand accepted the offer of Zacharias, and the united Longobard and Roman forces compelled Trasimund to submit. Luitprand obliged him to take clerical orders, and appointed his nephew duke of Spoleto.

Pope Zacharias had an interview with Luitprand at Orta, when the king received him with great honours, and restored all the prisoners made in the preceding war, not only those belonging to the duchy of Rome, but also those belonging to Ravenna and its territory. At the same time Luitprand restored several towns and domains belonging to the duchy of Rome, which he had occupied, but he gave them in writing as a donation to St. Peter, and not to the duchy or the empire. The duke of Chiusi and other personages of his court were sent to escort the pope back to Rome.

In the following year, 742, the Exarch of Ravenna, with whom Luitprand was still at war, unable to resist the Longobards, appealed to the pope to mediate between them, and Zacharias repaired with some difficulty to Pavia, where he prevailed on Luitprand to make a truce with the Exarch, and to restore some districts belonging to Ravenna, and two-thirds of the territory of Cesena; the king was to retain the other third until the return of the ambassadors whom he had sent to Constantinople.

Luitprand died about 743. He was one of the ablest and wisest kings that the Longobards ever had. His successor Ratchis, at the recommendation of the pope, concluded, in 744, a truce of twenty years with the Eastern emperor. Five years afterwards however Ratchis, for reasons which are not known, broke the truce, invaded the Pentapolis, and besieged Perusia. Zacharias with part of his clergy repaired to his camp, and there prevailed on the king to restore peace. Soon after Ratchis abdicated the crown, and retired to Monte Cassino, where he became a monk. His brother Astolphus succeeded him, and peace was maintained as long as Pope Zacharias lived. His successor Stephen III. was either not so conciliating or not so successful, for soon after his accession (A.D. 753, according to others 752), war broke out again in Italy, Astolphus became master of Ravenna, and threatened Rome, demanding her submission and a capitation tax from all the inhabitants of the duchy. After some fruitless negociations, Pope Stephen repaired to Pavia with John Silentiarius, an imperial commissioner, but Astolphus was deaf to their remonstrances. The pope then went to France, where he crowned Pepin, the son of Charles Martel, king, declaring him and his two sons Charles and Carloman patricians of Rome. [PEPIN LE BREF.] Pope Stephen at the same time pleaded his cause with Pepin against the Longobards, and it was resolved in a council of the Frankish nobles to make war against Astolphus. Pepin entered Italy with a large army, and Astolphus shut himself up in Pavia. After a short siege, a treaty was concluded, by which Astolphus promised to leave Rome in peace, and to restore the towns of the duchy which he had seized. Pepin, whose forces were led by turbulent nobles, was obliged to recross the Alps, and Astolphus broke his promise, and in the year 755 he besieged Rome and devastated its territory. The pope despatched by sea messengers with an autograph letter addressed to Pepin, his sons, and the whole Frankish nation, requesting them in the name of St. Peter to defend Rome and the church. Pepin again crossed the Alps, Astolphus retired to Pavia, and soon after concluded a new treaty, by which he engaged to pay a large sum of money, and not only to restore all that belonged to the duchy of Rome, but also Ravenna and the Exarchate to the see of St. Peter. In the mean time Constantine, emperor of the East, had sent ambassadors to the Franks, who, on arriving at Marseille, were surprised and grieved to find that Pepin had already crossed the Alps. One of them, called Gregory, overtook Pepin near Pavia, and urged the restoration of the Exarchate to his master. Pepin replied that he had already given it to St. Peter, and dismissed the ambassador. The act of donation of the Exarchate, the Pentapolis, and the town of Comacchio was made by Pepin. [PAPAL STATE.] In the following year, 757, Astolphus died, and Desiderius, duke of Istria, was proclaimed king of the Longobards. Desiderius refused to observe the stipulations of Astolphus, and retained several towns of the Exarchate; he also refused to restore the domains of the church situated in his kingdom, which went by the name of 'Justitiæ beati Petri.' A convention however was entered into between Desiderius and the pope about the year 760, and a letter of thanks was sent to Pepin in the name of the senate and the people of Rome for his effectual protection.

In the year 767, after the death of Pope Paul I., a disgraceful scene took place in Rome. Toto, duke or governor of Nepi, entering Rome with a body of men, compelled several bishops to ordain and consecrate his brother Constantine, a layman, and he put him in possession of the Lateran. Others of the clergy escaped, and applied to the Longobard duke of Spoleto, who in the next year sent a party of armed men, who defeated and killed Toto. The clergy then elected Stephen IV., and the mob tore to pieces Constantine and his adherents.

In the year 768 Pepin died, and was succeeded by his two sons, Charlemagne and Carloman, but the latter soon after dying, Charlemagne remained sole king of the Frankish monarchy. A fresh quarrel broke out between Desiderius and Pope Adrian I., and Desiderius advanced with an army as far as Otriculum. The pope sent three bishops to threaten him with excommunication if he violated the territory of the duchy of Rome, and Desiderius returned to Pavia. Adrian had applied for assistance to Charlemagne, who passed the Alps and besieged Desiderius within Pavia. Desiderius surrendered in 774, and the kingdom of Italy passed under the dominion of the Franks.

Period III.:—Rome under the Emperors of the Carlovingian Dynasty, A. D. 774-888.—Charlemagne, having assumed the iron crown of Lombardy, confirmed Pepin's donation to the pope, who acknowledged him as patrician of Rome and his temporal superior. In the year 800 the sovereignty of Charlemagne over Rome was confirmed by Pope Leo III., who crowned him at Rome emperor of the West, with the title of Carolus I., Cæsar Augustus, a title which was acknowledged by Nicephorus, emperor of the East, who defined the limits between the two empires. [CHARLEMAGNE.] Those limits in Italy were the old boundary between the Longobard duchy of Benevento and the Byzantine provinces of Apulia and Magna Græcia. Rome and Ravenna were included within the limits of the new Western empire, of which Rome was still the nominal capital. From that time the popes assumed a temporal authority over the city and duchy of Rome, subordinate however to the emperor of the West as their suzerain; and they began to coin money with the name of the pope on one side and that of the emperor on the other. The pope was in fact a great vassal of the empire, but his authority was also limited by that of the senate and the general assemblies of the people and clergy. The name of Roman republic was even occasionally revived. Like other great vassals, the popes made subinfeudations to numerous nobles or barons in the duchy of Rome and the Romagna. [ROMAGNA.] The period of the Carlovingian supremacy was upon the whole prosperous for Rome. The Western emperors made ample donations to the papal see, and the papacy being the highest object of ambition in those times, and the fountain-head of clerical dignities, Rome became the resort of numerous applicants, and again assumed the appearance and bustle of a great capital. But the public peace was often disturbed at Rome by factions, especially among the clergy, in which however the lay population took an active part. Instances of the violence and atrocities committed on those occasions are given under LEO III.

Under Louis the Pious, successor of Charlemagne, Lotharius, his colleague in the empire, came to Rome for the express purpose of reforming many abuses. In doing this he acted in concert with Pope Eugenius II. He restored much property to its lawful owners, which had been unjustly appropriated by the papal fiscus under the preceding pope, Paschal I., who was also accused of having caused several of the clergy to be put to death without a regular trial; he dismissed and banished those Roman judges who had been guilty of great extortion, and in lieu of them he appointed judges 'ex latere imperatoris,' who were to hold office as long as the emperor should think proper. Lotharius made several constitutions regulating the privileges of the city and duchy of Rome, and also calculated to prevent the disorder, violence, and robberies which generally took place during the election of a new pope. Imperial missi, or commissioners, were directed to be sent every year to hear complaints against the judges, dukes, and officers of the government, and report first to the pope, who was to see justice done and then report to the emperor. They were also to ask the senate and people of Rome by what laws they would be judged, whether by the Roman, the Longobard, the Salic, or the Ripuarian, which were all in force in Italy at the time, owing to the admixture of various nations who had settled in the country. Several nobles having taken possession of church property on the pretence that it was given to them by former popes, Lotharius ordered its immediate restitution. Lastly, and this is not the least curious feature of the times, Lotharius enjoined the inhabitants of the duchy of Rome from committing depredations on the borders of the neighbouring provinces of the kingdom of Italy. Lotharius called into his presence the dukes, judges, and other magistrates who were in Rome, and registered their names and offices; he instructed them on their duties, and enjoined them to pay proper respect to the pope, if they valued the favour of the emperor. According to the continuator of Paulus Diaconus, Lotharius, before he left Rome, required of the clergy and people a solemn oath of fidelity to Ludovicus and Lotharius, emperors, in which there was also a protest against any future election of a pope which should not be according to the canonical forms, and a promise not to cause the pope elect to be consecrated until he had taken the oath of fidelity to the imperial commissioner. All these reforms, promises, and protestations were however forgotten during the subsequent weakness and decline of the Carlovingian dynasty, and the old system of misrule prevailed at Rome more than ever.

Louis II., son of Lotharius, being appointed by his father king of Italy about the year 844, repaired to Rome, where he was crowned, whilst the French soldiers whom he had brought along with him remained outside of the walls plundering the country. In the following year an armament of Saracens or Moors came to the coast of Rome, ascended the Tiber, and plundered the churches of St. Peter and of St. Paul outside of the walls. It was in consequence of this that Pope Leo IV. determined to enclose the Vatican Basilica and its adjoining suburb by a wall; and Lotharius and his brothers sent money for the purpose, besides which a tax was laid on the duchy of Rome. The line took four years to complete it. Under the year 856 is registered a dreadful inundation of the Tiber, followed by a pestilence which destroyed a great part of the inhabitants of Rome.

Louis II., son of Lotharius, who had assumed the imperial crown, as well as that of Italy, after the death of his father, and who must not be confounded with his cousin Louis II. of France, called 'Le Begue,' or the stammerer, son of Charles the Bald, and grandson of Louis the Pious [LOUIS II. of France], resided in Italy, continually waging war against his great vassals, the dukes of Spoleto and Benevento, and also against the Greeks and the Saracens. He was a good-natured and well-intentioned but weak prince. Under his reign the usual disturbances took place at Rome during the elections of new popes.

Adrian II. being elected pope in 867, without the knowledge of the imperial commissioners, who protested against his consecration, Lambert, duke of Spoleto, entered Rome with a party of soldiers, and, upon the pretence that the people were rebels against the emperor, he plundered the town, broke into churches and monasteries, and carried off many young women. Lambert however was punished by the emperor, being deprived of his duchy, and the election of Adrian was confirmed. Adrian was married before he took priest's orders, and his wife Stephania was still living separate from her husband with a daughter, who was betrothed to a noble Roman. Eleutherius, brother of Anastasius, rector of S. Marcellus, and bibliothecarius of the Roman see, carried off the girl and married her clandestinely. It seems that the pope undertook to separate them, when Eleutherius, a violent man, went to Stephania's house and killed both mother and daughter. Adrian demanded a trial of the murderer by the imperial commissioners: Eleutherius was condemned to death, and his brother Anastasius was excommunicated by a council.

The emperor Louis II. died A.D. 875, and his succession was disputed between Louis, king of Germany, and his brother Charles the Bald, king of France. A period of confusion followed, in which the imperial authority in Italy became almost extinct. Charles was proclaimed emperor, but died soon after, A.D. 877; then Carloman, son of Louis of Germany, caused himself to be proclaimed king of Italy by the nobles of Lombardy; and lastly, after his death, Charles the Fat, Carloman's brother, was crowned emperor at Rome, by Pope John VIII., A.D. 880. In 885, after the death of Pope Adrian III., the territory of Rome was ravaged by swarms of locusts from Africa. Stephen V., Adrian's successor, found the people famishing, the granaries empty, and the Lateran palace and the Basilicæ stripped of their treasures in the interregnum between the late pope's death and the installation of his successor. The new pope sold his patrimonial property to relieve the poor. He ordered holy water to be sprinkled over the country in order to destroy the locusts, but finding this insufficient, he promised a reward for every measure of dead locusts brought in by the peasants.

In the year 887 Charles the Fat was solemnly deposed as unworthy of the crown, and in him ended the imperial dynasty of the Carlovingians. Arnulfus, a natural son of Carloman, was elected in Germany; Eudes, count of Paris, was proclaimed in France; and Berengarius, duke of Friuli, of Frankish race, was elected king of Italy by the nobles.

Period IV.:—Rome during the disputed succession to the kingdom of Italy, 888-961.—Berengarius had for a competitor Guy, duke of Spoleto, who collected a large force and defeated Berengarius on the banks of the Trebbia. Guy was crowned king of Italy, at Pavia, by a council of bishops, and afterwards repaired to Rome, where he was crowned emperor by pope Stephen VI., in February, 891. Pope Stephen soon died, and a double election followed, one part of the clergy and people of Rome choosing a deacon named Sergius, and another electing Formosus, bishop of Porto. Formosus remained master of the field, and Sergius fled to Tuscany. In 894 Arnulfus came to Italy from Germany with a large army, being invited both by pope Formosus and by Berengarius. He took Brescia and Bergamo, the latter by storm; his German soldiers committed the greatest atrocities, which so frightened the other towns of Lombardy, that they opened their gates. On the death of Guy, his son Lambert remained to dispute the crown against both Berengarius and Arnulf. In 895 Arnulf repaired to Rome, drove away the partizans of Lambert, who had occupied the Leonine or Vatican suburb, and was received at the Milvian bridge with great honour by pope Formosus and the Roman senate. He was crowned emperor by Formosus, and received the oath of allegiance of the city of Rome. Retreating to the north, he crossed the Alps into Germany, his troops being harassed on their march by the revolted population of Lombardy. The history of Italy during the latter part of the ninth and the first part of the tenth centuries is extremely obscure and confused, and it is hardly possible to ascertain dates and facts accurately. In the year 897, pope Stephen VII., who had disinterred the body of his predecessor Formosus, and thrown it into the Tiber, was seized by the revolted Romans, cast into prison, and strangled. [FORMOSUS.] John IX., in a council held at Rome, annulled the election of Arnulf, and confirmed that of Lambert as lawful emperor. In the same council it was again decreed that no pope elect should be consecrated without the Imperial sanction; and it was likewise forbidden, under pain of canonical censure, and of the Imperial displeasure, to strip the pontifical palace at the death of a pope, a practice which was become customary on the part of the relatives of the deceased, not only in Rome, but in other Italian sees.

Pope John then proceeded to Ravenna, where he met Lambert, and held another council of seventy-four bishops, in which, among other things, it was decreed that every Roman should be at liberty to appeal to the Imperial court. Lambert, on his part, confirmed the pope in the possession of the lordship of Rome, the Exarchate, and the Pentapolis. In the following year Lambert was killed while hunting, and Berengarius was acknowledged by most towns as sovereign of Italy.

In the year 899 the Hungarians entered Northern Italy, committed dreadful ravages, and defeated Berengarius. In the same year Ludovic, or Louis, king of Provence, came into Italy, was proclaimed king at Pavia, and in the following year was crowned emperor at Rome by Benedict IV., where he also administered justice to those who resorted to him.

In the year 902 Berengarius re-appeared in the field, defeated Ludovic at Verona, and took him prisoner, but allowed him to return to Provence. After the death of Benedict IV., at Rome, the usual disorders took place on the election of his successor Leo V., who, after two months, was deposed and imprisoned by Christopher, his chaplain, who, in 904, was also driven away by another faction, and Sergius III. was elected pope. Sergius completely restored the Basilica of the Lateran, which had fallen to ruin. The Saracens from Sicily were now devastating Southern Italy; the Spanish Moors, having formed a settlement at Frassineto on the coast of Liguria, overran the neighbouring valleys of Piedmont; and the Hungarians also crossed the Alps to devastate the plains of Lombardy. It was then that Berengarius permitted the towns to fortify themselves with walls, ramparts, and ditches. At Rome, Theodora, a woman of loose character, and her daughter Marozia, wife of Alberic, patrician, were exercising considerable influence in municipal and also in ecclesiastical affairs, and they brought about the election of John X., said to be Theodora's lover. [JOHN X.] This pope crowned Berengarius emperor in the Vatican, with great pomp, A.D. 916. About the same time the Saracens were completely routed and destroyed on the banks of the Liris, by the united troops of Berengarius, and of the dukes of Benevento, of Naples, and of Gaëta.

In the year 921 several Italian nobles and the archbishop of Milan conspired against Berengarius, and called to the throne Rudolf II., king of Burgundy. After much fighting, Berengarius was assassinated at Verona, in March, 924. He was by all accounts a good, just, and humane prince, in an age of barbarism. Hugh, duke of Provence, being called by a strong party, came into Italy, drove away Rudolf, and was crowned king at Milan, A.D. 926. During this period of confusion Rome was left to itself and its factions. Marozia and her second husband, Guy, duke of Tuscany, supported by armed partisans, and having possession of the castle of St. Angelo, ruled by force. The pope, John X., who had already quarrelled with the marquis Alberic, Marozia's first husband, was also in opposition to Guy. A party of Marozia's satellites entered the Lateran palace, murdered Peter, the pope's brother, and dragged the pope to a dungeon, where he soon after died; it was said that he was smothered. His successor Leo VI. died in a few months, and he also was murdered, according to report. Of Leo's successor, Stephen VII., nothing is known. To Stephen succeeded John XI., son of Marozia. Duke Guy being now dead, his brother Lambert succeeded him as duke of Tuscany; but king Hugh, his half-brother, being jealous of him, seized him, deprived him of his sight, and substituted his brother Boson in the duchy. Hugh, who wished to have Rome in his possession and to be crowned emperor, proposed to marry Marozia, who accepted the offer. Hugh came to Rome, A.D. 931, was received by his bride in the castle St. Angelo, having left his armed bands outside of the walls. He is said, by Luitprand, to have behaved insolently towards the Roman nobles, and to have given a blow in the face to Alberic, Marozia's son, while the latter, by his mother's desire, was handing him a ewer and basin to wash his hands. Alberic conspired with the nobles against Hugh, and besieged him in the castle, from which Hugh escaped by being lowered down the wall by a rope, and repairing to his camp, quitted the duchy of Rome. Alberic placed his mother in confinement, and let his half-brother John XI. attend to his duties as pope, but he allowed him no share of temporal power, and watched him closely.

Alberic assumed the title of prince and senator of all the Romans, 'Dei gratia humilis princeps atque omnium Romanorum senator.' It is conjectured by some, that the senate of Rome consisted at that time of a certain number of counts, each of whom presided over a region, and that the 'princeps senatus,' or president, was also the head magistrate of the whole city. (Conrigius Curtius, *De Senatu Romano post Tempus Reipublicæ Liberæ.*) Alberic struck money in his name, with the legend 'Albericus P.' He governed Rome till his death, which happened about the year 954, and he appears to have administered it wisely; he reformed many abuses, and above all checked the licentiousness of the clergy and convents. King Hugh twice marched against Rome, and devastated its territory, but he could not enter the city. At last Hugh, through his tyranny and debauchery, became odious to the Italians, who called to their deliverance Berengarius, marquis of Ivrea, who had taken refuge in Germany. Berengarius arrived with some troops, and entered Milan, where many Italian nobles and prelates joined him. Hugh, who had retired to Pavia, sent his son Lotharius to Milan, proposing to transfer the crown to that youth. The modest demeanour of Lotharius so pleased the assembled people, that they unanimously proclaimed him king, but Berengarius exercised all the authority in his name, A.D. 946. Hugh returned to Provence, where he died. In the year 949 or 950 Lotharius died, not without suspicion of poison administered by Berengarius, who was proclaimed king, with his son Adalbert as his colleague, and both where crowned at Pavia. Berengarius wished his son to marry Adelaide, the widow of Lotharius, who was only twenty years of age, and on her refusal he shut her up in prison. Her sufferings have been sung in Latin verse by a contemporary nun called Rosvida. A priest found access to Adelaide's prison, and led her out in disguise to Adhelard, bishop of Reggio, who gave her in charge to Azzo, lord of Canossa, the great-grandfather of the famous Countess Matilda. Otho of Saxony, king of the Germans, being informed of all this, came to Italy with an armed force, in the year 951, defeated Berengarius, and married Adelaide at Pavia, and in the following year returned to Germany. He however allowed Berengarius to retain the crown of Italy as his vassal, after swearing fidelity to Otho in the presence of the court and army, excepting Friuli and the March of Treviso, which were kept by Otho under his immediate dominion. Otho himself handed to Berengarius a sceptre of gold, in token of investiture.

From this transaction arose the claims of the kings of Germany upon the kingdom of Italy. Berengarius however soon forgot the lesson that he had received: he laid siege to Canossa, intending to revenge himself upon Azzo, but Otho came again from Germany, defeated and deposed Berengarius, and was himself elected king of Italy, and crowned in the church of S. Ambrose at Milan, with the antient crown and other insignia of the Longobard kings. [OTHO I.]

Meantime, prince Alberic having died at Rome, his son Octavianus, a mere youth, assumed the title of prince of Rome, and on the death of pope Agapetus II., A.D. 956, he was also elected pope, by the name of John XII. He was the first who changed his name on being made pope. Whilst Rome and its duchy had become in fact independent of the kingdom of Italy, the kings of Italy, on their side, had taken possession of the Exarchate, and Adalbert, son and colleague of Berengarius, had his residence at Ravenna, till he was deposed by Otho.

Period V.:—Rome under allegiance, real or nominal, to the kings of Germany and of Italy, 961-1278.—Otho, after his coronation at Milan, repaired to Rome, where pope John XII. crowned him emperor. He swore to respect the authority of the Roman see, and not to encroach upon its temporal rights and possessions. He was acknowledged emperor, and his son as king of the Romans, but the pope remained lord of the Roman duchy as a great imperial feudatory, as in the time of the Carlovingians. It has been observed by some writers that the imperial dignity was thus restored to the French kings, as the name of Francia was then given also to Germany, and Constantine Porphyrogennetus (*De Administrando Imperio*) calls Otho king of Saxony and Francia.

In the year 963 Otho returned to Rome, being called there by numerous complains against pope John, who, it was said, had transformed the Lateran Palace into a brothel, and also by information which he received of intrigues between the pope and Adalbert, son of Berengarius, who had still a party in Italy. John escaped, and Otho assembled a council in the Vatican, which, having heard the charges against John, deposed him, and elected Leo VIII. The clergy, senate, and other orders, styled Primates Romanæ civitatis, sanctioned his deposition, and swore not to proceed in future to elect a pope without the emperor's consent. In the following year, after Otho's departure from Rome, John re-entered the town, called together another council, which declared the election of Leo VIII. unlawful, and put to death or mutilated many of those who had taken part in the former council: 'Multa cæde primorum in urbe debacchatus,' are the words of the chronicler Gerbert. [JOHN XII.] Upon hearing this, Otho marched against Rome, but pope John dying, his faction elected Benedict V., whilst Leo remained with the emperor. Otho then besieged Rome, and reduced it by famine. Benedict was deposed, and exiled to Germany, and Leo was reinstated. Both Leo and Benedict however died soon after, and Otho having sent the bishops of Speyer and of Cremona as his commissioners to be present at the election, John, bishop of Narni, was elected by the clergy and people, A.D. 965. John, styled XIII., however, having incurred the dislike of the nobles by his haughtiness and harshness, was seized by the prefect of Rome, and taken prisoner to a castle in Campania, where he remained ten months, after which, through fear of Otho, he was liberated and restored to Rome. Otho came to Rome, and hanged thirteen of the principal people, styled by some, tribunes, who had taken part in those proceedings; the præfect however escaped.

Rome remained tolerably quiet during the remainder of Otho's reign; but after his death, A.D. 973, it again fell a prey to disorder. A faction, at the head of which were a cardinal called Francone and a certain Crescentius, seized pope Benedict VI., and strangled him. Francone took possession of the papal chair, but he was soon driven away, though not before he had plundered the Vatican Basilica. Benedict VII. was then elected with the approbation of Otho II., A.D. 974. Nothing particular seems to have occurred at Rome till Otho II.'s death, which took place in that city in the year 983.

During the long minority of Otho III. there was anarchy at Rome. Cardinal Francone, who styled himself Boniface VIII., having returned to Rome, put to death pope John XIV., and again usurped the papal chair; but he died suddenly in the year 985, and his body was dragged through the streets by the populace. John XV. was elected his successor, but Crescentius, who is styled senator of Rome, probably the chief senator, and by others consul, quarrelled with the pope, took possession of Hadrian's mausoleum, and obliged John to run away. Crescentius however soon after recalled him, and went with the senate in a body to ask his forgiveness. The chronicler Romualdus of Salerno says that the nobles, 'Romani Capitanei,' had usurped the authority in Rome. In the year 989 the empress regent Theophania, young Otho's mother, came to Italy, and visited Rome, from whence she issued several placita and diplomas. We are told that there were at that time within Rome no less than 40 convents of men and 20 of nuns, chiefly Benedictines, besides a vast number of regular canons.

In the year 996 Otho III. came to Ravenna with a numerous army. Pope John XVI. having died about that time, Otho sent to Rome his relative Bruno with the archbishop of Mainz and the bishop of Utrecht, and the Romans elected Bruno by the name of Gregory V. Otho was crowned emperor at Rome. He cited before him Crescentius for his conduct to the late pope John, condemned him to exile, but forgave him at the intercession of the actual pope. But after Otho's departure, Crescentius quarrelled with the new pope, and drove him out of Rome. Gregory repaired to Pavia, where he assembled a council, and excommunicated Crescentius. Crescentius however kept up a correspondence with the Byzantine court, and his design was to place the duchy of Rome again under the allegiance of the Eastern empire. He arrested the legates of Gregory, and caused John, bishop of Piacenza, a Greek by birth, to be elected pope, but he was generally considered as an intruder. In the year 998 Otho came to Italy, and having collected an army, he marched to Rome, taking with him pope Gregory. The Romans in alarm seized the antipope John, pulled out his eyes, cut off his nose and tongue, and threw him into a dungeon. When the emperor entered Rome, he was entreated by a certain holy abbot called Nilus to give up to him the person of that unfortunate man, and the emperor was inclined to release him, but pope Gregory insisted upon his being dragged ignominiously through the whole town, for which Nilus threatened him with the vengeance of God. Crescentius, who had shut himself up in the castle of S. Angelo, was taken, but some say that he capitulated; he and twelve of his partisans were beheaded by order of the emperor, and their bodies hung on the castle battlements. In the following year pope Gregory died, and Gerbert, archbishop of Ravenna, who had been Otho's preceptor, was chosen pope by the name of Sylvester II. In the year 1001 a quarrel broke out between the Romans and the people of Tibur, which was the beginning of a long and bitter animosity between the two cities. The emperor took the part of the Romans, and Tibur was besieged and obliged to surrender. In the following year Otho died of fever at Paterno in the territory of Perugia. The story of his having been poisoned by the widow of Crescentius does not seem authentic.

The line of Otho the Great, to whom the Italians had sworn allegiance, having become extinct with Otho III., the Italians considered themselves at liberty to elect another king, and they chose Hardouin, or Hardwig, marquis of Ivrea, who was crowned at Pavia, in February, 1002. Hardouin was violent and overbearing; he maltreated several nobles and bishops, who applied to Henry II., king of Germany, offering him the crown of Italy. Henry came in 1004, by way of Trent; but finding the 'Chiuse' or defile of the Adige well guarded by Hardouin's forces, he followed another route by the sources of the Brenta, and arriving at Verona, was received by the great feudatories of Italy, who had mostly forsaken Hardouin. He was crowned at Pavia. Unfortunately a quarrel broke out between the Italians and the German troops, much blood was spilt, and part of Pavia was burnt. Henry soon after returned to Germany, and Hardouin recovered Pavia and part of Lombardy, but Milan, Piacenza, Cremona, and other towns remained faithful to Henry, and the two parties continued at war for several years. This was the origin of the great rivalry between the Lombard cities, and especially between Milan and Pavia. At Rome, pope Sergius IV. having died in 1012, Benedict VIII. was chosen for his successor; but another party elected a certain Gregory, who obliged Benedict to leave Rome and to take refuge at king Henry's court in Germany. In 1013 Henry came to Italy with his wife Cunegunda and a large army, and all Italy submitted to him. He then proceeded to Rome, where pope Benedict anointed and crowned him in 1014. The chronicler Ditmar says that twelve senators, six of whom wore their beards and the other six were shaven, escorted the emperor to church with wands in their hands. At the gate of the Vatican Basilica, Henry was asked whether he would be the defender of the Roman church, to which he replied in the affirmative. An affray however took place between the populace of Rome and the German soldiers, excited, it is said, by John, the son of Crescentius, in which many were killed. Henry returned to the North, Hardouin having withdrawn to a convent, where he died.

In Rome all civil affairs were decided by the senate, but the more important political questions were referred to the pope or his vicar, and to the emperor, or his vicar the prefect of the city (the office having been restored by Otho I.), who acted also as supreme judge in criminal matters, having received the investiture of the sword from the emperor for that purpose.

Conrad II. of Germany, Henry's successor, was crowned king at Milan and emperor at Rome in 1027. On this occasion another affray took place between the Romans and the German soldiers, and many were killed on both sides. The Romans however were obliged on the following day to send to the emperor to beg his pardon: the members of the deputation were barefooted, the freemen with swords hanging at their neck, the serfs with halters. Conrad forgave them. In 1038 Conrad came again to Rome to restore pope Benedict IX., who had been driven away by a faction.

Henry III., Conrad's successor in Germany, was acknowledged king of Italy, but did not come to be crowned in the latter country for some years. In the mean time pope Benedict IX. had become so odious through his misconduct, and the robberies and cruelties committed by his adherents, that the people of Rome drove him away, and elected for his successor John, bishop of Sabina, who styled himself Sylvester III. After six months Benedict returned with a strong support, and expelled his rival. But continuing in his evil courses, and seeing the general indignation roused against him, he sold the papal chair to John, or Gratianus, who assumed the name of Gregory VI., A.D. 1044. [BENEDICT IX.] Gregory, who is reckoned among the lawful popes, found Rome, on his accession, in a deplorable state. The property of the see of Rome had been plundered and alienated, so that he had hardly enough left for mere subsistence; the roads were infested by robbers, and no one could travel to Rome except with a large armed party, and the offerings made to the churches were seized by the factions. Gregory, after trying exhortations and excommunications without any effect, collected a force of both foot and horse, with which he hunted down the robbers. The people of Rome, accustomed to anarchy, called the pope a sanguinary man, and unfit to celebrate the sacred offices. At last Henry III. came to Italy in 1047, was crowned at Milan, and then proceeding southwards, arrived at Sutri, where he convoked a council, to which Gregory VI. was invited. There were then no less than three popes; Benedict IX., Sylvester II., and Gregory VI. The council deposed them all, and Gregory VI., on rising from his chair, laid aside of his own accord the pontifical robes. Henry entered Rome, and the clergy and the fathers of the council chose Suidger, bishop of Bamberg, who assumed the name of Clement II., and was consecrated on Christmas-day: at the same time Henry was proclaimed emperor, after which great feasts were given in the Lateran palace. During the remainder of Henry's reign Rome enjoyed comparative tranquillity. His son, Henry IV., yet an infant, succeeded his father in 1056, under the guardianship of his mother Agnes. His minority was a troubled period for Rome. After the death of pope Stephen IX., in 1058, John, bishop of Velletri, an illiterate man, was tumultuously elected by the name of Benedict X. Pietro Damiano, bishop of Ostia, and other cardinals, protested against the election as illegal, but they were obliged to run away for their lives. The empress Agnes sent to Italy the monk Hildebrand, whose reputation for learning and piety stood very high, charging him to act in concert with Godfrey, duke of Tuscany, in order to adjust the controversy. A council was held at Siena, in which Gherardus, bishop of Florence, was elected pope under the name of Nicholas II. In the following year Nicholas proceeded to Rome, and Benedict of his own accord resigned his claim. Shortly after began at Milan the schism concerning the marriage of the clergy; those of Milan followed the example of the Eastern church, which does not require celibacy of its presbyters. A deacon of the name of Arialdus formed a party against the married clergy, and excited the people against them. Guido, archbishop of Milan, favoured the married priests, and excommunicated Arialdus. Nicholas sent two legates to Milan, who induced the archbishop to desist, and the marriage of the priests was forbidden. But this arrangement was only precarious, and the schism lasted much longer. Arnulphus and Landulphus Senior have given an account of this famous controversy. (Muratori, *Rer. Ital. Scriptores*, vol. iv.) In 1059 pope Nicholas issued a decree limiting the right of election to the cardinals, leaving however to the rest of the clergy of Rome the right of approving of the election. For the origin of and alterations effected in this institution see CARDINAL.

Nicholas died in 1061, and much contention arose about the election of a successor. One party, with Hildebrand at their head, contended for a free election, without waiting for the emperor's consent; another party sent to Germany to ask Henry's approbation. At last Hildebrand prevailed, and Anselmus, bishop of Lucca, was elected and consecrated pope, under the name of Alexander II. Thus the Romans asserted the right of free election, and the imperial confirmation was no longer considered necessary for the consecration of the pope elect. The ministers of Henry, irritated at the conduct of the Romans, refused to acknowledge Alexander, and at the same time the Lombard bishops, especially those who were favourable to the marriage of the priests, had, with the support of the imperial court, elected Cadalous, bishop of Parma, a prelate wealthy, but of loose principles, who assumed the name of Honorius II. Cadalous, having raised with his money an armed force, marched in the following year to Rome, where he had many partizans, among others a certain Pietro di Leone, or Pierleone, a converted Jew, very wealthy, but disliked by the people as a usurer. Cadalous defeated the partizans of Alexander, but Godfrey, duke of Tuscany, having come to his assistance, Cadalous was obliged to retire. He returned the following year, entered the Leonine town or suburb, and took possession of the castle of S. Angelo, but the people rising in arms, he was unable to enter the Vatican Basilica, and he shut himself up in the castle, where he remained blockaded for nearly two years, and at last escaped by paying a large ransom. Alexander was then universally acknowledged pope. He died in 1073, and was succeeded by Hildebrand, who assumed the name of Gregory VII., by which he is known in history. Soon after the famous quarrel of the investitures broke out between the church and the empire. The events of Gregory's busy pontificate are related under GREGORY VII. Rome was entered by force by the emperor Henry, in the year 1084, and Guibert, archbishop of Ravenna, was consecrated pope by the name of Clement III., and he afterwards crowned Henry emperor in the Vatican. On the approach of Robert Guiscard, with his Normans, Henry withdrew and Robert entered the city, but it seems that his soldiers, and especially the Saracen bands in his service, committed all sorts of atrocities, and that a part of Rome extending from the Lateran to the Colosseum was set on fire. When Robert retired from Rome to his dominions, Gregory, not thinking himself safe, withdrew to Salerno, where he died, A.D. 1085. His successor, Victor III., was opposed by the antipope Guibert, and the imperial party, who had possession of the Vatican and of the Capitol, until the countess Matilda came with her troops, when Victor entered Rome and took possession of the city, which however he was soon after obliged to leave again. He died at Monte Cassino, and his successor, Urban II., finally drove away Guibert. Urban died in 1099, and was succeeded by Paschal II. During his pontificate Henry V. visited Rome to be crowned, A.D. 1110, and a scene of outrage followed, which is related under PASCHAL II.

In 1116 we find Pietro di Leone applying to Paschal to use his influence to have one of his sons appointed prefect of Rome. The people of Rome, who disliked Pierleone and his family, elected the son of the late prefect, a mere boy, and presented him to the pope for his confirmation. Paschal refused, and an affray followed during the holy week between the populace, led by Tolomeo, brother of the late prefect, and the pope's armed men. The country around rose in arms, and Paschal withdrew to Sezze. The mob sacked and destroyed the houses of Pierleone and his family.

In the following year Henry V. came again to Rome, and was crowned by the archbishop of Braga, Pascha having fled to Benevento, which had become a favourite place of residence of the popes. Henry won the hearts of the chief Roman nobles by gifts and promises, and even gave one of his daughters in marriage to one of the Tolomei, a noble family of that time. After Henry's departure from Rome, Paschal came with his troops to Anagni, where he fell ill: he however advanced to the gates of the Vatican, which was occupied by the Imperial party, and while the military engines were being disposed for the attack, Paschal expired, A.D. 1118. He was buried without any opposition in the Basilica of the Lateran, and three days after the cardinals elected Giovanni Gaëtano, cardinal chancellor of the Roman church, who took the name of Gelasius II. Cencio Frangipane, a partisan of the emperor, disapproving of the election, broke open the gates of the Lateran Basilica, seized the pope elect, an old man, by the neck, and kicked him and dragged him to his own house, where he kept him in prison. But the prefect of Rome, many of the nobles, and the people of Transtevere rose against Frangipane and his adherents, and obliged him to release the pope, who was carried in triumph back to the Lateran. Henry however returned to Rome with armed men, and the pope, alarmed, fled by night to Ardea, from whence he went to Gaëta. Henry then caused an antipope to be elected, who assumed the name of Gregory VIII. After a time Gelasius returned to Rome, and a battle ensued between his partisans on one side, and the opposite faction, led by the Frangipani. Gelasius declared that he would remove his residence far from Rome, which he called a new Babel, where everybody wanted to rule. He embarked for France, leaving the bishop of Porto as his vicar at Rome, a Norman, named Stephen, as gonfaloniere, and confirming the son of Pierleone as prefect of the city. He died in the monastery of Cluny, in January, 1119. His successor, Calixtus II., was elected in France by the few cardinals who were there, and his election was approved by the cardinals and clergy of Rome as a matter of necessity, circumstances preventing the election being held at Rome according to custom, as the antipope Gregory had still possession of the city. In 1120 Calixtus came to Italy, and in the following year, with the assistance of the Normans, he entered Rome, and having taken the antipope prisoner, shut him up in a fortress. In 1122 the dispute of the investitures was settled between Calixtus and Henry V. Calixtus died in 1123, and the cardinals elected Lambert, bishop of Ostia, who assumed the name of Honorius II., but a body of bishops assembled in the church of S. Pancratius elected Theobald, surnamed 'Bocca di pecora,' cardinal of Santa Anastasia. The powerful family of Frangipani supporting Honorius, Theobald was induced to resign his claim, and Honorius submitted to a second election by the clergy and people, who confirmed him. This serves to show that notwithstanding the alleged decree of Nicholas II., the cardinals had not yet monopolised the exclusive right of electing the popes. Honorius granted to Count Roger of Sicily the investiture as duke of Apulia and Calabria. On the occasion of the disputed succession to the crown of Germany, between Lotharius and Conrad of Suabia, Honorius excommunicated Conrad, and acknowledged Lotharius. Honorius died at Ostia in 1130. Several of the cardinals elected cardinal Gregory, a man universally esteemed, who assumed the name of Innocent II.; but another, and, it is said, a more numerous party, chose Peter, one of the sons of the said Pierleone, who assumed the name of Anacletus II.; and, being the strongest, they took possession of the Vatican. The Frangipani declared in favour of Innocent, whom they received in their palace, or rather in their buildings, for this family seem to have had possession of a whole district, which they had fortified. Anacletus, with the treasures found in the Vatican and other churches, enlisted a number of mercenaries, attacked the quarter of the Frangipani, and obliged Innocent to escape to Pisa, leaving the bishop of Sabina at Rome as his vicar. Innocent repaired to France, where he was recognised legitimate pope; and at Liège he crowned Lotharius king of Germany and Italy, who promised to assist Innocent in recovering his see. Anacletus was acknowledged by the Milanese, and by Roger of Sicily, whom he caused to be crowned king by his legate at Palermo, in 1130. In 1133 Lotharius and pope Innocent advanced to Rome, and being received by the prefect and several nobles, entered the city. Innocent took possession of the Lateran, Lotharius fixed his residence on the Aventine, and Anacletus shut himself up in the castle of S. Angelo, from whence he sent repeatedly messengers to Lotharius, asking for a canonical inquiry into his election and that of his competitor Innocent. Lotharius refused this apparently reasonable demand, but as he was not strong enough to drive out Anacletus, whose party occupied the Vatican, it was resolved to crown Lotharius in the Lateran; after which the emperor returned to the north, and Innocent soon after followed. Innocent had a powerful support in St. Bernard, the celebrated abbot of Clairvaux, who induced the kings of France and England, and the people of Milan and other Lombard towns, to acknowledge him as pope. [BERNARD, ST.]

Lotharius, in 1137, after an expedition into Apulia against Roger of Sicily, returned northwards by way of Rome, when Innocent again took possession of the Lateran; Lotharius however did not stay at Rome, but moved on towards Germany, and died at Trent the same year. St. Bernard advised both Innocent and Anacletus to take Roger of Sicily for their umpire, and each to send three cardinals to Salerno. Roger, after listening for four days to the two parties, could not come to a decision, but desired one cardinal on each side to accompany him to Sicily, where he would assemble a council of the bishops and abbots of that kingdom.

Anacletus dying (A.D. 1138), his party elected in his place Cardinal Gregory, who assumed the name of Victor IV.; but St. Bernard by his eloquence persuaded him to renounce in favour of Innocent. The sons of Pierleone also made their submission, kneeling at the feet of Innocent, and swearing allegiance to him, and all Rome acknowledged him as pope. Thus ended (St. Bernard, *Epist.*, 328) this schism, which is one of the most intricate as a question of right in the whole history of the papacy.

The cardinal of Aragon, in his 'Life of Innocent II., observes that, through the exertions of Innocent and of St. Bernard, 'a profound peace reigned at Rome, such as was not remembered for a long period.' Innocent led his troops against Roger of Sicily, but was defeated and taken prisoner near St. Germano. Roger treated him with great honour, and obtained of him the confirmation of his title of king, and that of his son as duke of Apulia, A.D. 1139. Innocent returned to Rome, where the people bore impatiently the temporal power which was exercised by him with a firm hand, and a war with their neighbours of Tibur, which broke out in 1141, led to a total change of affairs. The people of Tibur, having surrendered in 1142 to Pope Innocent, gave up themselves and their county or territory, which embraced the valley of the Upper Anio, 'to Pope Innocent and his successors.' This excited the jealousy of the Romans, who requested the pope to raze Tibur to the ground, and to disperse the inhabitants. Innocent refused, and the people, in 1153, ran to the Capitol, restored the Roman senate, of which nothing is heard for a long period previous, as a sovereign council, and declared war again in the name of the senate and people of Rome against Tibur. This insurrection of the Romans is partly attributed to the spread of the republican doctrines preached by Arnaldo of Brescia, who had been banished from Italy by Innocent some years before. [ARNALDO DA BRESCIA.] Innocent, unable to put down the revolt, fell ill, and died in September, 1143. He was a remarkable pontiff for his abilities and determination. His successor Celestine II. died after a few months, and Lucius II., who succeeded Celestine, found himself controlled at Rome by the senate, which sat in the Capitol and exercised sovereign power. As for the nominal Imperial authority, it was utterly obliterated, the crown of Germany being then contested between Conrad of Suabia and Henry Guelph. In 1144 the Romans elected as princeps senatus, and patrician of Rome, Giordano, another son or grandson of Pierleone; as Alberic had been elected two centuries before. In 1145 Lucius attempted to force the Capitol at the head of some armed men, but the senators and the people threw showers of stones upon him, one of which mortally wounded the pope. The cardinals elected Bernard of Pisa, a disciple of St. Bernard, who assumed the name of Eugenius III. The senate however refused to permit his consecration unless he acknowledged their sovereign power, and Eugenius withdrew by night into Sabina with some cardinals, and was consecrated in the monastery of Farfa. About this time Arnaldo da Brescia came to Rome, and added to the popular excitement by his preaching in public on politics. He exhorted the Romans to restore the equestrian order and the other institutions of the antient republic. The mob, who cared little for the equestrian order, or any order whatever, ran to the houses of the cardinals and nobles who were suspected of belonging to the papal party, and sacked and destroved them. They abolished the office of prefect of Rome, and obliged all the nobles to swear allegiance to the patrician Giordano. Eugenius excommunicated Giordano, and in the following year, being supported by the people of Tibur, he returned to Rome by virtue of a convention in which he recognised the senate as a legislative body, and the Romans agreed to dismiss the patrician, restore the prefectship, and acknowledge the pope as their sovereign. But this concord was precarious, and in 1146 Eugenius was obliged to quit Rome. He returned again in 1149, but was soon obliged to leave it, and take refuge in Campania. St. Bernard, in his book 'De Consideratione,' which he addressed to Eugenius in his exile, observed that the perverseness of the Romans had been notorious for centuries, that they were 'a people unused to peace, fond of tumults, intractable and remorseless, not knowing how to obey unless they could no longer oppose resistance.' In 1152 Eugenius returned to Rome under a convention, the terms of which are not known; and he applied himself to gain the affection of the lower orders by his liberality, and 'he would have succeeded,' says a contemporary chronicler, 'in upsetting the senate, had not death cut him short in the same year.' Before his death he is said to have concluded a convention with the new king of the Germans, Frederic I., by which the latter bound himself not to enter into any agreement with the people or senate of Rome, nor with Roger of Sicily, without the participation of Eugenius or his successors, and to defend the rights of St. Peter; and the pope on his part promised to crown him emperor. (Vitale, *Storia Diplomatica dei Senatori di Roma.*) Of Anastasius IV., who succeeded Eugenius, little or nothing is known. He died in 1154, and was succeeded by Nicholas Breakspeare, bishop of Albano, an Englishman, who assumed the name of Adrian IV. The senate was then in the plenitude of its power; money was struck with the heads of St. Peter and St. Paul on one side, and the legend 'Senat. P. Q. R.' on the other; all acts were done in its name, and the years were dated from the restoration of the senate, 'Anno . . . Senatus.' It appears that the senators were fifty-six in number, annually renewed or confirmed, they were elected by a body composed of delegates, ten from each region of the city. The president of the senate was styled 'Dei Gratia Summus Senator;' it appears also that there were consuls chosen from among the senators.

An affray which took place in Rome soon after Adrian's election, and in which a cardinal was mortally wounded, induced the new pope to leave Rome, which city he placed under an interdict, forbidding divine service to be celebrated within its walls. This novelty, which had never occurred at Rome, made a great impression on the minds of the people, who sent away Arnaldo, and invited the pope to return and remove the interdict. In 1155 Frederic I. came to Rome to be crowned, accompanied by an army. Before he entered the city, he gave orders that Arnaldo, who had taken refuge in Campania, should be tried as a heretic. The count of Campania gave him up to the prefect of Rome, by whose sentence he was hanged, his body burnt, and the ashes scattered to the wind. The circumstances attending Frederic's coronation are given under ADRIAN IV. Frederic spoke to the Romans as their master, but he could not subdue them; his soldiers took possession of the Vatican, but the people of Rome kept aloof from the ceremony of his coronation: they even assailed and killed a great number of the German soldiers, and both Frederic and the pope hastened away to Tibur.

The wars of Lombardy prevented Frederic from attending to the affairs of Rome, and Adrian, having quarrelled with him on some points of jurisdiction, had no support to expect from him. Adrian during the rest of his pontificate was generally absent from Rome, where probably his temporal authority was not great. He died at Anagni in 1159. His successor Alexander III., although duly elected by the majority, found a competitor in cardinal Octavianus, who, having had some votes in his favour, and being secretly encouraged by Frederic's missi at Rome, assumed the pontifical robes, and took the name of Victor IV. The Frangipani and the people took the part of Alexander, who however was obliged to quit Rome, and was consecrated at Ninfe. The antipope was consecrated by some bishops of his party at Farfa in Sabina. Alexander returned to Rome in 1161, but finding that the antipope, supported by the emperor and by many of the Roman nobles and senators, was master of the field, he went to France He left however a cardinal as his vicar at Rome, who took possession of the Vatican. The antipope died at Lucca in 1164, but a successor was appointed through the influence of Frederic, by the name of Paschal III. In 1165 pope Alexander returned to Rome, and was received by the united senate, clergy, and people with great applause. Alexander was then at open variance with Frederic, and the Romans, who disliked that emperor ever since his first visit, made common cause with the pope. In 1167 Frederic marched against Rome, but on his way he laid siege to Ancona, which had joined the league of the Lombard cities against him, and which made a long resistance. The Romans attacked Tusculum and Alba, which towns were in favour of the Imperial party. The count of Tusculum applied to Raynaldus, archbishop of Cologne, and Christian, archbishop of Mainz, who commanded the emperor's forces in central Italy, and a battle took place near Tusculum, in which the Roman militia, to the number, it is said, of 30,000, were completely routed by the Imperial troops and those of Tusculum, and their loss has been, by the exaggeration of the contemporary chroniclers, compared with that of Cannæ. Soon after, Frederic came in person, accompanied by the antipope Paschal; he forced the walls of the Vatican, but found the Basilica strongly defended by the 'masnada of St. Peter's, that is to say, a body of militia raised on the domains of the Roman see. After a week's siege, the German soldiers set fire to a tower close to the Basilica, and the little garrison capitulated. Frederic beginning to intrigue with the leaders of the Romans, Alexander thought it prudent to quit the city. The Pisan galleys also sailed up the Tiber as auxiliaries to Frederic, and the Romans then came to terms. Frederic confirmed the senate and the municipal franchises of the city, and the Romans on their part, with the exception of the Frangipani, the Pierleoni, and some other nobles, acknowledged Frederic as emperor and king of the Romans. In the oath tendered on the occasion no mention appears of either pope or antipope. The summer brought disease into the emperor's camp, and he withdrew to the north, leaving a prefect at Rome. In the following year the Romans destroyed Alba; and in 1170 attacked Tusculum, which, in order to save itself, surrendered to the pope, who was then at Benevento. In 1177 pope Alexander made his peace with the emperor, and acted as mediator at Venice between him and the Lombard cities. A truce for six years was agreed upon, which led afterwards to the famous peace of Constance (1183). The people of Rome, seeing a good understanding restored between the pope and the emperor, thought it prudent to come to a definitive arrangement with the former, and sent a deputation to invite him to return to Rome. Alexander sent three cardinals to confer with the senators on the subject, when it was agreed, after long debate, that the senate should exist, but that on the renewal of that body, at the next September kalends, they should take the oath of allegiance to the pope and the Roman church, and should swear to do nothing contrary to the papal dignity. The Vatican was restored to the pope, with all the rights of St. Peter. Alexander made his entrance into Rome, A.D. 1179, amidst popular acclamations. In the year 1181, Alexander died; a pontiff distinguished for his great qualities, and the events and length of his pontificate. He was succeeded by Lucius III., a weak man, upon whose accession the Romans proposed to re-establish the office of Patrician as head of the senate, and as the first magistrate and chief of the administration of the city, independent of the pope. Lucius opposed this measure, and was obliged to leave Rome, and the Patrician was appointed. Lucius died at Verona, in 1185. His successor, Urban III., was elected and consecrated at Verona, and he died in 1187, at Ferrara, without, it seems, having visited Rome. His successor, Gregory VIII., died at Pisa in the following year, and the successor of Gregory was styled Clement III. He came to an arrangement with the Romans; one of the conditions of which was that the senate should be confirmed, but that the senators elect were to receive the investiture 'per mantum' from the hands of the pope. Vitali gives the text of this convention, which is styled 'Concordia,' dated the year 44 of the senate, with the names of all the senators who signed it. The number of senators having become much increased by the ambition of belonging to that body, Celestine III., who succeeded Clement in 1191, decreed that in future they should not exceed fifty-six. He at the same time solemnly confirmed and determined the prerogatives of the senate by a charter which is found in Murator

(*Antiqu. Ital. Dissert.*, 45). During Celestine's pontificate however the Romans became tired, it is not very clear why, of their senate, and they elected only one senator, whom they made the head of their militia, and their first judicial magistrate; the senatorial palace in the Capitol was his residence. The first senator thus appointed was Benedetto Carissimo, who, after two years, was succeeded by Giovanni Capoccio. The Romans obliged the towns of Sabina and the Campagna to receive in future their magistrates from Rome. Innocent III., who succeeded Celestine in 1198, was not a man to forego an opportunity of asserting and extending his authority. He contrived by his influence to have the senator elected from among his friends, and he dictated the form of the oath which that magistrate was to take to him. The senator bound himself to maintain the pontiff in possession of the rights which belong to St. Peter's see; not to conspire against him, but to reveal to him all conspiracies which might come to his knowledge; and lastly, to provide for the safety of the cardinals and their household within the jurisdiction of the city of Rome. (Vitali, *Storia Diplomatica*.) At the same time, Innocent, under the pretence that the empire was then vacant, and the succession to the German crown dubious, obliged the prefect of the city, who had been till then appointed by the emperor, to receive a fresh investiture from himself, and pay allegiance to him; and he also removed the judges and podestas of the towns of the Campagna, who had been appointed by the senate in the name of the Roman republic, and he appointed others in their places. The authority of the senate and that of the emperor over the city of Rome were thus virtually at an end. [INNOCENT III.]

Under the pontificates of Innocent and his successors Honorius III. and Gregory IX., Rome remained in quiet subjection to the papal authority. After the death of Gregory, A.D. 1241, Frederic II., who had long been at variance with the pope, devastated the territory of Rome; and he was favoured by the powerful baronial family of Colonna, who were of the Guibeline party. The cardinals ran away from Rome; and it was not till 1243 that they assembled at Anagni, and elected pope Sinibaldo dei Fieschi, who assumed the name of Innocent IV. He was haughty and determined; he showed himself bitterly hostile to Frederic; and the papal troops, commanded by Cardinal Octavian, conquered the whole Romagna in 1248. Frederic II. died in December, 1250. Innocent was long absent in France and other places, and when he returned to Rome, about 1253, he found his capital in a state of anarchy. The turbulent barons, emboldened by the absence of the pope, and the dissensions between him and the emperor, had resumed their old habits of plunder and civil warfare. They had fortified themselves in the massive antient monuments, and had also raised lofty towers, in which they kept a number of armed retainers, and from thence sallied to attack their weaker neighbours. The citizens of Rome elected for their senator Brancaleone of Bologna, who for several years hunted down the refractory nobles, razed their towers, and at last restored order. He died in 1258, and his relative Castellano was elected senator in his place. [BRANCALEONE D' ANDALO.]

Alexander IV., who succeeded Innocent IV. in 1254, and who died in 1261, was succeeded by Urban IV., a Frenchman, who determined on the ruin of Manfred, the last scion of the house of Suabia. For this purpose, he offered the crown of Sicily to Charles of Anjou, and made him likewise senator of Rome, the people having conceived the wish of having a powerful prince for their chief magistrate. Urban however died in 1264; but his successor Clement IV., another Frenchman, pursued the same policy, and Charles of Anjou embarked at Marseille, and arrived at Rome, where he collected his troops for the invasion of Naples. The battle of Benevento and the death of Manfred followed. In 1268, young Conradin came to Italy upon his chivalric errand of recovering his paternal kingdom. He entered Rome, where he was received with applause by the Guibeline party, which was strong in that city; but he was soon after defeated at Tagliacozzo, taken prisoner, and beheaded at Naples. Gregory X., Clement's successor, entered Rome with King Charles of Naples, who swore allegiance as a feudatory of the holy see. Nothing particular occurred at Rome during that and several following pontificates; but Cardinal Orsini, being elected in 1277 by the name of Nicholas III., applied to Rudolph of Habsburg, king of Germany, to define by a charter the States of the Church, and separate them for ever from those dependent on the Empire. He sent him at the same time copies of the former charters of donation, real or supposed, of his imperial predecessors. Rudolph, engrossed with German affairs, and little acquainted with those of Italy, wishing also to oblige the pope, from whom he expected the Imperial crown, defined by letters patent, dated May, 1278, the States of the Church as extending from Radicofani to Ceprano on the frontiers of Naples, and from the Mediterranean to the Adriatic, including the former duchy of Spoleto, the March of Ancona, and the Romagna. He released the people of all those places from their oath of allegiance to the Empire, giving up all rights over them which might still be settled in the Imperial crown, and acknowledging the sovereignty of the same to belong to the see of Rome. This important document, which is found in Raynaldus (*Annales*), was confirmed by the electors and princes of the Empire. Thus ended the former Imperial authority over Rome and its territory.

Period VI.:—Rome under the sovereignty of the Popes.—Nicholas, having thus freed himself from all dependence on the emperor, determined to shake off also the importunate interference of his powerful vassal, Charles of Naples, who in his quality of senator of Rome, exercised a sort of absolute sway over that city and territory. With much difficulty he prevailed upon Charles to renounce his office, and by a constitution he then forbade the election as senator of Rome of any emperor, king, prince, duke, marquis, or other powerful personage. In apparent contradiction to this constitution, he caused himself to be appointed perpetual senator of Rome, and he named as his vicar his nephew Orso. Nicholas embellished Rome with several new buildings; he began the Vatican Palace; but he also enriched his nephews, and the system of nepotism may be said to have begun with him, as well as the rivalry between the Orsini and Colonna parties. He died near Viterbo, in 1281.

After the death of Nicholas a party rose against his nephew Orso, and it was agreed that two senators should be elected, one of the Orsini family and the other of the Annibaldeschi. After an interregnum of six months, a French cardinal was elected through the influence of Charles of Naples, and was styled Martin IV., who declared himself perpetual senator, and appointed King Charles as his substitute. Nothing very particular seems to have occurred at Rome till 1293, when, during the interregnum after the death of Nicholas IV., great disorders broke out, accompanied by robberies, murders, and fires. Rome was without a senator for six months, and at last two were appointed, one from each of the two rival parties. The cardinals elected Celestine V., who however soon after resigned on the score of incapacity, and Cardinal Gaetani was elected, by the name of Boniface VIII., A.D. 1295. His was a most stormy pontificate. He quarrelled with Philip le Bel of France, with Frederic of of Sicily, and with the Colonna. Two cardinals of the great baronial family of Colonna had opposed his election, and they refused to admit a papal garrison into their patrimonial towns and castles which they had in the Campagna. They were also accused of holding intelligence with Frederic, king of Sicily, who had been excommunicated by the pope. Boniface excommunicated the cardinals Colonna and all their adherents. The Orsini family, rivals of the Colonna, supported the pope. The Colonna fortified themselves in their castles, protested against the election of Boniface as illegal, and appealed to a future general council of the church. Upon this Boniface ordered their palace at Rome to be pulled down, and sent troops to attack their towns and castles in the country. In 1298 he took Palestrina by treachery, and razed it to the ground. [PALESTRINA.] He took likewise Zagarolo and La Colonna, fiefs of the same family. The cardinals Colonna escaped to France. Their uncle, Sciarra Colonna, went to sea, was seized by pirates, and, after a course of romantic adventures, found his way back to Italy, where he had his revenge, and caused the death of the pope, in 1303. [BONIFACE VIII.] In 1300 Boniface celebrated the first Jubilee at Rome, and thus a new source of attraction and wealth was opened to that city. [PILGRIMAGE.]

Benedict XI. succeeded Boniface. By the assistance of Charles II. of Naples, he restored peace to Rome and its territory; he absolved the Colonna and their adherents from the canonical censures, except those who had lifted up their hands against the late pontiff. In the following year, 1304, however, finding that the factions were still active in Rome, and many crimes were committed with impunity, he repaired to Perugia, where he died, and, as it was reported, by poison. The interregnum lasted eleven months, the cardinals being divided between those who wished for an Italian pope, and those who, being in favour of Philip of France and Charles of Naples, wished for a French pope.

The people of Perugia, tired of delay, kept the cardinals in arrest in the Conclave Hall, and threatened to starve them if they did not come to a decision. The French party prevailed, and Bertrand, archbishop of Bordeaux, was elected. It is said that he had promised to Philip le Bel to restore the Colonna cardinals to their dignities and possessions, to allow the king to dispose of the tithes for five years, to appoint a certain number of cardinals according to his pleasure, and, lastly, to remove the papal residence to France. Bertrand, who assumed the name of Clement V., did not go to Rome: he was consecrated at Lyon, and, having summoned the cardinals to France, fixed his residence at Avignon, A.D. 1305. For seventy years after this the popes resided at Avignon; and this period was styled by some Italian writers the Babylonian captivity.

Period VII.:—The Papal See at Avignon, 1305-1376.—During this period Rome and its territory were administered, in quiet times, by the popes' legates: the great families Colonna, Orsini, and others held the chief authority in their hands, and the city was often a prey to factions and civil war. Two senators were elected annually by the pope from among the great families, but in turbulent times they were chosen by the people. In 1311, Henry of Luxemburg, king of Germany, commissioned Stefano Colonna to uphold the Imperial or Guibeline party at Rome, preparatory to his going there to be crowned emperor. The opposite party, or Guelphs, led by the Orsini, and supported by Robert, king of Naples, had taken possession of S. Angelo, Borgo, the Vatican, and all Transtevere, and also of the Capitol, and of the tower of the market, which was then at the foot of the Capitol. [Orsini.] The Colonna party fortified the Pantheon, the Colosseum, the Aventine, and the tower of Milizia, which was afterwards enclosed within the monastery of Santa Catarina da Siena.

The streets were barricaded, and the whole town was in arms. At last Henry came, with a considerable force of men and horse, and partial combats took place between his troops and those of king Robert, but Henry, being unable to take the Vatican, was crowned emperor in the Lateran, by the papal legate, soon after which he left Rome.

When Louis of Bavaria came to be crowned at Rome, accompanied by Castruccio Castracani, in January, 1328, the ceremony passed off more quietly. Louis, supported by Sciarra Colonna, took possession of the Vatican. From the Capitol he harangued the people, who elected him senator and captain of the city for one year. Louis was crowned in the Vatican by two bishops, who however had no papal commission for the purpose, and one of whom was even under an interdict. The emperor appointed Castruccio senator and imperial vicar, and afterwards convoked a 'parlamento,' or assembly of the people, in the square before St. Peter's, in which he summoned John XXII., who was at Avignon, by the name of Jean de Cahors, or any one to answer for him; but no one appearing, a syndic of the clergy demanded that the accused should be tried *en contumace*, as guilty of heresy and high treason, and the emperor pronounced him guilty, and a new pope or antipope was elected by the name of Nicholas V. [John XXII.] It was also decreed by the emperor, with the hearty approbation of the people, that every future pope should reside at Rome; and if absent for more than three months, should be considered as deposed. Louis however left Rome, Castruccio died, Nicholas renounced his claim to the papacy, and pope John recovered the ascendancy at Rome, although he continued to reside at Avignon. It was soon after this that the electors of Germany passed a resolution declaring that in future the king of Germany elect should be considered emperor and king of the Romans, without the sanction or consecration of the pope.

When Peter of Limoges was elected pope by the name of Clement VI., in 1342, the Romans sent him ambassadors, one of whom was Cola di Rienzo, or Nicolas, the son of Lorenzo, a tavern-keeper, to beg the restoration of the papal see to Rome. Petrarca, who was at that time residing at Rome, where he had received the poetical crown in the Capitol from the hands of one of the senators, also unsuccessfully exerted himself to induce the pope to return to that capital. [Petrarca.]

In 1347 began the insurrection of Cola di Rienzo. Rome, in the protracted absence of the popes, was left a prey to its factions, each of whom chose one of the two senators; and it may be easily imagined that little harmony subsisted between those two head magistrates. Cola was a man of warm imagination, imbued with vague and confused notions of the former glory of Rome, and endowed with natural eloquence. He began to declaim in public against the disorders of the nobles and the tyranny of factions. The people named him by acclamation their tribune. He went to the Capitol, drove away the senators, and assumed the title of 'Nicholas, severe and clement, liberator of Rome, zealous for the weal of Italy, friend of the world, tribune august.' He appointed various magistrates, mostly deserving men, and put to death several factious leaders who were convicted of heinous crimes, and obliged the rest to swear obedience to him, under pain of banishment. He also sent ambassadors to various towns and princes, for the purpose of forming a union of all Italy. Perugia, Arezzo, and other cities submitted to him; and he threatened with war Viterbo which refused allegiance. He summoned Clement VI with the cardinals to return to Rome; and he also summoned Louis of Bavaria, Charles, king of Bohemia, and the electors of Germany, to state their reasons for pretending to elect the emperor. To the papal vicar at Rome, who remonstrated with Cola upon his presumption, he answered that he was inspired by the Holy Ghost, and that he followed its dictates. He arrested the heads of the families Savelli, Orsini, Colonna, and others, and threatened them with death; but he only banished them. The exiles collected and armed their feudal dependants, and marched against Rome; but the people, led by Cola, issued out of Porta S. Lorenzo, defeated them, and killed several of the Colonna. In the following year however, Cola having met with a check at the siege of the castle of Marino, which belonged to the Colonna, his enemies, stirred by the papal legate, excited a revolt against him. Cola's soldiers were overcome, and he withdrew into the castle S. Angelo, from which he escaped, disguised as a monk, into the Abruzzo. The Colonna re-entered Rome; and Stefanuccio, or Stefanello Colonna, restored the city to the papal allegiance, annulled all the acts of the tribune, and appointed two senators, one of the Orsini and one of the Colonna. Cola di Rienzo, being taken, was confined in a prison at Avignon. In 1348 Queen Joan I. of Naples sold Avignon and its territory to the papal see for 30,000 golden florins.

In 1353 a tumult broke out at Rome, in consequence of a scarcity; and one of the two senators, Bertoldo degli Orsini, was killed by the mob. Stefanello Colonna escaped. In the same year Pope Innocent VI. sent Cardinal Gil Albornoz, his legate, to Italy, to restore the papal authority. He took with him Cola di Rienzo, to assist him in quieting Rome. Cola repaired to Rome in 1354, being appointed senator by the pope. Cola took possession of Rome, and put to death Fra Moriale, a famous condottiere, who had been guilty of much violence and extortion. The Colonna however were still his inveterate enemies, and Cola by his rashness ruined himself. He laid a fresh duty upon wine; he caused Pandolfuccio di Guido, a man much beloved by the people, to be beheaded on slight grounds; he became suspicious and cruel; and the people, disgusted with him, rose in September, 1354, burnt his house, attacked him in the Capitol, and having caught him as he was escaping in disguise, stabbed him to death. The acts of Cola di Rienzo constitute a very interesting episode in the history of modern Rome. His life, written in the Romanesco, or dialect of the lower classes of Rome, is inserted in Muratori's great collection.

The papal authority was now re-established in Rome, and in 1358 it was decided that there should be only one senator yearly appointed by the pope, and that he was to be a stranger, and unconnected with any of the patrician families of Rome. But for many years after, Rome being frequently disturbed by insurrections, the pope had seldom an opportunity of appointing the senator, and the people took the appointment in their own hands. In 1367 Urban V. came to Rome, where Albornoz had prepared everything for his reception. [Albornoz.] The pope found Rome in a sad state, full of ruins, half deserted, and exhibiting all the traces of half a century of anarchy. In 1370 Urban left Rome to return to France, induced, as Petrarch says in his epistles, by the advice of the French cardinals, who regretted the easy and loose life which they used to live at Avignon. His successor, Gregory XI., in 1376, came to Rome, and finally fixed the papal residence there again, where it has continued ever since with some trifling interruptions. But Gregory found the Romans rather restive. The twelve caporioni, or heads of districts, would not give up their command, and retained the salaried armed companies called 'banderesi.' At the same time the pope's legate in Romagna gave up Cesena to his mercenary bands for pillage, when 4000 people were murdered, and the young women violated. In the meantime Gregory was busy restoring the churches of Rome, which had become, according to the expression of some historians, the haunts of owls and bats. He died in 1378.

Period VIII.:—Rome after the Restoration of the Papal See.—After the death of Gregory XI., in March, 1378, the French cardinals, who formed the most numerous part of the conclave, wished to elect a French pope, who should transfer the papal see back to Avignon; but the people of Rome assembled tumultuously in the streets, and called for an Italian, or rather a Roman pope; and the magistrates of the city in alarm sent a message to the conclave to the same effect. At last Cardinal Prignano, archbishop of Bari, a Neapolitan, was chosen. The people, being still dissatisfied, broke into the conclave hall, and most of the cardinals ran away. The magistrates however restored peace, and Prignano was consecrated under the name of Urban VI. The French cardinals however, supported by Queen Joan of Naples, who disliked and feared Prignano for his harsh imperious temper, assembled at Fondi, protested against the election of Prignano as having been compulsory, and chose Robert, cardinal of Geneva, who assumed the name of Clement VII. Thus began a schism which lasted nearly half a century, and which has been called the great Western schism. France, the duke of Savoy, and Queen Joanna of Naples acknowledged Clement; Germany, England, and several Italian states acknowledged Urban. The history of that contest forms part of the history of the church. Its effects upon Rome were most lamentable; for although Urban and his successors were acknowledged there, and have been since considered by the church as legitimate popes, yet Clement and his successors, who resided chiefly in France, had a strong party among the Roman nobles, and this gave rise to civil commotions in the city, from which the pope was repeatedly driven away. The turbulent career of Urban is noticed under URBAN VI. His successor, Boniface IX., 1389-1404, had also a most stormy pontificate. He was driven three or four times from Rome by the Colonna and other factions, and as often re-entered it by force. His return was generally attended by bloodshed and executions. Innocent VII., who succeeded Boniface, was a man of a milder temper; but the Colonna, Savelli, and other factious barons, encouraged by Ladislaus of Naples, who availed himself of these dissensions to extend his power over Rome and its territory, besieged the pope in the Vatican. One of Innocent's relatives having committed an act of treachery by seizing the deputies of the people who had come to a conference with the pope, killing them on the spot, and throwing their bodies into the Tiber, the people became furious, hunted down and killed the adherents of the pope, among others many lawyers, and plundered their houses. Innocent escaped to Viterbo, and the people plundered the pontifical palace. Ladislaus sent his troops to take possession of Rome, but the people shut the gates against them. After a time the pope returned to Rome, the people submitted, and Ladislaus also made his peace through the mediation of Paolo Orsino, A.D. 1406.

Innocent was succeeded by Gregory XII., who wished to have a conference with his rival, Benedict XIII., who was then in France, in order to put an end to the schism. [BENEDICT, ANTIPOPE.] A tumult however broke out at Rome to prevent his departure. The Colonna entered the city through a breach in the wall, but were defeated by Paolo Orsino at the head of the papal militia; and several of their party, being taken, were beheaded. The pope then left Rome, and repaired to Lucca, for the purpose of the conference, which however did not take place. In the meantime Ladislaus, with the connivance of Paolo Orsino, took possession of Rome, drove away the papal vicar, and established new magistrates. He likewise invaded Rieti, Terni, Todi, Perugia, and other papal territories. In 1409 a council assembled at Pisa, deposed both Gregory and Benedict, and elected a new pope by the name of Alexander V. But neither Gregory nor Benedict submitted to the decision of the council, and Gregory escaped to Naples, where he placed himself under the protection of Ladislaus, to whom, according to Sozomenus, he sold Rome and the other states of the church for a sum of gold. Louis of Anjou, who had claims on the throne of Naples, being supported by the new pope Alexander V., whose legate, Cardinal Cossa, accompanied him, marched upon Rome, and took possession of the Vatican and Castle of S. Angelo; but he could not enter the city, which was defended by the troops of Ladislaus and the Colonna party. Louis and the legate retired, leaving Paolo Orsino with a body of troops under the walls. After a time Orsino, assisted by people within, entered Rome by night, and drove away the soldiers of Ladislaus, who only retained possession of two gates, Porta Maggiore and Porta S. Lorenzo.

Rome was now, nominally at least, subject to Pope Alexander V., to whom the keys of the city were sent with a deputation from the people, urging him to come and fix his residence there. Alexander however died at Bologna in May of the following year, 1410, and the legate Cossa was elected in his place by the name of John XXIII. The new pope visited Rome in the following year, together with Louis of Anjou, who afterwards moved on towards Naples with a large force, under the command of Paolo Orsino, Sforza Attendolo, Braccio da Montone, and other celebrated condottieri, and defeated Ladislaus near Roccasecca; but Louis, through want of money and provisions, was unable to follow up his success, and was obliged to return to Provence.

In the following year, 1412, the great condottiere Sforza Attendolo, whom the pope had made Count of Cotignola, having had some differences with Paolo Orsino, abandoned the pope and the Anjou party, and entered into the service of Ladislaus. The pope now thought it prudent to make peace with Ladislaus, to whom it was said that he paid down 100,000 florins. But in 1413 Ladislaus broke the peace, and sent an army under Sforza to invade the March of Ancona, while another body under the condottiere Tartaglia, entered Rome by a breach in the wall: the pope ran away to Viterbo, pursued by the Neapolitans, who killed and plundered several of his retinue. The pope had displeased the people of Rome, by levying heavy taxes, especially upon wine. Ladislaus came to Rome, took the Castle of S. Angelo, occupied the whole Roman state, and afterwards advanced towards Tuscany, threatening Florence, and indeed all the rest of Italy, when he was attacked in his camp near Narni by a contagious disease, of which he soon after died at Naples, A.D. 1414. Upon his death the papal authorities, supported by the nobles and people, recovered possession of Rome. [JOHN XXIII.]

The general council, having assembled at Constance, deposed John XXIII., as well as his two competitors Benedict and Gregory, and named Cardinal Colonna, by the name of Martin V., A.D. 1417.

Rome was in the power of John's legate, when Braccio da Montone, a celebrated condottiere, attacked it, and being introduced by some partisans, assumed the title of defender of the city, saying that he would keep it for the future pope who should be elected. He appointed a new senator, and besieged the castle, in which the legate had shut himself up. The legate applied for assistance to Joan II., who had succeeded Ladislaus on the throne of Naples. Joan sent Sforza, who entered Rome, defeated the troops of Braccio (who retired to Perugia), changed the authorities, arrested Cardinal Stefanacci, who had taken the part of Braccio, and confined him in S. Angelo, where he was probably put to death, being heard of no more. In the next year, 1417, Sforza returned to Naples, leaving a garrison in Rome for Queen Joan. In 1418, the new pope Martin V. came to Rome, Queen Joan having made an alliance with him. During his pontificate, he strove, and in some measure succeeded in restoring order to Rome, and in recovering most of the territories of the church. Martin died in 1431, and was succeeded by Eugenius IV., who did not imitate the wise conduct of his predecessor. Eugenius had been supported in his election by the Orsini party, and he began his pontificate by persecuting the rival family of Colonna, at the head of which were the nephews of the late pope, and he put to death more than 200 of Martin's agents and adherents. Cardinal Colonna left Rome, and his relatives, having collected their feudal retainers, assailed the city; but they could not enter it, and all their houses and those of their friends in the town were plundered by the mob. In 1433, Fortebraccio, a captain of the pope, revolted, seized Tivoli, and threatened Rome; and in the following year Francesco Sforza, the son of Attendolo, pretending to act in the name of the council of Basle, which was at open variance with the pope, occupied the whole of Umbria, as far as Otricoli. Upon this Eugenius sent his secretary Biondo, the historian, to treat with Sforza, and agreed to make him vicar for life of the March of Ancona, and gonfaloniere of the Roman Church.

Another condottiere however, Piccinino of Perugia, urged secretly by Filippo Maria Visconti, who aimed at enlarging his dominions at the expense of the pope, joined Fortebraccio with a body of horse, and advanced to the walls of Rome. The people, excited by the Colonna, and weary of the oppression of the papal officers, ran to arms, arrested Cardinal Condulmero, the pope's nephew, and invested the pontifical palace, from which Eugenius had just time to escape, disguised as a monk, to Ostia, where he embarked for Tuscany. Fortebraccio and his bands entered Rome, and gave themselves up to plunder and bloodshed, and all sorts of violence. The Romans, being weary of this disorder, sent two bishops to the pope, to beg his return; but the pope remained absent, delegating his authority to the Cardinal Vitelleschi, a bold unscrupulous man, who by means of the sword and the halter, restored peace to Rome and its territory, A.D. 1437. He reconquered Foligno and other towns for the pope, but at last he became suspected of a secret correspondence with the duke of Milan and with Piccinino, and the pope ordered his arrest. Vitelleschi was mortally wounded in defending himself, and being taken into the Castle S. Angelo, died there, A.D. 1440. In 1443, Eugenius returned to Rome, where he opened a council in the Lateran. He formed an alliance with king Alfonso of Naples against Sforza and the Florentines, and thus contributed to keep all Italy in a state of confusion for several years longer. Eugenius died in 1447. His long contention with the council of Basle, and with the antipope Felix, and his other transactions as head of the church, are noticed under EUGENIUS IV. He was the last pope that has been expelled from Rome by an insurrection of the people. He restored many churches and other buildings in that city.

His successor, Nicholas V., is one of the most illustrious in the long series of popes. He restored peace to Rome and to all Italy, ended the schism with the antipope Felix, embellished Rome with useful buildings, restored the walls and the Basilicæ, and began the Vatican library: he may be considered as having begun a new æra for Rome, in which the city recovered from the distractions and calamities of past ages, and became again a seat of learning, of the arts, and of polished society. [NICHOLAS V.] In 1452, Frederic III. of Germany came to Rome, where he was crowned by the pope, with great pomp, first as king of Lombardy and afterwards as emperor. He was the last emperor who was crowned at Rome, and the people were greatly rejoiced and almost astonished to see the coronation of a German emperor pass off without tumult and bloodshed.

The last years of Nicholas's pontificate were disturbed by the news of the taking of Constantinople by the Turks, 1453, and also by the conspiracy of Stefano Porcari, a Roman noble and demagogue, which some writers have chosen to look upon as a patriotic effort to restore liberty to Rome, while others have considered it as the last struggle of the expiring factions led by ambitious nobles, who, flattering the populace by empty words of liberty and a republic, had so often brought Rome to the brink of destruction. Porcari had once made an attempt at insurrection in the Piazza Navona, and the pope had treated him leniently, merely exiling him to Bologna. Here he kept up a correspondence with other exiles and malcontents, and appointed a meeting at his house at Rome, in January, 1453. Escaping from Bologna, he repaired to Rome, attended by several hundred men, with whom he was to attack the Capitol, seize the pope, re-establish the senate, and renew in short the scenes of Crescenzio, Analdo da Brescia, and of Cola di Rienzo. Cardinal Bessarion, legate of Bologna, however, having discovered the flight of Porcari, had sent information to the pope. The conspirators were seized in the midst of their nocturnal meeting, with their arms and other evidence of their guilt, and Porcari and nine of his associates were hung on the battlements of the Castle of S. Angelo.

Nicholas V. died in March, 1455. He left the papal power firmly established at Rome. He entrusted the administration chiefly to churchmen, and this system of hierarchical government has continued to the present day. The senator remained a lay magistrate, appointed by the pope. The senator must not be a native of Rome. His jurisdiction has gradually dwindled to almost nothing, as the governor of the city, who is a prelate, has the whole police under his control, and the senator is merely president of a court of première instance for civil matters, which is composed of himself and three conservatori, or lay judges, generally noblemen, who are appointed by the pope, and renewed every six months, and of the priore de caporioni, or head of the head-boroughs of the fourteen districts of Rome. This court, called Tribunale del Campidoglio, takes also cognizance of petty offences and misdemeanours. The senator has also the superintendance of the markets, of the annual horse-races, and attends the great processions and other public ceremonies.

The successors of Nicholas V., during the remainder of the fifteenth century, consolidated the papal power in Rome, and Alexander VI. and Julius II., at the beginning of the following century, extended it to the rest of the dominions of the See of Rome. [PAPAL STATE.]

Nicholas V. was succeeded by Calixtus III., whose pontificate does not exhibit any important feature. The history of the city of Rome henceforth becomes identified with that of the popes, and may be traced, in order of date, under the heads of PIUS II.; PAUL II.; SIXTUS IV.; INNOCENT VIII.; ALEXANDER VI.; and his nephew BORGIA (CESARE); JULIUS II.; LEO X.; and CLEMENT VII.

Under Clement VII., Rome was stormed, in May, 1527, by an army of mercenary and disorderly Germans, led by the Constable of Bourbon, who was in the service of Charles V., but who led his freebooting bands against Rome without any commission from the emperor, and with no other object than to pay his troops their arrears by giving them the plunder of Rome. [BOURBON, CHARLES DE.] This was the last storming and pillage of Rome, but it was also one of the most cruel. From 1527 till 1798 Rome was not entered by any hostile army, nor exposed to any political revolution. Of the popes who sat in the papal chair during this period of nearly three centuries, the most remarkable are: PAUL III., PAUL IV., PIUS V., GREGORY XIII., SIXTUS V., CLEMENT VIII., PAUL V., URBAN VIII., INNOCENT X., ALEXANDER VII., CLEMENT IX., CLEMENT X., INNOCENT XI., INNOCENT XII., CLEMENT XI., BENEDICT XIII., BENEDICT XIV., CLEMENT XIII., CLEMENT XIV., and PIUS VI. Under Pius VI. Rome was occupied without any resistance by the armies of the French executive Directory, and although not actually pillaged by the soldiery, it was shamefully plundered in a more systematic manner by the generals, commissaries, and other agents of the Directory. In 1799 it was occupied by the Neapolitans, who also made it pay dear for what they called its deliverance from the French.

In 1800 the new pope, Pius VII., recovered possession of Rome, and the memorable events of his long and troubled pontificate are noticed under PIUS VII. Since the restoration of 1814 there has been no material change in the political condition of Rome. The popes who have done most for improving and embellishing Rome are:—Nicholas V.; Paul II., who built the Palace of Venice and part of the Corso; Julius II.; Leo X., who began St. Peter's church; Gregory XIII., who founded the Roman college; Sixtus V., who raised most of the obelisks; Paul V. (Borghese), who built the splendid church of Santa Maria Maggiore, the palace Borghese, and other structures; Gregory XV., who founded the Propaganda; Innocent X., who embellished the Piazza Navona; Alexander VII., who raised the present building of the University; Innocent XII., who built the palace for the courts of justice at Monte Citorio; Clement XI., Benedict XIV., and last, though not least, Pius VI., who created the Vatican Museum. Besides the popes, many cardinals of the Albani, Borghese, Barberini, Farnese, and other families have greatly contributed to the embellishment of modern Rome during the last three centuries. The French administration during its second occupation of Rome, 1810-14, also contributed materially to the improvement and ornament of the city.

MODERN ROME (*continued*).

A sketch of the actual papal administration, its judicial system, its finances, the manufactures and trade of the country, and other statistical details, are given under PAPAL STATE.

With regard to popular education, Rome has adopted no general and uniform system. The rectors of some parishes, aided by charitable individuals, have established parish school, in which poor boys, from five to twelve, are instructed gratis. Other schools are kept by the Scolopj, the fathers of the Christian doctrine, the Ignorantelli, and other clerical congregations, in which boys are taught, either gratuitously or for a trifling fee, writing, arithmetic, grammar. All the children of each parish are required to attend at the parish church every Sunday afternoon to hear the catechism explained, and to be questioned by the rector on points of religion and morality. Besides this, the curate (Sotto Curato) of the parish generally keeps a private school, in which he teaches, for a trifling remuneration, writing and the rudiments of Latin. There are also sixty schools, called regionarie, kept by private teachers, in which about 2000 boys of the middle classes, by paying from half a dollar to a dollar a month, are taught reading, writing, arithmetic, and the elements of Latin and French. These schools are subject to the inspection of a deputation of clergymen, who report to the Cardinal Vicario. Several charitable institutions, such as the Orphans' Asylum, that known by the name of Tata Giovanni, the foundling hospital, that of S. Michele already mentioned, supply elementary instruction to their inmates. Females are instructed in some convents, and in the Conservatorj, where a number of poor girls are lodged, boarded, and instructed, and partly defray, by the produce of their labour, the expenses of the institution, the remainder being made up by legacies and subscriptions. Some evening schools for the children of the working classes have of late years been opened at Rome by benevolent individuals.

For scientific education there is the university called Archiginnasio della Sapienza, which is attended by nearly 1000 students, and has a library, a cabinet of natural history, and other collections: next comes the Gregorian or Roman college, which is now again in the hands of the Jesuits; it has a collection of antiquities and an observatory; and the colleges Nazareno and Clementino, for boarders chiefly of the higher class. An account of the Gregorian college is given in No. I. of the 'Quarterly Journal of Education.' Several public libraries are daily opened at Rome; the principal are those of the Dominican convent of La Minerva, and that of the Augustine convent, called Angelica.

Charitable establishments are more numerous at Rome than in any other Italian city. The principal hospitals are those of S. Spirito and S. Michele, already noticed in the first part of this article; the fever hospital of the Lateran; the hospital of La Consolazione, at the foot of the Capitol, for surgical cases; that of San Gallicano, for cutaneous diseases; that of the Incurabili, or S. Giacomo, near the Corso; the lying-in hospital of S. Rocco: the hospital of Santa Trinita dei Pellegrini, for poor convalescents; and that of the Ben Fratelli, in the island of the Tiber, already mentioned. The Orphan Asylum, the Foundling Hospital of S. Spirito, and the house for the insane, must also be reckoned. The whole annual revenue of these establishments amounts to 840,000 dollars, of which about one-half is derived from endowments, and the remainder is supplied by the papal treasury. The pope distributes yearly out of his own private purse from 30,000 to 40,000 dollars among the poor. A commission of subsidies distributes about 172,000 dollars more among poor families. There is also a society for portioning poor girls on their marriage, which expends about 132,000 dollars yearly for that purpose. It is reckoned that about 1000 girls are yearly portioned in this way. (Serristori, *Statistica*; Morichini, *Su gli Stabilimenti di Pubblica Beneficenza in Roma.*) See also Tournon, b. iv., c. 7.

The lower orders at Rome live generally very poorly, their means of support being scanty and precarious. They depend much on charity, and when years of scarcity or political convulsions occur, the amount of suffering is very great, as was the case when the French overthrew the papal government in 1809. A great part of the population depend, either directly or indirectly, for their subsistance on the papal court, the cardinals and prelates, the nobility, the foreign ministers, and foreigners in general.

The clergy of the city of Rome consisted, in 1838, of 54 rectors of parishes, 1439 priests non-incumbent, 2012 monks or friars, besides 31 prelates, with the rank of bishops, belonging to the papal court. The numbers of nuns was 1456. The whole population consisted of 148,903 individuals, besides 4500 Jews.

The police in Rome is maintained by the Carabineers, a well selected and well equipped military body, resembling the French gendarmes. They are under the orders of the governor of Rome, who is a prelate.

Rome has an insurance company, a bank, and a savings' bank; these institutions have all been established within a few years. The Monte di Pieta is a much older foundation. [MONT DE PIETE.]

Rome had no municipal council when the French took possession of it in 1809, its financial administration being in the hands of the home department. Count Tournon established a municipal council, consisting of the principal nobles and citizens. Its revenues, derived from various taxes and rent of buildings, amounted to 2,800,000 francs, which was found sufficient for the expenditure. We are not acquainted with the alterations that have been made since the restoration of 1814, except that we find in the Motuproprio of Leo XII., 1824, under the head of the 'Organization of the Communes,' that 'with regard to the city of Rome, the rights of the senator and conservatori, and of the Roman people, are maintained in their present state,' which seems to mean the state in which they were before the French occupation.

The population of modern Rome consists of a very mixed race, and the admixture is yearly renewed. The deaths at Rome exceed the births, which is owing in a great degree to the number of people who live in a state of celibacy, not only in consequence of their religious vows, but also from choice. The population is yearly recruited from the provinces; a number of young men come to the capital in quest of employment or to pursue their studies, and many of them settle there. Tournon justly observes that it is out of the question to look at Rome for any descendants of the antient Romans, even among the Transteverini, who by tradition claim that descent. It is in the elevated country near Rome, among the Sabine, Alban, and Cimini mountains, that we may expect to find the descendants of the antient inhabitants of those districts. The men in the city of Rome are not generally favoured by nature, with the exception of the Transteverini, who are usually well made; the women are far superior with regard to form, but after the first period of youth, they become lusty and large, owing probably to their sedentary habits; their busts however are generally handsome.

With regard to their moral qualities, the people of Rome may be said generally to be remarkably keen in their perceptions, disposed to criticism and satire, and yet guarded in the utterance of their sentiments, serious and rather pompous, but withal warm-hearted. Revenge and jealousy are still a source of crimes among the lower orders. 'The modern Romans,' says Tournon, 'are full of intelligence; they have a strong feeling of self-respect, and although prone to anger under provocation, they are, in the common relations of life, gentle, benevolent, and warm-hearted, and particularly expressive of their gratitude. In the manifold relations which I have had with all classes of the Roman people—in the meetings for the drawing of the conscription, so obnoxious to a country to which war and its stern necessities had been strangers for ages; in the midst of the popular festivals; in the fairs and markets—nowhere have I seen traces of that turbulence and ferocity which travellers have been pleased to ascribe to the modern Romans. I have found, among the inhabitants of the most secluded districts of the Campagna, a remarkable mildness of manners, not unmixed with a certain degree of natural politeness; when often alone among them, or in the midst of the formidable Transteverini, my confidence in the good disposition of the people has never been betrayed for a moment, and my own experience, to which I may add that of every other Frenchman in an official situation like myself, has given me a full conviction that it depends entirely upon the government to make these people as orderly and peaceful as those of any country in Europe.' (*Etudes sur Rome*, vol. ii., p. 104.)

The amusements of the people of Rome are chiefly connected with religious festivals. The principal are those of the Holy Week, when the evening service and Miserere at the Sixtine Chapel are celebrated, at which however only a privileged few can be admitted; but then there is the cross of fire suspended above the Confession in St. Peter's church, whither thousands resort, and the aisles of that vast temple become a sort of fashionable promenade. On Easter Sunday the pope officiates with great solemnity in St. Peter's church, after which he ascends the balcony in front of the building, and gives his benediction 'urbi et orbi.' Then comes the great procession of the Corpus Domini, the Thursday after Trinity Sunday, when the pope and all the clergy walk round the colonnade of St. Peter's. Next comes the festival of St. Peter, on the 29th of June, when, in the evening after the ceremonies of the day, the whole exterior of that magnificent building, with its swelling dome, lantern, and cross, is lighted up first by paper lanterns, which give a soft ethereal light, and then, at a given signal, another set of thousands of bright lamps are suddenly ignited, as if by magic, spreading like a blaze of fire along that vast structure. Then follows the Girandola, or fireworks on the castle of St. Angelo, which are far superior to any other fireworks in the world. The Christmas festivals are also splendid. All these have been described by most travellers who have visited Rome, and some of them most beautifully by Madame de Staël in her 'Corinne.'

The profane amusements are those of the Carnival, with its horse-races in the Corso and the masks in the streets; the inundation of Piazza Navona twice a week, in the month of August; the bull-fights and fireworks during the summer season; and the vignate, or country excursions in the autumn. There are generally two if not three theatres open at Rome, one for the Opera Seria, and another for the Buffa, but although the people are very fond of music, yet their rulers, through regard for their profession, abstain from attending plays, and this renders the amusement less national than at Naples or Milan. The fashionable carriage-drives are along the Corso, and outside of the Porta del Popolo, and along the road to Porta Pia.

We must refer for other particulars concerning the habits and pastimes of the modern Romans to books of travels, and especially to that under the name of Stendhal, 'Rome, Florence, et Naples,' and also the 'Promenades dans Rome,' by the same author, and Miss Waldie's 'Rome in the Nineteenth Century.'

The language of Rome is good Italian, but the lower orders, like those of every other country, fall into grammatical inaccuracies, wrong inflections, &c., and have moreover a drawling way of speaking, which is peculiar to them, and is easily recognised. The popular dialect thus disfigured, though much more intelligible than that of most other countries of Italy, is called Romanesco, and there are burlesque poems written in it. One of these is entitled 'Meo Patacca,' the name of a bravo or leader of the lower class of Rome, who, hearing of the siege of Vienna by the Turks, proposes to march to its relief, but after many delays and episodes, the whole troop vent their courage upon the poor Jews of Rome, whose district they take by storm. The following is a sample of the style:

> 'Era quell' ora ch' i Pizzicaroli
> Con le partiche aggiustano le tenne
> Innanzi alle lor mostre, e i Fruttaroli,
> E ognun che robba magnaticcia venne;
> Perche pè fa servizio a i Nevaroli,
> El caldo insopportabile se renne,
> E allora il Sol, se non ci son ripari,
> Scalla le robbe, e scotta i Bottegari.'

There is another poem, called 'Maggio Romanesco,' by Peresio, which is founded upon the history of Cola di Rienzo. But most of the popular poems, songs, and ballads of Rome are in good Italian. The 'Ritornello' is a favorite composition of the lower classes, and consists of asonante rhymes, such as follows:

> 'Fiore de Pepe,
> E quanto me ne dite e me ne fate,
> E ch' io ve voglio bene non lo credete.'

A collection of popular Roman songs was published by the Cavaliere Visconti: 'Saggio di Canti Popolari della Provincia Marittima e Campagna,' Roma, 1830. The following is a specimen.

> 'Palomba che per l' aria va a volare,
> Ferma, che voglio dirti due parole,
> Voglio cavà una penna a le tue ale,
> Voglio scrive una lettra al mio amore,
> Tutta di sangue la voglio stampare,
> Per sigillo le metto lo mio core;
> E finita da scrive e sigillare,
> Palomba, portacella a lo mio amore,
> E se lo trovi in letto à riposare,
> O Palomba riposati tu ancora.'

The satirical humour for which the modern Romans have been long celebrated, has been noticed under Pasquin.

The upper class at Rome consists of two distinct orders: the hierarchy or clerical dignitaries, cardinals and prelates, who constitute the court and cabinet of the pope, and who have in their hands the government, and fill the principal offices in the administration; and the lay nobility, with the titles of princes, dukes, marquises, and counts, who live upon the revenue of their estates, and have little or no influence in political affairs. In the middle class, 'mezzo ceto,' the lawyers form an important order; they are divided into—1, avvocati concistoriali, who alone can plead before the sovereign in concistoro, or papal privy council; 2, avvocati rotali, who plead before the other courts; 3, curiali, or patrocinatori, who are the same as the English solicitors; 4, notaries, who form a corporation under the prefect of the archives. In the early part of the present century, the advocates Bartolucci, Bontadossi, Angelotti, Lasagni, were distinguished among the members of their profession. Among the physicians and surgeons, Bomba, Egidi, Giovannelli, Trasmondi, Savetti, had a considerable reputation.

The artists form another important body at Rome. Many of them are foreigners, but they generally live on good terms, and there is a sort of professional fellow-feeling among them all. The life which the artists lead at Rome, their studies, and their meetings, have been described by Stendhal and other travellers. The Academia of S. Luca, or the fine arts, is the connecting bond of all the artists at Rome. France and other countries have their separate academies, or 'pensionats,' where a certain number of artists of their respective nation are boarded and pensioned by their government for a certain period. The antiquarians have also their academy. Among these the names of Visconti, Fea, Nibby, Ré, and others are well known

The mercanti di Campagna, or great farmers, who rent the vast estates into which the Campagna is divided, belonging to the nobility, or to various churches, convents, charitable institutions, or corporations, are a wealthy class; they live in a good style at Rome, have their counting-houses, and employ numerous agents, clerks, messengers, and servants. The smallest of these farms requires a capital of 2000*l.*, and the largest of above 20,000*l.* Almost the whole of the Roman lowlands, from Corneto to Terracina, are in the hands of about 150 of these farmers, of whom one-third, and those the wealthiest, reside at Rome. Both Châteauvieux and Tournon give animated descriptions of the farm of Campomorto, which is among the largest.

Rome is well supplied with provisions; butchers' meat, fish, game, and vegetables are good and abundant; the common country wine is small and light, but the Romans are generally a sober people. Cheese, butter, ricotta, and other produce of the dairy, is plentiful and varied.

In conclusion, there is much that is interesting and much that is good in modern Rome, both materially and morally; but it ought to be borne in mind that the state of society is totally different from what it is in England, Prussia, or France. English travellers have not sufficiently attended to this; they have judged of Roman society after the English standard; they have contrasted its stationary but orderly condition, with the prodigious activity, excitement, and perpetual agitation of the population of Britain. But the human race can accommodate itself to various conditions; it can thrive and be content under very different institutions. It is neither possible nor perhaps desirable to make at once a complete revolution in the habits and ideas of all the nations of the earth; that must be the slow work of time, of education, and of spreading intercourse. This has been the great mistake of the so-called republicans of our age; they have considered man as a plastic being, whom they could remodel at will, without any consideration for his moral feelings, habits of thought, and early impressions, which will not easily bend themselves to the will of another.

The great mass of the population of the city of Rome has shown, of late years, that it is, generally speaking, in tolerable harmony with the form of government. If the government would but take care to accommodate itself gradually to the very slow change which must be taking place even in the minds of the people of Rome, that would be sufficient at present for the purposes of peace, welfare, and good government, without any violent and sudden change in the established form of society. Some remarks on this subject which were elicited by the abortive insurrection of the northern papal provinces, in 1831, in which movement Rome and the southern provinces did not participate, may be found at the end of an article upon 'Rome and the Papal Government,' in No. xxi. of the 'Foreign Quarterly Review,' January, 1833.

RÖMER, OLAUS, a Danish astronomer, was born at Arhusen in Jutland, in 1644, of parents who, though not in affluent circumstances, were able to give their son the benefits of a scientific education by sending him to the university of Copenhagen, where he applied himself diligently to the study of astronomy under Erasmus Bartholinus.

He was brought into notice by Picard, who, in 1671, was sent from France by Louis XIV. to make celestial observations in the north, and to verify the position of Uraniburg, once the residence of Tycho Brahé. The French astronomer conceived so great an esteem for the talents of the young Dane, that he engaged him to visit Paris, and when there procured for him the honour of being presented to the king. In consequence of this introduction, Römer was appointed to instruct the Dauphin in mathematics, a pension was settled on him, and the next year the Royal Academy of Sciences made him a member of their body.

While in France, Römer was employed, together with MM. Cassini and Picard, in performing geodetical operations for the survey of the kingdom; he also assisted at the Royal Observatory at Paris, and from the observations which he had occasion to make on the immersions and emersions of Jupiter's first satellite, he was led to the discovery of certain inequalities in the times of the occurrence of these phenomena, which had not before been noticed. It was then first remarked, that between the times of the opposition of Jupiter to the sun and the next following conjunction, the emersions of the satellite from the shadow of the planet took place always later than the times indicated by calculation, and that the difference between the observed and the calculated times when the planet was near the points of opposition and conjunction was about fourteen minutes. A contrary circumstance was observed from the time of a conjunction of Jupiter with the sun to the next following opposition; for the immersions appeared to take place more early than the calculated times, the difference of the times, when near the points of conjunction and opposition, being also about fourteen minutes.

There appears however to be some uncertainty whether Römer or Cassini (J. D.) is the astronomer to whom the honour of being the first to perceive the inequality belongs, and Montucla asserts not only that the latter made the discovery, but that he gave an explanation of its cause. He states that Cassini published, in 1675, a paper in which it is shown that the phenomena result from the difference between the times during which the particles of light are passing from the satellite to the earth (the planet being, when in opposition, nearer to the earth than when in conjunction, by the whole diameter of the earth's orbit) and in which it is inferred that the velocity of light must consequently be such as to allow it to pass from the sun to the earth in about eight or ten minutes. On the other hand, it is well known that Cassini at first objected to the transmission of light through a part of space in a certain time as a cause of the observed inequality, on the ground that similar inequalities were not observed in the immersions or emersions of the other satellites. Now it is more probable that the French astronomer should have made objections to the hypothesis of another man, than that he should have abandoned one which himself had formed; and even if such abandonment had taken place, Römer ought in justice to be considered as the real discoverer of this important element in astronomical science, since it is admitted that he took up the subject and gave a precise explanation of the circumstances. The reason why the like retardation or acceleration of the times was not, then, observed in the second and the remaining satellites is, that the theory of the motions of those bodies was in that age so imperfect, that the times of the phenomena could not be determined by computation within the number of minutes to which the optical inequality amounts. It is now well known that the latter takes place similarly in the phenomena of all the satellites.

Römer was as good a mechanician as an astronomer. It is to him we owe the application of the epicycloidal curve in the formation of the teeth of wheels, by which the movement is rendered uniform; and an account of the invention was sent to the Academy of Sciences in 1675. De la Hire afterwards claimed the honour of having first discovered the advantage of teeth so formed; but Leibnitz, in a letter to John Bernoulli, states that Römer had communicated the invention to him twenty years before the date of De la Hire's publication. Römer is said to have designed several machines for representing the motions of the planets, and particularly one which exhibited the revolutions of Jupiter's satellites; by this machine it is said that the immersions and the emersions might be determined with great precision.

Having remained ten years in France, Römer returned to Copenhagen, where the king, Christian V, made him professor of astronomy. He was at the same time employed in reforming the coin, in regulating the weights and measures, and in making or repairing the public roads. Having acquitted himself in the performance of these scientific commissions to the satisfaction of his sovereign, he was named chancellor of the Danish exchequer, and assessor of the supreme tribunal of justice. At length, under Frederic IV., he became burgomaster of Copenhagen, in which city he died, September 19, 1702, having suffered at intervals from the stone during the three last years of his life.

Peter Horrebow, one of his pupils and his successor in the chair of astronomy, published (1735), under the title of 'Basis Astronomiæ,' the series of celestial observations made by Römer, with a description of the observatory at Copenhagen, and an account of the manner in which the instruments were used.

In determining the apparent places of celestial bodies, it had, previously to the time of Römer, been the practice to observe their altitudes and azimuths, and also their distances from one another or from some body whose place was already found. The trouble of computing the right-ascensions and declinations from these elements was considerable, and the Danish astronomer made an important change in the practice of observing, by which this trouble was avoided. He used what is called a transit telescope, with a clock, and also a mural quadrant; with these he observed directly the differences between the right-ascensions (in time) and between the declinations of the sun and the planets or the fixed stars. It is right to remark however that Picard had somewhat earlier fixed in the plane of the meridian a telescope, by which he could, it is said, obtain altitudes between 56° and 61°. Now a space equal in extent to five degrees cannot be seen at once in a telescope, and therefore it is probable that this was moveable in altitude to that extent; and if Römer was at any time a witness to the performance of the instrument, he may have taken from it the idea of making a telescope turn on a horizontal axis through 360 degrees in the plane of the meridian. It appears also that De la Hire contended with Römer for the honour of having been the first to fix a quadrantal instrument in that plane.

ROMFORD. [Essex.]

ROMILLY, SIR SAMUEL, was born in London, on the 1st of March, 1757. His grandfather, a French Protestant, was entitled by inheritance to a considerable landed estate at Montpellier, but he quitted France in consequence of the persecutions which succeeded the revocation of the Edict of Nantes, and established himself in the business of a wax-bleacher, in the neighbourhood of London. His youngest son, Peter, the father of Sir Samuel Romilly, was brought up to the trade of a jeweller, in which he became successful and eminent. Of the numerous family of Peter Romilly, two sons and a daughter alone survived their infancy, of whom Samuel was the youngest. The early education of Samuel Romilly was extremely defective. He was sent with his brother to a day-school, frequented by the children of the French refugees in London, the master of which was ignorant and tyrannical, and incompetent to instruct his pupils in anything beyond reading, writing, and the rudiments of the French language. The elder brother being intended for his father's trade, it was attempted to lead Samuel's inclination to the business of a solicitor; but a disgust implanted in his mind by a view of the discouraging apparatus of an attorney's office in the city, caused the abandonment of this scheme. It was then proposed to place him in the commercial house of the Fludyers, who were near relations of his family, and one of whom, Sir Samuel Fludyer, was his godfather. With a view to this employment he received instruction in book-keeping and mercantile accounts, but the death of both the partners in the house of Fludyer put an end to this promising project, and his father, having failed in several other schemes respecting him, eventually employed him in his own trade, at first simply for the purpose of furnishing him with occupation, and afterwards with the intention that the two brothers should succeed to the business in partnership upon their father's retirement.

During the intervals of leisure which were abundantly afforded him for several years after he left school, at the age of fourteen, Samuel Romilly applied himself assiduously to literary studies, which were more suitable to his serious and somewhat melancholy disposition than the usual exercises and amusements of youth. Antient history, English poetry, and works of criticism were at this period his favourite objects of pursuit. When he was between fifteen and sixteen years of age, he determined to become acquainted with the Latin language, and by means of hard study, and with the assistance of a master, he acquired so much proficiency as enabled him, in the course of three or four years, to read through almost all the classical writers of Rome. He also applied himself to Greek, but, discouraged by the difficulties of self-instruction, he abandoned the attempt, and contented himself with studying the Greek authors by means of Latin versions. In addition to classical studies, he read travels, and acquired a competent knowledge of geography, and some acquaintance with natural history; and he also attended private lectures on natural philosophy, and the lectures on painting, architecture, and anatomy delivered at the Royal Academy. Thus, though he had not the opportunity of becoming a scholar in the academical sense of the term, he contrived by his perseverance and unaided efforts to refine his taste, and to lay up in his mind a store of elegant and useful knowledge, which enabled him to proceed in the exalted walk of life to which his fortunes subsequently led him, without experiencing those impediments and mortifications which usually arise from an imperfect education.

It is not surprising that a devotion to such pursuits as these should excite aspirations for an occupation more congenial to them than the trade of a jeweller; and his indulgent father, whose pecuniary means had been about this time increased by considerable legacies to his family, and among them a bequest of 2000*l.* to Samuel Romilly, readily yielded to his son's wishes in this respect, and articled him for five years to one of the sworn clerks in chancery. The mechanical duties of this office, though in some degree enlivened by his master's practice as a solicitor, were scarcely more attractive to Romilly than his attendance upon his father's business; but he devoted his frequent leisure at this period to literary studies, and in particular to strenuous exercises in prose composition. The object of serving a clerkship of this kind was the purchase of a seat in the Six Clerks' Office at the expiration of his articles, and the intended retirement of his master was likely to offer a favourable opportunity for the attainment of this object; but Romilly's dislike to the business, and his disinclination to embarrass his father by withdrawing from his hands the amount of the bequest above mentioned, which would have been necessary in order to purchase the seat, determined him to renounce his prospects in the Six Clerks' Office entirely, and to qualify himself for the bar. Accordingly, in May, 1778, having served his clerkship, and completed his twenty-first year, he entered himself at Gray's Inn, placed himself in the chambers of an equity draughtsman, and commenced with great ardour the study of the law. He still, however, pursued his literary studies and exercises, employing much of his time in reading and translating the Latin historians and orators, occasionally writing political essays for the newspapers, and sometimes attending the houses of parliament for the purpose of exercising his own powers of abstraction, argument, and expression, by composing imaginary answers to the speeches which he had heard there.

Not long after he commenced his legal reading, he was attacked by serious illness, which, aggravated and protracted as it appears to have been by his constitutional disposition to despondency, compelled him to lay aside all severe studies, and threatened wholly to interrupt his professional prospects. Fortunately a family incident induced him to undertake a journey to Switzerland, where he remained several weeks in the society of his brother-in-law and most intimate friend the Rev. John Roget, and, returning by way of Paris, he became acquainted in that capital with D'Alembert and Diderot, and formed intimate friendships with several of the most eminent political philosophers of that day, whose conversation and correspondence produced a marked effect upon his character and opinions. He arrived in London after an absence of several months, with his health entirely restored.

In Easter term, 1783, Romilly was called to the bar; but his entrance upon the practice of the possession was postponed for several months in consequence of a second journey to Switzerland, which he undertook for the purpose of attending his sister to England, upon the death of Mr. Roget. In Michaelmas term, 1783, however, he began his attendance upon the courts, and opened his practice with a very inconsiderable amount of employment in drawing chancery pleadings. In the following spring he joined the Midland circuit; but being unknown and without connections of any kind, no encouraging prospect of business appeared for several years. Success at sessions however led to employment on the circuit; and though his progress was by no means rapid, we have his own authority for stating that when the extent of his practice in the Court of Chancery compelled him to restrict himself to London, he had attained to a larger amount of leading *nisi prius* business than was possessed by any other counsel upon the circuit. (*Memoirs of Sir Samuel Romilly*, vol. i., p. 94.)

In the year after that in which he was called to the bar, Romilly, through his connections in Paris, became acquainted with Mirabeau. By his means he was introduced to the late Marquis of Lansdowne, who had become desirous of his acquaintance upon learning that he was the writer of an anonymous tract, entitled 'A Fragment on the Constitutional Power and Duties of Juries;' and who, having from the first conceived a high opinion of Romilly's talents, continued to be for many years his steady friend and patron. Lord Lansdowne's estimate of his character, and his anticipation of his eventual success, are evinced by the fact, that in the first years of their acquaintance, and before the tide of Romilly's professional fortunes had begun to flow, he was twice offered a seat in parliament by that nobleman, which he declined from a feeling of independence. The early introduction of Romilly to the confidence and familiar friendship of many persons of the highest distinction for their station and talents, both in France and England, must be considered as an unquestionable proof of his eminent merit. A young man barely twenty-six years of age, the son of a jeweller, unknown at any public school or university, and a barrister of only a year's standing, could have been indebted to nothing but his own personal character for his admission into such society, and for the esteem and respect with which he was regarded by his superiors in rank, age, and reputation, at the very commencement of his active life.

Soon after his first introduction to Lord Lansdowne, his attention was directed by that nobleman to Madan's 'Thoughts on Executive Justice,' a tract now forgotten, but which at that time excited much notice, and is said to have had considerable influence with the judges in enforcing the execution of capital punishment. The author of this tract relied upon the well-known principle, that as the object of judicial punishment is to deter from crime, the effect of penal laws is in a great measure lost unless execution follows the sentence with certainty. The principle is true in the abstract; but it was absurd to attempt to apply it in practice to laws so severe as at that time existed in England. In answer to Madan's tract, Romilly published some sensible observations in an anonymous pamphlet, his composition of which was probably the first occasion on which he was induced to consider with attention the principles of criminal law.

Romilly's practice, both on the circuit and in the Court of Chancery, within ten years after he was called to the bar, became considerable. The precise period at which he quitted the circuit is not mentioned in any published account of his life; but it must have been subsequent to 1797, in which year he successfully defended at Warwick a delegate of the London Corresponding Society, prosecuted by the government for sedition (*Howell's State Trials*, vol. xxvi., p. 595), and was probably previous to the summer of the year 1800, when he was made king's counsel. It is not improbable that upon his marriage, which took place at the commencement of 1798, he may have formed the determination to confine his practice to the Court of Chancery.

After obtaining rank in the profession as king's counsel, his business in the Court of Chancery rapidly increased; and in 1805, we learn from his own evidence, 'that of the barristers who attended the Court of Chancery, he was then in the most practice.' (*Memoirs*, vol. ii., p. 111.) About this time the Bishop of Durham gave him the office of Chancellor of the County Palatine of Durham, which he held for many years. In the autumn of the year 1805 he was offered a seat in parliament by the Prince of Wales (afterwards George IV.), who at that time adhered to the Whig party, and whose attention had been particularly drawn to Romilly from the circumstance of his being about that time retained in a cause in chancery, in which the prince was much interested. This offer was declined from the same independent feeling which had induced him to decline two offers of a similar kind previously made by Lord Lansdowne.

Romilly's early association with some of the most distinguished persons interested in the French revolution, and, above all, perhaps his intimacy with Mirabeau, had given him in the outset of life a decided bias towards what are termed popular or liberal opinions in politics. In consistency with his general principles he became a decided adherent of the Whigs, and, long before he obtained a seat in the House of Commons, was in the habit of confidential communication with the leaders of that party. On the formation of the Grenville administration at the commencement of the year 1806, he received the appointment of solicitor-general, and the honour of knighthood, and was brought into parliament by the government for the borough of Queenborough. He was appointed one of the managers for the Commons, on the trial and impeachment of Lord Melville, and summed up the evidence in support of the charge. He states in his diary that he spoke on this occasion for three hours and twenty minutes (*Memoirs*, vol. ii., p. 139); but from the report of his speech in the printed accounts of the trial, it does not appear to have been by any means the most successful of his forensic or parliamentary performances. In truth, the occasion was most unfortunate; and he undertook the task not as a matter of inclination, but of duty, conceiving that in his position with respect to the government and the party under which he had taken office, he could not with propriety decline it. In the course of his first session in parliament he introduced a bill for the amendment of the bankrupt laws (46 Geo. III., c. 135), which passed both houses with very little objection or observation, and constituted a material improvement of that which was then an extremely defective branch of the law of England. After the dissolution of parliament, which took place at the close of the year 1806, he was re-elected for the government borough of Queenborough; and in the early part of 1807, and while in office as solicitor-general, he introduced a bill for the purpose of making real property in all cases assets for the payment of simple contract debts. This just and reasonable measure, although approved by Lord Ellenborough, was strongly opposed in the House of Commons by the Master of the Rolls, Sir William Grant, and rejected by a considerable majority. The opposition offered to this measure by the Master of the Rolls was personally resented by Sir Samuel Romilly with a degree of acrimony scarcely justified by the occasion. A measure founded upon a more limited application of the same principle, by confining it to the freehold property of traders, was, during the next session of parliament, proposed by Romilly, and carried (stat. 47 Geo. III., c. 74). At subsequent periods he made several attempts to carry his proposition into execution to its full extent, but without success. His reply to the Master of the Rolls in the first debate on this bill, and his speech about the same time in favour of the abolition of the slave-trade, established his reputation as a parliamentary speaker of the highest character.

In March, 1807, the Whig ministers were displaced, and with their removal ended the short official employment of Romilly. He retained, however, his seat in parliament, and continued until the end of his life a zealous and leading member of the opposition party. On the dissolution of parliament, which took place after the change of ministers, he purchased his return for the borough of Horsham from the duke of Norfolk—a mode of entering the House of Commons which he characterised as 'detestable' (*Memoirs*, vol. ii., p. 201), but which he justified in his own case as being at that time the only mode by which he could hope to obtain a seat in parliament consistently with that entire independence of action which alone made it valuable to him. In the session of 1807 he opposed the several harsh measures which were passed for the suppression of disturbances in Ireland, and warmly supported Mr. Whitbread's bill for establishing parochial schools; and besides the measures respecting the freehold estates of traders above alluded to, he introduced an important practical improvement in the administration of justice, by abolishing an unfair and useless privilege of members of the House of Commons as defendants in equity.

In the early part of the session of 1808, Sir Samuel Romilly lost his seat in parliament for Horsham upon a petition; but after the interval of about a month, he was returned for the borough of Wareham, having purchased his election for 3000*l.*

In the autumn vacation of 1807, Romilly had applied himself to the consideration of the criminal law of England, with a view to remove some of its glaring evils and defects. His attention had been called to the subject at an earlier period, when he composed his observations on Madan's treatise; and he now found himself in a situation, with respect to influence and authority, which justified the hope that he might be enabled to carry into practical operation the doctrines which experience and reflection, together with his acquaintance with foreign laws and the writings of foreign jurists, had long before impressed upon his mind. The English penal law is founded upon no general principles of jurisprudence, and is arranged upon no system, but consists for the most part of a vast number of positive and disconnected provisions, made at different periods of time, and in totally different states of society, so that the harsh and rugged enactments of a barbarous time have been carried on into a period of civilization, to the manners and institutions of which they are wholly unsuited. Unfortunately too, until very lately, it was the practice of the legislature, in making new provisions for particular exigencies, rather to attempt to equalize punishments, by imitating the severity of the antient laws, than to render them just and consistent by a general revision of the whole system. It was from this cause that, at the time when Sir Samuel Romilly began to apply his mind to the subject, the penal laws of England were far more severe than those of any other European country—nearly 300 crimes of various degrees and qualities of moral guilt being then indiscriminately punishable with death. The necessary consequence was a great uncertainty in the execution of criminal justice, proportionately impairing its effectiveness; for, as Lord Coke long ago observed, 'too severe laws are never duly executed' (3 *Inst.*, 163). To the removal or mitigation of this great evil Sir Samuel Romilly devoted himself with uncommon energy and perseverance during the last ten years of his life. At first his views of practical improvement were limited, and the only measures which he originally contemplated were, first, a provision by which acquitted criminals should be allowed compensation out of some public fund; and, secondly, an enactment raising the amount of the value of property to the stealing of which capital punishment should be annexed. The first of these measures, though just in principle, was liable to many serious difficulties in its application to practice, and being strongly opposed in the House of Commons, was early abandoned, and never afterwards resumed; and the second was modified at the recommendation of the present Lord Abinger, then Mr. Scarlett, who suggested to Romilly, as a much more effectual improvement of the law, the total repeal of all statutes which punish with death mere thefts unaccompanied by any act of violence or other circumstances of aggravation. Though Romilly readily adopted this suggestion, he thought that a proposition for the simultaneous repeal of so large a number of statutes stood no chance of success in parliament, and for that reason he resolved to propose, in detail, the repeal of individual laws, by which punishments of disproportionate severity were enacted, and thus gradually to expunge the whole from the statute book. Accordingly immediately after he had taken his seat for Wareham, in 1808, he brought in a bill to repeal the stat. 8 Eliz., c. 4, which made it a capital offence to steal privately from the person of another; and this measure, after some objection and discussion in the House of Commons, was eventually passed (48 Geo. III., c. 129). His next step towards the attainment of his object was taken in the early part of the session of 1810, when he introduced three bills to repeal several statutes which punished with death the crimes of stealing privately in a shop goods of the value of five shillings, and of stealing to the amount of forty shillings in dwelling-houses or in vessels on navigable rivers; and in order that his views on the subject might be generally understood, he published the substance of the speech delivered by him on his first proposal of the bills, together with some further arguments, in the form of a pamphlet, entitled 'Observations on the Criminal Law as it relates to Capital Punishments, and on the Mode in which it is administered.' One of the bills introduced by him on this occasion was thrown out in the House of Commons by a majority of two voices, in a very thin house; a second reached the House of Lords, and was there thrown out by a large majority—the lord chancellor (Eldon) and Lord Ellenborough using reasons against it which at the present day cannot be perused without astonishment; and the third bill was withdrawn by Romilly, after having in vain attempted to make a house in order to have it read a third time. Notwithstanding this failure, his confidence in the justice of his principles, added to his characteristic firmness and perseverance enabled him, in spite of all the discouragements arising from the apathy of friends, and the ignorance, prejudices, and party-spirit of enemies, to renew his endeavours to pass these measures in each succeeding session during the remainder of his life; but although several severe laws of a local and special nature were repealed, and although a considerable effect was produced on public opinion by the repeated discusions of the subject, it was not until several years after his death that any substantial improvement of the criminal law was effected.

In the anticipation of a dissolution of parliament on occasion of the king's illness, at the latter part of 1811, Sir Samuel Romilly was invited to allow himself to be put in nomination to represent the city of Bristol. Having accepted this invitation, he went down to Bristol upon the dissolution of parliament at the close of the year 1812, with the most encouraging prospect of success; but an opposition was excited in favour of a merchant of Bristol, whose personal influence and local connections gave him a much more efficient interest among the numerous constituency of that city than that which Romilly had acquired by means of his public character. The consequence was, that afte few days' struggle, he abandoned the contest as hopel Upon this failure, he was returned by the duke of Nor for his borough of Arundel; and Sir Samuel considered that the objections which he had entertained in early life against accepting a seat in parliament from the proprietor of a borough no longer applied, inasmuch as his public character was now so fully established, that he could never be suspected of intending to speak or vote merely at the dictation of his patron; and because, since the law had declared the former practice of selling seats to be illegal, there was no other means of entering the House of Commons than by the nomination of a patron or a popular election.

In the interval between the dissolution of the former parliament and the meeting of the new one in 1813, he published a small pamphlet, entitled 'Objections to the Project of creating a Vice-Chancellor of England.' This unsatisfactory plan of reforming the evils of the Court of Chancery he in all its stages strenuously though unsuccessfully opposed.

It would exceed the proper limits of the present article to relate in detail the circumstances of the parliamentary career of Sir Samuel Romilly during the last five years of his life. In addition to his proposals for the improvement of the criminal law, he took an active part in all the political questions of the time, generally acting in zealous opposition to the ministers. He supported Mr. Whitbread's resolution against declaring war with France upon the return of Napoleon from Elba in 1815; he opposed the bills for suppressing Irish insurrections, and for the suspension of the Habeas Corpus Act in 1817, and moved resolutions condemning Lord Sidmouth's circular to magistrates respecting the prosecution of seditious libels. He also spoke and voted against the Alien Act, and in favour of an extension of the elective franchise, and of Roman Catholic emancipation.

In the summer of 1818 a dissolution of parliament took place, and Romilly, being solicited to appear as a candidate for the representation of Westminster, was returned at the head of the poll, though he declined to take any part in the canvass, and did not appear upon the hustings until the termination of the election. He died however before the meeting of parliament. Lady Romilly, to whom he was devotedly attached, and whose health had been for some months declining, died at Cowes in the Isle of Wight, on the 29th of October, 1818; and this event occurring to a mind already dangerously excited by recent exertions and anxiety, produced a delirium, under the influence of which he put an end to his existence on the 2nd of November, 1818.

In his profession Sir Samuel Romilly attained to greater success than has been enjoyed by any advocate since the time of Sir Edward Coke. Nor did his professional reputation at all exceed his merits. He had a familiar knowledge of the principles of English law as administered not only in courts of equity, but in common-law tribunals, an unusual perspicacity of thought and expression, strong power of reasoning, great earnestness in enforcing his arguments, entire devotion to the interests of his client, and singular prudence in the management of a cause. To these qualities were united a deep sonorous voice, and unequalled impressiveness of manner. On the other hand, he is related to have been stern in his deportment to juniors, and unnecessarily severe in forensic altercation. This may have arisen from that contempt for the members of his own profession, which, it appears from his diary, was a prevailing sentiment in his mind, and which he expresses in some instances without sufficient reason. Being himself far in advance of the opinions of his profession, and feeling in his own mind with the certainty of demonstration the truth of those principles upon which he founded his projected improvements of the law, he was too much inclined to treat the ignorance and bigotry which often opposed them with an undue proportion of personal acrimony. Although in his early letters Romilly occasionally expressed in strong terms his aversion to his profession, declaring that he 'every day felt more unfit for it, and disliked it the more the more he met with success in it' (*Memoirs*, vol. i., p. 454.), these feelings do not appear to have been the confirmed sentiments of his mind, and were probably excited by the irksomeness of the mechanical business with which the practice of a chancery barrister commences. At a later period, when the nature of his practice was different, we do not meet with similar expressions of discontent; and it is hardly possible to suppose that his exalted position in the Court of Chancery during the latter years of his life, should not have been a source of just pride and gratification to him. At all events, the tradition of the profession ascribes to him much eagerness, both in acquiring and retaining his practice.

As a politician, Romilly was inflexibly consistent in all his general views, and uniformly acted up to his principles. He displayed however more of the mere spirit of party than might have been expected from his enlarged mind and otherwise independent character. In some instances, especially in the case of Mr. Perceval, he suffered the feelings of party to interfere with the friendships of private life; and with a species of bigotry hardly credible, seemed to consider it morally wrong that he should associate cordially with one who differed from him in political opinion. The same rigid attachment to party induced a degree of intolerance in uniformly ascribing to corrupt or interested motives the occasional desertion of individuals from the Whig standard; and sometimes, as in the case of his personal attack upon lord Melville in the debate on Mr. Brand's motion in 1807, led him into expressions of rudeness which his own excellent taste afterwards strongly condemned.

His public speaking was perhaps more deeply impressive than that of any speaker of modern times. He expressed himself with great readiness and fluency. Without aid from artificial means, and without the use of figurative language or ornament of any kind, his simple, correct, and nervous style, supported by his serious and dignified deportment and fine voice, often produced an effect equally surprising to the speaker and his hearers. Romilly mentions in his Diary an instance of this kind, which occurred in his farewell speech to the electors of Bristol, in 1812: 'There was nothing,' says he, 'in this speech at all calculated to excite the passions, and I know not to what cause is to be ascribed the effect it produced; but it is certain that before I got to the conclusion, I saw the tears streaming down the cheeks of many of my hearers.' (*Memoirs*, vol. ii., p. 61-2.) The writer of this article was present on the occasion here alluded to, and well remembers the powerful impression produced by the few simple sentences uttered by Sir Samuel Romilly.

Romilly's style in writing displays the same features as his manner of speaking,—clear, easy, forcible, and totally unadorned. In very early life, he acquired the habits of reading with care and reflection, and of thinking clearly and closely; and hence arose the faculties of accurate reasoning, and of distinct and powerful expression, for which he was singularly remarkable.

ROMNEY and ROMNEY MARSH. [Kent.]

ROMNEY, GEORGE, born at Dalton in Lancashire, December 15, 1734, was the son of John Romney, a wealthy cabinet-maker of that town. As he showed a mechanical turn at a very early age, he was taken away from school in his eleventh year, and placed in his father's workshop. A watchmaker of the name of Williamson, an eccentric man, who was devoted to alchemy, exercised an influence over the mind of young Romney which seems to have left a lasting impression; he endeavoured to initiate him in the mysteries of his favourite pursuits, and our young painter was not an unwilling disciple. How Romney first manifested a talent for the art in which he subsequently attained such distinction, is not satisfactorily shown by his several biographers. His son the Rev. John Romney states that he met with Lionardo da Vinci's treatise on painting, embellished with various illustrations, at a very early age. According to Hayley, he appears to have had a passion for sketching people and taking likenesses, which he exercised by drawing his fellow-workmen in various attitudes upon the deals and boards in his father's workshop. His first effort that attracted any notice was a drawing of Mrs. Gardiner, which induced his father, encouraged by the persuasion of several friends, to place him with a portrait-painter of the name of Steele, who painted heads at Kendal, to whom he was bound for four years, at the age of nineteen.

At Kendal, in 1756, Romney contracted an early marriage with Mary Abbot of Kirkland, by which he displeased his parents; and according to Hayley, although his son denies the fact, he himself shortly afterwards repented of his precipitate step. The result however proved that his choice was eminently worthy of his affections. Having cancelled the indenture with his master, Romney, at the age of twenty-three, commenced painting on his own account. His first production was a hand holding a letter for the post-office window at Kendal, which continued there for many years. His first portraits were two half-lengths of Walter Strickland of Sizergh, and his lady, at whose house he saw a portrait of Sir Walter Strickland, by Lely, and two portraits, by Rigaud, the only pictures by other masters that he had any opportunity of studying previous to his arrival in London. His industry was indefatigable, and nature alone being his guide, he gradually formed for himself a simple and natural style, unblemished by those artificial or adventitious qualities which are so easily acquired from the schools. Through the influence of his friend Mr. Strickland, he obtained considerable employment from the gentlemen of Westmoreland, in some of whose portraits he introduced dogs, painted with great spirit and truth. Besides portraits he painted many fancy pieces, twenty of which he exhibited in the town-hall of Kendal, and disposed of afterwards by lottery, for which he issued eighty tickets at half-a-guinea each. After exercising his talents for about five years in the north, his ambition directed his views towards the capital; and in the spring of 1762, he set out alone for London, leaving his wife and two young children in Kendal, who, according to the painter's son, were to join him when he had established himself in the metropolis; but the sequel casts a shade over the moral character of Romney. He rose rapidly to fame and fortune, and, with Reynolds and Gainsborough, divided the patronage of the great and the wealthy; but his young wife was never called to share the fortunes of her husband; he concealed his marriage from his friends, and only returned to the neglected mother of his children when he was old and feeble, and required a nurse to administer to his wants and bear with his weaknesses.

Romney commenced his metropolitan career by painting heads for four guineas in the city. In 1763 he obtained the second prize of fifty guineas from the Society of Arts for a picture of the Death of Wolfe, but through the influence of Reynolds the decision was revised and reversed in favour of Mortimer, for his picture of Edward the Confessor seizing the Treasures of his Mother. Romney received a present of twenty-five guineas. This circumstance is supposed by some to have been the principal cause of the enmity which ever after subsisted between Romney and Reynolds.

Romney seems to have met with considerable and early encouragement. He soon moved from the city to the west end, and raised his price for a head to five guineas. At this time he paid a short visit to Paris, where he was much struck with the great Mary de' Medici series of pictures by Rubens, in the Luxembourg. Upon his return he painted the portrait of Sir Joseph Yates, one of the judges of the court of king's bench, a picture which procured him a valuable connection amongst lawyers. Shortly afterwards he obtained a fifty-guinea premium from the Society of Arts for a picture of the Death of King Edmund.

In 1767, in consequence of his rapidly increasing practice, he removed to Great Newport Street, within a few doors of the former residence of Reynolds. Here he added greatly to his reputation by a portrait of Sir George Warren and his Lady, with a little girl caressing a bullfinch. He now not only ranked with the first painters of fancy subjects, but he bid fair to rival the President in portrait.

Romney's intercourse with men of taste and learning was now such as to make him feel the necessity of an acquaintance with the great works of art upon the Continent. He accordingly set out for Italy in 1773, with a letter of introduction to the pope from that great patron of the arts the duke of Richmond. In Rome he paid particular attention to the works of Michel Angelo and Raphael; and during his stay there produced one of his most beautiful pictures, the Wood Nymph, representing a naked female reposing upon the ground with her back towards the spectator.

From Rome he went to Venice, where he painted the portrait of Wortley Montagu in a Turkish dress. He returned to London in the summer of 1775, greatly improved in every respect by his continental tour.

Shortly after his return to London, he took a house in Cavendish Square, and, under the auspices of the duke of Richmond, recommenced his career as a portrait-painter, charging 15 guineas for a head, 30 for a half-length, and 60 for a whole-length; the president's price being at that time 35 guineas for a head. But Romney soon found it necessary to raise his prices, for sitters of all ranks crowded to his studio; and, notwithstanding they were still comparatively low, in a few years he realised an income of nearly four thousand a year by portraits alone.

He subsequently raised his prices considerably: in 1787, to 25 guineas; in 1789, to 30; and in 1793, to 35 guineas for a head, which continued to be his charge during the remainder of his life, the other sizes being charged in proportion.

Romney was now the acknowledged rival of the President in portrait. Reynolds's admirer and biographer, Northcote, says, 'Certain it is, that Sir Joshua was not much employed in portraits after Romney grew into fashion.' Lord Thurlow is also reported to have said, 'Reynolds and Romney divide the town; I am of the Romney faction.' To characterise these two factions technically, we should term them the factions of form and colour, the former being that of Romney. Romney's great success seems to have excited an active jealousy upon the part of Sir Joshua, who, when he spoke of him, used to term him 'the man in Cavendish Square;' and, from a passage in Northcote's 'Life of Reynolds,' we may infer that the President occasionally spoke disparagingly of the works of Romney. Northcote represents Garrick as saying of Cumberland the dramatist, 'He hates you, Sir Joshua, because you do not admire the painter whom he considers as a second Correggio.' 'Who is that?' said Reynolds. 'Why, his Correggio,' answered Garrick, 'is Romney the painter.'

Notwithstanding Romney's great employment in portraiture, he found abundant leisure to *lay in* fancy pieces, many of which however were left unfinished. The most remarkable of those of the earlier part of his career were, The Tempest; Tragedy and Comedy nursing Shakspere; the Infant Shakspere attended by the Passions; the Alope; Children in a Boat drifted out to Sea; Shepherd Boy asleep, watched by his Dog, at the approach of a Thunder-storm; Nature unveiling herself to Shakspere, &c. Romney is said to have been the originator of Boydell's 'Shakspere Gallery.' The Tempest and the Infant Shakspere attended by the Passions were painted for that collection. He made sketches also for five other subjects, but they were never executed; the Banquet and the Cavern Scene in 'Macbeth;' Mrs. Ford and Mrs. Page; Bolingbroke and Margery Jourdain conjuring up the Fiend; and the Maid of Orleans.

Romney was an enthusiastic admirer of the celebrated Lady Hamilton, then the beautiful Emma Lyon. According to his son, he made no less than twenty-three pictures from her, some of which however were never finished. She was painted in various characters, as Iphigenia, St. Cecilia, Sensibility, a Bacchante, Alope, the Spinstress, Cassandra, Calypso, Magdalene, Joan of Arc, and Pythian Priestess.

Romney's ambition appears to have increased with his years, and in his later days he devoted himself more ardently to fancy subjects than ever. Milton and his Daughters, and Newton making Experiments with the Prism, as a companion to it, were the most popular of these later productions. He sent 100*l.* to Flaxman, then studying in Rome, to purchase casts from the antique for him, who sent him 'the cream of the finest things in Rome.' The group of the Laocoon, the Niobe, the Apollo Belvidere, the Apollo Sauroctonos, groups of the Castor and Pollux, and Cupid and Psyche, the relief on the Borghese vase, several busts, and the best fragments of legs and arms that could be found. These splendid monuments of antient genius tended only still further to excite the emulation and ambition of Romney; he conceived grand designs of painting 'the seven ages,' 'the visions of Adam with the angel,' 'the flood, and the opening of the ark,' and many from Milton, some of Adam and Eve, and others having Satan as their hero.

This constant excitement seems to have been too much for the painter's nerves, and his mind was gradually giving way under it. His observations called forth by the melancholy fate of his friend Cowper seem to have been almost foreboding of the similar fate that awaited himself: 'If there is a situation more deplorable than any other in nature, it is the horrible decline of reason, and the derangement of that power we have been blest with.' The health of his faculties was now rapidly declining, but the return of his friend Flaxman from Rome, of whose talents he had a very high opinion, cheered him for a season. He shortly however became possessed with an idea that his house in Cavendish Square was not sufficiently spacious to admit of the execution of the magnificent designs he had in contemplation, and he accordingly had a house and gallery constructed at Hampstead, upon his own plans and under his own direction. He left Cavendish Square in 1797, after a residence there of twenty-one years, and repaired to his new studio at Hampstead, but not to revel in the dreams of his wild genius, for he was soon oppressed with a degree of nervous dejection that deprived him of all energy. After one or two efforts upon the canvass, he complained of a swimming in the head, and a paralytic numbness in his right hand, and then renounced the pencil for ever.

In the summer of 1799 he was seized with a sudden impulse, and started abruptly for the north, where, in Kendal, his amiable wife still resided, surviving the cold neglect and long estrangement of her husband, and in whom he found an attentive and affectionate nurse, 'who had never been irritated to an act of unkindness or an expression of reproach' by thirty-seven years of absence and neglect, during which long interval he had paid but two visits to the north. The kind attentions of this exemplary woman awakened feelings of intense gratitude in the heart of Romney, and he once again enjoyed real happiness, to which in the long years of his prosperity he had been a total stranger. He gave orders for the sale of his property at Hampstead, and purchased a house at Kendal, where he had resolved to remain. But this bright period was of short duration, for upon the return of his brother, Colonel Romney, from India, which was little more than a year after his arrival at Kendal, he suddenly fell into a state of utter imbecility, and he lingered on for nearly two years, unconscious of existence, until the 15th of November, 1802, when he died, in the sixty-eighth year of his age. He was buried at Dalton, the place of his birth.

In person Romney was tall and strong, 'his features were broad and manly, his hair dark, his eyes large, quick, and discerning.'

Romney attained to greater eminence in two branches of art, history and portrait, than it is the lot of most men to attain in one. According to Flaxman, he surpassed all British painters in poetic dignity of conception; and in portrait he was the acknowledged rival of Sir Joshua Reynolds. His productions in poetic and historic art, finished and unfinished, are extraordinarily numerous, comprising every variety of subject from the illustration of the most simple historical fact, to the endeavour to embody the wildest fictions of the poets. Some of these designs were presented in 1817, by the painter's son, to the university of Cambridge, to be deposited in the Fitzwilliam Museum; and the Cartoons, so much admired by Flaxman, were by the same gentleman presented, in 1823, to the Royal Institution of Liverpool. They consist of eight from the story of Cupid and Psyche, two from that of Orpheus and Eurydice, and one from each of the following subjects.—Prometheus chained, Descent of Odin, Medea, Birth of Shakspere, Infant Shakspere, Death of Cordelia, Ghost of Darius, and Atossa's Dream.

The following examples will serve to show how extensively Romney was patronised in portrait:—the Duke of Richmond, the Duke of Portland, the Duke of Grafton, Lord Chancellor Thurlow, Warren Hastings, Cowper, Earl of Chatham, William Pitt, Gibbon, David Hartley, Sir Hyde Parker, Lord Melville, Lord Ellenborough, the Archbishops of Canterbury, York, and Dublin, Dr. Parr, Dr. Paley, John Wesley, Thomas Paine, Mrs. Fitzherbert, Mrs Jordan, and Flaxman modelling the bust of Hayley.

Romney was not a member of the Royal Academy, and he never sent any of his works to its exhibitions. He has had several biographers: Cumberland, the dramatist, wrote a short account of him; his friend Hayley, the poet, published an elaborate life, for which Flaxman wrote the character of his works; another was afterwards written by his son the Rev. John Romney; and there is an excellent memoir of him in Allan Cunningham's 'Lives of the British Painters,' &c.

The following are extracts from Flaxman's character of the works and genius of Romney:—'When Romney first began to paint, he had seen no gallery of pictures, nor the fine productions of antient sculpture: but then women and children were his statues, and all objects under the cope of heaven formed his school of painting.' 'His genius bore a strong resemblance to the scenes he was born in: like them it partook of the grand and beautiful; and like them also the bright sunshine and enchanting prospects of his fancy were occasionally overspread with mist and gloom.' 'Few painters have left so many examples in their works of the tender and delicate affections; and several of his pictures breathe a kindred spirit with the Sigismonda of Correggio. His Cartoons, some of which have unfortunately perished, were examples of the sublime and terrible; at that time perfectly new in English art.' 'His compositions, like those of the antient pictures and basso-relievos, told their story by a single group of figures in the front; whilst the background is made the simplest possible, rejecting all unnecessary episode and trivial ornament, either of secondary groups or architectural subdivision. In his compositions the beholder was forcibly struck by the sentiment at the first glance; the gradations and varieties of which he traced through several characters, all conceived in an elevated spirit of dignity and beauty, with a lively expression of nature in all the parts. His heads were various; the male were decided and grand; the female lovely; his figures resembled the antique; the limbs were elegant and finely formed; his drapery was well understood.' 'Few artists since the fifteenth century have been able to do so much in so many different branches.'

ROMORANTIN. [Loir et Cher.]

ROMSEY. [Hampshire.]

RO'MULUS. The numerous legends about Romulus, the founder of Rome, may be distributed into two principal classes. One of these represents him as closely connected with the royal family of Alba, and may be considered as the native legend which probably originated among the Romans themselves, and was almost universally believed by the Romans. The second, which connects Romulus with Aeneas and the Trojans, is manifestly of Greek origin, and did not become current until a comparatively late period of the history of Rome. According to the latter story, Romulus was sometimes described as the son of Aeneas, and sometimes as his grandson; and while some writers mention Romulus alone, others represent him as having a brother, (Remus), or several brothers. (See the various modifications of this legend, or rather Greek fabrication, in Festus, *s.v.* 'Roma;' Plut., *Romul.*, 2; and Dionys. Hal., i. 73; comp. Niebuhr, i., p. 210, &c.) This story leaves a vacuum in the history of Rome, which amounts to about three centuries and a half, that is, from the return of the heroes from Troy, till the middle of the eighth century before Christ, and various means were devised by antient writers, such as the building of a second, and even of a third Rome, for filling up this gap. But this story, notwithstanding its incongruities, has sometimes been adopted even by Roman writers, such as Sallust, who states that Rome was founded by Trojans, under the guidance of Aeneas. The genuine Roman legend made Romulus and Remus the twin-sons of Silvia, daughter of the Alban king Procas. The royal house of Alba was in later times represented as descended from Aeneas, while others, preserving the legend more in its original purity, made no mention of its Trojan descent. The main features of the Roman legend which are preserved in Livy (i. 3, &c.; Cic., *De Republ.*, ii. 5; comp. Plut., *Romul.*, 3, &c.; Dionys. Hal., i., p. 61, &c.), are these:—

When Procas, king of Alba, died, he left two sons, Numitor and Amulius. The latter wrested the government from his elder brother, who yielded without a struggle, and lived as a private person in quiet retirement. But Amulius, fearing that the descendants of his brother might punish him for his usurpation, had the son of Numitor murdered, and made his daughter Silvia a priestess of Vesta, an office which obliged her to perpetual celibacy. One day however when Silvia went into the sacred grove to draw water from the well for the service of Vesta, an eclipse of the sun took place, and the maid, frightened by the appearance of a wolf, fled into a cave. Here she was overpowered by Mars, who promised her a glorious offspring. She was delivered of twins, but the god apparently forsook her, for she was condemned and put to death by Amulius, and it was determined that the two children should be drowned in the river Anio. But the river carried the cradle, with the children in it, into the Tiber, which at the time had overflowed its banks. The cradle was driven into shallow water to a wild fig-tree (Ficus Ruminalis) at the foot of the Palatine hill. A she-wolf, which came to the water to drink, heard the cries of the children, and suckled them, whilst a woodpecker, which was, like the wolf, an animal sacred to Mars, brought them other food whenever they wanted it. This marvellous spectacle was observed by Faustulus, the herdsman of the flocks of king Amulius, and he took the children and carried them to his wife Acca Laurentia or Lupa. Thus they grew up in the shepherd's straw huts on the Palatine; that in which Romulus was said to have lived was kept up to the time of the emperor Nero. The two youths became the stoutest and bravest among their comrades, with whom they shared their booty. The followers of Romulus were called Quinctilii, and those of Remus, Fabii. A quarrel one day broke out between the two brothers and the shepherds of the wealthy Numitor. Remus was taken by a stratagem, and led to Alba before Numitor, who, struck by his appearance and the circumstance of the age of the two brothers, ordered Romulus likewise to be brought before him. Faustulus now disclosed to the young men the secret of their birth, and with the assistance of the faithful comrades who had accompanied them to Alba, they slew Amulius, and their grandfather Numitor was restored to the government of Alba.

The love of their humble home however drew the youths back to the banks of the Tiber, to found a new city. The district assigned to them for this purpose by Numitor extended in the direction of Alba as far as the sixth milestone, which was the frontier of the original *Ager Romanus*, and where, down to a very late period, the Ambarvalia were solemnized. A dispute arising between the brothers as to the site and name of the new city, it was agreed that it should be decided by augury. Romulus took his station on the Palatine, and Remus on the Aventine. Remus had the first augury, and saw six vultures, but Romulus saw twelve. Considering that his double number was a signal proof of the favour of the gods, Romulus and his party claimed the victory. In observance of the rites customary among the Etruscans in the building of towns, Romulus yoked a bullock and a heifer to a plough and drew a furrow round the foot of the Palatine hill to mark the course of the walls and of the pomerium. Over the parts where he intended to build the gates (portæ), he carried (portare) the plough. The new city thus built on the Palatine was called Roma. Remus, who felt indignant at the wrong which he had suffered, in order to show his contempt of the rude and simple fortifications, leaped over them; and Romulus punished his brother's insolence by putting him to death.

The population of the new city being very small, the gates were thrown open to strangers. Exiles, robbers, runaway slaves, and criminals flocked to the city as an asylum, and found a welcome reception. The only thing they now wanted was women; but none of the neighbouring people were willing to form matrimonial connections with the new settlers. Romulus therefore had recourse to a stratagem; he proclaimed that festive solemnities and games should be held in the city, and he invited his neighbours the Latins and Sabines to attend them with their daughters. In the midst of the solemnities the females were forcibly carried off: the number thus taken was said to have been thirty. The three nearest Latin towns, Antemnæ, Cænina, and Crustumerium, now took up arms against Rome, but Romulus defeated them successively, and having slain Acron, king of Cænina, he dedicated the first spolia opima to Jupiter Feretrius. The Sabines, under their king Titus Tatius, likewise made war upon Rome, and the treachery of Tarpeia, a Roman woman, opened to them the gates of the fortress on the Capitol. The Sabines attempted to storm the city, and Romulus in this emergency vowed a temple to Jupiter Stator, in order to inspire his men with courage and to prevent them from flying before the enemy. The war was continued with doubtful success, and finally terminated by the Sabine women throwing themselves between the combatants, and thus restoring peace between their fathers and husbands. Romulus rewarded the women of Rome for their services by the grant of various privileges, and the thirty curiæ were called after the names of the thirty Sabine women. The two nations, the Romans on the Palatine, and the Sabines on the Capitoline and the Quirinal, were united as one nation, though each continued to have its own king.

The two kings and the citizens of the two states met in the valley between the Capitoline and Palatine (comitium) whenever it was necessary to transact business which was of importance to both nations. This union however did not last long, for Tatius was killed during a national sacrifice at Lavinium, and Romulus henceforth ruled alone over the two nations.

During the period that Romulus was sole king, he is said to have carried on two wars, one against Fidenae, and another against Veii. Fidenæ commenced the war from fear of the growing strength of its neighbour; but Romulus got a victory over them by stratagem, and took possession of their town. The war against Veii rose out of that against Fidenæ, for both were Etruscan towns. Veii was likewise humbled, but it obtained a truce of one hundred years, after surrendering part of its territory to Rome.

Such are the fortunes and achievements which the old Roman legend ascribed to the founder of the city. Respecting his political institutions, see the article ROME. He is said to have died after a reign of thirty-seven years (716 B.C.). His death is represented in as marvellous a light as his birth. On the nones of Quinctilis, or on the Quirinalia, the king, while reviewing his people near the marsh of Capra, was taken up by his father Mars, and carried to heaven. The people in terror fled from the spot; but Romulus soon afterwards appeared as a glorified hero to Proculus Julius, and bade him inform his people that in future he would watch over them as the god Quirinus.

Such are the main features of the story of the founder of Rome, which was handed down by tradition, and commemorated in national songs to the time of Dionysius. (Dionys. Hal., i., p. 66.) Writers both antient and modern have attempted to elicit historical truth from this beautiful and in most parts truly poetical legend, or have struck out some parts of the narrative as altogether fabulous, and retained others which are more in accordance with the events of real history. The mischievous results of such perverse criticism have been clearly shown by Niebuhr (i., p. 235, &c.). The acts and institutions attributed to Romulus which are of any importance to the historian, and which from their connection with events of a more historical age, or with the general state of the nations of Italy, may be considered as history, are given in the article ROME.

RONCESVALLES (French, *Roncevaux*) is the name of a valley formed by the Pyrenees of Navarre between Pampeluna and St. Jean Pié de Port, on the French frontier. It is also the name of a small village in that valley, remarkable only for an antient abbey (Nuestra Señora de Roncesvalles), where the tomb of Don Sancho el Fuerte (the strong), king of Navarre, is shown, as well as several antient relics bearing the name of Roland. According to tradition, this hero, and many others of Charlemagne's peers, who had invaded Spain in 778, whilst attempting to regain France, were surrounded by the Navarrese, commanded by Bernardo del Carpio, and put to death. This event however, which forms the subject of many Spanish romances and chivalrous chronicles, is far from being supported by historical evidence.

RONDA, a city in the south of Spain, formerly belonging to the province of Malaga, is now the capital of a province so called since the late division of the Spanish territory. It is generally supposed, though erroneously, to occupy the site of the antient Arunda (Plin., iii. 1), which stood some miles to the south-west. It is an ascertained fact that it was entirely built by the Moors, with the remains of Acinippo, or Ronda la Vieja (old Ronda), which is two leagues to the north, and where the ruins of an amphitheatre, a temple, aqueduct, and extensive walls are still standing. Ronda is situated in the midst of the lofty mountains of the Sierra de Ronda, and is fourteen leagues from Gibraltar, twenty from Cadiz, and about the same distance from Seville. It is considerably elevated above the sea, being built on a hill, which terminates abruptly just below it to the west. The city is separated into two parts by a very narrow ravine of great depth, called El Tajo (the cut), through which flows the river Guadiaro. Though divided by nature, the city has been united by means of a bridge of most stupendous dimensions, springing from the banks of the river on massive stone piers, and at the height of nearly 400 feet above the bed of the river.

The city of Ronda has a population of about 20,000 inhabitants. The streets are narrow, but clean. There is a public walk, called Alameda, well shaded with trees and shrubs; and a Plaza de Toros (bull-ring), built entirely of stone, and capable of holding eight or nine thousand persons. The Alcazar, or Moorish castle, one of the most extensive and best built in all Andalusia, is now a mass of ruins, having been blown up by the French on their evacuation of Ronda during the Peninsular war. It was considered impregnable as long as the Moors held it, and resisted several sieges, until it was finally reduced by Ferdinand in 1485, towards the close of the Moorish war. [Moors.] With the exception of a few tan-yards, which are not in a very prosperous condition, Ronda has no trade whatever; the inhabitants occupy themselves chiefly in farming and raising fruits and vegetables for the consumption of Gibraltar. An annual fair, originally instituted for the sale of horses, but which now is not confined to that traffic, is held at Ronda. It is attended by merchants from almost every part of southern Spain.

RONDEAU (Fr.), or **RONDO** (It.), a kind of air consisting of two or more strains, in which, after finishing the second strain, the first is repeated, and again after the third, &c., always returning to and concluding with the first. (Rousseau.)

RONDELE'TIA, a genus of plants of the natural family of Rubiaceæ, named after Rondelet, a French botanist of the sixteenth century. It is characterised by having a calyx with a subglobular tube. Corol superior, funnel-shaped, ventricose at the throat. Segments four to five, ovate, obtuse, spreading. Anthers four to five, sessile within the corol. Ovary two-celled. Style filiform. Stigma bifid. Capsule round, crowned with the limb of the calyx. Seeds minute, numerous, or few when abortive. The genus, as formerly constituted, included many shrubby trees which occur in India (Roxb., *Fl. Indica*), but these have been referred by modern botanists to Adenosacme, Greenia, and Wendlandia. The present genus Rondeletia occurs chiefly in America and the West Indies.

RÖNGEBIRGE. [Germany.]

RONSA'RD, PIERRE DE, born in 1524, in the district of old France called Vendômois, was the son of a maître-d'hôtel of Francis I., who made him a knight. Pierre studied for a short time in the college of Navarre at Paris, but soon after he entered the service of the duke of Orléans, son of Francis I., in the quality of page. He afterwards attended, in the same capacity, James Stuart, king of Scotland, who had come to Paris to marry Marie de Lorraine, and he accompanied James on his return to Scotland, where he remained three years. On his return to France he resumed his post with the duke of Orléans, who sent him on several missions to Scotland, Ireland, and other countries. He was afterwards sent by Francis I. on a mission to Piedmont. In these several journeys he suffered much, in consequence of which he became deaf. On withdrawing from active life he retired to the college of Coqueret, where he studied the classics under Turnèbe, became a good Greek scholar, and took orders as a priest. He also began writing French poems, and was crowned in the floral games at Toulouse. [Clemence, Isaure.] He was considered as the successor of Marot, and the chief of the French poets of the time. [Marot.] Montaigne, De Thou, Scaliger, Muret, Pasquier, and others commended him highly; but modern critics have judged him more severely. Boileau says that Ronsard's language was a heterogeneous compound of various languages and dialects, and that his muse spoke Greek and Latin in French verses. Malherbe and La Bruyère have spoken of him in the same strain. Charles IX. bestowed on Ronsard an abbacy and other benefices. His moral conduct however is said not to have been strictly clerical. He died in 1585, in one of his livings near Tours, and a solemn funeral service was celebrated in honour of him at Paris, in the chapel of the college of Boncour. Ronsard had certainly poetical genius, but he was deficient in taste. He was in this respect in France what the seicentisti of the following century were in Italy and Spain. His poetical works are numerous; they consist of odes, hymns, eclogues, &c., 'Mascarades, Combats, et Cartels faits à Paris et au Carnaval de Fontainebleau.' He also began a poem, 'La Franciade,' which he left unfinished. His works are now nearly forgotten. The most complete edition of them is that by Richelet, 2 vols. fol., Paris, 1623.

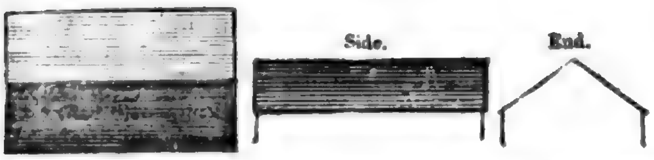
ROOD, the quarter of an acre. [Acre.]

ROOF, the covering of a house or other building. The name, in its most extended sense, embraces the external covering itself, and the framework by which it is supported; but, as a term in carpentry, it is limited to the carcass roof or framing.

The importance of this part of a building can hardly be overrated, since on its right construction depends not only the comfort of those for whose shelter it is designed, but also the safety and durability of the edifice itself. For the former of these purposes it is desirable that a roof should exclude extremes of heat and cold, and be impervious to rain or snow. For the latter, the exclusion of water is equally necessary, and it is essential that the framework be so disposed as to throw the least possible strain on the walls. By a judicious arrangement in this particular, a roof may not only be prevented from pressing on the walls in an injurious manner, but may be made to contribute greatly to the stability of the whole structure. In order to the due combination of the requisite qualities, an intimate acquaintance with the principles of mechanical philosophy is indispensable; and a correct knowledge of the strength of different materials, when exposed to various kinds of strain, is necessary to the economical adjustment of the dimensions of the several parts of a roof. A roof of large span forms, indeed, one of the most interesting applications of the science of carpentry, theoretical or constructive.

In order to cover in a building in which the space to be spanned is greater than can be covered by single blocks of stone extending from one point of support to another, it is necessary either to have recourse to the principle of the arch, as in vaults and domes of stone or brick, or to form a framework of timber to support the covering. The former plan is objectionable in the case of ordinary buildings from its expense and weight, and from the great solidity required in the walls, where they have to be used as the abutments of an arch. The principles on which such coverings of masonry are formed are explained under Arch and Dome, and in this article the more usual kind of roof, that sustained by a wooden framing, will be described. Such structures occasionally partake of the character of an arch or dome, but more usually consist of flat planes variously disposed. Roofs formed of one level plane, which are extensively used in eastern countries, are not adapted for buildings in which a large space has to be spanned over, nor to resist the penetration of water; and are therefore unsuitable for climates in which rain and snow are common. A simple inclined plane is well adapted to resist injury from weather, but, as it is scarcely more favourable to an economical disposition of the timbers than a flat roof, it is only suited for small buildings, and is seldom used except as a lean-to. Another objection to its use on a large scale is the disproportionate height it requires in one side of the building. The best figure for a simple roof is that formed of two inclined planes, rising from the two opposite walls that approach nearest to each other, and meeting over the centre of the edifice, so as to form a ridge. By this form, supposing the same slope to be maintained, one half of the height of the single inclined plane is avoided; and, the length of the timbers being diminished one half, their scantling may be considerably reduced. *Fig.* 1 represents a plan, with side and end views of such a roof, which is called a *common* or *gable-ended roof*

Fig. 1.



Frequently four inclined planes are used, disposed as shown in *fig.* 2, representing a *hipped roof*, which takes its name from the hips, or inclined ridges formed by the meeting of the sides and ends. Where a hipped roof covers a perfectly square building, the faces all meet in a point, and form a pyramid; but when, as in the diagram, the plan of the roof is oblong, the planes rising from the nearest opposite walls meet in a ridge. Sometimes the inclined faces are not continued upwards till they meet, but the roof is completed by a horizontal plane. Such a roof is called a *truncated*, *terrace*, or *cut roof*, and may have two, three, or four inclined faces. *Fig.* 3 represents a truncated roof hipped at one end, and terminating at the other in a vertical wall, like the gable-ended roof.

Fig. 2.

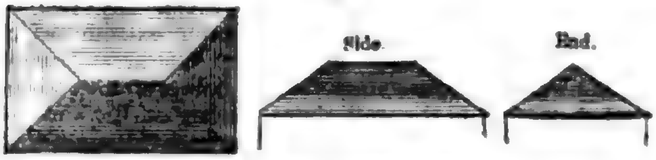
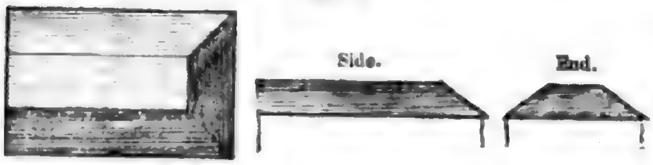
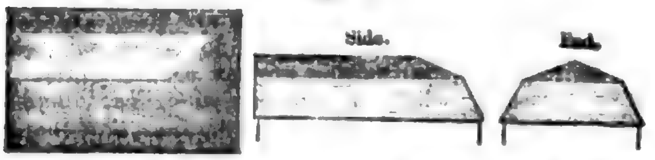


Fig. 3.



This arrangement is useful in diminishing the height of a roof, the level platform being covered with lead to compensate for the want of slope. It should be observed however that even this part is not perfectly level, the centre being slightly elevated to throw off water. A similar saving of height is frequently obtained by means of a roof in which each sloping face consists of two planes of different degrees of inclination. This form, which is denominated a *curb roof* (or, from its inventor, a *Mansarde roof*), is very common in London, because it affords more space for the formation of bedrooms in the roof than the simpler forms. A curb roof may be hipped or not, according to circumstances. *Fig.* 4 represents it hipped at one end only, as the last figure, showing, like the previous diagrams, the plan, and side and end elevations.

Fig. 4.



Such are the principal forms of roof used in covering simple rectangular buildings, but they require many modifications to suit irregularities of shape, or combinations of rectangular forms. Thus in *Figs.* 5 and 6, which represent the junction of different roofs or portions of roofing at right angles with each other, the lines *a a a* indicate *valleys*, or the junction of two planes in such a manner as to form hollows the reverse of hips. When two faces of a roof join so as to form an angle similar to a valley, but in an horizontal instead of an inclined position, the term *gutter* is applied instead of valley.

Fig. 5.

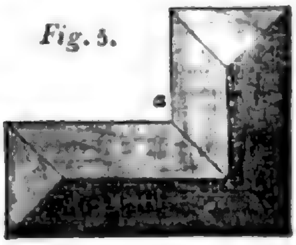
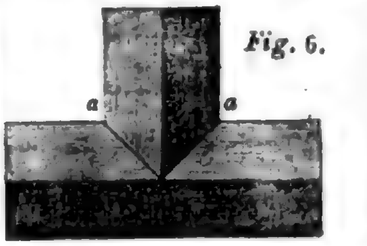


Fig. 6.



A further distinction, which it may be well to mention before entering upon the details of construction, is that between roofs with dripping eaves, and those in which the water is collected in gutters. In the former case the roof projects several inches, or even feet, beyond the walls, and the water running from the roof either drops at once on the ground, or is collected in troughs fixed under the margin of the eaves, and conducted by them to descending pipes. This arrangement has a clumsy appearance, and is perhaps unnecessary where a sufficient projection is given to the eaves, though it is essential to the dryness of the walls when they are of the diminutive size often adopted by modern builders. In gutter roofs the timbers do not extend to the outside of the walls, which are carried up as parapets, of a reduced thickness, to such a height as to conceal the roof either wholly or partially. The gutters, which are troughs of wood covered with lead or other metal, are laid at the bottom of the slopes, just within the parapets, and have a gentle inclination (usually about an inch in ten feet), to cause water to run freely towards the pipes. In extensive roofs it is well to use two or more falls instead of one, that the elevated end of the gutter may cover as little of the roof as need be. Similar troughs are often used in the valleys. Gutters are generally made wide enough for a man to walk along them, and should be sufficiently capacious to avoid all risk of overflowing during a sudden heavy fall of rain.

The degree of slope given to the inclined faces of a roof varies according to the covering material employed, as well as to the climate. The antient Grecian temples had very low, or pediment roofs, varying from about 12° to about 16°, the height being from one-ninth to one-seventh of the span. In Roman buildings the inclination is somewhat greater, being usually 23° or 24°, or from one-fifth to two-ninths of the span. The general introduction of the pointed style of architecture led to the use of very high-pitched roofs, a very common proportion being that in which the length of the rafters is the same as the span, so that they formed an equilateral triangle. In comparatively modern domestic architecture in this country, it has been considered desirable for the length of the rafters to be three-fourths that of the span, and an angle of 45° is still considered by some to be the best pitch when plain tiles are used. As builders can, in the present day, obtain excellent covering materials, the pitch may be made of any required degree, down to the low Grecian pediment, and it therefore depends on the style of architecture and the taste of the builder; the most common height being from one-fourth to one-third of the span. High roofs discharge rain the most rapidly, and do not retain snow so much as those of low pitch; but where they have gutters they are liable to become choked by snow sliding into them, and to overflow from water running into them faster than the pipes can convey it away. Steep roofs may be covered with small slates, and are less likely to be stripped by violent winds. Low roofs, in consequence of their superior lightness, are less expensive, the timbers not only being shorter, but of proportionately smaller scantling, and they press less injuriously on the walls. The following table, extracted from Tredgold's 'Elementary Principles of Carpentry,' shows the proper angle for roofs covered with the materials specified in the first column, the last column indicating the comparative weight of each kind of covering:—

Covering.	Inclination to the horizon.	Height of roof in parts of the span.	Weight upon a square of roofing.*
Copper or lead ...	3° 50′	[illegible]	copper 100 lead ... 700
Slates, large	22°	$\frac{1}{5}$	1120
Ditto, ordinary ...	26° 33′	$\frac{1}{4}$	900 to 500
Stone slate	29° 41′	$\frac{2}{7}$	2380
Plain tiles	29° 41′	$\frac{2}{7}$	1780
Pan-tiles	24°	$\frac{2}{9}$	650
Thatch of straw, reeds, or heath ..	45°	$\frac{1}{2}$	.. ..

In describing the timber-work of an ordinary roof, each of the planes of which it is composed may be considered to be bounded by a frame, the parts of which have the general name of bordering pieces. Those which join the wall are the *wall-plates*; that at the meeting of two faces, parallel to the wall-plates, is the *ridge-piece*; and the inclined bars extending from the wall-plates to the ridge-piece are *rafters*, those which form the salient angles in hipped roofs being distinguished as *hip-rafters*. The support necessary for the external covering is given by a series of rafters or inclined bars, extending from the wall-plates to the ridge-piece, and placed parallel with each other at equal distances. In a hipped roof, the rafters near the ends, being parallel with the others, are necessarily diminished in length, extending from the wall-plate to the hip-rafter instead of the ridge-piece. All such pieces, being shorter than the length between the wall-plate and the ridge-piece, are called *jack rafters*.

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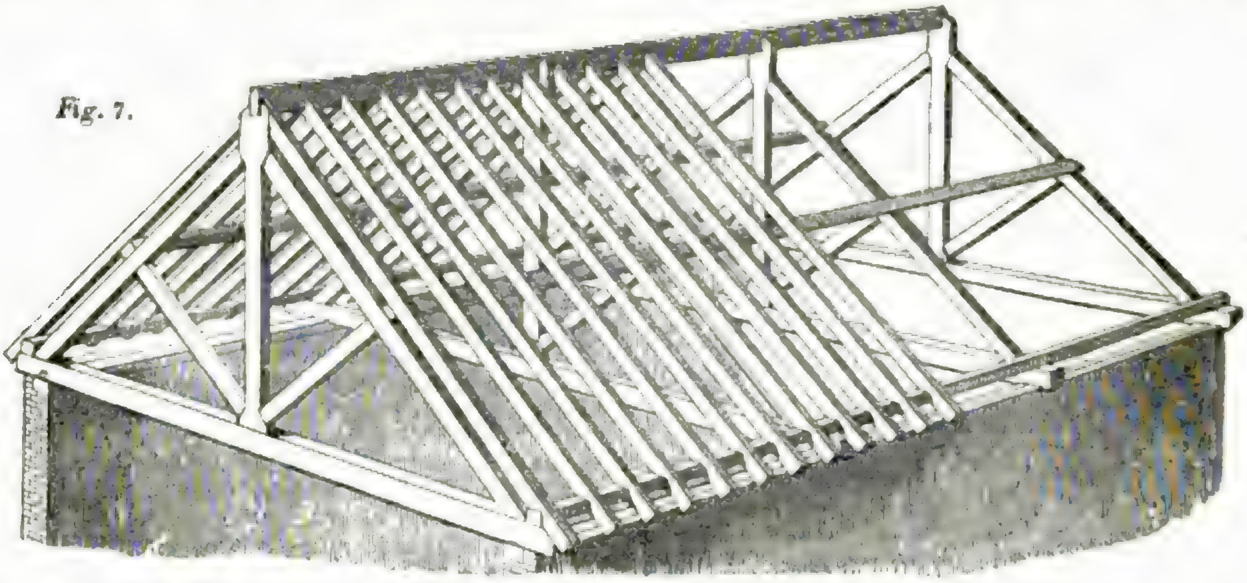
* A square of roofing contains 100 square feet.

It is not usual to vary the scantling, or transverse dimensions of rafters, in any considerable degree, on account of their various lengths; nearly the same scantling being used in all buildings, and the required strength being obtained by introducing intermediate supports between the wall-plates and ridge-piece where the size of the roof renders such necessary. This additional support is supplied by horizontal rectangular bars called *purlins*, placed under the rafters in such a manner as to divide their length into two or more equal parts, the ends of the purlins being fixed to the sides of the bordering frame. Like the rafters, the purlins are not much varied in thickness according to the strain upon them, but they are in turn supported by a series of bars placed equidistant from each other, and parallel with the rafters, but with their upper face in the same plane as the lower face of the purlins. These are called *principal rafters*, or, for brevity, *principals*, to distinguish them from the first described, or *common rafters*. Where it is desirable to save room by reducing the thickness of a roof, the purlins may, as shown in *fig*. 15, be notched into the principals and common rafters, but this practice is not to be recommended, as it weakens the timbers. Where principals are used, their lower ends are mortised into the ends of a *tie-beam*, which stretches across the building, and rests upon the wall-plates. This beam keeps the lower extremities of the principals from separating, and discharges the weight of the roof on the walls in a vertical direction, relieving them entirely from the lateral thrust of the rafters. The triangular frame formed by the two principals and a tie-beam, with any bars it may comprise for additional strength, is called a *truss*, and such frames being placed at regular intervals, the timber-work between any two of them is called a *bay of roofing*. The lower extremities of the common rafters, being elevated by this arrangement above the wall-plates, are supported by *pole-plates*, or pieces of timber parallel to the wall-plates, resting on the ends of the tie-beams. The supporting frame-work altogether is called a *carcass-roof*.

Fig. 7, which represents a small carcass-roof supported by four trusses, and having one purlin only between the wall-plate and ridge-piece, may assist the reader in comprehending the arrangement of the parts enumerated; and their names will be found more distinctly by referring to the representation of a more complicated truss at *fig*. 11.

Fig. 7.



In this figure the common rafters are represented on one half of the roof only, that the trusses may be more distinctly seen; and the end walls are omitted for the same reason.

The proper construction of the trusses of a roof, with reference to the size of the building and the weight of the covering, is a matter requiring much scientific knowledge. For the want of this it is not unusual to encumber trusses with much more timber than is necessary or useful; and the disadvantage of this is not confined to the increased weight and cost of the roof, as superabundant timbers frequently occasion injurious strains, and the increased number of joints adds to the risk of derangement by the shrinking and warping common to all timber constructions. The general principles to be acted upon may be illustrated by a few diagrams; but in the limited space devoted to this article no attempt can be made to describe all the modifications required by the ever-varying forms of buildings; in the design of which it is too common, instead of assigning its due importance to the roof, to treat it as an unsightly feature, to be concealed as much as possible from view.

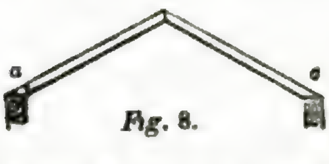


Fig. 8.

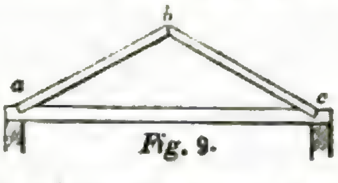
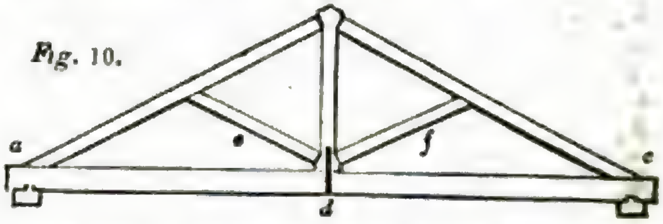


Fig. 9.

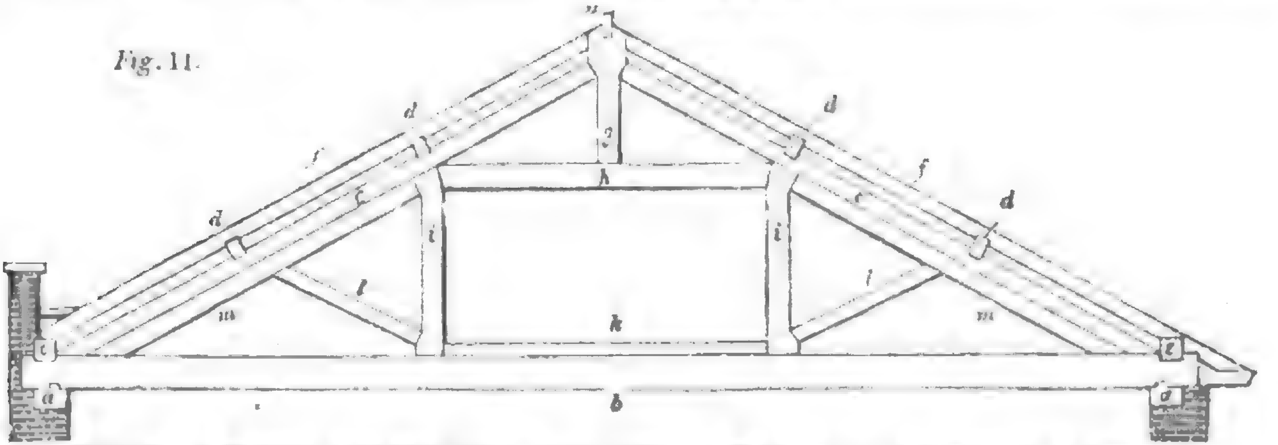
In a roof formed as shown in *fig*. 8, consisting simply of two inclined planes abutting on the walls, it is evident that the weight of the rafters *ab* and *bc*, as well as that of the covering sustained by them, will have a tendency to thrust out the walls. This tendency ordinary walls have not the strength to resist, and therefore it becomes necessary to add the beam *ac* (*fig*. 9), which, by receiving the outward thrust of the rafters, relieves the walls of lateral strain. If the tension of the tie-beam *ac* be sufficient to resist the extending force of the rafters without sensible elongation, the only effect that such a roof can have upon the walls is a vertical pressure on each, equal to half its weight; and it cannot fall without the tie-beam, which acts the part of a cord or chain, being pulled asunder, or the rafters being crushed. If the materials were perfectly rigid, no additional parts would be required; but as they are not so in practice, it becomes necessary, when the timbers are of considerable length, to provide means for counteracting their tendency to sinking, or *sagging*. By adding a bar shaped like *bd* (*fig*. 10), the centre of the tie-beam may be suspended from the crown of the roof. This piece is called a *king-post*, but the name is perhaps not a good one, as, though it appears like a post to support the ridge or crown of the roof, it is in reality a *tie*, supported by it, and sustaining, instead of resting upon, the centre of the tie-beam. By cutting the king-post out of a piece of wood of larger scantling than the shank of the post itself, projections of the shape indicated in the cut may be formed at its ends. These are called *joggles*, and those at the upper end form a wedge between the heads of the rafters, like the key-stone of an arch. It is evident that a weight pressing on the projecting joggles at the base of the king-post will be by it transmitted to the

Fig. 10.



crown of the roof. These therefore form fixed points, from which support may be obtained, by means of *struts* or *braces*, *e* and *f*, for the centre of each rafter. Where purlins are added, they rest on those points of the principal rafters that are thus supported by struts, as may be seen by reference to *fig.* 7. It may be observed that this truss consists of two pieces (the tie-beam and king-post) in a state of tension, and four (the two rafters and the two struts) in a state of compression; and that in every well-contrived truss, however the number of its component parts may be increased, every bar is in one or other of these states. Those parts which are in a state of tension, acting merely as cords to bind the truss together, may be and sometimes are formed of slender rods of wrought-iron; but the others, needing stiffness as well as cohesion, require bars of considerable substance, and are therefore mostly formed of wood or cast-iron. Sometimes the king-post is dispensed with, and its office performed by two similar posts, called *queen-posts*, at equal distances from the centre of the truss. In order to keep these in their right position, a short horizontal beam, called a *collar-beam*, is inserted between their upper extremities, and another, termed a *straining sill*, between their lower ends. This arrangement is explained by *fig.* 11, which also shows the position of other parts of a truss. One side is represented as a gutter-roof, and the other with eaves.

Fig. 11.

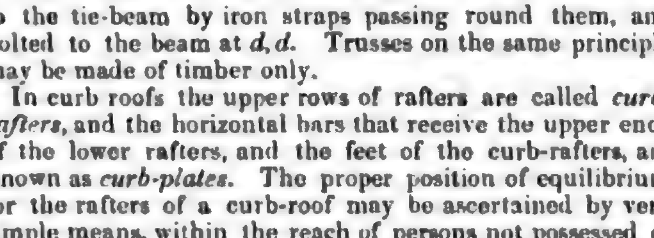


a a, Wall-plates. *b*, Tie-beam. *c c*, Principal rafters. *d d d d*, Purlins. *e e*, Pole-plates. *f f*, Common rafters. *g*, King-post. *h*, Collar-beam. *i i*, Queen-posts. *k*, Straining-sill. *l l*, Struts or braces. *m m*, Auxiliary rafters. *n*, Ridge-piece.

The *auxiliary* or *cushion rafters*, *m*, *m*, are pieces occasionally added, in large roofs, to strengthen the principals; and they, with the collar-beam, &c., form a complete truss within them. The trusses of truncated roofs are formed in this manner, the collar-beam forming, as it were, the keystone of the arch, and being surmounted by a *camber-beam*, the upper edge of which is formed into two slightly inclined planes, to give the necessary slope to the lead covering. In such a roof, pieces of wood resembling ridge-pieces are inserted at the angles formed by the meeting of the rafters with the horizontal bars that support the flat.

The following representation of a very simple truss, from Nicholson's 'Carpenter and Joiner's Companion,' illustrates the use of slender king-posts and queen-posts of wrought-iron, and shows how the stress of every part of the roof may be brought to bear on the ridge. The lower ends of the struts rest in stirrups attached to the vertical rods, and the weight bearing on the strut *a* is imparted, through *b* and *c*, to the king-post. The tie-beam is suspended by bolts from each of the vertical rods, and the ends of the rafters are secured to the tie-beam by iron straps passing round them, and bolted to the beam at *d*, *d*. Trusses on the same principle may be made of timber only.

Fig. 12.



In curb roofs the upper rows of rafters are called *curb-rafters*, and the horizontal bars that receive the upper ends of the lower rafters, and the feet of the curb-rafters, are known as *curb-plates*. The proper position of equilibrium for the rafters of a curb-roof may be ascertained by very simple means, within the reach of persons not possessed of sufficient mathematical knowledge for determining it by calculation. If the rafters are to be equally loaded, as in a roof entirely covered with one material, this position will be exactly the reverse of that which they would take by gravity, were they suspended in a chain or festoon, the joints being flexible. If they are framed together in this position of equilibrium, they will balance each other like the stones of an arch; and the tie-beams, posts, and braces will have no other office to perform than that of resisting such irregular strains as might tend to alter their arrangement. The rafters thus suspended would fall into the position *a b c d e*, *fig.* 13, a line drawn through the angles being a catenarian curve; and $a'\,b'\,c'\,d'\,e'$, in the same figure, represents the corresponding position in which they should be placed in an equally loaded roof. If the rafters *b c* and $c'\,d'$ are to bear a greater weight than $a'\,b'$ and $d'\,e'$, they will, if proportionately loaded when suspended in a curve, fall in such a way as to increase the angles *a b c* and *c d e*, and diminish *b c d*, thereby indicating their proper position in the roof. When the roof is to be loaded unequally, and more on one side of the ridge than the other, as it would be if $b'\,c'$ were to be covered with lead, and the other planes with slates, a corresponding weight added to the centre of gravity of *b c* will cause the bars to arrange themselves as *a b c d e*, *fig.* 14, the angles of which, being transferred to the roof, give the position of equilibrium $a'\,b'\,c'\,d'\,e'$. This practical method of finding the proper angles of a curb-roof may be applied under all circumstances, the dimensions of the experimental bars being proportionate to those of the rafters, and their centres of gravity being loaded according to the pressure to be sustained by each plane of the roof. The great advantage of curb-roofs consists in the space they afford for chambers in the roof, such chambers being lighted by dormer windows in the lower inclined faces. When the trusses of the roof form partitions between the bed-rooms, their posts and braces are so arranged as to leave one or more doorways for communication between them.

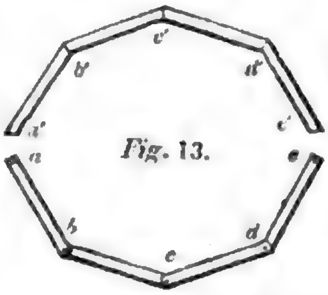


Fig. 13.

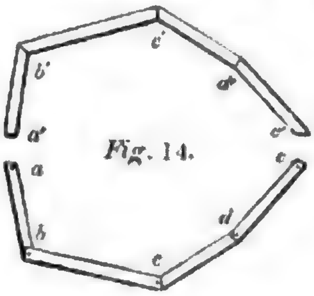


Fig. 14.

In roofs of very large span it is often desirable, in order to avoid running up to a great height, to form two or more ridges. When intermediate support can be obtained from partition walls, such constructions may be regarded as combinations of two or more distinct roofs placed side by side. *Fig.* 15 is an example of a roof of large span without any intermediate support, and having a large available space between the tie and collar beams. It represents the form of the trusses, which were placed fifteen feet apart, of a roof of eighty feet span, erected over Drury-Lane Theatre in 1793.

It is sometimes necessary, in order to obtain additional height inside a building, to raise the tie-beam above the

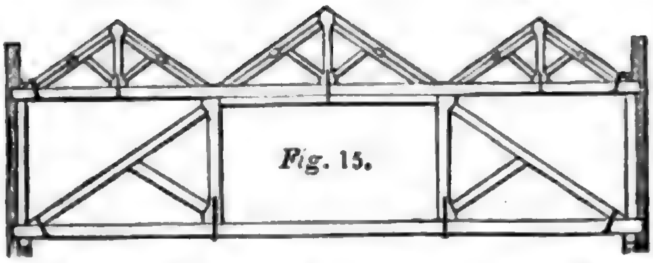


Fig. 15.

level of the top of the walls. In small spans this may be done by the simple arrangement called the *carpenter's boast* (A, *Fig.* 16), in which a firm union is effected between the beam and the rafters without the use of nails or pins. Such a roof can only press injuriously on the walls by the rafters sinking into a concave form, which however their lower ends are very liable to do. In such a case additional strength may be obtained by inserting a longitudinal truss, as in B, *Fig.* 16, where *c* represents the end of the truss, which should be firmly built into the gables. *d* and *e* are side views of two longitudinal trusses suitable for such a situation, the first being stiffened by an arch of iron notched into the short vertical pieces, and the second formed of timber only. Similar trusses are occasionally introduced under the purlins. Roofs without ties may be greatly strengthened by the use of parabolic curves of iron, notched into the rafters of each inclined face, and abutting on the wall-plates, which in such a case are firmly bolted together. The timbers of such a roof may be framed together in planes, each having a distinct ridge-piece, and the ridges being screwed or otherwise firmly connected together. The curves may be cast in short segments, as they are compressed when in use, it being merely necessary to provide that the joints should always abut on a rafter. Tredgold, in his 'Elementary Principles of Carpentry,' recommends the use of similar curves, of either wood or iron, in the trusses of an ordinary roof, by which the derangement often arising from the shrinking of the king-posts and queen-posts may be avoided. In this case the curves take the place of the principal rafters, and, if made of wood, may be constructed of short straight pieces, arranged as shown in *Fig.* 17, and held together by bolts or wooden keys. When curved timber can be obtained it is to be preferred, as it reduces the number of joints. For small roofs timbers may be bent into the required form, as it is found that a piece of wood the thickness of which does not exceed $\frac{1}{18}$th part of its length, may be bent into a curve rising one-eighth of its span without impairing its elasticity. Two such pieces may be laid together, and bent by twisting a rope attached to their ends, as is done in tightening the frame of a bow or pit saw; and, being bolted together while curved, they will spring back but little when the rope is relaxed. Another mode of forming such a rib is to take a piece of wood whose thickness is about one-sixtieth of its length, and cutting along the middle with a thin saw from each end, leaving about eight feet in the centre solid. The beam may then be bent, and bolted or pinned together as before described. In either case the rib should be bent about one-fourth more than it is intended to remain, to allow for springing back. A parabolic curve is the form most recommended; but a circular arc, rising half the height of the roof, will answer the purpose. *Fig.* 18 represents the truss of a truncated roof strengthened by a curved rib, the suspending pieces being, when the rib is formed in the manner first described, placed at each joint, and each consisting of two pieces, one on each side of the rib, notched to it and the beam, and fastened by bolts and straps.

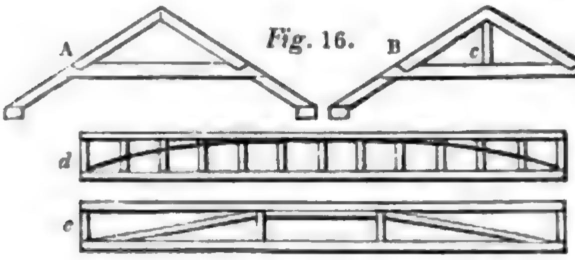


Fig. 16.

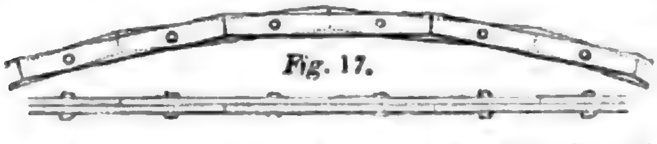


Fig. 17.

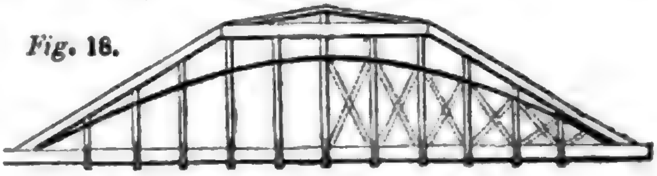


Fig. 18.

One of the advantages of this mode of construction is that the tie-beams may be suspended from any number of points, which is important in large spans, where the beams have to be formed of several pieces scarfed together. [SCARFING.] Diagonal braces, though unnecessary with parabolic curves, may be added to meet accidental strains, as shown by the dotted lines in the cut. This principle of construction, with an arc composed of several pieces of timber, was followed in one of the largest roofs ever built, that erected in 1791 over a riding-house at Moscow. The span of this roof, which has been said to be the most extensive in the world, is stated by Tredgold at 235 feet, the slope being about 19°, and the external dimensions of the building 1920 by 310 feet. He states that it had sunk so much that it was proposed to add a second curve for additional strength.

A simple and economical roof, invented by Mr. A. H. Holdsworth, and rewarded by the Society of Arts in 1820, is supported by curved ribs of timber applied in a different manner. A detailed description is given in the 38th volume of the Society's 'Transactions,' but *Fig.* 19 will sufficiently explain the principle of its construction: *a* is a beam serving as a tie-beam, and also to support the upper floor of the building; *b b* are curved ribs, formed in a similar manner to those just described, the lower ends of which are firmly secured to the tie-beam *a*. The principal rafters rest on these ribs, and their lower ends bear upon short timbers resting on the walls, these pieces being fastened by strong iron straps to the curved ribs, to counteract the outward thrust of the rafters. By this arrangement the whole of the interior of the roof, which is usually encumbered with king-posts, queen-posts, braces, &c., is rendered available for useful purposes, in addition to which it effects a considerable saving of timber.

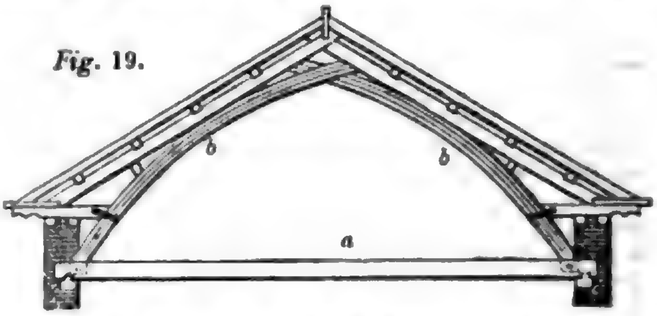


Fig. 19.

Wrought-iron straps of various forms are very useful when judiciously applied, in strengthening the joints of a roof. They should be fixed with regard to the unavoidable tendency of the timbers to shrinking, so that while they may, in some cases, counteract or lessen its effect, they may so far yield to it as to prevent a strain which should come upon a timber, being entirely thrown, by its alteration of form, upon the strap. Tie-beams are often suspended to the trussing-posts by means of straps, so arranged as to allow the beam to be keyed up to its true position in case of the roof sinking. When this is not the case, the ties are sometimes drawn up into a slightly convex or cambered form, to meet the same contingency. Height may be gained inside a building by disposing the timbers as in *fig.* 20, the want of a continuous tie-beam being compensated for by an iron strap to unite the ties to the bottom of the king-post at *a*; but it is evident that the safety of the plan must depend wholly on the straps, which alone counteract the outward thrust of the rafters.

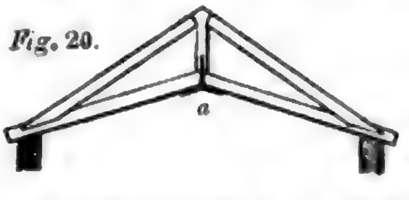


Fig. 20.

In roofing a church with a nave and side aisles, the continuity of the tie-beams may be dispensed with, intermediate support being obtained from columns. It is however necessary to guard carefully against any lateral strain to the columns.

Many of the high-pitched roofs of old Gothic churches and halls are very ingeniously contrived, but they often throw great pressure on the walls, owing to the absence or elevated position of the ties; thereby rendering very solid walls and buttresses necessary. The *Norman roof* is an ingenious contrivance for the construction of roofs of large span with small pieces of wood. *Fig.* 21 shows this arrangement, in which all the rafters abut on joggled king-posts, of which there are several, their relative position being maintained by diagonal braces. The timbers of this kind of roof are often left visible, being so carved as to have an ornamental effect. Such a roof may be made to exert very little injurious pressure on the walls.

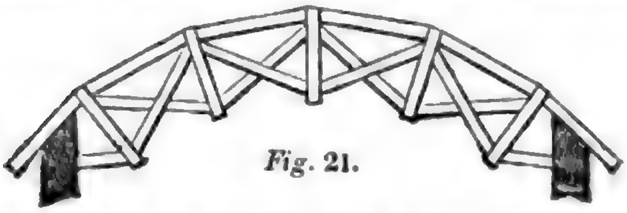
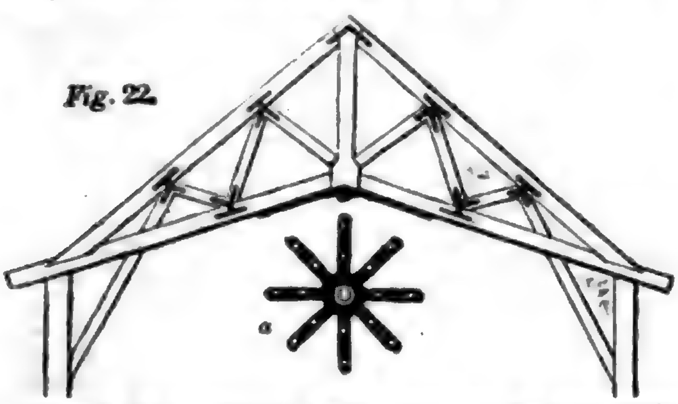


Fig. 21.

When the space covered in is of an irregular shape, it is best to arrange the inclined planes of the roof in a similar manner to those of a rectangular building, leaving a level platform in the centre, corresponding to the plan of the inclosed space. Where the space covered is circular, elliptical, or polygonal, although the construction of the roof may appear more complicated to the eye, it is, in fact, simpler and easier than that of a quadrangular building, the strain of the roof being more equally distributed. The nearer a roof approaches to a circle in plan, the stronger it will be, the parts deriving that mutual support from each other which forms the distinguishing character of the dome. Domes of wood, of great size, have been made without trussing, simply by forming the timbers into curved ribs abutting on the wall-plates, which then form a circle, and kept in their proper positions by horizontal circles framed with them at intervals. As the ribs approach the upper part of the dome, the intervals between them diminish in width, to allow for which every second or third rib is discontinued at intervals, the ends of the ribs thus discontinued being received by the horizontal circles, which may be compared to purlins, the ribs taking the place of rafters. The wooden dome formerly existing at the Halle aux Blés, at Paris, was a remarkably bold example of this kind, being 200 feet in diameter, and having a large opening in the centre. It was built at the suggestion of M. Moulineau, and, having been destroyed by fire, has been replaced by a similar structure of iron, but of smaller dimensions.

When the roof approaches the circular form, but not sufficiently to have the character of a dome, it may be considered as consisting of several trusses resembling those of an ordinary roof, but so contrived as to intersect each other in the centre; the king-post being common to all the trusses. *Fig.* 22, representing a design for a polygonal roof, from Nicholson, may illustrate this, and exemplify also some of the applications of iron straps *a* shows the form of the strap by which the ties are secured to the king-post; the post having as many faces, and the strap as many arms, as there are trusses in the roof.

Fig. 22.



Though the number of contrivances for the construction of roofs is very great, as may be seen by reference to various works on carpentry, allusion can here be made to only one other. It is an admirably simple plan for making a very flat roof, described in the 37th volume of the 'Transactions' of the Society of Arts, in a communication from the inventor, Mr. Smart. The beams or rafters are cut, with a circular saw, as shown at *a*, *fig.* 23, while *b* represents their form when in use, a wedge being inserted between the ends of the parts that are elevated into a sloping position. These may be raised to an angle of 10° or 12°, and will bear a great weight, as they cannot be depressed without thrusting off the ends of the beam, or breaking the lower part of it by tension. This is called, by the inventor, the *bow and string rafter*, and was used by him to support a roof at the Ordnance Wharf, Westminster Bridge. Strong laths were nailed upon the rafters, and on these a platform of bricks was laid in cement, the whole being covered with tiles also bedded and pointed with cement, and twice coated with hot linseed-oil. The cost of this roof is stated to be not more than half that of lead. For a further notice of the experiments of the inventor of this simple truss, see Trussing.

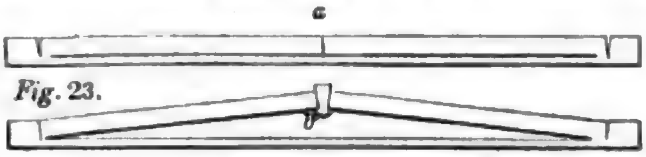


Fig. 23.

In the valuable practical works of Nicholson, Tredgold, &c. the methods of calculating the strength necessary in the various parts of a roof may be found; and in the 'Principles of Carpentry,' by the latter author, tables are given of the dimensions suitable for different spans. The table here quoted refers to a roof similar to *fig.* 7; the trusses being not more than ten feet apart, and the pitch at an angle of about 27° with the horizon, for a covering of slates. The scantlings are suited for yellow fir, and must be some what increased for timber of inferior quality.

Span.	Tie-beam.	King-post.	Principal Rafters.	Braces.	Purlins.	Common Rafters.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
20	9½×4	4×3	4×4	3½×2	8 ×4¾	3½×2
22	9½×5	5×3	5×3	3¾×2½	8½×5	3¾×2
24	10½×5	5×3½	5×3½	4 ×2½	8½×5	4 ×2
26	11½×5	5×4	5×4½	4¼×2½	8¾×5	4¼×2
28	11½×6	6×4	6×3½	4½×2¾	8¾×5½	4½×2
30	12½×6	6×4½	6×4	4¾×3	9 ×5½	4¾×2

For the strength of different materials, under various circumstances, the reader may consult Materials, Strength of, vol. xv., p. 8. As a general remark, it may be observed that oak, when exposed to tension, is weaker than fir, and is therefore less adapted for ties. Being however less compressible, it is usually preferred for rafters, straining pieces, and struts; but Tredgold observes that its greater tendency to warping in summer renders it less fit for rafters and purlins than foreign fir. Cast-iron is not much used, except in fire-proof roofs, and each piece requires to be well tested. Wrought-iron is very useful for straps and fastenings, and also for ties and trussing-posts; but care is always necessary to guard against imperfections, which are more likely to pass unobserved than in wood. Wherever iron is applied, provision should be made for its expansion and contraction, and it is desirable to protect it from oxidation by painting. Though iron is far stronger for its size than any kind of timber, it is neither so strong nor so cheap as yellow fir, *weight for weight.*

The joints in the frame-work of a timber roof are of various kinds, according to the nature of the strain they have to resist. They should be formed with great care, and with due regard to such probable changes of form as all constructions of timbers are liable to from shrinking and warping. *Cocking* or *cogging* is the name given to that kind of joining in which one piece of timber, in a state of tension, is so attached to another that it cannot be drawn away without one piece breaking. *Figs.* 24 and 25 represent two methods of cocking the ends of tie-beams on the wall-plates, giving a plan and elevation of each. In both figures *a* represents the beam, and *b* the wall-plate. In the first plan, which was formerly much practised, the contraction of the dove-tailed end of the beam would allow it to be

Fig. 24.

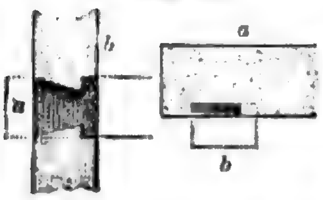
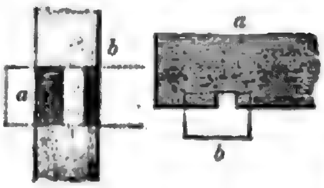


Fig. 25.



drawn considerably out of its place, and would therefore permit the walls to spread; but in the second the amount of contraction is diminished, owing to the small width of the rectangular tongue that enters the tie-beam, while its position is such as to prevent the beam being drawn out of its place beyond the actual extent of the contraction of the tongue. The shrinking of the joggles of king-posts and queen-posts is often productive of serious derangement, a circumstance greatly in favour of the substitution of iron for wood for such parts, especially in large roofs. This inconvenience is sometimes avoided by making the upper ends of the principal rafters abut immediately upon each other, as represented in *fig.* 12. A similar arrangement is made, in some cases, where wooden king-posts are used, the king-post and rafters being strapped together with iron. The sinking of a roof, particularly if it be of low pitch, is very injurious to the mortise-and-tenon joints of the struts and rafters, by throwing the strain on the shoulders of the tenons in such a way as to break off the tenons or splinter the wood. To guard against such injuries, it has been proposed by M. Perronet, a French engineer, instead of making the tenons and joggles square, to form them into circular arcs, the centres being at the opposite end of the strut or rafter. This plan appears worthy of general adoption, as it allows the joints to accommodate themselves to changes of form without injury. All the timbers of a roof are usually fitted and framed together on the ground, and taken to pieces again before being elevated to the building.

Allusion has been made in a previous column to the various materials used for the covering of roofs, with reference to the different degrees of inclination suitable for them. Thatched roofs have been considered by some to maintain the most equable temperature in the buildings covered by them, keeping out alike the extreme heat of summer and cold of winter. They are objectionable on account of their harbouring vermin, being easily damaged by wind, and dangerously combustible. The frequent repairs required make thatch also an expensive material. Besides straw, reeds and heath are sometimes used for thatching, and possess the advantage of greater durability. Tiles admit heat and moisture more than good slates. Pantiles, having no holes for nailing through, are simply hung, by ledges, upon laths nailed to the rafters. Plain tiles, laid in mortar, and over-lapping, so as to be double thickness everywhere, make a very good though heavy covering. Tiles of a peculiar form, called *hip-tiles*, are used for covering salient angles; and *gutter-tiles*, which are similar to them, but placed with the concave side upwards, in the valleys or receding angles. Slates are laid in various ways. They are sometimes nailed down on a close boarding; or, if large, on *battens*, or pieces of wood from two and a half to three inches wide, and three-quarters of an inch to an inch thick, which are nailed to the rafters at intervals regulated by the length of the slates. Lozenge-shaped slating is occasionally used, and has an ornamental appearance, but is easily injured, as there is but one nail through each slate. It is always laid on boarding. For what is called patent slating the best large slates are selected, and fixed without either boarding or battening, the common rafters being placed at such a width as to come under the joints. The slates are screwed down, the courses over-lapping about two inches. The meeting joints are covered by fillets of slate about three inches wide, set in putty, and screwed down; and the hips and ridges are sometimes covered in the same manner, though it is best in all such cases to use lead. Patent slating, when well executed, is water-tight with as low a slope as one in six. In some districts laminæ of stone are used in lieu of slates or tiles. Shingles, which are like slates, but made of wood, were formerly much used in covering pyramidal steeples, and in roofs of steep pitch. They are still used in the United States, and are usually laid on boarding, in a similar manner to common slates.

Sheets of metal are very convenient for covering domes, and curved or angular surfaces generally; and also for flat roofs, or such as have too little slope for slating. Lead is the most common material for such purposes, though copper, iron, tinned iron, and recently zinc, are also used. Lead terraces or flats are commonly laid on boarding or plaster. The joints are sometimes soldered, but the most approved method is to roll or wrap the edges into each other, making allowance for expansion and contraction. A fall of a quarter of an inch in a foot is sufficient for surfaces covered with sheet metal.

Cements of various kinds have been applied to the formation of roofs, and in some cases with success, though they have often been found to crack, and thereby become permeable to water. Mixtures of tar with lime, sand, gravel, ashes, &c., have been recommended; and asphalte has been applied to this purpose, apparently with great advantage. Compositions of tar, resin, and similar substances, spread upon sheets of coarse paper, have also been used.

(Nicholson's *Architectural Dictionary*, *Practical Builder*, &c., &c.; Tredgold's *Principles of Carpentry;* Robison's *Mechanical Philosophy*.)

ROOK (*Corvus frugilegus*, Linn.), This well-known gregarious and familiar bird (for it seems to affect the neighbourhood of man, and even not to be scared by the smoky atmosphere of great towns) is the *Cornacchia nera* and *Cornacchione* of the Italians; *Graye*, *Grolle*, *Freux*, and *Frayonne* of the French; *Corneille Moissoneuse* of Brisson; *Schwartze Krähe* of the Germans; *Roka* of the Swedes; *Rook* of the modern British, and *Ydfran* of the antient British.

Belon and Caius, the latter of whom names the Rook *Spermologus, seu Frugilega*, appear to be of opinion that it is the σπερμολόγος of Aristotle (*Hist. Anim.*, viii. 3). It is doubtless, as Pennant observes, the *Corvus* of Virgil, who has happily described a flock of them

'E pastu decedens agmine magno.' (*Georg.*, lib. i., v. 381.)

Geographical Distribution.—The Rook is spread over the greater part of Europe; but nowhere does it seem to be more abundant than in Great Britain and Ireland. Wooded and cultivated districts are its favourite haunts. The farther north the observer goes in Scotland, the fewer rooks does he see. In Orkney and Shetland there are none, nor are there any in Guernsey and Jersey. They do not appear to be numerous in Denmark, nor in the southern districts of Sweden, nor in Russia and northern Asia, though they may be seen there. In Italy the rook is common and permanent; but it appears to be migratory over a part of the continent of Europe. In France it is also common, and the following quatrain appears under the cut of it in the *Portraits d'Oyseaux*:

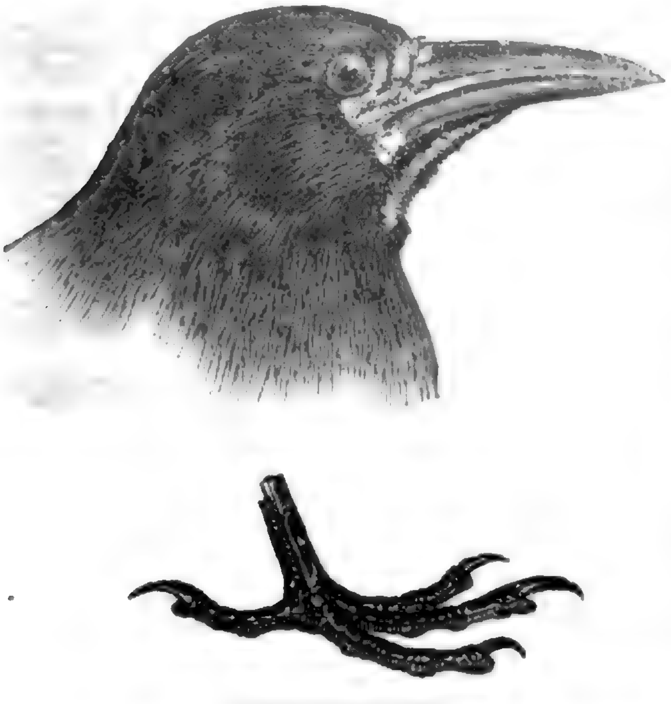
'Jamais le Freux ne hante le rivage,
Et ne se paist que de grains et de vers,
Il est oyseau commun, gros et pervers,
Qui vole en trouppe, et crie à l'avantage.'

It occurs between the Black and Caspian seas; and Dr. Von Siebold and M. Bürger note it among the European birds seen by them in Japan.

Food, Habits, &c.—Grain, and insects especially, form the food of the Rook, and there can be no doubt that it amply repays the farmer for the seed which it takes, by its assiduity in clearing his land of wire-worms and the larvæ of the cock-chaffer (*Melolontha vulgaris*). These last are called Rook-worms in many places, and the birds may be seen following the plough-tail to gather them up as the share exposes them. In the end of May and beginning of June, when the young are able to fly and go abroad with their parents, they may often be seen among the bright green leaves of the horse-chestnut and other trees bending the branches with their weight as they assemble to pick off the cock-chaffers in the winged state. Where these birds have been inconsiderately destroyed, on account of the supposed damage which they had done, a total failure of the crops has made the farmer glad to try to get them back again. The stick-built nest contains four or five pale greenish eggs, blotched with dark greenish brown; these are sometimes palmed upon the undiscerning for Plover's eggs, but are easily distinguished from them. Not that a rook's egg is by any means bad; though far inferior in every respect to the other. The male is most attentive to the female while she is setting, and feeds her assiduously; both are very industrious in supplying their young, and the skin under the tongue may at this season be often seen dilated into a kind of pouch by the collected food. During the building season they have great squabbles among themselves about their nests. An account of one of their battles with the Herons for the possession of a disputed territory is alluded to in the article Herons [vol. xii. p. 167]. They frequently visit their nest-trees in the autumn on their way to roost in some distant wood, and come to them for the purpose of repairing their nest, and setting about the business of incubation early in March.

The Rook is not without the power of mimicry granted so largely to the greater part of the true crows, is docile, capable of learning amusing tricks, and becomes much attached to the kind hand that feeds it. It has been heard to imitate the note of a jackdaw (Hewitson) and the barking of dogs so perfectly that if the mimic had been out of sight, no ear could have discovered the deception. (Macgillivray.)

Varieties.—White, pied, and cream-coloured. 'A gentleman,' says the charming author of the *History of Selborne*, 'had two milk-white rooks in one nest. A booby of a carter, finding them before they were able to fly, threw them down and destroyed them, to the regret of the owner, who would have been glad to have preserved such a curiosity in the rookery. I saw the birds myself nailed against the end of a barn, and was surprised to find that their bills, legs, feet, and claws were milk-white.' These perhaps were perfect albinos, and might so have continued; but instances are not wanting where the original light colour deepens into the usual sable with age. Mr. Yarrell quotes Mr. Hunt of Norwich, who states that a gentleman of his acquaintance had in 1816 a young rook of a light ash-colour, most beautifully mottled all over with black, and the quill and tail feathers elegantly barred; but when the bird moulted it became a jet-black rook, and in this state was suffered to join its sable brethren in the fields. Mr. Yarrell remarks that this agrees with his own observations, and he adds that accidental varieties will generally be found to be comparatively small and weak birds; as these young birds increase in age and gain constitutional power, the secretions, he observes, become perfect, and the plumage assumes its natural colours, whilst the assumption of white feathers, by old birds, is probably the effect of the converse operation of the physiological law. (*British Birds.*)



Head and Foot of Rook.

It has been, and indeed still is with some, a question whether the loss of the feathers at the base of the beak in the young rook upon the first moult, is or is not a specific distinction, or merely the result of denudation from plunging the bill into the ground in search of prey. It must be borne in mind that some foreign birds resemble the rook in this particular. Mr. John Blackwall's observations (*Researches in Zoology*) touching this matter are full of interest. He refers to a rook preserved in the Manchester Museum, which has its mandibles crossed near their extremities, but so slightly that the malformation could not have interfered materially with the mode of procuring food usually resorted to by rooks, as is clearly shown by the denuded state of the nostrils and anterior part of the head, both of which are entirely destitute of feathers. But he notices another specimen, in the possession of Mr. R. Wood of Manchester, which has the mandibles greatly elongated and much curved. 'Now,' says Mr. Blackwall, 'it is evident that the bird possessing a bill thus formed could not thrust it into the ground in search of worms and larvæ of insects, as the rook is known to do habitually; and accordingly the plumage at the base of the bill of this individual, and the bristly feathers which cover its nostrils, are very conspicuous, not having sustained the slightest injury. The opinion entertained by many persons that the naked condition of the nostrils and anterior part of the head is an original peculiarity in the rook, is thus satisfactorily proved to be incorrect; indeed, the fact that young rooks exhibit no deficiency in these particulars, is sufficiently conclusive on this point; but the possibility of an entire species being endowed with an instinct destructive of a usual portion of its organisation was probably never contemplated by these observers; it is not surprising therefore that the inference deduced from a partial view of the subject should be erroneous.'

ROOKE, SIR GEORGE, ADMIRAL, the eldest son of Sir William Rooke, was born at his father's seat, the priory of St. Lawrence near Canterbury, in the year 1650. He entered the navy as a volunteer, and at the age of thirty had attained the rank of post-captain. In 1689 he was sent out as commodore with a squadron to the coast of Ireland, where his services were such as to induce William III. to promote him to the rank of rear-admiral of the red. He soon afterwards bore a part in the indecisive action between the earl of Torrington's fleet and that of the French admiral Tourville, off Beachy Head.

In 1692 Rooke was advanced to the rank of vice-admiral of the blue, and greatly distinguished himself in the battle off Cape La Hogue (properly La Hague) between the French fleet and the combined English and Dutch fleets under admiral Russell, May 19, 1692; but a part of the French fleet having escaped into La Hogue, and being hauled up so high that the English ships of the line could not reach them, Rooke volunteered on the following day to attack them with the boats of his squadron. This service he performed at night under cover of a fire from his frigates and smaller vessels; and so well was his plan contrived, and so unexpectedly and suddenly executed, that though six French three-deckers were burnt that night and seven other ships of the line on the following morning, the loss of the English only amounted to ten men. For this exploit Rooke was rewarded with the rank of vice-admiral of the red, a pension of 1000*l.* a year, and the honour of knighthood.

After the peace of Ryswick in 1697, Sir George Rooke was elected member of parliament for Portsmouth; and though he was attached to the Tory party, then in opposition to the government, queen Anne, on her accession in 1702, appointed him 'vice-admiral and lieutenant of the admiralty, and also lieutenant of the fleets and seas of this kingdom,' having previously constituted her royal consort prince George of Denmark generalissimo of her forces by land and sea.

The war of the succession had now commenced, and an attack upon Cadiz was resolved upon, the land-forces being under the command of the duke of Ormond, and the combined English and Dutch fleets under Rooke. The attack was begun, but, in consequence of the opposition of the prince of Hesse, was not persevered in. Having received intelligence however that the Plate fleet, under convoy of a French squadron, had taken shelter in the port of Vigo, the duke and Sir George resolved to proceed there. The duke stormed the town with 3000 men, while the fleet took and destroyed seventeen ships; six galleons being taken by the English and five by the Dutch, who burnt five others. The value of the specie and goods taken was estimated at five millions of dollars.

Sir George Rooke having been joined by Sir Cloudesley Shovel, with a large reinforcement from England, they resolved to make an attack upon Gibraltar. On the 21st of July, 1704, the prince of Hesse, with 1800 marines, was landed on the isthmus, while the ships commenced a cannonade upon the fortress, which, having been kept up for about six hours, the Spaniards began to fly from the batteries. The boats were then manned and armed, and the seamen succeeded in making themselves masters of the great platform, which they retained till the following day, when a reinforcement of seamen enabled them to carry another strong battery, which put them in possession of most of the enemy's cannon. The governor then accepted the offered terms of capitulation, and the fortress surrendered.

On the 9th of August, 1704, Rooke fell in with the French fleet under the Comte de Toulouse, who had recently put to sea from Toulon, with fifty-two ships of the line and twenty-four galleys. The French admiral endeavoured to get away, though, according to Rooke's statement, he had a superiority of 600 guns, but on the 13th of August Rooke brought him to action off Malaga. The battle began in the forenoon, and ended with the day, when the French went off to leeward, and, the weather being hazy, escaped. This was a hard-fought battle. The French lost upwards of 3000 men, and the English upwards of 2000.

Sir George Rooke on his return to England was received by queen Anne at Windsor with great distinction, but finding that the government was hostile to him, he resigned his employments, gave up his seat in parliament, and passed the rest of his life at his seat of St. Lawrence, where he died on the 24th of January, 1709, aged fifty-eight, and was buried in the cathedral of Canterbury. He was thrice married. (Campbell's *Lives of the Admirals*; Looker's *Gallery of Greenwich Hospital*.)

ROOKER, MICHAEL ANGELO, an artist of considerable merit as a landscape-painter and engraver, was born in London about the year 1743. His father, Edward Rooker, also a skilful designer and engraver, who excelled in landscapes and architectural views, appears to have been a singular character, having for some time acted as a harlequin at Drury-Lane Theatre. Michael Angelo was taught engraving by his father, and executed the head-pieces to the 'Oxford Almanack' for several years, from his own drawings. In landscape-drawing, which is said to have been his favourite occupation, he was instructed by Paul Sandby, whose style he imitated. His manner is not powerful, but his drawings display much taste and feeling. For several years Rooker painted the scenes for the Haymarket Theatre. He was one of the earliest associates of the Royal Academy, and died on the last day of February, 1801, at the age of fifty-seven or fifty-eight.

ROOS, PHILIP PETER, a painter commonly called *Rosa da Tivoli*, from his long residence at that place, was born at Frankfort in 1655. He was instructed in art by his father, who was in the service of the landgrave of Hesse, by which prince Philip was sent to Italy, and allowed a pension during the period of his study. On arriving at Rome, he applied himself assiduously to painting, and acquired a most astonishing facility of hand; indeed, such was his rapidity of execution, that C. le Blond, who was at the same time at Rome, declares that Roos copied in chalk the arch of Titus within half an hour, and that with a considerable degree of finish. He devoted his talents chiefly to painting animals, which he designed mostly from nature. To facilitate his studies he established himself at Tivoli, where he kept a kind of menagerie for the purpose of drawing from the life with correctness such animals as he required for his pictures. His other subjects generally represent pastoral scenes, with herdsmen and cattle, and works of a similar nature, some of which are executed as large as life. His groups are composed with great judgment; and the landscapes in his backgrounds, his skies and distances, are treated with surpassing truth, and executed in a masterly style. Yet, although he painted with great facility, his productions betray no appearance of negligence or inattention; they are free, without being deficient in finish. His pictures, according to Lanzi, are to be found in the galleries of Vienna, Dresden, and other capital cities of Germany, besides an immense number in Italy and many in England, though we have no specimen by his hand in the National Gallery. He was a member of most of the principal academies of Europe. He is said by Huber to have etched a few plates of pastoral subjects, which are very scarce. M. Périès, in the 'Biographie Universelle,' mentions three pictures by this master which were in the Musée Napoléon, but which were returned to Vienna, whence they had been taken, in 1815. These are a view of the Cascade of Tivoli, a picture of animals, and a wolf devouring a sheep, the landscape in which latter work was painted by Tempesta. (Pilkington's *Dictionary*, by Fuseli; Lanzi, *Storia Pittorica*, ii. 174; *Biographie Universelle*.)

ROOT. The mathematical use of this term has gradually been extended, until it may be defined as follows: every value of an unknown quantity which satisfies a given equation is called a root of that equation. Thus, 2, 1, $1+\surd(-3)$ and $1-\surd(-3)$ are the roots, and all the roots, of the equation

$$x^4=5x^3-12x^2+16x-8,$$

since they are the only algebraical formulæ and arithmetical numbers which satisfy it. On this general use of the term root, see THEORY OF EQUATIONS and INVOLUTION.

The more common use of the term root is as follows: the seventh root of 8 is the incommensurable fraction whose seventh power is 8, or the solution of the equation $x^7=8$. There are altogether seven such solutions, one only arithmetical, the others of the form $a+b\surd(-1)$; the method of obtaining the arithmetical solution has already been discussed in the article INVOLUTION; the importance of the SQUARE ROOT will justify its consideration in an article apart. We reserve for the present article the method of finding and using any root (in the common sense) of any algebraical quantity, a necessary completion of the article NEGATIVE AND IMPOSSIBLE QUANTITIES.

Every algebraical result is of the form $a+b\surd(-1)$ at widest, or may be reduced to that form. Here a and b are meant to be real algebraical quantities, that is, reducible to positive or negative whole numbers or fractions, commensurable or incommensurable. Thus, if $b=0$, we have the simple real quantity a; if $a=0$, we have the simple impossible quantity $b\surd(-1)$. It is indifferent, as to the present article, in what light the impossible quantity $\surd(-1)$ is considered; whether, as in NEGATIVE AND IMPOSSIBLE QUANTITIES, upon that extended system of definitions which makes it explicable and rational, or upon the more common system in which it is used without such explanation: for we are now merely considering all algebraic formulæ as results, subject to certain laws by which their use is to be regulated, and without any reference to interpretation. When we desire to consider only the arithmetical root of an arithmetical quantity, we shall use the symbols $\surd$, $\sqrt[3]{}$, $\sqrt[4]{}$, &c., but the exponential fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, &c. will denote any one of the algebraical roots of a formula. Thus $\surd 16$ means simply 4; but $(16)^{\frac{1}{2}}$ is an ambiguous symbol standing for either $+4$ or -4. And when we have an equation which presents an ambiguous formula equated to an unambiguous one, we mean that the unambiguous side of the equation is *one* of the values of the ambiguous one: in this sense $(1)^{\frac{1}{3}}=\frac{1}{2}(-1+\surd(-3))$. When we use the simple arithmetical symbol $\surd$ before an algebraical quantity, as in $\surd(-3)$, we merely mean to signify that the two values of $(-3)^{\frac{1}{2}}$ are distinguished into $+\surd(-3)$ and $-\surd(-3)$.

Let us now take a quantity of the form $a+b\surd(-1)$. Assume $r\cos.\theta=a$, $r\sin.\theta=b$, which gives

$$r=\pm\surd(b^2+a^2)\qquad\tan.\theta=\frac{b}{a}.$$

Let us choose for r, which is called the *modulus* of the expression, the positive value $\surd(b^2+a^2)$. We can then always make the angle θ give the equation

$$a+b\surd(-1)=r\cos.\theta+r\sin\theta\,\surd(-1)\ \ldots\ldots\ (1)$$

identically true. If a and b be both positive, θ must lie between 0 and a right angle, or between 0 and $\frac{1}{2}\pi$ [ANGLE]: if a be positive and b negative, θ must lie between $\frac{3}{2}\pi$ and 2π: if b be positive and a negative, θ must lie between $\frac{1}{2}\pi$ and π: and if both be negative, θ must lie between π and $\frac{3}{2}\pi$. Thus reducing angles to degrees and minutes,

$$2+3\surd(-1)=\surd 13\,\{\cos.56^\circ\,19'+\sin.56^\circ\,19'.\surd(-1)\}$$
$$-2+3\surd(-1)=\surd 13\,\{\cos.123^\circ\,41'+\sin.123^\circ\,41'\,\surd(-1)\}$$
$$2-3\surd(-1)=\surd 13\,\{\cos.303^\circ\,41'+\sin.303^\circ\,41'\,\surd(-1)\}$$
$$-2-3\surd(-1)=\surd 13\,\{\cos.236^\circ\,19'+\sin.236^\circ\,19'\,\surd(-1)\}$$

Generally, if a and b be positive, and if, returning to the theoretical mode of measuring angles, θ be that angle which lies between 0 and $\frac{1}{2}\pi$ and has $b:a$ for its tangent, we must use θ for $a+b\surd(-1)$, $\pi-\theta$ for $-a+b\surd(-1)$, $2\pi-\theta$ for $a-b\surd(-1)$, and $\pi+\theta$ for $-a-b\surd(-1)$.

Again, since $\theta+2k\pi$ has the same sine and cosine as θ, when k is any whole number, positive or negative, if we take θ so as to satisfy (1), we find that the following is also satisfied:

$$a+b\surd(-1)=r\,\{\cos.(\theta+2k\pi)+\sin.(\theta+2k\pi).\surd(-1)\}\ \ldots\ (2)$$

for all integer values of k positive or negative, but not for any fractional value of k whatsoever. This and various other results of common trigonometry should be familiar to every student who attempts the present subject.

Common multiplication makes it obvious that

$$\{\cos. x+\sin. x . \sqrt{(-1)}\}\ \{\cos. y+\sin. y\ \sqrt{(-1)}\}= \cos. (x+y) + \sin. (x+y)\ \sqrt{(-1)}$$

for all real values of x and y; so that if we represent $\cos. x+\sin. x . \sqrt{(-1)}$ by ηx we have $\eta x \times \eta y=\eta(x+y)$. Now in BINOMIAL THEOREM it is proved that this equation cannot be universally true without giving as a consequence $(\eta x)^n=\eta(nx)$, for all values of n, whole or fractional, positive or negative. We have then

$$\{\cos. x+\sin. x\ \sqrt{(-1)}\}^n=\cos. nx+\sin. nx . \sqrt{(-1)} \ldots (3)$$

an equation which goes by the name of De Moivre's Theorem. It is the key of the present subject.

Let it now be required to raise the nth power of $a+b\sqrt{(-1)}$, n being integer or fractional, positive or negative: this includes every case of raising a power, extracting a root, performing both operations, and taking the reciprocal of any result. Reduce $a+b\sqrt{(-1)}$ to its equivalent form $r\eta(\theta+2k\pi)$, or

$$r\ \{\cos. (\theta+2k\pi) + \sin. (\theta+2k\pi) . \sqrt{(-1)}\},$$

whence $\{a+b\sqrt{(-1)}\}^n$ is $\{r\eta(\theta+2k\pi)\}^n$ or $r^n\eta(n\theta+2nk\pi)$, or $\{a+b\sqrt{(-1)}\}^n$

$$=r^n\{\cos.(n\theta+2nk\pi)+\sin.(a\theta+2nk\pi).\sqrt{(-1)}\},$$

in which r^n is found by purely arithmetical operation, and $\cos.(n\theta+2nk\pi)$ and $\sin. (n\theta+2nk\pi)$ by aid of the trigonometrical tables. So many distinct values as the variation of k enables us to give to $n\theta+2nk\pi$, so many values do we find of $\{a+b\sqrt{(-1)}\}^n$. Two angles are distinct when they are unequal, and do not differ by 2π or a multiple of 2π.

Firstly, let n be a whole number, positive or negative, then $2nk$ is always an integer even number, and there is only one value, namely,

$$\{a+b\sqrt{(-1)}\}^n=r^n\{\cos. n\theta+\sin. n\theta . \sqrt{(-1)}\}.$$

Next, let n be a fraction in its lowest terms, and, choosing an example, say $n=\frac{4}{5}$. Let us examine all the values of k, from $k=-5$ to $k=+5$, making $A_k=n\theta+2nk\pi$.

$$A_{-5}=\frac{4}{5}\theta-8\pi,\ A_{-4}=\frac{4}{5}\theta-\frac{32}{5}\pi,\ A_{-3}=\frac{4}{5}\theta-\frac{24}{5}\pi,\ A_{-2}=\frac{4}{5}\theta-\frac{16}{5}\pi,\ A_{-1}=\frac{4}{5}\theta-\frac{8}{5}\pi,\ A_0=\frac{4}{5}\theta,\ A_1=\frac{4}{5}\theta+\frac{8}{5}\pi,\ A_2=\frac{4}{5}\theta+\frac{16}{5}\pi,\ A_3=\frac{4}{5}\theta+\frac{24}{5}\pi,\ A_4=\frac{4}{5}\theta+\frac{32}{5}\pi,\ A_5=\frac{4}{5}\theta+8\pi.$$

Here it would seem as if from this set of the possible values of k, we get eleven distinct values of the fifth root of the fourth power of $a+b\sqrt{(-1)}$. But a moment's inspection shows that A_{-5}, A_0, A_5, are not distinct angles, since they differ by multiples of 2π: neither are A_{-4} and A_1, nor A_{-3} and A_2, nor A_{-2} and A_3, nor A_{-1} and A_4. Also it will be found that for every value of k

$$A_{k\pm5},\ A_{k\pm10},\ A_{k\pm15},\ \&c.,$$

are all angles which differ, each from its predecessor, by 2π; so that there are but five distinct angles in the whole series, which may be found by taking A_k, A_{k+1}, A_{k+2}, A_{k+3}, and A_{k+4}, with any value of k positive or negative. And generally, if n be a fraction whose denominator (when the fraction is reduced to its lowest terms) is q, it will be found that there are q distinct values of $\{a+b\sqrt{(-1)}\}^n$ and no more.

The most important cases are those in which $r=1$, or $a^2+b^2=1$, in which $\cos. \theta + \sin. \theta\sqrt{(-1)}$ may represent the expression. And of this particular case, the most important more particular cases are

$\theta=0 \quad \cos. \theta+\sin. \theta\sqrt{(-1)}=1$

$\theta=\pi \quad \cos. \theta+\sin. \theta\sqrt{(-1)}= -1$

$\theta=\frac{1}{2}\pi \quad \cos. \theta+\sin. \theta\sqrt{(-1)}= \sqrt{(-1)}$

$\theta=\frac{3}{2}\pi \quad \cos. \theta+\sin. \theta\sqrt{(-1)}= -\sqrt{(-1)}$

Of these, again, the two first are the most important.

Let $n=1:q$, and let the question be to find the q qth roots of 1. Putting unity in the form $\cos. 2k\pi+\sin. 2k\pi . \sqrt{(-1)}$, all these roots are the distinct values of

$$\cos. \frac{2k\pi}{q}+\sin.\frac{2k\pi}{q}\sqrt{(-1)} \text{ or } \left\{\cos.\frac{2\pi}{q}+\sin.\frac{2\pi}{q}\sqrt{(-1)}\right\}^k.$$

Let $\cos. \frac{2\pi}{q}+\sin.\frac{2\pi}{q}.\sqrt{(-1)}=a$, $\cos. \frac{2\pi}{q}-\sin \frac{2\pi}{q}.\sqrt{(-1)}=\beta$.

Then $a\beta=1$, as will be found by multiplication, and $a^k=\beta^{-k}$: $a^k=a^{k\pm q}=\beta^{-k\pm q}$, since $a^q=1$. Consequently, since the series of powers of a, positive and negative, are successions of qth roots of 1, the series of powers of β will be the same; and we may therefore select these roots at convenience from either series, or partly from one and partly from the other. Thus, if we would have the ten tenth roots of unity we may form them in pairs, as follows:—

a^0 and β^0 give $\cos. \frac{2.0\pi}{10}\pm\sin. \frac{2.0\pi}{10}\sqrt{(-1)}$ both $=1$

a^1 and β^1 or a^9 . . $\cos. \frac{2\pi}{10}\pm\sin. \frac{2\pi}{10}\sqrt{(-1)}$

a^2 and β^2 or a^8 . . $\cos. \frac{4\pi}{10}\pm\sin. \frac{4\pi}{10}\sqrt{(-1)}$

a^3 and β^3 or a^7 . . $\cos. \frac{6\pi}{10}\pm\sin. \frac{6\pi}{10}.\sqrt{(-1)}$

a^4 and β^4 or a^6 . . $\cos. \frac{8\pi}{10}\pm\sin. \frac{8\pi}{10}.\sqrt{(-1)}$

a^5 and β^5 or a^5 . . $\cos. \frac{10\pi}{10}\pm\sin. \frac{10\pi}{10}\sqrt{(-1)}$ both $=-1$

Of these twelve forms, ten only are distinct, giving the ten tenth roots required. In this way the following theorems may be easily demonstrated.

1. The $(2m)$th roots of unity are $+1$, -1, and the $2m-2$ quantities contained in

$$\cos. \frac{2k\pi}{2m}\pm\sin. \frac{2k\pi}{2m}\sqrt{(-1)}$$

for all values of k from $k=1$ to $k=m-1$, both inclusive.

2. The $(2m+1)$th roots of unity are 1 and $2m$ quantities contained in

$$\cos. \frac{2k\pi}{2m+1}\pm\sin. \frac{2k\pi}{2m+1}\sqrt{(-1)}$$

for all values of k, from $k=1$ to $k=m$, both inclusive.

3. If μ be one of the qth roots of unity, μ^2, μ^3, ... are also qth roots, but do not contain all the q roots, unless μ be made from a value of k which is prime to q. Thus, if $q=12$, and $k=1$, we get

$$a=\cos. \frac{2\pi}{12}+\sin. \frac{2\pi}{12}\sqrt{(-1)}$$

the list of roots is complete in 1, a, a^2, a^3, ... a^{11}, and a^{12} is 1, a^{13} is a, &c.

But if we make $k=8$, or take a^8 for μ, we have

$$\mu^2=a^{16}=a^4,\ \mu^3=a^{24}=1,\ \mu^4=a^{32}=a^8,\ \mu^5=a^{40}=a^4,\ \&c.,$$

so that we get no roots from this series but a^8, a^4, 1, which are only the three cube roots of 1 (cube roots are among twelfth roots). But choose a^5 (5 is prime to 12) and its successive powers are a^5, a^{10}, a^{15} or a^3, a^{20} or a^8, a^{25} or a, a^{30} or a^6, a^{35} or a^{11}, a^{40} or a^4, a^{45} or a^9, a^{50} or a^2, a^{55} or a^7, a^{60} or 1, after which the series recurs in the same order.

4. If m be any factor of q, all the mth roots of unity are among the qth roots. Thus, if $q:m=v$, and if a be the first of the series of qth roots, the mth roots are a^v, a^{2v}, ... a^{mv} or 1. For $(a^v)^m=a^{vm}=a^q=1$, &c. All those powers of a which have exponents prime to q, may be called primitive qth roots of unity: thus the primitive 12th roots are a, a^5, a^7, a^{11}.

5. The qth roots of unity exist in pairs of the form $\cos. \phi\pm\sin. \phi\ \sqrt{(-1)}$. These pairs are are a and a^{q-1}, a^2 and a^{q-2}, &c., or a and a^{-1}, a^2 and a^{-2}, &c.

Let the question now be to find the qth roots of -1. If we now take

$$-1 = \cos. (\pi+2k\pi) + \sin. (\pi+2k\pi) . \sqrt{(-1)}$$

we have all the qth roots in the distinct values of the formula

$$(-1)^{\frac{1}{q}} = \cos. \frac{(2k+1)\pi}{q} + \sin. \frac{(2k+1)\pi}{q} . \sqrt{(-1)}.$$

Let $a=\cos. \frac{\pi}{q} + \sin. \frac{\pi}{q}\sqrt{(-1)}$, then the qth roots required are a, a^3, a^5, ... a^{2q-1}, beginning with $k=0$, and ending with $k=q-1$. Thus, if μ be any one root, all the odd powers of μ (positive or negative) are also roots, but do not contain among them all the roots unless the value of $2k+1$, from which μ is derived, be prime to q. Thus if $q=15$ and if $\mu=a^9$, we have (since $a^{30}=1$)

$$\mu^3=a^{27}=a,\ \mu^5=a^{45}=-1,\ \mu^7=a^{63}=a^3,\ \mu^9=a^{81}=a^{21},\ \mu^{11}=a^{99}=a^9;$$

so that we only get, from the powers of a^9, the distinct roots a^9, a, -1, a^3, a^{21}, which are also the fifth roots of -1. But if $2k+1$ be prime to q, all the qth roots of -1 may be obtained from μ. And as before, if m be any factor of q, all the mth roots of -1 are among the qth roots. Also these qth roots occur in pairs of the form $\cos.\ \phi \pm \sin.\ \phi\sqrt{(-1)}$, the pairs being a and a^{2q-1}, a^3 and a^{2q-3}, &c., or a and a^{-1}, a^3 and a^{-3}, &c.

Every qth root of -1 is one of the $(2q)$th roots of $+1$, and the $(2q)$th roots of $+1$ consist of all the qth roots of -1 and all the qth roots of $+1$.

The following equations will also be easily proved:—

$$\{\sqrt{(-1)}\}^{\frac{1}{q}} = \cos.\frac{(2k+\frac{1}{2})\pi}{q} + \sin.\frac{(2k+\frac{1}{2})\pi}{q}\sqrt{(-1)};$$

$$\{-\sqrt{(-1)}\}^{\frac{1}{q}} = \cos.\frac{(2k+\frac{3}{2})\pi}{q} + \sin.\frac{(2k+\frac{3}{2})\pi}{q}\sqrt{(-1)}.$$

As it is not our object here to write on the applications of these formulæ, but only to supply an article of reference for those who may have forgotten or imperfectly learnt the groundwork of this very important branch of analysis, we finish here, referring to SERIES for such applications as fall within the plan of this work.

ROOT is that part of a plant which is sent downwards into the earth, at the same time that the stem is sent upwards into the air. Every part of the plant which exists underground is not root, as large portions of the stem itself may remain under the surface of the earth; and large buds, called bulbs, also exist underground. These parts have been often confounded with the root. The creeping root, and some forms of the tuberous and bulbous roots of older botanical writers, are only so many different forms of the stem. [STEM.]

The root is distinguished by certain structural peculiarities, by which it may be easily known from the stem. First, its ramifications are irregular, not having the symmetrical form of branches, nor are they developed like branches from buds. Secondly, roots generally produce no leaf-buds. When they do appear, which occasionally occurs, they are called adventitious buds. Thirdly, roots never have leaves, scales, or other appendages developed upon their surface; and fourthly, the cuticle of roots is never found to possess stomates, which are frequently very numerous on various parts of the stem.

The smaller divisions of roots are called *fibrils*, which consist of a little bundle of ducts or spiral vessels, surrounded by woody fibres, lying in a mass of cellular tissue. At the apex of the fibril the cellular tissue is loose and devoid of cuticle, from which cause it absorbs more rapidly the fluid by which it is surrounded than the other parts of the root. Although the terminations of the roots cannot be considered as special organs, they have been named by De Candolle *spongelets* or *spongioles*, in reference to their absorbing power.

The relation between the size and extent of the roots and that of the branches varies very much. In some tribes, as the Coniferæ and Palmaceæ, the roots are very insignificant compared with the size of the stem. In other plants the roots are much the longest, as in the lucern, &c. In the greater proportion of trees the roots extend wider than the branches, but do not penetrate so deep as the stem is high.

The internal structure of the root resembles that of the stem, but in Exogens the roots do not possess a central pith. The cellular tissue of many roots is exceedingly abundant, and on this account they are used as articles of diet. Their nutritive property depends on the saccharine and other secretions which are deposited in the cells of the cellular tissue. Many of these roots, by attention to their culture, may be increased in size; and the growth of esculent roots is an object of importance in the kitchen-garden. The principal esculent roots are: the Jerusalem artichoke (*Helianthus tuberosus*); turnip (*Brassica Rapa*); carrot (*Daucus Carota*); parsnip (*Pastinaca sativa*); red-beet (*Beta vulgaris*); skirret (*Sium Sisarum*); scorzonera, or viper's-grass (*Scorzonera hispanica*); salsafy, or purple goat's-beard (*Tragopogon porrifolius*); radish (*Raphanus sativus*). Besides these, which are commonly cultivated, there are many of our native plants which possess roots yielding a nutritive matter, and are occasionally used as articles of diet. The arrow-head, common arum, bitter vetch or mouse-peas, earth-nut, meadow-sweet, pilewort, sago, silver-weed, Solomon's seal, and common comfrey, are recorded as yielding edible roots. (*Cyclopædia of Gardening*, p. 882.)

During dry seasons and in dry situations the roots of many plants swell and become tuberous, which seems to be a provision for supplying nutriment to the stem and its appendages.

Roots are called *annual*, *biennial*, or *perennial*, according to their duration. When a root perishes after its first year's herbage and flowering, it is annual: if after the second year's herbage and first year of flowering, it is biennial. If a root endures for many years, although its herbage may perish every year, it is perennial.

There are various forms of roots distinguished by botanists. The *fibrous root* possesses a multitude of small divisions of the fibrillæ, as is seen in the Poa annua and many other grasses. The *nodulose root* presents occasional dilatations, as in the Phleum nodosum. A *præmorse root* is one in which the extremity of the primary axis has perished, or its development has been prevented by the extension of fibrillæ from its sides, as in the Devil's-bit Scabious (*Scabiosa succisa*). The *fusiform root* is seen in the carrot and turnip; such plants are also called tap-rooted. The term *tubercules* is applied by some to the roots of the orchis and dahlia; the former are *palmated* or *lobed*, the latter are *fasciculated*.

Although most if not all the higher plants possess roots, amongst many of the lowest forms they are not to be distinguished. The lower plants which float about in water, as the Oscillatoria, Diatoma, &c., and which consist of little more than simple cells, possess no appendages which can be called roots. In many of the Confervæ a downward development of the cells of cellular tissue, attaching them to the objects on which they grow, has been observed. Some of the Lichens, as the *L. esculentus* of Pallas, and the lower forms of Fungi, as the Tremellas, &c., possess no roots. Many of the floating water-plants, as the Aldrovanda vesiculosa, do not develop roots, and derive their nourishment from the medium in which they live by the direct contact of the cellular tissue. In fact we find that the simple cells of cellular tissue in the lower plants perform all those functions which, as we ascend in the scale of organization, are performed by particular parts of the plant. In the Charas and the Marchantia, the roots become more evidently developed, and the downward growth of the cells is more observable than in the Confervæ. On the lower surface of the Marchantia, prolongations of the cellular tissue are observed, which Meyen calls root-hairs or capillary fibrils. In the Equisetaceæ and Ferns the roots become more perfectly developed, and their surface is almost entirely covered with capillary fibrils. These fibrils are developed on almost all roots, and perform the function of absorption. They are only seen on recently-formed roots, as with the increasing age of the root they drop off; and in old roots none at all are found. They are not so numerous in the roots of the higher plants as in those of the lower, but their number varies exceedingly according to the circumstances in which a plant is placed. The number of these root-hairs is greatest in those plants which derive their nutriment from the earth, and accordingly they may be looked upon as a provision for extending the absorbing surface. They attain sometimes the length of a quarter and the third of an inch.

In many plants the roots, instead of being covered with the capillary fibrils, present a condensed membrane, which also encloses the roots as in a sheath, and extends to the point of the root where the fibrils commence their growth. This structure occurs in most water-plants, and in the roots of those plants which are accidentally projected into water, and in some land-plants. It drops off with increasing age, in the same manner as the root-hairs. Meyen considers this sheath a modification of the root-hairs, and hence infers that it performs the same functions. (Meyen, *Neues System der Pflanzen Physiologie*, band ii.)

What the absorbent vessels are to the animal, the roots are to the plant, and a difference between plants and animals has been pointed out as dependent on the relative situation of their organs of absorption. The animal derives its nutriment, by means of its absorbents, from an internal reservoir, the stomach; whilst the plant derives its nutriment from an external reservoir, the earth. The spongioles of the roots, as we have already stated, are the active agents in the absorption of nutritious matter from the soil. By some botanists it is supposed that no other part of the root absorbs except the spongiole; but from the observations of Meyen and others it appears that the capillary fibrils and the epidermis of the root have also the power of absorbing fluid, though not in so high a degree as the delicate point of newly developed tissue situated at the extremity of the fibrilla. The power of absorbing by the spongioles is supposed by De Candolle to be due to the capillarity and hygroscopicity of the cellular tissue of which they are composed. Dutrochet explains the absorption of fluids by plants on his theory of endosmose. But whatever theory is brought forward to explain the process, it cannot be connot be considered as merely mechanical, as the process ceases immediately on the death of the plant, and is undoubtedly connected with those more complicated relations of matter whose result we term vitality.

Roots do not absorb everything that is presented to them. It was long ago ascertained by Davy that plants did not absorb particles of charcoal and other substances that he diffused through water. Experiments also by Meyen, Link, and others, prove that the colouring matter of various infusions is not taken up by the roots, and that when this has been supposed to have taken place, it has arisen from mistaking a deposition of the colouring matter on the outside of the tissue for an absorption into it.

When the roots of plants are placed in solutions of gum, sugar, starch, &c., they thrive if the solutions are thin; but if thick solutions of these substances be prepared, the plants die in them. Experiments of this kind were performed by Sir H. Davy, who attributed the non-absorption of the thick solution, and the death of the plant, to the blocking-up of the pores of the vegetable tissue by the thick matter. But the theory of endosmose and exosmose gives a far better explanation of these facts. [ENDOSMOSE.]

When plants are submitted to solutions of various poisonous agents, they take up very varying proportions. De Saussure instituted a series of very careful experiments for the purpose of ascertaining the quantities of earthy and alkaline salts taken up by the roots of plants. For this purpose he prepared solutions of the hydrochlorates, nitrates, sulphates, and acetates of soda, potassa, and copper, and having submitted plants of Polygonum and Bidens to them, he found that the plants constantly absorbed a larger proportion of the water than of the salt, and that the salts were taken up in different proportions. The salts were not absorbed in proportion to their innocuous qualities, as the sulphate of copper, which was the most poisonous, was absorbed in largest quantity. De Saussure concludes that it was not the properties of the salts that determined their relative absorption, but that it depended upon the relative consistence of the solutions. Plants absorb poisons much more quickly when their roots are injured by being torn or cut, and do not suffer much by exposure to weak solutions of poisonous matters. This is a point of some practical importance, and will explain how it is that vegetation does not suffer when exposed to poisonous solutions.

Another function which has been attributed to the roots is that of excretion. Du Hamel first called the attention of botanists to this subject; he found that the roots of plants grown in water gave out a brackish secretion, and looked upon it as a secretion from the fluids of the plant. Brugmans followed up this point, and, in conjunction with Coulon, came to the conclusion, from the experiments they made, that the secretion given out from the roots of plants was a process of a similar nature to the rejection of the excrements in animals, and that these secretions acted beneficially in the nutrition of some plants, and injuriously in others. At the suggestion of De Candolle, M. Macaire prosecuted some researches on this subject, which were published in 1832 (*Mémoires de la Société de Génève*, tome v., p. 287). He confirmed the views of Brugmans and Coulon, and examined more attentively the nature of the different excretions given out by plants of different orders. Thus he found that the Leguminosæ gave out a gum and carbonate of lime; Graminaceæ deposited a matter containing hydrochlorates and carbonates of alkalis and earths, and containing but little gum; Cichoraceæ, an abundant brown matter analogous to opium; Euphorbiaceæ, a gum-resinous matter. It was inferred that these excretions were matters injurious to the plant, which were thus thrown off from the system. This inference seemed to be confirmed by an experiment of Macaire's, in which, having divided the roots of a plant of Mercurialis annua into two parcels, he plunged the one into a glass with solution of acetate of lead, and the other into a glass of pure water; in a short time it was found that the acetate of lead had not only been taken up by the roots from the one glass, but that it had been excreted by them into the other.

These researches have been considered to offer a satisfactory explanation of the practice of rotation of crops in agriculture; the rotation being *required* on account of the excretions of a plant being injurious to itself, and *beneficial*, as the excretion of one plant is the food of another [ROTATION.]

The experiments and conclusions of Macaire and De Candolle have however been called in question by some German botanists. Meyen and Unger object to the employment of a plant like the Mercurialis for determining the absorption and excretion of poison in water, as in the first place its roots must be injured by removal from the soil, and in the second place water is not its natural medium of growth. They employed water-plants, and, having placed them in various solutions, could not detect, by the most delicate re-agents, the rejection of any of the absorbed agents. Meyen considers the excreted matters examined by Macaire to be merely secretions resembling those which are found on various other parts of the plant. He gives numerous instances of plants secreting various matters on the surface of their stems, leaves, &c., when they have been grown in soils which are overcharged with the same substance as that which the plant has secreted. The chalk incrustations of Chara, and those of various Saxifrages, with the crystals of salt that occur on the plants on salt-plains, are given as examples. (Meyen, loc. cit., p. 530.)

This is a subject of practical importance, and worthy further investigation. In the late 'Report on Organic Chemistry,' by Professor Liebig, the views of De Candolle and Macaire are adopted. (Liebig's *Organic Chemistry*, p. 165.)

Besides the functions of absorption and excretion, the roots serve other purposes in the economy of the plant. It is by means of the roots that a plant maintains its position in the earth; and if for the increasing nourishment of the plant an increase of the absorbing surface is required, it is no less necessary that, for the purpose of maintaining its stem erect and firm, an extension of its holdfasts should take place. In many instances the root appears to serve merely the purpose of holding the plant in the ground, as in the mosses, and many of the plants belonging to the orders Crassulaceæ and Cactaceæ. By means of the roots the temperature of plants is kept below that of the atmosphere in summer, and above it in winter. This arises from the roots absorbing fluids from some depth below the surface of the earth, where its temperature is not much affected by the changes in the atmosphere. It is thus that the inhabitants of tropical climates are supplied with fruits whose delicious juices, pumped up from the earth, are much cooler than the atmosphere, and thus afford the most refreshing articles of diet.

ROOTSTOCK. [STEM.]

ROPE, a combination of fibres of hemp, or other material, so arranged as to form a flexible and tenacious cord or band; retaining, as far as possible, their collective strength. The name Rope is generally confined to the larger descriptions of cordage, such as exceed an inch in circumference, though the principles of formation are much the same for cordage of every size.

If the fibres used by the ropemaker were of sufficient length, the most effectual way of obtaining their united strength would be to lay them side by side, fastened together at each end, so as to form a bundle or skein; but, as the fibres of hemp do not, on an average, exceed the length of three feet and a half, it becomes necessary, in order to obtain a rope of greater length, so to twine them together that the strength of any single fibre shall be insufficient to overcome the resistance caused by the friction of those surrounding and compressing it; so that it will sooner break than be drawn out from the mass. This requisite entanglement is produced by twisting, which causes the fibres to compress each other; and it not only enables the ropemaker to produce cordage of any required length, but also, by making the rope hard and compact, increases its durability, and enables it to resist the penetration of water, which would rapidly impair its strength. While however some degree of twist is absolutely essential to the cohesion of a rope, any twist beyond that which simply prevents the fibres being drawn out without breaking, is injurious. A skein of fibres, or a rope, may be twisted so hard that any further attempt at twisting would break it, and such a skein or rope will evidently have no power to support a weight, each fibre being already strained to the utmost extent that it will bear. In fact, whatever force is exerted by any fibre in compressing the rest, may be considered the same as a weight hanging on that fibre and must be subtracted from its absolute strength before its useful effect can be ascertained; the available strength of a rope being the remainder of the absolute strength of its component fibres, after deducting the force exerted in twisting them.

Were a rope to be formed by simply twisting together, in one direction, the whole of the fibres of which it is composed, there would be nothing to prevent its untwisting as soon as left to itself. It is therefore necessary to twist the fibres in comparatively small portions, and so to combine these into a rope that the tendency to untwist in one part may counteract the like tendency in another. Thus the same force which would cause the component parts, if separate, to become loose or untwisted, is employed, when they are combined into a rope, to keep the whole firm and compact.

The first process in rope-making consists in twisting the hemp into thick threads, called rope-yarns. This process, which resembles ordinary spinning, is performed with various kinds of machinery. The common mode of spinning rope-yarns by hand is performed in the rope-ground, or rope-walk, an enclosed slip of level ground six hundred feet or more in length. As many of the operations of a ropery are impeded by wet weather, and by the unchecked heat of the sun, it is not unusual to cover the walk with a slight roof. At one end of this ground a spinning-wheel is set up, which gives motion by a band to several small rollers or whirls. Each whirl has a small hook formed on the end of its axis next the walk. Each of the spinners is provided with a bundle of dressed hemp, laid round his waist, with the bight or double in front, and the ends passing each other at his back, from which he draws out a sufficient number of fibres to form a rope-yarn of the required size; and, after slightly twisting them together with his fingers, he attaches them to the hook of a whirl. The whirl being now set in motion by turning the wheel, the skein is twisted into a rope-yarn, the spinner walking backwards down the rope-walk, supporting the yarn with one hand, which is protected by a wetted piece of coarse cloth or flannel, while with the other he regulates the quantity of fibres drawn from the bundle of hemp by the revolution of the yarn. The degree of twist depends on the velocity with which the wheel is turned, combined with the retrograde pace of the spinner. Great care is necessary in this operation to make the yarn of uniform thickness, and to supply the hemp equally from both sides of the bundle; because, if a considerable body of hemp be supplied to a yarn that is becoming too thin, it will not combine perfectly with it, but form a loosely connected wrapper; and any irregularity in the last-mentioned particular will cause the fibres to bear the strain unequally. The best mode of supplying the hemp is in the form of a thin flat skein. When the spinner has traversed the whole length of the rope-walk (or sooner, if the yarns are not required to be so long), he calls out, and another spinner detaches the yarn from the whirl, and gives it to a person who carries it aside to a reel, while the second spinner attaches his own hemp to the whirl-hook. The hemp, being dry and elastic, would instantly untwist if the yarn were now set at liberty. The first spinner therefore keeps fast hold of it all the while that the reeler winds it up, walking slowly up the walk, so as to keep the yarn equally tight all the way. When it is all wound up, the spinner holds it until another is ready to follow it on the reel. Sometimes, instead of being wound on a reel as they are made, the yarns are laid together in large hooks attached to posts at the side of the walk until about four hundred are collected together, when they are coiled up in a *haul* or skein, in which state they are ready for tarring.

Attempts have been made to introduce machine-spun yarns, in order to avoid the irregularities and defects of those formed by hand, and the recent improvements effected by Mr. Lang, of Greenock, in the spinning of yarns by machinery, are said to succeed very completely. By his process the hemp is more completely heckled, or divided into fibres, than in the common mode of proceeding; and the advantage of each fibre being laid at full length in the yarn, instead of being doubled, as in hand-spinning, is ensured. By a modification of the usual process, the fibres of hand-spun yarns may be laid in at full length, instead of being doubled, as when they enter the yarn by their bight; but experiment has not shown any great advantage from such a mode of spinning. That some improvement in this operation was needful, may be inferred from the result of a comparison between Mr. Lang's machine-spun yarns and those of equal grist spun by hand; the result showing the strength of the former to exceed the latter by fifty-five per cent. This improved process has been adopted by some of the principal rope-manufacturers of Great Britain.

The common size of rope-yarns is from one-twelfth to rather more than one-ninth of an inch diameter; 160 fathoms of white or untarred yarn weighing from two and a half to four pounds.

The next process is warping the yarns, or stretching them to a given length, in order that they may, when formed into a strand, bear the strain equally. When the rope is to be tarred, that operation is usually performed upon the yarns immediately after their being warped; as the application of tar to the yarns previous to their combination is necessary to the complete penetration of the whole substance of the rope. The most common method of tarring the yarns is to draw them in hauls or skeins through the tar-kettle by a capstan; but sometimes the yarns are passed singly through the tar, being wound off one reel on to another, and the superfluous tar being taken off by passing the yarn through a hole surrounded with spongy oakum. Great care is required in this process that the tar may boil neither too fast nor too slow, the common heat being from 212° to 250° Fahrenheit. In Huddart's patent of 1800, the covering of the tar-kettle is recommended, to prevent the escape of the evaporated matter, which would make the tar too thick. The degree of impregnation necessary depends on the kind of cordage: cables and water-ropes needing a considerable quantity of tar, while for standing and running rigging it is sufficient that the yarns be well covered.

In making large cordage, it is not usual to twist together, at once, as many yarns as would suffice to form a rope of the required thickness; a suitable number of yarns, frequently from fifteen to twenty-five, are formed into a strand, and three or more such strands are afterwards combined into a rope. The twist of the strand is in an opposite direction to that of the yarns of which it is composed, in order that, as before mentioned, the tendency to untwist in the individual yarns may be counteracted, and taken advantage of to prevent the untwisting of the strand. In closing or laying the rope, three strands, or sometimes four, in which case a small central strand, or heart, is added, are stretched at length along the walk, and attached at one end to separate but contiguous hooks, and at the other to a single hook; and they are twisted together by turning the single hook in a direction contrary to that of the other three, a piece of wood called a *top*, in the form of a truncated cone, being placed between the strands, and kept during the whole operation gently forced into the angle formed by the strands, where they are united by the closing or twisting of the rope. As the rope shortens in closing, one end only of the apparatus is fixed, the other being on a moveable sledge, whose motion up the rope-walk is capable of regulation by suitable tackle attached to it, or by loading it with weights. The top also is mounted on a sledge, for closing large cordage, and its rate of motion may be retarded, in order to give greater firmness to the twist of the rope. The art of the rope-maker, in this operation, consists in so regulating the various movements that the strands may receive separately at one end just as much twist as is taken out of them at the opposite end, by their twisting the contrary way in the process of combination.

Such is the method, more or less modified by the kind of machinery employed, of forming a *shroud-laid* or *hawser-laid* rope, and such appears to have been the whole process of rope-making until cordage of very large size was called for by the progress of navigation. In making such it was not found advisable to increase the number of yarns in a strand, it being difficult, when their number is very great, to throw an equal strain upon each and thereby obtain their aggregate strength. To obviate this inconvenience, cables, or such large ropes as are said to be *cable-laid*, are formed by the combination of smaller ropes twisted round their common axis, just as shroud-laid ropes are composed of strands twisted round their common axis. As cable-laid ropes are harder and more compact than others, this mode of formation is adopted for ropes to be exposed to the action of water, even though their thickness may not be very great.

Ropes formed by plaiting instead of twisting are made use of for some purposes in which pliability is especially needed, they being more supple and less liable to entanglement than those of the ordinary make. Such ropes are preferred for sash-lines, clock-lines, &c., and generally where the rope has to pass over pulleys of small diameter.

Towards the latter end of the last century much attention was directed to the improvement of the rope manufacture, between twenty and thirty patents having been taken out on this subject from 1783 to 1807. The application of machinery, instead of manual labour, to its various departments, has been attended with much benefit. The reader may find a detailed account of many of the ingenious and complicated contrivances for the purpose, in Chapman's *Treatise on the Progressive Endeavours to Improve the Manufacture and Duration of Cordage*, 1808.

Originally all the yarns composing a strand were of the same length, an arrangement extremely defective, as it is evident that when a number of yarns are stretched at length in a cylindrical mass, they will lie at different distances from the centre of the cylinder; so that, when twisted together, as all the yarns must form spirals of the same number of turns, those which are near the outside, forming spirals of large diameter, will be stretched to their full extent; while those near the centre, forming spirals of smaller diameter, will be less shortened by the process of twisting, and must therefore be more or less puckered up, according to their proximity to the centre of the mass. The first successful attempt to remedy this defect by varying the length of the yarns according to their position in the strand, was that under Captain Huddart's patent of 1793, since which time many further improvements have been effected in this essential point.

Flat ropes, which are much used for mining purposes, are either formed of two or more small ropes placed side by side, and united by sewing, lapping, or interlacing with thread or smaller ropes; or of a number of strands of shroud-laid rope similarly united. In either case it is necessary that the component ropes or strands be alternately of a right-hand and left-hand twist, that the rope may remain in a quiescent state. The latter method of making flat ropes was patented by Mr. Chapman, in 1807; and he considered it to afford the strongest possible combination of rope-yarns, his belts or flat ropes appearing to be even stronger than *salvages* (which are skeins of rope-yarns without any twist) of the same number of yarns. This seeming inconsistency is occasioned by the imperfection of hand-spun yarns, because if each yarn bears its own strain unaided, it will break at its weakest part, while, if combined, the mean strength of each will be rendered available.

From the experiments of Réaumur, recorded in the Memoirs of the French Academy of Science for 1711, it appears that a well-made small hempen cord broke in different places with 58, 63, 67, and 72 lbs., its mean breaking weight being 65 lbs.; while the three strands of which it was composed bore 29½, 33½, and 35 lbs. respectively; so that the united absolute strength of the strands was 98 lbs., although the average real strength of the rope was only 65 lbs., showing a loss of strength from twisting equal to 33 lbs. It appears that the cord used by Réaumur was of very unequal quality, as another portion of it broke with 72 lbs., while its strands bore separately 26, 28, and 30 lbs.; which shows the diminution of strength from twisting to have been from 84 to 72 lbs., the loss being in this instance only 12 lbs.

The more recent experiments of Sir Charles Knowles indicate a diminution of strength nearly equal in amount to the first-mentioned of Réaumur. He found a white or untarred rope of 3¾ inches in circumference break, on an average of several trials, with 4552 lbs.; while the aggregate strength of its yarns, which were 72 in number, and bore on an average 90 lbs. each, was 6480 lbs.; the loss being equal to 1928 lbs., or about 30 per cent.

Duhamel, who tried many important experiments in the dockyards of France, about the middle of the last century, endeavoured to ascertain what degree of twist would produce the most useful effect. He caused some ropes to be made so that only one-fourth of the length of the yarns was absorbed in twisting, instead of the usual proportion of one-third. These ropes were tried in shipping, and found to be lighter, thinner, and more pliant than those of the ordinary make. The following statement shows the comparative strength of ropes formed of the same hemp, and the same weight per fathom, but twisted respectively to two-thirds, three-fourths, and four-fifths of the length of their component yarns:—

Degree of twist.	Weight borne in two experiments.	
⅔	4098 lbs.	4250 lbs.
¾	4850	6753
⅘	6205	7397

The result of these experiments led Duhamel to try the practicability of making ropes without any twist, the yarns being wrapped round to keep them together. These had great strength, but very little durability, the outer covering soon wearing off, or opening at bendings, so as to admit water, and occasion the rope to rot. But while such untwisted skeins of rope-yarns, or *salvages*, are unfit for most of the purposes to which cordage is applied, they are used with advantage for the tackle of great guns and some other purposes for which the greatest strength and pliancy are required.

It has already been intimated that the usual reduction of length by twisting is one-third. This applies to shroud or hawser-laid ropes, those which are cable-laid being further shortened, so that 200 fathoms of yarn are required to make 120 fathoms of cable.

Ropes formed in the most common manner, with three strands, do not require a *heart*, or central strand, because the angles formed by the union of the three cylindrical strands are so obtuse that the pressure of the operation of laying or closing the rope causes the strands to fill them up completely; but when the number of strands exceeds three, a heart is essential to keep them equidistant from the axis of the rope, and to fill up the vacuity that would otherwise be left by their not meeting in the centre. The heart can however add very little to the strength of the rope, as its fibres lie much straighter than those of the outer strands, and, not being able to extend with them when the rope is stretched, are soon pulled asunder.

The following simple rule for calculating the strength of ropes is given by Robison:—Multiply the circumference of the rope in inches by itself, and the fifth part of the product will express the number of tons the rope will carry. For example, if the rope be six inches in circumference, $6 \times 6 = 36$, the fifth of which is 7⅕, the number of tons which such a rope will sustain.

The following rules for calculating the weight of cordage may also prove useful:—

To find the weight of shroud or hawser-laid rope, multiply the circumference in inches by itself, then multiply the product by the length of the rope in fathoms, and divide by 420, the product will be the weight in cwts. Example: to find the weight of a six-inch hawser-laid rope, 120 fathoms long, $6 \times 6 = 36 \times 120 = 4320$, which, divided by 420 gives the weight of the rope, 10 cwt. 1 qr. 4 lbs.

To find the weight of cable-laid cordage, multiply its circumference in inches by itself, and divide by 4. The product will be the weight, in cwts., of a cable 120 fathoms long; from which the weight of any other length may be readily deduced. Example: required the weight of a twelve-inch cable, 120 fathoms long; $12 \times 12 = 144$, divide by 4, and the product, 36, is the weight in cwts.

Much attention has been devoted to the discovery of the best method of preserving ropes from decay, especially when exposed to the action of water. The operation of tarring, which has been almost universally practised for this purpose, effects it very imperfectly, and materially diminishes the strength of the cordage. Taking the mean of several experiments by Duhamel, it seems that untarred ropes bore a greater weight, by nearly 30 per cent., than those to which the tarring process had been applied; and he states that it is decided by experience that white cordage in continual service is one-third more durable than tarred, that it retains its force much longer when kept in store, and that it resists the ordinary injuries of the weather one-fourth longer. Notwithstanding these facts, it is found that for cables and ground-tackle, which are much exposed to the alternate action of water and air, tarring is a valuable preservative; though cordage that is only superficially tarred is said to be stronger than such as is tarred throughout, and better able to bear the alternations of wet and dry.

The removal of the defects and bad qualities of common tar was the object of a patent taken out in 1802 by Mr. Chapman. Unsuccessful attempts had been made to substitute oils and various fat substances, which would be insoluble in water, for tar: but they had been found to impede the operation of twisting. Chapman improved the ordinary tar, first, 'by boiling the tar in water one or more times, each of which extracts a portion of its superabundant acid, and its mucilage, which contains a disengaged acid;' and, secondly, 'by continuing these processes until the tar has thrown off a larger portion of its essential oil, and becomes more pitchy than usual; and, finally, by restoring the requisite plasticity through the addition of substances less injurious and less volatile, and therefore more continuous, viz. by the addition of suet, tallow, animal oils, or *suitable* expressed oils.' Of the advantages attending this process, an idea may be formed from the subjoined statement of the relative strength of the cordage without any tar, with common tar, and with Chapman's purified tar. The rope was made on the 10th of August, 1802, and contained twelve yarns in each strand; part was tried immediately, and the rest steeped in water for about three months, then removed to a foundry stove for three months, and finally kept at the ropery till November 3, 1803, the date of the second experiment:

Description of rope.	Aug. 10, 1802. Cwt.	Nov 3, 1803. Cwt.	Portion of original strength retained.	
White . . .	33·4	1·9	5·7	per cent.
Common tarred . .	22·2	7·35	33·0	
Tarred with purified tar	29·1	12·35	43·8	

Satisfactory as these experiments appear, Mr. Chapman's process has not been brought into general use.

Sir Joseph Banks had some ropes tarred with *teak* tar, by way of experiment, and found them to be one-third stronger than those done with common tar. Tanning has been tried for the preservation of ropes, but apparently without realizing any decided advantage. The same may, if the writer be not misinformed, be stated of Kyan's process for the prevention of dry-rot. A solution of caoutchouc, in lieu of tar, has been used with success.

Several other kinds of vegetable fibre have been made use of in the manufacture of cordage, and some appear greatly to exceed hemp in strength. In a comparative trial made at Paris between ropes made of hemp and of the aloe from Algiers, the latter was found to bear 2000 kilogrammes, while the former, of equal size, bore only 400. Ropes have been formed also of long wool, but they are only about one-third as strong as the best hempen cordage of the same size. Ropes composed of fibres of hemp intermixed with threads of caoutchouc are very valuable for some purposes, owing to their superior strength and elasticity. Their power of bearing sudden jerks without injury is a highly important property. It may be mentioned that such a rope has been used with the grapnel or anchor of the great Nassau balloon, and found to arrest the balloon without any unpleasant check when the grapnel catches. Ropes made of thongs of ox-hide twisted together, are used in the rope-bridges of Peru, and for some other purposes.

Ropes formed of iron wire have been, within the last few years, introduced to a considerable extent, and have been found to effect a great saving of expense from their durability and superior lightness. From a paper communicated by Count Breunner to the British Association for the Advancement of Science, in 1838, it appears that such ropes had been introduced about seven years before, in the silver mines of the Harz Mountains, and had been found so advantageous as almost entirely to supersede flat and round ropes of hemp in the mines of Hungary, and most of those in the Austrian dominions. The count observes that these iron ropes are nearly equal in strength to solid bars of the same diameter, and equal to hempen ropes of four times their weight. One of them had been in use for upwards of two years without any perceptible wear, though a common flat rope performing the same work would not have lasted much more than one year. The diameter of the largest rope in ordinary use is stated to be one inch and a half, and it is composed of three strands, each containing five wires of two lines in diameter. Great care is observed in the manufacture of these ropes, that the ends of the wires may be set deep in the interior of the rope, and that two ends may not occur near the same part. In use, it is necessary that the ropes be wound on a cylinder of not less than eight feet diameter, and be kept well coated with tar, to prevent oxidation. In one case mentioned by Count Breunner, so great a saving of power was effected, that four horses were doing as much work with a wire rope as six with a flat hempen rope.

Prior to the date of this memoir, patents had been obtained in this country for the manufacture of wire ropes, and they have since been improved and partially acted upon. The ropes of Mr. Andrew Smith, who appears foremost in the introduction of wire ropes in this country, have been used in mines and shipping for some years; and are being adopted for other purposes, having undergone a satisfactory trial for several months on the London and Blackwall railway, where the trains are drawn by stationary engines and ropes. They are formed in various ways, according to their intended use. For standing rigging straight untwisted wires are employed, bound round with cloth or small hempen cordage saturated with a solution of caoutchouc, asphaltum, or other preservative from rust. Flat ropes may likewise be made of straight wires, interwoven or wrapped with hempen yarn, or sewed between canvass, &c.; but the patentee prefers using them with a slight twist. Other ropes are formed much in the same way as those of hemp, the wires taking the place of rope-yarns, and being twisted into strands, and combined into ropes, both hawser-laid and cable-laid. The twisting should not be so hard as in hempen cordage; and all the wires must be protected by an anti-corrosive composition, or by coating with tin, zinc, &c. In the patent obtained by Mr. Newall of Dundee, for improvements in wire ropes, coating with the following mixture is recommended:—Tar, six parts; linseed oil, two parts; and tallow, one part: the whole being melted together, and applied while hot. In this patent it is proposed to twist wires round a core, either of wire, hemp cord, spun yarn, or other material, to form a strand; and to lay such strands round a similar core when there are more than three strands in a rope. For joining the wires, Messrs. Smith and Newall both recommended twisting their ends together for a few inches; and the latter also suggests the possibility, in some cases, of welding them. Wire ropes may be very conveniently and firmly secured at their ends by passing them through the small end of a conical collar, and doubling up, or *upsetting*, the ends of the wires, which may then be welded into a solid mass, or secured by running melted brass or solder among them. The collars may then be attached, in various ways, to anything with which it is desired to connect the rope; or they may, as suggested in Newall's patent, be screwed together, so as to unite several lengths of rope.

Iron is the material usually employed for wire ropes, but copper and other metals may also be used.

The annexed table, showing the comparative size and weight per fathom for equal strength, gives the result of experiments with the wire ropes of Mr. Andrew Smith, and may serve to show their great superiority to those of hemp, which they surpass even in flexibility:—

Hemp Rope.			Patent Wire Rope.			Equal to a strain of	
Size.	Weight per fathom.		Size.	Weight per fathom.			
Inches.	lbs.	oz.	Inches.	lbs.	oz.	tons.	cwts.
3	2	4	1¼	1	4	2	10
4	3	15	1½	1	9	3	10
5	6	0	1¾	1	14	6	15
6	9	0	2	2	2	8	0
7	12	3	2¼	2	9	8	11
8	14	3	2½	4	1	9	18
9	19	6	3	5	4	15	6
10	25	0	3½	7	1	24	6
11	30	0	4	11	6	29	5
12	36	8	4½	15	12	35	4

RÖRASS. [TRONDHEIM.]

RORQUAL. [WHALES.]

ROSA (from the Latin *Rosa*, through the medium of the French *Rose*; the Latin 'Rosa' and the Greek ῥόδον are evidently the same), the name of the most universally admired and cultivated genus of plants forming the type of the natural order Rosaceæ.

The rose was known in early times, and was as great a favourite among the nations of antiquity as it is in modern times. The rose is found generally in almost every country of the northern hemisphere, both in the Old and New World; from Sweden to the north of Africa; from Kamtchatka to Bengal, and from Hudson's Bay to the mountains of Mexico. It is not found in South America or in Australia. All the species are included between 70° and

19° N. lat. It is found more generally on dry and free soils than on those which are wet and tenacious. In the north of Europe it occurs with single flowers, but in Italy, Greece, and Spain more frequently double.

The characters of the genus Rosa are—calyx five-parted, tube fleshy, urceolate; petals five; stamens numerous, attached to the calyx and corolla; ovaries attached to the inner surface of the tube of the calyx; style long, stigma projecting beyond the mouth of the calyx; achenia numerous, hard. They are mostly shrubs with alternate pinnate leaves and beautiful odoriferous flowers. There are few better marked genera amongst plants than this, but as of all plants it has been the greatest favourite, and thus surrounded by the greatest variety of external influences, its species and varieties are the most difficult to distinguish. The best arrangement of this genus is that of Dr. Lindley, in his *Rosarum Monographia*, published in 1820. He arranges the species under eleven divisions, the first of which, including but one species, has since been made into the genus Lowea. We shall here give the remaining divisions, and point out the species which, on account of their ornamental flowers or uses, are most frequently cultivated.

1. FEROCES, with branches permanently tomentose and naked fruit. They are generally low shrubs, remarkable for thick hoary branches clothed with numerous prickles; and hence their name. There are only three species belonging to this division, of which *Rosa ferox*, the hedgehog rose, is most common. It is a beautiful plant, with fine showy crimson blossoms appearing early in the season.

2. BRACTEATÆ. The species of this division have not only their branches, but also their fruit clothed with a persistent tomentum. They have mostly bright green leaves, and their organs of fructification are in the highest state of development of any of the genus. They belong to the class of evergreen roses. *R. bracteata*, the Macartney rose, is a native of China, and was introduced into this country by Lord Macartney. It has upright branches, 5-9 leaflets, stout prickles, with large white terminal solitary flowers, and large globose orange-red fruit. It is a handsome plant, flowering abundantly late in the season. It is however tender, and is best grown against a wall. *R. microphylla*, small-leaved rose, resembles *R. bracteata*, but differs in being smaller, and having prickly fruit and ovate obtuse leaves.

3. CINNAMOMEÆ, distinguished by their long lanceolate leaflets, without glands, bracteated flowers, and delicate disk, but little thickened. The shoots are either with or without setæ. There are several species in this division, but comparatively few are known out of the herbarium. *R. lucida*, the bright-leaved rose, is not uncommon in gardens, producing its fine red flowers in the latter months of the summer and in autumn. *R. laxa*, loose or spreading Carolina rose, is frequently found cultivated. *R. Carolina*, the true Carolina rose, is a native of the marshes of North America, and is often found enlivening our shrubberies by its beautiful crimson blossoms when few other flowers are to be seen. It is known by its narrow convoluted stipular lanceolate leaflets and entire spreading sepals. It attains a height of about six feet, bearing numerous flowers on short peduncles.

4. PIMPINELLIFOLIÆ, branches either crowded with nearly equal prickles or unarmed; leaflets ovate or oblong; bracts absent; sepals connivent and persistent. Although this division approaches the last in artificial characters, it is essentially different in habit. *R. spinosissima*, the Scotch rose, is a dwarf, compact, green bush, with creeping roots; it has unequal prickles, flat, glabrous, simple serrated leaflets, and small, solitary, white, or bluish-coloured flowers. It is found native in the mountainous districts and sea-coasts of all Europe, and also in the Caucasus. It was the only rose found by Sir W. Hooker in Iceland. A great number of varieties are found in the gardens of Britain, produced from the wild plant found in the North of England and Scotland. They produce an abundance of seed from which varieties may be easily raised. The seeds should be sown in pots in October, when they will produce plants in the spring, which blossom the next season. *Rosa sulphurea*, the double yellow rose, is one of the most splendid plants in the genus. It has never been known to produce single flowers. Its native country is still unknown; it was procured by Clusius from some of his correspondents in the East, of whom he made inquiry concerning this plant, after having seen a model of it in some little paper gardens sent from Constantinople. It has linear divaricating stipules, dilated at the apex, glaucous leaflets, and a hemispherical tube. This plant requires some care in culture; it only flowers in open airy situations, and requires to be freely watered whilst in flower. It is grown in greater perfection in Italy than in this country. As its flowers are double, it never produces seeds. *Rosa alpina*, the Boursalt rose, is a native of the Alps of Austria, the South of France, Silesia, and Bohemia. It is destitute of prickles or setæ, has pendulous elongated fruit, hispid peduncles, and solitary, erect, blush-coloured flowers. It attains a height of seven or eight feet, and is well adapted for a pillar rose.

5. CENTIFOLIÆ, clothed with bristles and prickles; flowers bracteate; leaflets oblong or ovate, rugous, disk thickened, closing the throat; sepals compound. This division comprehends those species which have ever been most interesting to the florist, as also probably those that were earliest known. Although the garden varieties of this division would probably amount to several hundred, there are only three species.

Rosa centifolia, the hundred-leaved cabbage or Provence rose, is known by its large unequal prickles, glandulous leaflets, pendulous flowers, and oblong fruit. This rose has been said to be a native of France, but this is doubtful. It has been found wild in thickets on the eastern side of the Caucasus. It is the same plant as the *R. provincialis* of Miller, under which, name most of the varieties in our gardens have been propagated. Seventy or eighty varieties of this rose have been named. They are all characterised by their large pendulous fragrant flowers, seated on slender footstalks, which, when in bloom, have a peculiar graceful appearance. A botanical variety of this species, the *R. centifolia muscosa*, is the parent of the beautiful family of moss-roses. When this variety was produced or discovered is not known, but that it is nothing more than a variety of *R. centifolia* is proved by the fact that plain and moss roses are often seen on the same bush. When moss-roses are removed from our northern climate to Italy, the mossiness disappears. They are universal favourites, and between twenty and thirty garden varieties are enumerated. They are of almost all colours, from white to a dark rich crimson. They flower best in a light soil. The white varieties ought to be grown on a stock of the common dog-rose. They are all adapted for standards. If a succession of blossoms be required throughout the summer, they should be pruned in October and May.

Rosa Gallica, the French rose, has equal small prickles, erect flowers, ovate sepals, and globose fruit. It is found wild about Montalbanum, Walzenberg, and Geneva, also in Austria, Piedmont, and the Caucasus. This is supposed to be the species to which Pliny refers (*Hist. Nat.*, xxi., 18, 25, 72, 73). The *R. pumila* of Jacquin is a variety of this species. Upwards of one hundred varieties of this rose are found cultivated in gardens. They have stiff erect shoots, with brilliant-coloured flowers seated on short erect flower-stalks. The spotted, striped, and marbled roses belong to this species. The York and Lancaster rose is a variety possessing white and red coloured flowers. In the garden they will flourish as bushes on their own roots, or they may be grafted or budded on short stems, or grown as standards. In winter pruning, the stray shoots should be shortened to within six or eight buds of the bottom, those that are weak to within two or three buds.

A great number of varieties of roses found in gardens are hybrids between *R. Gallica* and *R. centifolia*. They mostly combine the long graceful shoots of the last with the rich crimson hues of the first. Hybrids are also produced between *R. Gallica* and *R. Indica*, but differ from the last in not being perpetual. They have a pleasing glossy subevergreen foliage. Of these varieties that known by the name of George the Fourth is one of the finest.

Rosa Damascena, the Damask rose, has unequal prickles; the larger ones falcate, sepals reflexed, fruit elongated. This plant is supposed to have been originally brought from Damascus, and to be a native of Syria. It is much cultivated in gardens, and has not fewer varieties than the two last. The monthly blush, blush damask, red and white monthly, and four seasons, are among the handsomest and best known varieties. The blossoms are exceedingly fragrant. Immense quantities of them in pots are sold weekly in the flower-markets of Paris.

6. VILLOSÆ. Root-shoots erect; prickles nearly straight; leaflets ovate or oblong, with diverging serratures, sepals

persistent, connivent; disk thickened, closing the fauces. The best known species of this division is the *R. alba*, white rose; it has rugose glaucous leaves, with simple serratures and acicular unequal prickles, by which it may be distinguished from both *R. tomentosa* and *R. canina*, with which it is liable to be confounded. It is a native of Piedmont, Cochin-China, Denmark, France, and Saxony. Its flowers are very large, exhaling a delicious fragrance. A number of handsome varieties are found in gardens, as the maiden's blush, double, semi-double, single blush, white, &c. In the garden the varieties of this species, varying in the colour of their flowers from pure white to vivid rose, contrast well with beds of darker varieties. They make good standards, bear close pruning, and blossom abundantly. *R. Hibernica*, the Irish rose, belongs to this division, and is interesting to the botanist as being entirely confined to Ireland.

7. Rubiginosæ, unequal and sometimes bristly prickles, ovate or oblong leaflets, with glands and diverging serratures, persistent sepals, thickened disk, and arched root-shoots. To this division belongs the eglantine, or sweet briar (*Rosa rubiginosa*). It is common in Britain in bushy places on a dry gravelly soil. From its extensive diffusion it has been subjected to a variety of changes in external character, and as a consequence of this has received a great variety of names. It is characterised by hooked spines, opaque rugous leaflets, and hairy peduncles and calyces. The Austrian briar (*Rosa lutea*) is nearly allied to the latter, but is known by its foliage existing only at the extremity of the branches, prickles under the stipulæ, and leaflets hollow. The most brilliant yellow roses are produced from this species. They require a moist soil and dry pure air, and will do without severe pruning.

8. Caninæ, with equal hooked prickles; oval eglandulose leaflets, with connivent serratures, deciduous sepals, and thickened disk closing the throat. To this division belong many of the varieties called autumnal or perpetual roses, on account of their blooming late in the season and continuing in flower a long time. Most of the perpetual roses are highly fragrant, and more so in the latter than the early months of the year. The soil in which they are grown cannot be too rich. In order to secure full blossoms in the autumn, all the flower-buds should be cut off in June, the shoots shortened, and the plants well watered and manured. They should never be planted on dry lawns, and wherever placed they should be manured every year. By retarding and forcing them, these roses may be made to blossom eight months in the year. Of the roses in this group that have afforded varieties for the garden, the *R. Indica*, Chinese rose, stands first. It is known by its whitish green or purple stem, stout falcate distant prickles, stamens bent inwards, and semi-double usually red flowers. It is found wild in China about Canton. It blossoms six or eight months in the year. The varieties of this plant are quite hardy; their colour varies from a delicate blush to a most brilliant red. There is a hybrid variety between this species and the *R. odorata*, which is well known in gardens under the name of tea-scented China rose (*Rosa Indica odorata*). This rose is the parent of a great number of sorts in gardens. They are the roses which are most commonly sold in Paris in little bouquets wrapped round with coloured paper. Most of the varieties of this plant are French, and only a few will grow in this country; they are fleeting in duration, and will not bear the cold well. They blossom best in August and September. When grown on their own roots in moist soils and situations, they must have a raised border in some warm and sheltered place: the border should be a compost of rotten manure or leaves, light loam, and sand, in equal parts, and raised about eighteen inches above the surface. When grown as low standards, they should be taken up in November.

The Bourbon rose (*R. Bourboniana*) is a natural hybrid between *R. Indica* and a variety called red four-seasons. This hybrid was found amongst a number of the latter plants in a hedge in the Isle of Bourbon. It was brought to Paris, and has since produced many beautiful varieties. The flowers of this rose are very handsome, pendulous, with fine colours, and a most delicious fragrance. The varieties are not yet much known to English cultivators. They form a pretty addition to clumps of roses, or may be grown in beds as standards and as pillars. Mr. Rivers, in his 'Rose-Amateur's Guide,' says, 'I consider the culture of these roses only in its infancy; we shall ultimately have the richest hues combined with perfection of form, and the complete plenitude of their flower.'

The Noisette rose was grown from seeds produced from *R. moschata* impregnated with *R. Indica*. It was first reared in America. In many of the sorts the clustered habit and peculiar fragrance of the musk-rose prevails; whilst in others the perfume and magnificent flowers of tea-scented roses are apparent. They form an elegant section of flowers for the rosarium, producing sometimes as many as seventy or eighty flowers in a corymb. They are all very hardy.

Rosa Lawranceana, the miniature or Lawrance rose, named after Miss Lawrance, who published a collection of drawings of roses, belongs to this division. It was first brought from China, and is probably only a dwarf variety of *R. Indica* or *R. semperflorens*, which it closely resembles in structure. All the varieties are known by their diminutive size; some of these little 'fairy roses' produce blossoms when they are not more than six inches high. In cultivation they will not bear moisture, requiring in most soils a very dry warm raised border. They form elegant ornaments for the drawing-room. *R. canina*, the dog-rose, is one of the most common species of the division in this country, and from its varying characters has given origin to a great number of names supposed to represent species. This is the species used for making conserve of roses.

9. Systylæ, styles cohering in an elongated column; stipules adnate. The habit of the plants of this division is nearly the same as that of the last. *R. arvensis*, the field or white dog-rose, belongs to this group. It is a very common plant in many parts of England, adorning the hedges with its elegant snowy blossoms. It has cord-like shoots, unequal falcated prickles, leaflets glaucous beneath; diverging stipules, and ovate crimson fruit. The varieties of this and allied species, as *R. multiflora* and *R. sempervirens*, produce the climbing roses of the garden, of which there are a great number now to be had. They can be grown as underwood, and nothing would add more to the beauty of a shrubbery than the introduction of the undergrowth of the varieties of these roses. They grow with most vigour when prostrate; but can be carried up frames, which may be made into various shapes for the purpose of effect.

R. moschata, the musk-rose, is one of the oldest inhabitants of our gardens. It is found native in the North of Africa, and in the temperate and warm provinces of Spain. It has slender recurved prickles, the surfaces of its leaflets of different colours; acute narrow stipules, with numerous white fragrant flowers. It is an autumnal rose, and is very generally cultivated on account of the beautiful musk scent of its flowers. It is a tender plant, and our winters are generally too severe for it. Its bunches of flowers are frequently very large, requiring props for their support. The musky odour is most powerful at night. It is supposed to be the famous rose of Persia, in the branches of which the poets of that country delight to describe the *bulbul* (singing nightingale) pouring forth her music.

10. Banksianæ, nearly free subulate stipules, usually deciduous; ternate shining leaflets and climbing stems. This is the last division of the species of roses. The most remarkable species in this group is the *Rosa Banksiæ*, Banksian rose, named after Lady Banks. It is a native of China, and has very numerous double sweet-scented nodding flowers, which are arranged in umbel-like corymbs. It is one of the most elegant plants of the genus; it grows well in the open air, but is tender, and requires to be grown against a wall or in a sheltered situation. It grows and blossoms better in a dry than in a moist situation. The branches should never be shortened, as it prevents their producing flowers. The seeds are not perfected in this country, but are in Spain and Italy.

The rose is more frequently cultivated as an ornament, than for its applications to medicine or the arts. It has however astringent and tonic properties which render it useful in medicine. In the East it is extensively grown for the purpose of procuring, in a variety of ways, the volatile oil which gives it its delicious fragrance. For these purposes the species that are mostly cultivated are *R. moschata*, *centifolia*, and *damascena*, from all of which the attar, butter, essence, or oil of roses may be procured in considerable quantities. [Attar.] The attar of roses forms an object of considerable commercial importance on the coast of Barbary, in Syria, Persia, India, and various parts of the East. Many other perfumes are made from roses, and are consumed in large quantities, as rose-water, vinegar of roses, spirit of roses, honey of roses, &c.

For those who would wish to know more of this favourite genus of plants, we append the names of some of the best works that have been exclusively devoted to its history and illustration:—Lindley, 'Monographia Rosarum,' 1820; 'A collection of Roses from Nature,' by Miss Lawrance, 1799; 'Les Roses,' by Redoute and Thory; 'L'Histoire Naturelle de la Rose,' by Guilleman, 1800; 'Prodrome de la Monographie du Genre Rosier,' by Thory, 1820; 'Rose-Amateur's Guide, with descriptive catalogue of Roses,' by T. Rivers of Sawbridgeworth, 1836 (a very excellent account of the garden varieties and their cultivation); the article 'Rosa,' in Rees's 'Cyclopædia,' by Sir J. B. Smith; 'Genus Rosa,' in Miller's 'Gardener's Dictionary,' by Don.

ROSA, Medical Properties of. Of the numerous species or varieties of this genus, three only are indicated in the 'Pharmacopœia' as the sources of the officinal articles; but a very considerable number of them contribute the different materials. Those indicated in the 'Pharmacopœia' are: the Rosa canina, or common dog-rose; Rosa gallica, the French or red rose; and Rosa centifolia, the hundred-leaved or cabbage rose. Of the first, the so-called fruit (hips) is the officinal part. This is truly the enlarged persistent calyx, enclosing the real fruits, which are numerous small achenia, clothed, as well as the inside of the calyx, with silky hairs. The hairs and achenia are to be carefully removed, and the fleshy calyx beaten into a pulp, to which gradually thrice their own weight of white sugar is to be added. The employment of heat in the preparation of this conserve, though directed by the 'Pharmacopœia,' is better omitted. The pulp consists chiefly of malic and citric acids, in combination mostly with some salts, tannin, resins, a small quantity of volatile and fixed oils, fibre, and a large quantity of sugar. The action on the stomach is slightly refrigerant and aperient, its sweetness recommending it to children, and as a vehicle for other medicines. It is apt to candy or concrete by keeping. The fresh hips, freed from the fruits and hairs, bruised, and having a little sugar added, yield, by pouring warm water upon them, a cooling mildly astringent drink, which would be grateful to the poor suffering from autumnal fevers.

The petals of both the Rosa gallica and R. damascena are supplied to herbalists for medical and chemical purposes. The latter is most extensively cultivated at Mitcham for the London market. The buds are collected before they expand, and the calyx and lower part of the petals, termed claws, being cut off, they are quickly dried. If this last process be conducted slowly, it impairs both their astringency and fine Modena colour. Their astringency and odour are greatest when collected before the process of anthesis, or bursting of the anthers. About 2000 flowers yield 100 lbs. of fresh petals, which when dry weigh only 10 lbs. After drying the odour is faint, the taste bitter and astringent. As by exposure to the light and air they lose their fine colour, and soon become mouldy or worm-eaten, they must be carefully preserved in well-stopped bottles or canisters.

According to the analysis of Cartier, they consist of volatile oil, colouring matter, fatty matter, gallic acid, tannin, albumen, soluble salts of potash, insoluble salts of lime, silica, and oxide of iron. The tannic and gallic acids are the cause of the astringency, and also of the dark colour, which results on adding a solution of any salt of iron to an infusion of roses, and of a slight precipitate when a solution of gelatine is added to the infusion. The property of forming a black compound with iron is taken advantage of by beating the petals with cloves and other spices in an iron mortar, till a thick black paste is formed, which hardens on exposure to the air, and is then polished or turned, so as to form the perfumed beads for necklaces or rosaries. The petals of R. centifolia are often preferred. The exact nature of the colouring principle has not been ascertained, but it is not owing to oxide of iron, as the quantity of iron is much greater in white than red roses, Cartier having obtained from 1000 grains of white roses 99 grains of ashes, containing 12·4 of iron, while a similar quantity of red roses yielded only 50 grains of ashes, containing only 4 grains of iron.

The petals of the Rosa damascena are the most laxative, except perhaps the R. semperflorens, but it is seldom that they are used as aperients, though the petals of the R. gallica are formed into a confection which has the advantage over that of the R. canina, inasmuch as it neither candies nor becomes mouldy. In forming this or the other preparations, a stone (not an iron) mortar must be used. The chief employment of the conserve of the Gallic rose is as a vehicle for other medicines and as the basis of blue pill.

The infusion of roses is made by pouring boiling distilled water on the petals, and adding dilute sulphuric acid, which are allowed to macerate for six hours, and when strained, refined sugar is to be added. The vessel in which this process is conducted should not be glazed with lead. By this means is obtained an elegant, fragrant, and mildly astringent tonic and refrigerant liquid, which is of great utility, either alone, especially to check the wasting perspirations of consumption, or as a vehicle for most salts which are formed with sulphuric acid. It is likewise employed as a gargle, alone, or with various adjuncts, one of the best of which is the mel rosarum, or honey of roses, made with the petals of this kind of rose. A syrup is sometimes made with them, which is only used to sweeten and colour other medicines.

The Rosa centifolia, hundred-leaved rose, especially the variety of it termed the *Provence* or *cabbage rose*, is cultivated both on account of its exquisite perfume and the uses to which it, with its products, can be applied. The petals are the officinal article. They are directed to be collected when the flower is full blown; and to be plucked off, not allowed to fall off. It is better to collect them before the flower is fully expanded, as the odour rapidly diminishes as the anthesis proceeds; 100 parts dry into 18 only. They are to be dried in the open air, and not in an oven, as desiccation impairs their fragrance, while it heightens that of the R. gallica. When dried, they are of a pale red, with a faint rose odour and an astringent taste. They easily part with their colour, and are therefore to be protected from air and light: if salted, they may be preserved unimpaired for years. With the addition of salt, pepper, and cloves, they are used to form the rose-pots which adorn the apartments of the rich, but which may equally be made to contribute to the enjoyment of the poor, as the expense of this perpetual feast is so small as not to be felt by the poorest occupier of a room. The colouring matter extracted by alcohol furnishes a most delicate test for the presence of alkalis.

A syrup is also made of this sort, but the chief use of it in England and France is to yield by distillation rose-water, the medical properties of which are too slight to merit further notice here. In hot countries a large quantity of volatile oil is elaborated by the flowers of this and several other species, such as the rosa moschata, rosa damascena, and in Italy the rosa sempervirens, which constitutes the *athar*, *ather*, *attar*, *utter*, or *otto* of roses. Attar of roses is said by Donald Monro to be procured by merely macerating the petals in water. The failure of Trommsdorf to procure it by this means is not conclusive against its accuracy, since less oil is found in cold countries, and it is less easily separated. But most writers describe it as being the result of distillation, and this is the mode generally followed. The quantity obtained varies with the season and the care observed in the process. Bishop Heber observes, 20,000 pounds of rose-leaves yield attar equal in weight to a rupee. Jackson states that from one lac of roses it is generally calculated that 180 grains, or one tolah, of attar can be procured. Polier states that to procure something less than three drachms of attar from 100 lbs. of rose-leaves, the season must be very favourable and the operation carefully performed. The same authors tates that 4366 pounds of rose-leaves yield by repeated distillations 8 ounces of attar. The oil concretes and floats on the surface of the distilled water when cold. Even in England a crystalline volatile oil with a faint odour of attar (English attar of roses) is frequently obtained when distilling rose-water from the petals of R. centifolia. The high estimation in which this perfume is held, and the price which it bears, offer great temptations to increase the quantity of oil. In some parts of India this is done by mixing the freshly plucked rose-leaves with the seeds called Geuzely, and also those of a sort of Digitalis termed Sisama, in successive layers, allowing them to remain ten or twelve days, and then placing the seeds in contact with fresh rose-leaves; and after repeating this process eight or ten times, the seeds are subjected to pressure. A dirty oil results, which on standing for some time forms several distinct layers, the upper one of which is sold as rose-oil. The Chinese adopt a similar expedient. Genuine attar of roses at all temperatures below 80° Fahr. is a crystalline solid, and generally colourless. At 90° Fahr. its specific gravity is 0·832. It consists of two volatile principles, one solid, the other liquid, at ordinary temperatures, in the proportion of one part of the first to two of the latter. The first is a stearopten, the last an eleopten. The entire oil, according to Göbel, consists of carbon 69·66, hydrogen 16·06, and oxygen 14·28; but the analyses of Saussure and Blanchet do not correspond with this: Saussure says it contains nitrogen also. This proves the variable nature of the article sold as attar, which is almost constantly adulterated. When mixed with any essential oil, such as that of an Indian grass (Andropogon, Acorus Calamus), or of sandal-wood, or of rhodium (from Convolvulus Scoparius), the sophistication is not easy of detection, but if with fixed oils, blotting-paper will reveal their presence. Alcohol is no criterion of the purity; for when castor-oil has been used to adulterate the attar, it is as soluble as the rose-oil in alcohol of sp. gr. 0·815. Attar of roses is chiefly brought from Constantinople and Smyrna. It is subject to a duty of 1*s.* 4*d.* per lb. In 1838, 973 lbs. and in 1839, 754 lbs. paid the duty.

(Pereira's *Materia Medica.*)

ROSA SALVA'TOR was born at Renella or Arenella, a village in the environs of Naples, on the 20th of June, 1615, and he was originally intended for the church. Whilst yet a boy he manifested a strong propensity for drawing, and in order to cure him his parents procured his admission as a student in the college of the congregation of Somasca in Naples; but before the expiration of the usual period of residence, he was either expelled or voluntarily quitted the college. On his return to Renella he devoted his time to the study of music, and cultivated his talent for poetry, and on the marriage of his eldest sister with Francesco Francanzani, a disciple of the Spagnuoletto school, he attended the studio of that artist. He also studied from nature in oil-colour, and in 1633 went from Naples on a tour through the wild scenery of La Basilicata, La Puglia, and Calabria. During his absence he associated with banditti. At this period Salvator seems to have fostered and matured his taste for romantic scenery, and the studies which he made of groups and single figures whilst with the bandits served him as valuable materials for his future works. Soon after his arrival at Renella his father died, leaving the family dependent upon Salvator, who was then certainly not more than eighteen years of age, for their support. To perform this duty, he executed with great rapidity subjects on primed paper, his poverty not enabling him to purchase canvas, and sold them to the dealers who keep the stalls in the Strada della Carità in Naples. One of these, representing the story of Hagar and Ishmael, was seen and purchased by Giovanni Lanfranco, who was then in the city decorating the church of Gesù Nuovo for the Jesuits. The admiration of that painter was valuable to Salvator, for his works rose in price accordingly, but at the same time it laid him open to the malice and envy of other Neapolitan artists. They ridiculed the efforts of a man who had been obliged to seek the patronage of mean dealers, and he retorted upon them in epigrams, and satirical verses which he set to music and sang. He however obtained the friendship of Aniello Falcone, an eminent painter of battles, the first and best of the pupils of Spagnuoletto, who gave him instruction, and after a time introduced him to the notice of that great painter, from whose advice and practice he derived great benefit.

On the invitation of his former friend, who was in the establishment of the Cardinal Brancaccio, he repaired to Rome. Here he enjoyed the patronage of the cardinal, who took him to the bishopric of Viterbo, where he painted an altar-piece representing the incredulity of St. Thomas, for the Chiesa della Morte, and other works. In 1639 he went again to Rome. The reputation of Salvator was now at its height; he was esteemed as a painter, a poet, a musician, and an actor, for the plays which he performed were written by him, the music composed by his hand, and the principal character represented by himself. As an artist, he was most extensively patronised, and at very high prices. In 1647, on the breaking out of the revolt of Masaniello at Naples, Salvator Rosa returned to that city, and became a member of the band. On the suppression of the revolt, he made his escape from Naples in the train of the Prince Carlo Giovanni de' Medici, with whom he went to Florence, where he was employed by the grand-duke to paint in the Pitti Palace. Here he associated with the literati and the principal nobility. After remaining several years at Florence, he returned to Rome, and was again extensively employed. In 1663 he executed three pictures for the exhibition of San Giovanni; one was Pythagoras on the sea-shore, the second was the same philosopher recounting his visit to the infernal regions, and the third the Prophet Jeremiah thrown into a pit for having prophesied the fall of Jerusalem; and soon after he produced his most celebrated picture, the Catiline Conspiracy. In 1668, at the annual exhibition of the Feast of San Giovanni Decollato, he placed his Saul and the Witch of Endor in competition with the works then shown of the elder masters. He did not execute many important works after this, and died of an attack of the dropsy, on the 15th of March, 1673. He was buried in the vestibule of the church of Santa Maria degli Angioli, which was erected over the ruins of the baths of Diocletian, by Michel Angelo. Salvator Rosa left one son, by Lucrezia, a mistress, who accompanied him from Florence, and to whom he was married shortly before his death.

Rosa possessed great invention, and had a wonderful facility of execution. He is superior when he confines his efforts to works of the easel size, and his figures are then correct in drawing and spirited in design. Such is the case in his picture of Atilius Regulus, formerly in the Palazzo Colonna at Rome, and now in the possession of the earl of Darnley. Of his landscapes, it may be observed, that he wholly rejected the simplicity and amenity cultivated by Claude and by Poussin, and indulged in gloomy effects and romantic forms; nor are his sea-pieces less forcible; in them he represents the desolate shores of Calabria, and not unfrequently adds interest to his works by the terror of shipwreck. According to Sir Joshua Reynolds, he gives a peculiar cast of nature, which, though void of grace, elegance, and simplicity, though it has nothing of that elevation and dignity which belong to the grand style, has yet that sort of dignity which belongs to savage and uncultivated nature; and Fuseli says, that though Salvator Rosa was without choice of form in design or much propriety of conception, and though his talent was better adapted to smaller dimensions, he could fill a large canvas with terrific effects, of which the Conspiracy of Catiline, formerly in the Casa Martelli, and now at the Pitti Palace at Florence, is a powerful instance. The subject of the Witch of Endor has been by some persons extravagantly praised, but the last-named acute critic has observed that the toads, bats, skeletons, and other accessories are vainly accumulated to palliate the want of dignity and pathos in Saul, and of sublimity in the apparition. He however admits that in landscape Salvator was a genius.

There are a great number of his pictures in England, several of which are in the collections of the Marquis of Westminster, Lord Francis Egerton, the Duke of Devonshire, the Earl of Darnley, the Duke of Buckingham, and others. The Finding of Moses, at Stowe, was purchased from the Orleans collection for 2500*l.* His etchings consist of about ninety in number, executed in a spirited and masterly style. The chiaro-'scuro is admirably managed, and the heads of the figures are full of expression. His monogram is composed of an S and an R combined, the former letter drawn over the straight line of the latter.

Some of the music-books of Salvator Rosa were, amongst other musical manuscripts, purchased by Dr. Burney, at Rome, and amongst many airs and cantatas by different masters there were eight entire cantatas, written, set, and transcribed by the painter himself. From the specimen of his talents for music there given, there seems to be no doubt that he had a truer genius for this science, in point of melody, than any of his predecessors or contemporaries, and there is a strength of expression in his verses which must always place him above the middle rank of poets. To his other accomplishments he added architecture, which, according to Pascoli, he understood perfectly, and he excelled as a comic actor, an improvisatore, and a performer on various musical instruments. (*Biographie Universelle: Life and Times of Salvator Rosa*, by Lady Morgan; Bryan's and Strutt's *Dictionary*, &c.)

ROSA DA TI'VOLI. [Roos.]

ROSA'CEA. (Malacology.) [DIPHYDES, vol. ix., p. 10.]

ROSA'CEÆ, a natural order of Polypetalous exogens.

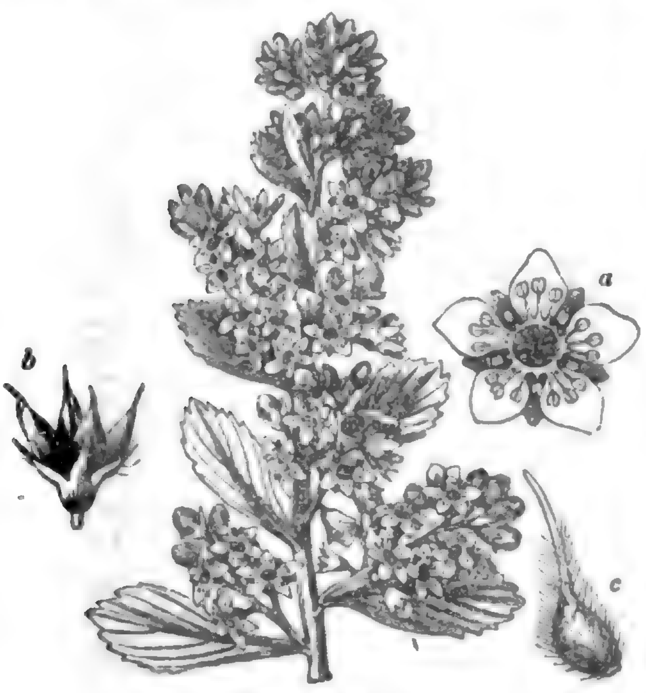
with 4- or 5-lobed calyx; 4 or 5 regular petals; indefinite perigynous stamens; exalbuminous seeds; and alternate stipulate leaves. The plants of this order are allied to Chrysobalanaceæ, from which they may be distinguished by their styles proceeding from the side of the ovarium near the apex, and not from the base, and by their regular petals and stamens. They are distinguished from Fabaceæ (Leguminosæ) by their regular petals and stamens, and especially by the odd segment of the calyx being posterior, and not anterior, as in that order. The genera of this order may be arranged under four groups or suborders, the principal distinctions of which will be seen in the following analysis:—

- Carpels numerous.
    - Ovaries superior. Rosaceæ (proper).
    - Ovaries inferior. Pomeæ.
- Carpels solitary.
    - Fruit a drupe. Amygdaleæ.
    - Fruit a nut. Sanguisorbeæ.

Rosaceæ proper include the true Roses (Roseæ), the Cinquefoils (Potentilleæ), the Spiræas (Spirææ), and the Neuradas (Neuradeæ). They are herbaceous plants or shrubs. This family includes about 570 species and 20 genera, principally inhabitants of the temperate and cold zones of the northern hemisphere of the New and Old World; a very few are found on high land within the tropics, and a small number in the southern hemisphere. None of the plants of this section of the order are unwholesome; they are characterised by the presence of an astringent principle, which has led to the use of many of them in medicine.

Pomeæ are known by the adhesion of their ovaries to the sides of the calyx, forming the fruit called a pome. Their ovula are always in pairs. The tendency of the flowers of this family to revert to their normal state frequently affords instructive examples of morphological changes. The fruit of many of the species contains a considerable quantity of malic acid, which gives to the fruit its peculiar flavour. The apple, pear, medlar, quince, service-tree, and mountain-ash belong to this family. They are inhabitants of Europe, Northern Asia, the mountains of India, and North America.

Amygdaleæ have but a single carpel, which, when ripe, is a drupe; but they are also distinguished amongst Rosaceæ by their leaves containing hydrocyanic acid, and their bark yielding gum. They are natives exclusively of the northern hemisphere, where they are found in cold or temperate climates. Many of the species are poisonous, on account of the hydrocyanic acid they contain. They yield however some of our most valued fruits, as the peach, nectarine, plum, apricot, cherry, and almond, which last is the seed of the Amygdalus communis.



(Spirea argentea.)

a, Flower, showing the perigynous arrangement of the stamens; b, fruit, showing its apocarpous structure; c, one of the follicles separate from the fruit.

Sanguisorbeæ are not only known by their solitary carpels, but they are destitute of petals, and have a hard thickened calyx. They are found wild in heaths, hedges, and exposed places in Europe, North and South America beyond the tropics, and the Cape of Good Hope. Their principal property is astringency, and some of the species may be used as fodder.

ROSACIC ACID, a name given by Prout to a peculiar acid which he imagined to exist in the lateritious sediment deposited in urine during fever. Dr. Prout is of opinion that it contains some purpurate of ammonia, and consequently, if this opinion be correct, no such substance as the rosacic acid exists.

ROSALI'NA. [Foraminifera, vol. x., p. 348.]

ROSAMOND, FAIR. [Henry II.]

ROSARIO. [Mexican States.]

ROSARY. [Beads.]

ROSAS, a small seaport town of Spain, in the province of Gerona in Catalonia, not far from Cape Creus, on the north side of a gulf in the Mediterranean known as the Gulf of Rosas; in 42° 15′ N. lat. and 3° 11′ E. long. Rosas was founded by a colony of Rhodians, who called it Rhodope. (Strabo, p. 160.) But the reading in this passage of Strabo is evidently corrupt, and should be Rhode. The town is mentioned under the name of Rhode by Stephanus Byzantinus (v. Ῥόδη), by Livy (34, c. 8), and by Mela (2, c. 6). It has a good and capacious harbour, which was formerly defended by a strong fort and batteries. The town itself is surrounded by a very thick wall and towers built by the Arabs. The fort however was blown up by the French on their evacuation of the Peninsula. During the sixteenth and seventeenth centuries the port of Rosas carried on a brisk trade with the Spanish colonies. It is now reduced to a mere fishing-town, the population of which, according to Miñano (vol. vii., p. 566), did not exceed 2200 inhabitants in 1830.

RO'SCIUS, QUINTUS, a celebrated Roman actor, was born near Lanuvium (Cic., *De Div.*, i. 36), but at what period is uncertain. He is frequently mentioned in the writings of Cicero, who was his friend and warm admirer His talents also obtained for him the friendship of Sulla, who, during his dictatorship, presented him with a gold ring, the mark of equestrian rank (Macrob., *Sat.*, ii. 10), which honour was the more remarkable, as many passages in the Roman writers prove that the histriones were generally held in great contempt. So perfect however was Roscius in his art, that his name became almost synonymous with excellence in any other branch, and thus when an orator produced a great impression on his audience, it was customary to say 'a Roscius is on the stage.' (Cic., *De Orat.*, i. 28; *Brut.*, 84.) Actors frequently received instruction from Roscius, who used to say however that he had never had any pupil with whom he was satisfied. (*De Orat.*, i. 28.) Macrobius relates (*l. c.*) that Cicero and Roscius used to try which of the two could more frequently express the same thought, the one by his eloquence, the other by his gestures; and that Roscius derived from this exercise such a high opinion of his own art, that he wrote a work, in which he compared eloquence with the art of acting. Macrobius also states that Roscius received about a 1000 denarii a day for his acting (upwards of 35*l.*). He died about B.C. 61; since Cicero, in his oration for Archias, which was delivered in that year, speaks of his death as quite recent (c. 8). There is an extant oration of Cicero, though considerably mutilated, in defence of Roscius. The subject of the oration is a claim of 50,000 sesterces against Roscius, by C. Fannius Chaerea (*Ueber die Rede des Cicero für Q. Roscius*, Zeitschrift, i., p. 248).

ROSCOE, WILLIAM, born in 1753, near Liverpool, received a common school education till he was twelve years of age, after which he continued to improve himself by reading. When in his sixteenth year he was apprenticed to an attorney in Liverpool, and in 1774 he was admitted an attorney of the Court of King's Bench, and began to practice as such. In the meantime he wrote some poems, among others one on the origin of the art of engraving, which made him known to Sir Joshua Reynolds, Fuseli, and other distinguished artists. In 1784 he was elected honorary member of the Manchester Literary and Philosophical Society. He also turned his attention to the subject of the slave-trade, and wrote several pamphlets recommending its suppression. When the French revolution first began, Roscoe was one of its warmest partisans in this country. He wrote 'Strictures' on Burke's 'Two Letters addressed to a Member of the present Parliament,' reflecting in severe terms upon what Roscoe considered as an apostacy in Burke's political conduct. In 1796 Roscoe published the 'Life of Lorenzo de' Medici, called the Magnificent,' a work which established his literary reputation. The subject was happily chosen, and the author treated it well. The work went through several editions, and was translated into Italian, German, and French. It was generally well received on the Continent, but its spirit was criticised by two classes of writers: one of them, of which Sismondi may be considered as the representative, see nothing but perfection in a republican government, and cannot forgive Lorenzo for having controlled and curbed the Florentine democracy. Sismondi charged Roscoe with having deceived himself and others with regard to the character of his hero, who in Sismondi's eye was an insidious and crafty tyrant. It is curious to see Roscoe, who at one time was the advocate of the French revolution, accused of being the panegyrist of the tyranny of the Medici. The grounds of this controversy are adverted to in FLORENCE, HISTORY OF, and MEDICI, HOUSE OF. Another class of critics was angry with Roscoe for having exposed the part which Pope Sixtus IV. took in the conspiracy of the Pazzi, which led to the murder of Giuliano, Lorenzo's brother, and also for having spoken unfavourably of Cardinal Barbo, afterwards Paul II. On the subject of the Pazzi, Sismondi joined the papal advocates in representing that conspiracy as a laudable deed, justifiable under the circumstances in which it took place. After many years Roscoe replied to his various critics in pointed though temperate language in his 'Illustrations, Historical and Critical, of the Life of Lorenzo de' Medici,' 4to., London, 1822. He inserted in the appendix, among other documents, an important letter written to Sixtus IV. by the signoria, or executive, of Florence after the failure of the Pazzi conspiracy, which letter was discovered in the archives of Florence by the Rev. F. H. Egerton, and printed at Paris in 1814.

The second historical work of Roscoe is his 'Life and Pontificate of Leo X.' In this also the author has been charged with undue partiality for his subject. He has reflected with much severity upon the great reformers of the sixteenth century, because, while they struggled against the overgrown absolutism of papal Rome, they could not divest themselves at once of the habit of intolerance which they had derived from early education. Count Bossi translated the 'Life of Leo' into Italian, adding notes in which he rebutted several of the charges brought against Roscoe's former work concerning Lorenzo: 'Vita e Pontificato di Leone X., di Guglielmo Roscoe, tradotta e corredata di annotazioni ed altri documenti inediti, dal Conte Luigi Bossi, Milanese,' Milan, 1817.

Considered as works of erudition and of general interest, the lives of Lorenzo and Leo by Roscoe stand deservedly high. They introduce the reader to a splendid period of modern history, among a chosen society of scholars, poets, statesmen, and artists, who gathered round the hospitable board of Lorenzo, and afterwards in the more pompous court of his son Leo. Numerous anecdotes and other particulars concerning those individuals make the reader familiar with their persons; and poetical extracts and valuable historical documents add to the value of the work. The style is remarkably pleasing and fluent. These merits of Roscoe's biographies have been universally acknowledged, even by those who have censured the general spirit of his works.

Roscoe contributed greatly to encourage among his countrymen a taste for Italian literature and the fine arts. In his own town of Liverpool, the Royal Institution owes its formation to Roscoe's exertions.

Roscoe was returned to parliament for Liverpool in the Whig interest. In the latter part of his life he became partner in a banking-house, in which however he was not successful. He died at Liverpool, in June, 1831. A biographical notice of him is appended to a new edition of his Life of Lorenzo, by his son.

ROSCOEA, a handsome genus of the highly ornamental family of Scitamineæ or Zingiberaceæ, which was named by Sir J. E. Smith, in honour of the historian of the Medici, who elucidated the plants and remodelled the genera of the Scitamineæ in his beautiful work on that family. The species have been figured by Smith, Wallich, and Royle.

The genus consists of only a few species, which are confined to the Himalaya Mountains, and is characterised by having spathaceous flowers, a single-leafed tubular calyx, corol ringent, limb double, the outer tripartite, with the upper segment erect and arched. Inner limb two-lipped, ovary inferior, style enclosed in the furrow of the anther, which is two-lobed, incurved, surrounding the style with an appendage split at the base.

The species of Roscoea, belonging to so tropical a family as the Scitamineæ, are generally accounted showy stove plants; but they are found only on the slopes of the Himalayas during the rainy season, when there is moisture with uniformity of temperature, and a much less degree of heat than is usually thought necessary is found to be sufficient for the growth of tropic-like plants, and therefore less would suffice for the cultivation of these plants than is generally supposed; indeed Roscoea purpurea has been flowered in a drawing-room in London, under a glass case, and without any artificial heat. Dr. Graham mentions its springing up in the open air every year in the Edinburgh Botanic Garden. But the genus Roscoea is that, of all the Scitamineæ, which is found at the greatest elevations. R. alpina is found at as great an elevation as 9000 feet above the level of the sea, and on places whence the snow had just melted, like the snowdrop in early spring in European countries. (Royle's *Himal. Bot.*, p. 357.)

ROSCOMMON, an inland county in the province of Connaught in Ireland, bounded on the north and north-east by the county of Leitrim, on the east by that of Longford, and on the south-east by those of Westmeath and King's, from all which it is separated by the river Shannon, except just on the north side; on the south-west it is bounded by the county of Galway, on the west by that of Mayo, and on the north-west by that of Sligo. The river Suck, a tributary of the Shannon, separates it along the greater part of the border from the county of Galway; and the Curlew mountains for a short distance from that of Sligo. The form of the county is irregular; the greatest length is nearly from north to south, from the border of the county of Leitrim west of Lough Allen to the junction of the Suck with the Shannon, 60 miles; the greatest breadth, at right angles to the length, is from the junction of the three counties of Galway, Mayo, and Roscommon to the bank of Lough Forbes near Tarmonbarry, 40 miles. The area is estimated by MacCulloch (*Statistical Account of the British Empire*) at 952 square miles, or 609,405 English acres, of which 453,555 are in cultivation, 131,063 unimproved mountain or bog, and 24,787 lakes. In the returns of the population for 1831, the area is stated to be 557,103 acres. We believe MacCulloch's statement, which is taken from a table furnished by Mr. Griffith, the engineer, to the Lords' Committee on Tithe, to be the most exact. The population in 1831 was 249,613, giving 262 inhabitants to a square mile. In area it is rather below the average of the Irish counties, but in amount and density of population rather above the average. Roscommon, the capital, is 80 English miles in a direct line west by north of Dublin, or 95 English miles by the road through Mullingar, Longford, and Lanesborough, or by Mullingar, Ballymahon, and Lanesborough.

Surface, Geology, Hydrography, Communications.—The surface of the county is partly undulating, but along the banks of the Shannon and the Suck, and in other parts, it is very flat. There are some mountains. The principal groups are the Braulieve, or Braughlieve, and Slievh Curkagh mountains (estimated at 1000 or 1200 feet high), which enter from the counties of Leitrim and Sligo on the north-west, and extend a little way into the county west of Lough Allen; the Curlew mountains, on the borders of Sligo near Boyle; the Slievh Bawn mountains, 839 feet in the northern part, and 857 feet high in the southern, parallel to the Shannon, and not far distant from it, on the east side of the county; the hills between the Shannon and the Suck in the south; and Slievh Aelwyn, between Castlerea and Ballinlough in the west. The Braughlieve and Slievh Curkagh have steep rugged acclivities and broad perpendicular faces of rock near their summits. The eastern side of the Slievh Bawn mountains slopes gradually down to the bogs in the valley of the Shannon at their base; the western side is more broken; the district at the foot is varied with wood.

The level parts of the county are for the most part occupied by the formations belonging to the great carboniferous limestone district of central Ireland. The impure argillaceous limestone, or 'calp,' the black shale, and the sandstone, which form one of the subdivisions of the limestone group, and the lower limestone, which constitutes another subdivision, subjacent to the calp, are found in this county. The hills west of Castlerea are composed of the yellow sandstone which is the lowest member of the limestone group. The Braughlieve and Slievh Curkagh mountains are composed of shales and sandstones, with three beds of coal resting on beds of the millstone-grit series, from which good ironstone is obtained. The coal of this district is not extensively diffused; it forms two fields partly or wholly in this county, separated from each other by the river Arigna, which flows between Braughlieve and Slievh Curkagh. There are some other coal-fields in other adjacent counties round Lough Allen. The coal answers well for smelting iron, and is used in the Arigna iron-works (the only iron-works in Ireland) in this county. Cast-iron of the best quality is produced at these works at a moderate expense. The company by which they are worked are in possession of the most extensive and valuable coal-fields of the neighbourhood.

The Curlew mountains and the Slievh Bawn mountains consist of rocks of the old red-sandstone formation. (Griffiths, 'On the Geological Structure of Ireland,' in *Appendix to Second Report of Irish Railway Commissioners; Parliamentary Papers* for 1837-8, vol. xxxv.) Good limestone is quarried for building. Potters'-clay and pipe-clay are found in various parts of the county.

The county belongs to the basin of the Shannon, except a very small portion at the western extremity, which is drained by the Moy, which flows into Killala Bay. Lough Allen, which the Shannon enters about five miles from its source, and through which it flows, is on the north-eastern boundary of the county. From the southern extremity of this lough the Shannon flows along the eastern boundary of the county to Carrick-on-Shannon, where it receives a stream from Lough Gara and Lough Key. From Carrick the Shannon pursues its course along the border, passing through Lough Corry, Lough Boderig, or Bodarg, Lough Boffin, and Lough Forbes to Lanesborough, below which it enters Lough Ree. It quits the southern extremity of Lough Ree just above Athlone, and runs southward to the junction of the Suck, where it quits the county, after a course along its eastern side, including the loughs through which it passes, of about 75 miles. The fall in this distance is very trifling. Lough Allen is only 160 feet above the level of the sea, and the fall between Lough Allen and the lower end of Lough Derg, which is above 40 miles below the junction of the Suck, is not more than about 62 feet, or about six inches to a mile. The Suck, the only important tributary of the Shannon, rises just within the county of Mayo, but its course is almost entirely within or upon the boundary of Roscommon; its length may be estimated at more than 60 miles.

Both the Shannon and the Suck are navigable. The navigation of the Shannon commences in Lough Allen, from whence to Battle Bridge, about seven miles and a half below the Lough, a canal is cut for the purpose of avoiding the difficulties of the natural channel. Other short canals are cut to avoid rapids or other difficulties in the lower part of the course. Agricultural produce, turf, coal, timber, bricks, flags, stone, slates, sand, and manure are the chief articles conveyed by the river. The navigation through Lough Ree is difficult, owing to its shoals and sunk rocks, notwithstanding which a great number of pleasure-boats are kept on it. The Royal Canal opens into the Shannon opposite Tarmonbarry in this county; the Grand Canal, just below the junction of the Suck. The traffic on the canals consists chiefly of corn and butter sent to Dublin, and English manufactures and general goods sent in return. The navigation of the Suck commences at Ballinasloe (county of Galway) for light flat-bottomed boats; small row-boats ascend higher. But a canal is cut parallel to it on the Galway side of the river, from Ballinasloe to the Shannon. Both the Suck and the Shannon abound with fish, especially eels, of which great quantities are taken in weirs and sent to Dublin. Those of the Suck are peculiarly fine.

The principal roads are the mail roads from Dublin to Sligo and to Galway. The Sligo road just crosses a corner of the county between Drumsna and Jamestown, re-enters at Carrick, and passes north-west through Boyle. The Galway road enters the county at Athlone, and crosses it in a south-west direction to Ballinasloe in Galway. The roads are excellent. Another road to Sligo, which branches off from the mail road at Longford in Longford county, passes through Tarmonbarry, Strokestown, and Elphin, and rejoins the mail road at Boyle. The road from Dublin to Roscommon (whether by Ballymahon or Longford) enters the county at Lanesborough, and runs south-west nearly eleven miles to Roscommon. Generally speaking the roads of the hilly district in the northern part of the county are inferior to those in the more level districts of the centre and south.

The principal lakes are Lough Allen (8 miles long from north to south, and 3 miles broad); Lough Bodarg, or Boderig, and Lough Boffin (forming one sheet of water of intricate form, 5 miles from the northern extremity to the south-eastern, and 7 miles to the south-western); Lough Forbes and Lough Ree (17 miles long from north to south, and 7 miles broad), all on the Shannon; Lough Gara (5 miles long from north to south, and 5 miles broad); Lough Key (otherwise Rockingham Lough); and Lough Oakport, all communicating with the Shannon by a stream called the Boyle Water; Lough Skean and Lough Meelagh, also communicating with the Shannon, and situate, as well as those just mentioned, in the northern part of the county; Lough Glin or Glynn, Lough Cloonagh, and Lough Aeluyn, all small, in the western part; Lough Funcheon and Lough Ballyneeny, in the southern part; and several others in the central and eastern part. The line of lakes on the Boyle Water, Lough Glynn, and Lough Meelagh are surrounded by picturesque and beatiful scenery. Besides these there are a number of 'turloughs,' or temporary lakes, formed in the hollows of the limestone tracts. They usually disappear in summer, but not always; and when dry early in the season, such as have grassy bottoms produce abundant crops. The water is drained off by fissures and passages in the limestone rock, which get choked by the vegetable matter washed into them by the first winter floods, and are cleared next summer by the decay of this obstruction. The size of these 'turloughs' varies with the season: some of them are of considerable extent.

The soil in the limestone district is commonly fertile; there is however a large extent of bog or other waste. The amount of pasture land is considerable: the natural pastures, which are esteemed to be some of the best ground in the county, are in the limestone districts, especially between Tulsk, Castlerea, and Boyle. Rich deep loams are met with; and there are, especially along the limestone ridges between the Shannon and the Suck, extensive tracts of light shallow soil, so shallow indeed that in some parts the plough cannot be used. These tracts are commonly used for sheep-feeding. The surface of the mountains is commonly wet and boggy, but there are intervening spots of dry ground covered with heath. Some of the soil in the sandstone districts, as in the Curlew Mountains, near Boyle, is very poor, but is capable of great improvement from the admixture of lime, or rather of a compost of lime and bog earth, which is to be had readily. Much may be done in this way, as well as by draining cold wet lands, whenever capital comes to be employed more extensively than at present in agricultural improvement.

The extent of the unimproved mountains and bogs has been estimated at above 130,000 English acres, the bogs being dispersed over the face of the country in patches of various size and in almost every variety of situation: they are found on the tops of the highest mountains, on the banks of the loughs and rivers, and in the bottoms of the valleys. Several of those on the uplands are comparatively dry, and afford in their natural state coarse pasturage for young and hardy cattle. Something has been done by spirited individuals towards reclaiming some portions of this large amount of waste land, but nothing has been done upon a large scale or upon any plan of co-operation.

Many of the estates in the county are large, some belonging to resident landlords, others to absentees. Rents vary; on farms of several hundred acres, 20*s.* and 25*s.* per acre are usual, but, sometimes 30*s.* and 35*s.* are given, and, in the immediate neighbourhood of towns, as much as 60*s.* and 80*s.* Tillage has been much extended of late years, and the quantity of food raised is probably greater than at any former period; but, excepting on the land held by a few wealthy individuals, the state of agriculture is very wretched, especially on the smaller farms. 'To say nothing of the deficiency of produce attributable to bad ploughing, unskilful sowing, want of manures, and an utter inattention to the alternation of green crops with those of corn, potatoes alone excepted, the loss upon what the land actually does yield is considerable, from bad and careless stacking, and the general want of barns. The stacks are commonly made very small, resting upon the earth; for in a country so bare of timber and hedgerows, boughs and bushes are scarce articles. If wet weather comes on and continues long, much of what lies below, next to the earth, perishes by attracting moisture: from the want of a broad and firm basis, the frail structure is liable likewise to be swayed by the wind; and the tops and sides losing their original form, and being no longer capable of throwing off the rain, still more damage ensues. To such losses are likewise to be added the depredations from vermin, rats, mice, and small birds, whilst the corn remains out of doors.

'As for barns, in the English and Continental acceptation of the term, they are literally unknown. The floor of some outhouse, or perhaps even that of the family room, may be used for threshing; but a vast proportion of the grain is beaten out in the open air, very commonly near the road side, where there happens to be a dry spot. These observations, it must be understood, apply to the small holdings; but upon such is raised a considerable quantity of the corn which is thrown into the market from the county of Roscommon.' (Weld's *Statistical Survey of the County of Roscommon*, 8vo., Dublin, 1832.)

The common ploughs of the small farms are very wretched: whether the instrument works well or ill is a matter of chance, and the plough is commonly followed by a man with a spade, or rather a 'loy,' to turn back the earth, which would else, after the plough had passed, revert to its former bed. However, on the lands of the principal gentry examples may be found of excellent tillage, with Scotch ploughs of the most approved construction, drawn by a pair of horses and driven by the ploughman. The 'loy' mentioned above is a sort of curved spade or shovel, of clumsy form, and with a handle of unusual length, far inferior to the spade in general utility, but not ill adapted for use in turning up a light shallow soil in rocky districts, where the plough cannot be used. In certain districts of the county where spade labour is common, the labourers unite in companies, and work for each other in rotation. This is the case especially in busy times, such as potato planting or digging, and lightens their toil by the cheerfulness which prevails.

'Wheat is commonly sown immediately after the crop of potatoes has been dug out. After the wheat, two or three crops of oats are taken, all for the one manuring for the potatoes; and then the ground is sometimes laid down with grass seeds, in a state unquestionably too poor for the purpose; sometimes "let out," in the phrase of the country, that is, left to nature to be clothed with grass of spontaneous growth, a process which is sure in time to be accomplished, though always more tardily than if the seeds were sown.' (Weld, *Statistical Survey of the County of Roscommon.*) This practice of 'letting out' is very injurious; and it is supposed that by the introduction of stall-feeding, and the cultivation of the artificial grasses and other green crops, the productiveness of the soil might be increased twofold.

The extensive grazing-farms of the county contrast favourably with the tillage land; yet, even in these, much improvement is needed. Thistles are allowed not only to remain, but to spread; so that it is no unfrequent circumstance for sheep to be pricked in the eye and blinded by them. The highest quality of pasture land consists commonly of natural grass. The favourite breed of oxen seems to be the long-horned Leicester. The principal graziers supply themselves at fairs for summer feeding: they raise only a few head themselves, and those of some superior breed. It is common also to have brood-mares on the large grazing-farms, and several fine horses of good blood are bred. There are no dairies on a large scale, but butter is made more or less in every part of the county. The sheep are considered to be far better than those reared in the adjacent counties, a result attributable partly to the superior skill and intelligence of the sheep-farmers, and partly to the dry and wholesome nature of their sheep-walks. The favourite breed is a cross between the old Connaught sheep and the Leicester, 'which produces an animal little inferior in size to the former, with a greater disposition to fatten in a short space, and with less waste or offal on the carcass.' (Weld, *Statistical Survey of the County of Roscommon.*)

The 'con-acre' system is general, but in some parts of the county is not carried to any great extent. The consolidation of the small farms into large has not been much practised; in some instances where it has taken place the tenants who were dispossessed were assisted to emigrate. Emigration has taken place in most parts of the county, but not to any great extent: the emigrants have been from various classes. They have gone chiefly to Canada or to the United States, but a few have gone to Australia. (*Appendix to First Report of Commissioners for inquiring into the State of the Irish Poor.*)

The condition of the peasantry, or 'cottiers,' is very miserable. In some places they occupy cabins without paying any rent; but more commonly they pay for a cabin, without land, a yearly rent varying with the locality, frequently rising to 1*l.*, in some cases to 1*l.* 10*s.*, and in the town of Boyle, as high as 2*l.* 10*s.*; with land, the yearly rent rises occasionally to 3*l.* and 3*l.* 10*s.* The rent is paid sometimes in money, sometimes in labour, in which cases the rate of wages is about 6*d.* a-day, and occasionally 8*d.* or 9*d.* The cabins are wretched hovels, built of mud or sods; or, where stone is abundant, with stone walls, either dry or with mortar, and thatched with straw or potato-stalks. The furniture is of the most miserable description, made up of a table, three or four stools, a box, and a pot or two. Bedsteads are comparatively rare; and the bedding consists of straw, having a blanket, perhaps only a sack, with the addition of the sleeper's day-clothes for a covering. In some parts of the county it is common for two families, or even more, to reside in one of these wretched habitations. The condition of the peasantry has very generally deteriorated since 1815, partly in consequence of the linen manufacture having declined. Disturbances have been frequent in many places, while in others the people have been very peaceable. There are a few charitable loan societies, some of them established from the funds raised in England for the relief of the Irish in 1823. Illicit distillation is prevalent, especially when corn is at a low price. Employment is scarce, and only a small portion of the peasantry have constant work. Wages are commonly 8*d.* or sometimes 10*d.* a-day without diet; or 6*d.* with diet, in summer; and 6*d.* a-day without diet in winter. In busy times, and in the neighbourhood of the towns, higher wages are paid. The average yearly gains of a labourer are variously estimated, but commonly from 7*l.* or 8*l.* to 10*l.* a year. Women and children get little employment, except at busy seasons, such as potato setting and digging, and in harvest, when they earn 4*d.* or 5*d.*, or even 6*d.* a-day without diet. Herdsmen are usually better off. On a farm of fifty acres, they get a cabin, an acre of potato or cabbage garden, and grass for a cow; on a farm of a hundred acres, two acres of garden, and the grass of two cows, with the opportunity besides of keeping a pig or a few geese. The diet of the peasantry consists of potatoes, with the addition, in some cases, of milk, or buttermilk, red herrings, and oatmeal for gruel. Their clothing is commonly of the most wretched character.

Divisions, Towns, &c.—The county is divided into six baronies, or half-baronies, as follows:—

	Situation.	Pop. 1831.
Athlone	S.	56,865
Ballintobber*	W.	70,597
Ballymoe (half barony)	S W.	7,353
Boyle	N. & N.W.	66,105
Moycarne or Moycarnon (half-barony)	S.	7,243
Roscommon	Central	41,450

There are, in the county, the assize and market town of Roscommon; the market and post towns of Boyle, Castlerea, Elphin, Frenchpark, and Strokestown; and the post towns of Athleague, Keadue, and Mount-Talbot. Portions of the borough of Athlone [ATHLONE], and of the towns of Ballinasloe [BALLINASLOE], Carrick-on-Shannon, and Jamestown [LEITRIM, COUNTY OF], and Lanesborough [LONGFORD, COUNTY OF], are also within the border. The principal villages are Lough-Glynn, Ruskey, Knockcroghery, Tarmonbarry, and Castle Plunket.

Roscommon is in one of the detached portions of the barony of Ballintobber. It appears to have derived its origin and its name (Ros-Coman, 'the pleasant place of Coman') from an abbey founded about A.D. 550, by St. Coman or Comanus. Another abbey of greater magnificence was founded here for the order of Preaching Friars, about A.D. 1257, by O'Conor, king or prince of Connaught; and a few years after, a strong castle was built by Sir Robert de Ufford, one of the early English adventurers. Of these last two edifices there are considerable remains; the castle is on the north side of the town, and the abbey on the south side. Both are on level ground, while the town occupies the eastern and southern slopes of an intervening eminence. The castle is an oblong quadrangle, with a tower at each angle, and two additional towers to defend the gateway, which is on the eastern side. The town consists of three or four streets irregularly laid out, having in the centre an open space opposite the old gaol, a building situated on the summit of the eminence on which the town stands, but now disused as a prison from want of sufficient space. Near this is the old court-house, now converted into a Catholic chapel. A new court-house, a substantial and commodious building, but deficient in architectural correctness and effect, and a new gaol, have been built, and near them are some good new houses; but with the exception of these, the town presents an appearance of wretchedness and decay; four-fifths of the houses are mere cabins. There is a neat church with a square tower. The town is ill supplied with water. There is a county infirmary near the new court-house, a plain brick building. The ruins of the Abbey church are of various dates; they contain a tomb, said to be that of O'Conor, founder of the abbey, with a mutilated effigy recumbent on it, and effigies of Irish gallow-glasses (antient light-infantry) sculptured in relief on the perpendicular sides of the tomb. The interior of the church is still used as a burial-ground.

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* The principal part of the barony of Ballintobber is on the west side of the county; but there are two other large portions quite detached from it, on the banks of the Shannon and Lough Ree.

The parish extends into the barony of Athlone; the entire population in 1831 was 8374, of whom 3306 were in the town. The shops are numerous, but business does not appear to thrive as in some other towns in the county. Course pottery is manufactured near the town. There is a weekly market on Saturdays, well attended, at which corn, the materials of clothing, and articles of clothing made up, are sold to a considerable extent. There is no direct communication with Dublin; but there are cars to Athlone and to Killashee on the Royal Canal. Mendicity and prostitution prevail to a frightful extent. There is a barrack not far from the town.

The assizes for the county are held here; and also the Epiphany and Midsummer quarter-sessions for the division, which comprises the baronies of Athlone, Ballymoe, Moycarne, and part of Ballintobber, and petty sessions for the district. The town was formerly a parliamentary borough, but was disfranchised at the Union, since which time the corporation has become extinct. There were in 1835 six schools connected with the Kildare-place Society, the London Hibernian Society, the London Ladies' Hibernian Society, or supported by endowment or contribution; a classical school, and eleven hedge-schools: in all, eighteen schools.

Boyle is about 108 miles from Dublin, on the mail-road to Sligo, and on the stream (the Boyle Water) which flows from Lough Gara into Lough Key. The town appears to have risen under the protection of a Bernardine abbey, which was transferred to Boyle, A.D. 1161, and attained great wealth. The ruins exist on the left or north bank of the Boyle Water, about a quarter of a mile below the town bridge; they are tolerably extensive, and include the remains of the church and of some of the monastic buildings, now enclosed in a private garden. Some of the arches were walled up after the suppression, when the abbey was for a time occupied as a military post. The older part of the town stands on the northern side of the river; the more improved part on the southern. The newer houses are in this part; they are built of limestone or sandstone. Of about five hundred houses, three-fifths are miserable thatched cabins, and half the remainder are little better. The town is inconveniently laid out. The bridge over the river is a handsome structure, 100 feet long and 42 feet wide, of three arches, and lately built in place of an older bridge, which had five low narrow arches. A new bridge of one arch has been thrown over the river a little below the town bridge, and just above the ruins of the abbey; and a third bridge lower down. The church is capacious, but the architecture is not in good taste. There are two Roman Catholic chapels, one or two dissenting places of worship, a new sessions-house, a bridewell, and a barrack; the last was formerly a nobleman's mansion. The old sessions-house has been pulled down, and a building for religious and charitable purposes erected on its site.

The population of the town, in 1831, was 3433; of the whole parish, 12,597. The town is fairly provided with shops, and is the mart of the surrounding district. Corn, and butter, which is sold in firkins for exportation, are the staple articles of trade. The butter-market is on Monday; but the principal market, at which a considerable quantity of linen yarn is sold, is on Saturday. Heavy goods are chiefly brought from Sligo, lighter ones from Dublin. There are six fairs in the year.

Boyle was formerly a parliamentary borough, but the privilege of returning members was lost by the Union; and the corporation has been dissolved by the late Irish Municipal Reform Act. There were in the parish, in 1835 seventeen day-schools, including two private boarding schools, two national schools, one school supported by the Baptist Society, four schools partly supported by subscription, four private day-schools, and four hedge-schools There were beside four Sunday-schools. A weekly newspaper is published at Boyle.

The quarter-sessions are held here twice in the year, for the division which comprises the baronies of Boyle and Roscommon and part of the barony of Ballintobber; petty-sessions are also held. There is a barrack for the county constabulary, of whom a body are stationed here. There are a charitable loan society, and two dispensaries, one maintained by Lord Lorton, whose beautiful mansion and demesne of Rockingham are on the banks of Lough Key near the town.

Castlerea is in Kilkeevan parish, in the barony of Ballintobber, 17 miles north-west of Roscommon, on the river Suck, which runs through the town, and divides it into two parts; a small stream, a feeder of the Suck, also runs through the town, and joins the river just below. The town consists principally of one long street, the continuity of which is interrupted by two bridges over the Suck and its feeder. Many of the houses are new, nearly one-half of the southern side of the street has been rebuilt, and new cottages for the peasantry are springing up on every part of the estate of Lord Mountsandford, whose demesne and residence are close to the town. The population of the town, in 1831, was 1172; that of the whole parish, 10,867. Of about 170 houses, nearly 70 were mere cabins, and about 25 were thatched houses of two stories; but the cabins are better than in most other towns in the county, and some of them are remarkably neat. There are several neat cottages with gardens in the neighbourhood.

The market is on Wednesday for corn, and on Saturday for provisions. There are a malthouse, a distillery, and a tan-yard, and a number of small shops. There is a market-place, with convenient shambles. There are four fairs in the year. The Easter quarter-sessions for the Boyle division of the county are held here. The sessions-house stands near the market-place; and there is a bridewell. Petty sessions are also held. The parish church of Kilkeevan is close to the town, and there is a Catholic chapel.

The parish had, in 1835, twenty-three day schools, including two national schools, one school chiefly supported from Erasmus Smith's fund, nine supported by Lord Mountsandford, one supported by the Catholic clergy of the parish, a classical school, and nine hedge-schools. There are a loan fund and a dispensary.

Elphin is in the barony of Roscommon, 11 miles south by east of Boyle. The town extends along the summit of a ridge, and runs nearly east and west: more than two-thirds of the houses are mere cabins, many of them of the most wretched character; there are scarcely any slated houses. The cathedral stands at the eastern end of the town, and the Catholic chapel at the western. The cathedral, a modern building, of barn-like appearance, about 80 feet long and 28 broad, with a slated roof, is little in harmony with the tall dilapidated square tower with which it is united. It is used as the parish church, and is neat in its internal appearance. The bishop's palace is a spacious and comfortable country-house, with a lawn in front. The Catholic chapel is commodious, but not elegant.

The population of the town, in 1831, was 1507; of the whole parish, 6643. The shops are small and ill-supplied. A market has been established within the last few years by the bishop. There is a dispensary. There were, in 1835, three day-schools, supported, one by the clergy and the Society for Discouraging Vice, and two by the London Ladies' Hibernian Society, and nine hedge-schools. The diocesan school, founded by Bishop Hodson, A.D. 1685, is not noticed in the Parliamentary Returns. There are two yearly fairs at Elphin.

French-park is in the barony of Boyle, 9 miles south south-west of Boyle. It is a small place, containing about a hundred houses, most of them mere cabins, at the junction of four roads. There are a Catholic chapel, a school-house, and a sessions-house; and a market-house has been erected within the last few years. The mansion and demesne of French-park, the seat of the French family, are close to the town; and about half a mile distant, on the verge of a bog, are the ruins of Clonshanvill Abbey. The ruins consist of the walls of the church, with its steeple, two detached chapels in the burial-ground, and the remains of a square building belonging apparently to the habitable part of the abbey. The ruins, from their situation in a flat open country, form a striking object at a distance, but are neither very picturesque nor of much antiquarian interest when viewed nearer. In the burial-ground, which is still used, is a lofty cross. The population of the town, in 1831, was 447; that of the parish of Tybohan or Taughboyne, in which it stands, was 16,460. Butter, yarn, and pigs are sold in the market, which is held on Thursday. There are three yearly fairs. Good sandstone is quarried in the immediate neighbourhood, and limestone in the town itself. Petty sessions are held here. French-park has a dispensary.

Strokestown is in the barony of Roscommon, between Elphin and Lanesborough. It contained, in 1831, about two hundred and sixty houses and 1547 inhabitants. The town consists of two streets crossing at right angles; the one which runs east and west is nearly 150 feet wide, and has Lord Hartland's demesne and mansion at one end, and a new church at the other. Three-fifths of the houses are mere cabins, and more than another fifth are thatched cottages, little better than cabins. The rest are built of limestone or sandstone, both of which are procured near the town, and are roofed with Welsh slates, imported into Sligo, and brought from thence by land carriage. Trade is prosperous, and the market is well attended; a considerable quantity of wheat, for the growth of which the soil round the town is particularly favourable, is sold; and the country-people bring in linen, linen yarn, tow, woollen stockings, flannels, and a peculiar kind of woollen stuff which is dyed and dressed in the town. The market is also well supplied with lake and river fish, and some sea-fish, and goods of all kinds are sold in stalls. There are four yearly fairs. There are a sessions-house and bridewell, and the quarter-sessions for the Boyle division of the county are held here once in the year. There is also a dispensary. The old mansion-house of Lord Hartland has been modernised: in the grounds, at a short distance from the house, are the roofless walls of an old church, used as the family burial-place. Races are held at Ballynafad, three or four miles south of the town.

Athleague is a small place, containing, in 1831, eighty-seven houses and 488 inhabitants: there is a long bridge, or rather series of bridges connected by a long causeway, carried obliquely across the river Suck, which here flows in a divided channel. Athleague is a dull place, with little trade; there is a flour-mill. Four fairs are held in the year. The church is an old building in bad repair; there is a Catholic chapel in the town. Keadue is in Boyle barony, ten or eleven miles north-north-west of Carrick-on-Shannon; it consisted, in 1831, of about forty houses, chiefly cabins. A market-house was then building; and the place was increasing in prosperity from the neighbourhood of the Arigna iron-works. There are ten yearly fairs. Keadue has a dispensary. Mount-Talbot is in Athlone barony, on the banks of the Suck, and takes its name from the demesne of the Talbot family, which is close to the village. It is a small place, pleasantly situated. Mount-Talbot has four fairs in the year. Petty sessions are held both here and at Keadue.

Lough-Glynn had, in 1831, about fifty houses, chiefly cabins, but superior to those commonly met with; there were a Catholic chapel and a dispensary near the village, and a parish church at some distance: the population was 254. Ruskey or Rooskey is in Ballintobber hundred, and on the Shannon, over which is a bridge of nine arches: the village extends across the river into Leitrim and Longford counties. The church of the parish of Tarmonbarry is in the village; also a Catholic chapel. Knockcroghery (pronounced Nocrohery) is in the barony of Athlone, about 5 miles south-east of Roscommon, not far from Lough Ree. It has a new church and new school-houses. A considerable manufactory of tobacco-pipes is carried on; and there are two yearly fairs, one of them a large one. Tarmonbarry is in Athlone barony, on the right bank of the Shannon, which is here divided into two arms, over each of which there is a bridge: these bridges are connected by a causeway over the intervening island. The Royal Canal terminates in the Shannon at Richmond harbour opposite Tarmonbarry: there are extensive basins, docks, and warehouses on the Longford side of the river. Castle-Plunket is a miserable place of about forty miserable cabins. Lough-Glynn and Tarmonbarry have each four fairs in the year; Castle-Plunket has three.

Divisions for Ecclesiastical and Legal Purposes.—The number of parishes in the county is differently stated; we believe the correct number to be fifty-six. These, with some of the adjacent parishes in the next counties, make up thirty-one benefices; of which twenty-seven are in the diocese of Elphin, one in that of Clonfert, one in Ardagh, and two in Tuam. All these dioceses were in the ecclesiastical province of Tuam, except Ardagh, which was in the province of Armagh; but by the late alterations in the Irish church, all are now in the province of Armagh.

The county is included in the Connaught circuit: the assizes are held at Roscommon, where is the county gaol. The county is divided into two parts for the sessions business: the division of Athlone comprehends the baronies or half-baronies of Athlone, Ballymoe, Moycarne, and part of Ballintobber; the division of Boyle comprehends the baronies of Boyle, Roscommon, and the rest of Ballintobber; the sessions for the first are held alternately at Athlone and Roscommon; those of the second, twice in the year at Boyle, once at Castlerea, and once at Strokestown. The county gaol is at Roscommon, and there are bridewells at Athlone, Boyle, Castlerea, and Strokestown. The discipline of the county-gaol is very defective; the great objects of prison discipline are altogether lost sight of; nor is the size of the gaol or the number of the cells sufficient. The bridewells of Athlone and Boyle are clean and well ordered. Those of Castlerea and Strokestown are for the temporary lodgment of prisoners. The constabulary force, on 1st January, 1838, amounted to 244, viz. 1 subinspector, 6 chief constables, 7 head-constables, 43 constables, and 187 subconstables.

There is a county infirmary at Roscommon, and dispensaries at Athlone, Boyle, Castlerea, Elphin, French-park, Strokestown, Keadue, Lough-Glynn, Croghan, Tulsk, and Ballyleague. The county is included in the district of the Connaught lunatic asylum, which is at Ballinasloe.

Two members are returned for the county, who are elected at Roscommon. Athlone, which is partly in this county, is the only parliamentary borough. The number of voters on the register for the county in 1834-5 was 1864; for the borough of Athlone 274.

The amount of grand-jury presentments in the year 1837 was 27,051*l.* 18*s.* 3*d.*, viz.: for new roads, bridges, &c. 2502*l.* 3*s.* 6½*d.*; for repairing roads, bridges, &c., 7884*l.* 2*s.* 11½*d.*; for building or repairing gaols, bridewells, and houses of correction, 41*l.* 10*s.*; for prison and bridewell expenses, 1915*l.* 15*s.*; for the police and expenses of witnesses, 4196*l.* 0*s.* 10¾*d.*; for salaries of county officers, not included in the foregoing heads, 3376*l.* 18*s.*; for public charities, 1454*l.* 17*s.* 2*d.*; for the repayment of government advances, 5108*l.* 6*s.* 10½*d.*; and for miscellaneous expenses, 572*l.* 3*s.* 10*d.*

History, Antiquities, &c.—In the earliest historical period this county appears to have been partly or wholly in possession of the Auteri, a people mentioned by Ptolemy, and supposed by Sir James Ware (*Hist. of Ireland*, vol. ii., ch. vi.) to have inhabited some part of the counties of Galway and Roscommon. At a later period it was occupied by the septs or clans of O'Conor Ruadh (red), Rough, or Roe; and O'Conor Dhunne (brown) Dunn, or Don, whose territories comprehended respectively the baronies of Roscommon and Ballintobber; and by the sept of the Macdermots, whose territories now constitute the barony of Boyle; the parts bordering on Galway were occasionally encroached upon by the O'Dalys and the O'Kellys of Galway. The territories of the two tribes of the O'Conors were called Hy-Onach; those of the Macdermots were called Moylarg or Moylurg; and those of the O'Dalys and O'Kellys, Hy-Maine or Mainech. Part of the county was included, with a portion of Galway, in Clanckonow, the territory of the Bourks: the most northern part was included in Coreachlann, the territory of the O'Hanlys and O'Broenans; between the Suck and the Shannon was the district of Dealbna Nuadhat; Hy-Briun Sinna was another district along the bank of the Shannon; and a district called Kierrigia-ai, afterwards Clan-Kethern, was included in the county, but in what part is not specified. (Ware, *Hist. of Ireland*, chap. vii., sec. 1.)

Of the earliest period there are few memorials, the raths (hill-forts or earth-works) are the principal. Of these there are more than four hundred and seventy. They are always upon natural eminences. They contained within their ramparts the dwelling-places of the chieftain and his family, commonly constructed of earth and hurdles, but having sometimes wooden walls upon a foundation of earth. At Oran, between Roscommon and Castlerea, is one of the round towers whose use and origin are so uncertain. It is only about twelve feet high, and bears the appearance of never having been finished, rather than of having been thrown down. Its interior diameter is 11 feet 3 inches; and the thickness of the walls 4 feet 6 inches. It is built of limestone; the stones are well cut, fit closely, and are laid in even courses.

Seven years after the English invasion of Ireland, the county was attacked by Milo or Miles de Cogan, one of the most active and warlike of the English adventurers. Roscommon formed at that time part of the kingdom of Connaught, and was governed by Roderic O'Conor, recognised as sovereign of Ireland. De Cogan advanced with 40 knights, 200 other horsemen, and 300 archers to the town of Roscommon, where he was joined by Murrough, son of Roderic, at the head of a body of malcontents. The natives however, by driving away their cattle and laying waste their country, reduced De Cogan and his army to great danger from famine, and obliged them to retreat. In 1204 the county was again ravaged by William Bourke (or de Burgo) Fitz-Aldelm, lord of Limerick and the neighbouring country: in 1216, the castle of Athlone, on the frontier, was erected to secure a ford of the Shannon, and in 1268 that of Roscommon was built to secure the quietness of the county, at that time assumed to be subject to the English, and included in a grant of Connaught, made by Henry III. to the family of De Burgo, or De Burgh, who held also the earldom of Ulster. The native princes of the country, though recognising the supremacy of the English crown, were not disposed to submit to such wholesale spoliation, and the castle of Roscommon was twice taken by them, A.D. 1272 and 1276. This part of Ireland appears to have been long in a state of anarchy, the Irish septs struggling for independence with the De Burgos, their Anglo-Norman masters. In A.D. 1315, Richard de Burgo, earl of Ulster, and Fedlim or Phelim O'Conor, Irish prince of Connaught, advanced in conjunction from Roscommon, to repel the invasion of the Scotch under Edward Bruce; but O'Conor, seduced by the offers of Bruce, entered into a secret treaty with him; and returned home to guard his own inheritance against his kinsman Roderic, who sought to usurp it. Fedlim, whose treaty with Bruce was not known, was supported by the English, and by their aid he defeated Roderic, who fell in the battle. He now avowed his alliance with the Scots, but was entirely defeated by the English under William de Burgo, brother of Earl Richard, and Sir John Bermingham, at Athenry in Galway, A.D. 1316. The victory utterly broke the power of the O'Conors, who split into clans or septs, of which two have been noticed as occupying portions of Roscommon. These two septs became rivals, and wasted their strength in mutual hostilities. Meanwhile, the inheritance of the De Burgos came by marriage to Lionel, duke of Clarence, son of Edward III., whose descendants afterwards came to the throne in the person of Edward IV., except such of the territories of the family in Connaught as were usurped by some of the younger branches.

Of this troubled period there are several memorials, in the ruined castles and monastic buildings which exist. Roscommon Castle, and Roscommon, Boyle, and Clonshanvill abbeys, the last near French-park, have been noticed. Between Roscommon and Castlerea are the ruins of Ballintobber Castle, the antient stronghold of the O'Conor Dhunne or Don. The walls enclose a quadrangle 270 feet by 237 feet, and are strengthened by polygonal towers resembling those of Caernarvon Castle. The walls and the towers are tolerably complete externally; but the towers are little more than shells. There are the walls of the church and of some of the dependent buildings of Tulsk Abbey standing. There was formerly a strong castle at Tulsk, and there was one at Ballynafad near Strokestown, of which the ruins are still visible: it was the stronghold of O'Conor Ruadh. A very remarkable ruined fort of unknown antiquity is to be seen near Lough Glynn. The keep of Athlone Castle, which is yet standing, is a decagon, and is in the Roscommon part of the town. There are several remains of small castles, especially of one on Castle Island in Lough Key, but none of them deserving particular description. There are considerable ruins of Coote Hall, a fortified mansion of the middle ages, between Lough Key and the Shannon.

In the reign of Elizabeth, Connaught was formed into counties, and the county of Roscommon divided into baronies. This measure is ascribed by some to the earl of Sussex lord-lieutenant (A.D. 1562-64); by others to his successor, Sir Henry Sidney, lord deputy (A.D. 1665-67); while Mr. Weld (*Statistical Survey of the County of Roscommon*) ascribes it to Sir John Perrot, lord deputy, whose administration was considerably later (A.D. 1584-88).

In the rebellion in Elizabeth's reign, the O'Conors remained faithful to the English. Boyle Abbey was besieged by the Ulster insurgents in the war of 1641. The county fell into their hands, and the O'Conor Dhunne now took part with them: some severe encounters took place, especially in 1642, when Callaugh O'Conor was defeated by the English. The insurgents long retained possession of the county, but on the termination of the war their chiefs were deprived of their estates, which were confiscated, and divided among English and Scotch adventurers. At the Restoration O'Conor Dhunne or Don obtained the greater part of his property again, and his descendants are among the few native Irish families who have retained their lands. In the war of the Revolution, the principal events connected with this county were the first ineffectual siege of Athlone by a body of William's army, under General Douglas (A.D. 1690), and the subsequent siege and capture of that city (A.D. 1691) by the main body of William's troops, then under General Ginkell. [ATHLONE.] This was followed by the decisive battle of Aghrim [AGHRIM], fought in the adjacent county of Galway. Roscommon gives the title of earl to the noble family of Dillon.

(Weld's *Statistical Survey of Roscommon*; Ware's, Cox's, Gordon's, and Moore's *Hist. of Ireland*; *Parliamentary Papers*; Lewis's *Topographical Dictionary of Ireland*.)

ROSCOMMON, WENTWORTH DILLON, EARL OF, was born in Ireland about 1633. He was the son of James Dillon, third earl of Roscommon, and Elizabeth Wentworth, sister to the earl of Strafford, who was godfather to his nephew, and gave him his own family name. Upon the breaking out of disturbances in Ireland, Strafford sent for him, and placed him at his own seat in Yorkshire, where he had him instructed in Latin, which Dillon is said to have learned so as to write it with purity and elegance, though he was never able to retain the rules of grammar. When the storm had overtaken Strafford, Dillon was sent to Caen, where he prosecuted his studies under Bochart. He afterwards travelled into Italy, where he examined with care the most valuable remains of classical antiquity, and he acquired uncommon skill in the knowledge of medals. He returned to England at the Restoration, and was made captain of the band of pensioners, a preferment which led him into the habit of gaming and the loss of much of his fortune. He was subsequently appointed master of the horse to the duchess of York, and he married the Lady Frances, daughter of the earl of Burlington, and widow of Colonel Courtney.

Wood says of Roscommon that he 'was educated from his youth in all kind of polite learning,' and that he 'was accounted most excellent in the art of poetry.' He was nominated at Oxford to be created LL.D., May 23rd, 1683, but did not appear at the time appointed. Whether he had previously been connected with the University is uncertain. He formed the intention of escaping apprehended evils at home by retiring to Rome, but he was delayed by the gout, which, through improper medical treatment, occasioned his death. At the moment in which he expired, he uttered, with an energy of voice that expressed the most fervent devotion, two lines of his own version of 'Dies Iræ:'

> 'My God, my Father, and my Friend,
> Do not forsake me in my end.'

He died in 1684, and was buried with great pomp in Westminster Abbey.

Roscommon wrote the following works: 1, 'An Essay on translated Verse,' London, 1680, 4to.; 2, 'Prologues and Epilogues to Plays,' &c., collected 1684, 8vo.; 3, Horace's 'Art of Poetry,' translated into English blank verse, 1680, 4to.; 4, 'Dr. Wm. Sherlock's case of Resistance of Supreme Powers,' translated into French, 8vo. A short time before his death, Roscommon, among other literary projects formed the plan of a society for refining the English language and fixing its standard, and he is said to have been assisted in the design by John Dryden; but no particulars upon this subject are recorded.

(Wood's *Fasti Oxonienses*; Johnson's *Lives of the Poets*; Walpole's *Royal and Noble Authors*, Park's edition.)

ROSE. [Rosa.]

ROSE-COLOURED OUZEL. [Sturnidæ.]

ROSE-ENGINE TURNING. [Turning.]

ROSEMARY. [Rosmarinus.]

ROSEN, FREDERIC AUGUSTUS, was born on the 2nd of September, 1805, at Hanover, and died in London on the 12th of September, 1837. He received his earliest education from his father, who still lives at Detmold in Westphalia, where he holds a high official situation in the government of the prince of Lippe Detmold. He afterwards went to the gymnasium at Göttingen. In the year 1822 Rosen went to the university of Leipzig, and two years afterwards to Berlin. The energy with which he applied himself to all branches of science and literature, and his great powers for acquiring knowledge, encouraged his friends to form the highest expectations of his future career. At an early period he had become distinguished for his classical attainments and his knowledge of the Semitic languages; but it was not until the year 1824 that he turned his attention to the Sanscrit, a language which at that time was almost unknown in Germany, although its importance in all questions connected with the early history of civilization had been pointed out by the two Schlegels, Creuzer, and William von Humboldt. During a short visit which he paid to his family, he made himself acquainted, with his father's assistance, with the antient language of the Brahmans, in which he received further instruction at Berlin from Professor Bopp, who had just returned from London, and been appointed professor of Sanscrit at the university of Berlin. William von Humboldt, who devoted his time to the same pursuits, also encouraged him to proceed in his Sanscrit studies. The total want of all useful aids towards obtaining a knowledge of this difficult language, suggested to Rosen the idea of supplying the deficiency, which his acquisitions rendered him well able to do. Accordingly, in 1826, when he took his degree of doctor of philosophy, he published his 'Corporis Radicum Sanscritarum Prolusio,' which was only the forerunner of his larger work 'Radices Sanscritæ,' Berlin, 1827. This work, which abounds in learning and sound criticism, has contributed more than any other to recommend and facilitate the study of the Sanscrit language in Germany. It is now out of print, and the author had prepared a second edition, in which he had remodelled his original plan, in order to adapt his work to the then advanced state of Sanscrit literature. Rosen also had applied himself, with the greatest success, to the study of Arabic and Persian; and he had prepared for publication several large episodes of the 'Sháh Náhmah,' the great epic poem of the Persians. This intense application to the literature and the languages of the East gave birth to a strong desire to visit Asia. A favourable opportunity presented itself, and he was appointed attaché to the Prussian embassy at Constantinople. Shortly before he started however he received a flattering invitation to become Professor of Oriental Languages in the University of London (now University College) then just established. He accepted the offer, hoping to find in this country a wide field for his literary labours. Before going to London, he visited Paris, in order to become acquainted with De Sacy, Remusat, and De Chézy; and after a short stay in that city he came to London. But his expectations of honour and profit were greatly disappointed; for though he had a few pupils in Sanscrit, Arabic, and Persian, it soon became evident that a teacher of the Hindustani language was more wanted at the London University than a professor of Oriental languages as the term is understood in Germany. His energy did not however fail him; and seeing that he could be useful in a secondary capacity, he applied himself for several months with great industry to the Hindustani, in order that he might qualify himself to teach the language. Some years afterwards he resigned his professorship of Oriental languages; but subsequently accepted the Sanscrit professorship in University College. The high opinion which the College entertained of his services may be collected from the Annual Report of the College for the year 1837-38, which was made after his death.

He derived more satisfaction from his occupation as honorary foreign secretary of the Royal Asiatic Society, and as secretary to the Oriental Translation Committee, then just established. This brought him into communication with that great Oriental scholar Colebrooke, for whom he entertained the highest admiration. By Colebrooke's advice he published, under the sanction of the Translation Committee, the Arabic text of the 'Algebra of Mohammed ben Musa,' with an English translation, accompanied with excellent notes [Musa]; he also prepared for publication the great 'Biographical Dictionary' of Ibn Khallikan, but this, as well as another work, in which he intended to give a comprehensive view of the system of Indian jurisprudence, was never completed.

Amidst these various occupations he had not lost sight of a higher and more arduous task, in which he wished to concentrate all his attainments. Having discovered that the character of the Indian literature and language could only be completely understood by tracing them back to the earliest periods to which the 'Vedas' belong, he desired to remove the obscurity by which they are surrounded. In 1830 he published his 'Rig Vedae Specimen,' Taylor, London, and from that time his principal attention was directed to this great object. In order to understand the obsolete language of these antient writings, he had to study the oldest of the grammatical works of the Hindus. Having done this, he applied himself to the Commentaries, without a full knowledge of which the texts are quite unintelligible. All this was done under very disadvantageous circumstances, and it is a matter of great regret that he was not placed in a situation which would have made other labour unnecessary.

Among his various literary labours at this period was the revision of the 'Dictionary, Bengali, Sanscrit, and English,' published by Sir Graves Houghton, London, 1833-4. He also made the 'Catalogus Codicum Manuscriptorum Syriacorum et Carshunicorum in Museo Britannico,' which has been published, since his death, under the care of the Rev. Mr. Forshall, who in his address to the reader has justly attributed to Dr. Rosen all the merit of this catalogue. Unfortunately Dr. Rosen's name does not appear either on the title-page of this catalogue, nor after the præfatio which he wrote, and which is printed at the head of the catalogue. To qualify himself for this labour, Rosen made himself master of the Syriac language, with which he was hitherto imperfectly acquainted. At Colebrooke's request he undertook the collection of his 'Miscellaneous Essays,' to which he added an excellent index, 2 vols., London, 1827. He also wrote all the articles relating to Oriental literature in this work, from the article 'Abbasides,' to the article 'Ethiopian Language,' both included, 'together with several articles on Eastern Geography, such as 'Arabia' and 'Armenia.' He revised the work on the Hindus, which was published in the 'Library of Entertaining Knowledge;' the chapter on the literature is entirely by his hand. For the 'Journal of Education' he wrote a review of Bopp's 'Vergleichende Grammatik,' &c. (vol. viii.), and two reviews of Pott's 'Etymologische Forschungen' (vols. 9, 10). He maintained a constant correspondence with almost all the distinguished scholars on the Continent, and for the last ten years of his life no important publication connected with Eastern philology or history was projected on the Continent to which he did not contribute either by his advice or by the supply of materials. His worth was fully appreciated on the Continent, and a desire was often expressed that he should return to his native country; but being anxious to accomplish his design of publishing the 'Vedas,' and conceiving that he was placed in a wider sphere of utility in England, he preferred remaining in London, where he found such valuable treasures of Oriental literature.

In the year 1836 he began to print the collection of the hymns of the 'Rig Veda,' giving the Sanscrit text, a Latin translation, and explanatory notes. In the autumn of 1837 he had advanced so far that he intended to publish a first volume, when his sudden death, in the prime of life and in the full vigour of his intellectual powers, interrupted an undertaking for which no man in Europe was so well qualified or prepared as himself. The Translation Committee published the book after his death, as far as it was completed, under the title 'Rig Veda Sanhita Liber Primus, Sanscrite et Latine,' London, 1838, 4to. Those who may hereafter profit by the study of this work, should know at what price it has been obtained: it is only a fragment, but it contains the energy of a whole life. Rosen's posthumous papers and collections have been confided for publication to the able hands of Professor Lassen of Bonn.

Although Rosen had acquired so honourable a rank as an Oriental scholar, his position in society was no less distinguished. The highest admiration for his talents and attainments was accompanied with universal respect for his virtues. The simplicity of his pure and elevated mind, the gentleness of his manners, and, above all, the genuine kindness of heart which formed the striking feature of his character, secured for him, in an eminent degree, the affection of all who knew him. His readiness on all occasions to aid and advise his literary friends, at any cost of labour, is well known to many who will read this notice.

The loss of such a man will always be severely felt by all, but especially by those who were intimately acquainted with him. His numerous friends, both English and Germany, have presented his father with a marble bust of his son, by Richard Westmacott, as a mark of their esteem for his character and regret for his loss, and have erected a monument to his memory in the cemetery at Kensall Green near London, where he is interred.

ROSENMÜLLER, JOHN GEORGE, was appointed Professor of Divinity in the University of Leipzig, and superintendent in the Lutheran church at the same place in 1785, and died in 1815. His chief works are: 1, 'Historia Interpretationis Librorum Sanctorum in Ecclesia Christiana, ab Apostolorum Aetate ad Literarum Instaurationem,' 5 parts, 8vo., 1795-1814; and 2, 'Scholia in Novum Testamentum,' 5 vols. 8vo. The latter is a useful work, especially for young students, but the author cannot be placed in the first rank of commentators. His labours were more directed to the explanation of particular words and phrases than to the general comprehension of the sacred writings. He seldom gives a satisfactory solution of any formidable difficulty.

ROSENMÜLLER, ERNEST FREDERIC CHARLES, son of the preceding, was born in 1768, and died on the 17th of September, 1835, after having for many years held the office of professor of oriental languages in the University of Leipzig. His chief works are: 1, 'Scholia in Vetus Testamentum,' 23 vols. 8vo., which is a philological and exegetical commentary on the Pentateuch, Isaiah, the Psalms, Job, Ezekiel, the minor prophets, Jeremiah, the writings of Solomon, Daniel, Joshua, Judges, and Ruth. The first edition was published 1795-1826, the second 1823-34. In the second edition several Rationalistic interpretations which appeared in the first are greatly modified. Rosenmüller's profound oriental learning and untiring industry have made this work one of the very best commentaries upon the Old Testament. In some cases he leans too much to the interpretations of the Jewish Rabbis. A 'Compendium of the Scholia,' in 5 vols. 8vo., containing the Pentateuch, Isaiah, the Psalms, Job, Ezekiel, and the minor prophets, has been executed by Dr. J. C. S. Lechner, under the author's superintendence. Rosenmüller did not live to complete his larger work. 2, 'Handbuch der Biblischen Alterthumskunde,' 4 vols. 8vo., 1823-31. This work was also left incomplete at the author's death. The volumes published are, three on the geography and one on the natural history of the Bible. Translations of parts of this work are published in the 'Biblical Cabinet,' namely, 'The Geography of Central Asia,' 2 vols., and 'The Mineralogy and Botany of the Bible,' 1 vol. 3, 'Institutiones Linguae Arabicae,' the best manual of Arabic grammar, chiefly founded upon De Sacy's 'Grammaire Arabe.' 4, 'Analecta Arabica.' 5, 'Vocabularium Veteris Testamenti.' 6, 'Das Alte und das Neue Morgenland,' 6 vols. 8vo.

ROSETTA, or EL RASCHID, a town of Lower Egypt, is situated in 31° 25′ N. lat. and 30° 28′ E. long., on the left or west bank of one of the principal branches of the Nile, and about four miles from its mouth. It is said to have been built by the son of the celebrated Haroun-al-Raschid, about A.D. 875; but it did not become a place of any note till the decline of Damietta, owing to the increase of the bar at the mouth of the Nile, which prevents large vessels from entering the river.

Rosetta at the present day is not so large as Damietta: its population amounts to about 9000, among whom are several Greeks and Copts. The country around Rosetta is a complete garden, but the town itself does not deserve the praises which have been bestowed upon it by some travellers. It contains several large mosques; the streets, which are exceedingly narrow, not more than two yards wide, lie parallel to each other in a line with the river, and are irregularly intersected by others which are shorter. Between the houses and the Nile there is a wide space, which is the promenade of Rosetta. The houses, which are built of a dingy red brick, are two or three stories high; the bazaars are narrow, dirty, and dark. Rosetta carries on a considerable trade both with Europe and the Levant; but the passage of the bar at the mouth of the Nile is always attended with some danger, as the sands are constantly shifting, and the surf is high.

ROSETTA STONE is the name given to a stone in the British Museum, which was originally found by the French among the ruins of Fort St. Julien, which is near the Rosetta mouth of the Nile. It was delivered up to the British on the capitulation of Alexandria, and was brought to England in the year 1802. This stone, which is a piece of black basalt, contains parts of three distinct inscriptions: the highest on the stone is in what we generally call hieroglyphics; the second is in that character commonly called the 'enchorial,' or 'the characters of the country;' and the third, which is in Greek, declares, at the end, that the decree which this stone contains was cut in three different characters, the 'sacred characters,' 'those of the country' or the 'enchorial,' and the 'Greek.' In its present state the stone is much mutilated, chiefly at the top and at the right side. Its greatest length, in its present condition, is about three feet, measured on the flat surface which contains the writing; its breadth, which in some parts is entire, is about two feet five inches. A large part of the hieroglyphic inscription is broken off, but it probably contained in its entire state about twenty or at the utmost twenty-one lines; the enchorial or second inscription consists of thirty-two lines, but the beginning of the first fifteen lines are wanting, and the Greek text contained, when entire, fifty-four lines, but the end of it is at present mutilated. We learn from the Greek text that the Rosetta stone was erected in the reign of Ptolemy V., Epiphanes, and probably about B.C. 193. Epiphanes succeeded to the throne on the death of his father Philopator, B.C. 205, when he was a child only four or five years old. In this monument the acts done during the prince's minority are attributed to him, and he is commended for his piety, his liberality to the temples, his remission of the arrears of taxes and diminution of the imposts, his victories over the rebels, and his protection of the lands by dams against the inundations of the Nile.

The discovery of this stone with the triple inscription upon it excited hopes that we should be able by means of it to decipher the numerous monuments of antient Egypt. Dr. Young, in the article 'Egypt,' in the supplement to the 'Encyclopædia Britannica,' was the first who deciphered several proper names in the enchorial and hieroglyphic inscriptions, and he was followed in his investigations by Champollion. This triple inscription however is not of so much value as it appears at first sight, since it is almost certain that the enchorial text is not faithfully represented by the Greek. It is, on the contrary, more probable that the Greek is not a translation either of the hieroglyphic or enchorial text, but expresses only generally the same substantial meaning.

The preceding account has been taken from the 'Egyptian Antiquities' of the British Museum, in the *Library of Entertaining Knowledge*, vol. ii., chap. 10, in which the whole subject is fully investigated. Compare also the articles CHAMPOLLION and HIEROGLYPHICS in this work.

ROSHEIM. [RHIN, BAS.]

ROSICRUCIANS is the name of a secret society whose existence became first known to the public in the 17th century, by means of several publications which have been attributed to John Valentine Andreæ, a German scholar, born at Herrenberg, in the duchy of Würtemberg, in 1586, who, after studying at Tübingen, became a minister of the Lutheran church, and in course of time was made almoner of the duke of Würtemberg and abbot of Adelberg. Andreæ died in 1654. He was a man of a mystical turn of mind, who had conceived the idea of effecting a general reform of mankind. He wrote many works, chiefly on mystic subjects. It is doubtful however whether those particular works which would establish his connection with the Rosicrucian Society are really his. The following are the titles of three of these works:—1, 'Elucidarius Major, ueber die Reformation der ganzen weiten Welt, F. C. R. auss ihren chymischen Hochzeit,' 1617, in which there is a mixture of precepts of alchemy with maxims of ethics. 2, 'Fama Fraternitatis des löblichen Ordens des

Rosenkreuzes,' Frankfort, 1617, in which there is a story of a certain Christian Rosenkreuz, a German noble of the fourteenth century, who, after travelling long in the East, returned to Germany; and there established a fraternity, or secret society, of a few adepts, under certain regulations, living together in a building which he raised under the name of Sancti Spiritus, where he died, at 106 years of age. The place of his burial was kept a profound secret by the adepts, and the Society renewed itself by the admission of successive new members in silence and obscurity, according to the last injunction of its founder, who directed the following inscription to be placed on a door of Sancti Spiritus:—'Post CXX. annos patebo.' 3. 'Confessio Fraternitatis Roseæ Crucis ad Eruditos Europæ,' which is appended to the preceding, and in which it is stated that the Order does not interfere with the religion or polity of states, but only seeks for the true philosophy; that many absurd fables have been told of the fraternity, either by its enemies or by fantastic people. It states also that once a year the members are to meet at appointed places to converse together upon secret matters, and that new members are to be admitted to supply the place of those who are deceased, and to work for the common purpose of the Order, giving no clue however for discovering what that purpose was. In fact the secret, if secret there was, has been effectually kept to the present day. This appearance of mysteriousness has given rise to various surmises. Some have ascribed to the Rosicrucians the same hostile plans against all established churches and monarchies which have been also attributed to the Illuminati, Freemasons, Carbonari, and other secret societies. (Barruel, *Mémoires pour servir à l'Histoire du Jacobinisme.*) Others say that the order of Rosicrucians is identical with that of Freemasons, one of whose degrees or dignities is called in some countries the degree of the Red Cross. The Rosicrucians have not been heard of as a separate order for nearly a century past, but some have thought that they continued to exist under the name of the Illuminati, who were much talked of in Germany and France in the latter part of the eighteenth century. Barruel, after describing the ceremonies with which candidates were admitted to the degree of Red Cross in some Freemasons' lodges, which however, he says, vary in different countries, observes that these ceremonies, which were apparently allusive to the Passion of Jesus Christ, were differently interpreted, according to the dispositions of the candidates; that some saw in it a memento of the Passion, others an introduction to the arcana of alchemy and magic, and others at last a blasphemous invective against the founder of Christianity, which the Rosicrucians had derived from the Templars of old. This assertion however has been contradicted by others. The reader who wishes to investigate this obscure subject may consult F. Nicolai, 'On the Crimes ascribed to the Templars;' Chr. Murr, 'On the True Origin of the Rosicrucians,' 1803; and J. G. Buhle, Ueber den Ursprung und die vornehmsten Schicksale der Orden der Rosenkreuzer und Freymaurer,' Göttingen, 1804. Buhle seems to thinks that the Rosicrucians are but a branch or affiliation of the Freemasons. The impostor Cagliostro pretended that he was a Rosicrucian. [CAGLIOSTRO.]

ROSIN. [TURPENTINE.]

ROSMARI'NUS, a genus of plants belonging to the natural order Lamiaceæ. It is one of the genera belonging to this order that are perennial and possess the character of shrubs. It is known by the following characters:—calyx ovate, campanulate, with two lips, the upper of which is entire, and the lower two-parted; corolla not ringed in the inside, the throat slightly inflated with two lips, equal, the upper one emarginate, the lower two-parted, the middle lobe very large and hanging down; stamens two; filaments slightly toothed at the base; style with the upper lobe very short.

Rosmarinus officinalis, the common Rosemary, is an inhabitant of the southern parts of France, Spain, and Italy, the basin of the Mediterranean, and some parts of Asia Minor. It is a very leafy shrub, growing to the height of three or four feet; the leaves are sessile, linear, quite entire, revolute at the edge, and covered with white hairs beneath; the flowers are few, and in short axillary racemes; the corolla has a dull leaden blue or white colour, with the tube protruding a little beyond the calyx, the flower-leaves or bracts are shorter than the calyx. The cultivated and garden plants differ very much in the shape and number of their leaves, on which account Miller described them as two species, the *R. angustifolia* and the *R. latifolia*. The size of the leaves varies according to the soil and situation in which the plant grows. It is generally observed that the broader and longer the leaves, the more vigorous is the plant. The rosemary is a very desirable plant for the garden, both on account of its evergreen character and its flowers, which appear from January to April. There are three varieties known in gardens, the green or common, the gold-striped, and the silver-striped, which are distinguished principally by the colour of their leaves. The green variety is the hardiest, and is most generally used. It may be propagated by seeds, or slips or cuttings of the young shoots. The striped varieties may be best propagated by layers of the young wood. They should be planted in a warm situation, as they are much more tender than the green. They are only cultivated as ornamental plants on account of their variegated leaves. The rosemary abounds in the district of Narbonne in France, where it is used to form hedges for gardens, &c. It is supposed to be the aroma of this plant gathered by the bees that gives to the honey of this district its peculiarly fine flavour.

Rosemary was formerly held in high estimation, especially on the Continent. In the songs of the troubadours it is frequently mentioned as an emblem of constancy and devotion to the fair sex. It was thought to be a comforter of the brain, and a strengthener of the memory; and on the latter account used as a sign of fidelity amongst lovers. Shakspere makes Ophelia say,—

> 'There's rosemary for you: that's for remembrance.'

In some parts of Germany rosemary is grown in large quantities in pots for the purpose of selling small sprigs of it when in blossom, in winter and early spring, for various religious purposes.

ROSMARI'NUS OFFICINA'LIS, *Rosemary*, called also Anthos, a term which is apt to lead to the confounding of Rosemary with the Ledum palustre or wild marsh-rosemary, which has very different and even dangerous properties. Genuine Rosemary is a shrub, a native of the south of Europe, Asia Minor, and China. The officinal part is the tops or upper part of the twigs. The leaves are about an inch long, linear, slightly revolute at the margins, dark green and reticulate on the upper surface, hoary and white on the under. The leaves and calyces of the flowers have a strong, penetrating, aromatic odour, which is rendered stronger by bruising them; and a bitter, burning, camphor-like taste. They owe this to the presence of tannic acid, bitter matter, perhaps resin, and especially to a volatile oil, of which one drachm may, by distillation, be obtained from one pound of the leaves.

Oil of Rosemary (Oleum Rorismarini, or Ol. Anthos) is chiefly prepared in Spain and the south of France, by distillation of the leaves and flowers. At first it is nearly transparent and very limpid, but by time it becomes both yellowish and thicker. It possesses the strong penetrating odour of rosemary, with a camphor-like intermixture, and a burning taste. It has an acid re-action. The specific gravity varies with the purity and age of the specimen; it is commonly 0·91, but by rectification with alcohol it is brought to 0·89 or 0·85. It mixes with alcohol of ·83 in every proportion. By evaporation or by shaking with potass, it deposits a stearopten, or rosemary-camphor. Hydrochloric acid gas blackens it, but does not form an artificial camphor. With iodine it partially explodes.

The oil of rosemary of commerce is an artificial preparation of oil of turpentine distilled with rosemary; it is also adulterated with spike oil, obtained from the Lavandula Spica. This may always be distinguished from the genuine by not reddening litmus-paper

Rosemary possesses valuable stimulant and carminative properties; but it is chiefly employed as a perfume, entering into the composition of the Queen of Hungary's Water, Eau de Cologne, and aromatic vinegar. It is also said to promote the growth of hair and prevent baldness.

ROSS and CROMARTY SHIRES, two Scotch counties, intimately connected both locally and otherwise. Ross comprehends a considerable area on the mainland of Scotland, together with the large island of Lewis, one of the Hebrides; and Cromarty is composed of a number of detached portions, either interspersed among the inland parts of Ross or lying along its border. The mainland portion of the two counties approximates in figure to a triangle, having its vertex (Tarbet Ness) towards the east; one side, facing the north, extending from Tarbet Ness to Loch

Enard, 59 miles in a direct line between its extremities; another side, fronting the south-east, extending from Tarbet Ness to the narrow strait which separates Skye from the mainland, 83 miles; and the base or third side, fronting the west, 62 or 63 miles. The northern side is for the most part conterminous with Sutherlandshire, the south-eastern side with Inverness-shire; but towards Tarbet Ness, Ross and Cromarty shires are separated from Sutherlandshire by Dornoch Frith; and from Inverness-shire, and also from Nairn and Elgin shires, by the Moray or Murray Frith. The Frith of Cromarty, between these two, penetrates 10 miles inland, forming a long narrow inlet, little more than two miles wide in the broadest part, and communicating with the open sea by a passage of scarcely more than half a mile. The third side is formed by the coast of the Atlantic, and is characterized by bold headlands separated from each other by deep but generally narrow inlets or lochs. There are several small islands, the Summer Islands, Martin, Eilan-Clearach, Longa, the Croulin Islands, &c., off this coast. The island of Lewis is to the north-west of the mainland part of the county: the distance between the nearest point of the island and the nearest point of the mainland, across the Minch, or intervening channel, is about 25 miles. Lewis is not, strictly speaking, an island of itself; it forms the northern and by far the larger portion of the principal island of the Hebrides, sometimes, though rarely, called the Long Island; the southern portion, called Harris, belongs to Inverness-shire. Lewis is 39 miles long from north to south, from the northern promontory, called the Butt of the Lewis, to the border of Harris, and 31 miles broad from east to west: its coast-line is as irregular as that of the mainland. The islands of Bernera and Scarpa lie close to Lewis on the western side. The Shiant Isles are a group of small islands or rocks between Lewis and the main, but much nearer Lewis.

The area of the two counties is given by Dr. Playfair (*Decription of Scotland*) thus:—Ross-shire, 2070 square miles, or 1,324,800 acres; Cromartyshire, 105 square miles, or 67,200 acres; Lewis (including the fresh-water lakes), 557 square miles, or 356,480 acres: total, 2732 square miles, or 1,748,480 acres. Mr. MacCulloch's estimate (*Statistical Account of the British Empire*) is as follows:—Ross-shire, 2069 square miles, or 1,324,160 acres of land; 60 square miles, or 38,400 acres of lakes: together, 2129 square miles, or 1,362,560 acres. Cromartyshire, 256 square miles, or 163,840 acres of land; 10 square miles, or 6400 acres of water: together, 266 square miles, or 170,240 acres. The isles belonging to Ross and Cromarty:—560 square miles, or 358,400 acres of land; 20 square miles, or 12,800 acres of lakes: together, 580 square miles, or 371,200 acres. The total is 2885 square miles, or 1,846,400 acres of land; 90 square miles, or 57,600 acres of lakes: together, 2975 square miles, or 1,904,000 acres. The population, in 1821, was 68,828; in 1831 it was 74,820, showing an increase in ten years of 9 per cent., and giving, on Mr. MacCulloch's statement of the area of the land (viz. 2885 square miles), nearly 26 inhabitants to a square mile. The shires taken together exceed in area all the counties of Scotland except Inverness and Argyleshire: in amount of population they are ninth in order, standing next below Inverness, and next above Dumfries; in density of population they are exceeded by all the counties of Scotland, except Inverness and Sutherland. Tain, the county town of Ross, is near the southern shore of Dornoch Frith, in 57° 48′ N. lat. and 4° 3′ W. long., 134 miles in a direct line north by west of Edinburgh, or 201 miles by the road by Queensferry, Kinross, Perth, Dunkeld, Blair-Athol, the valleys of the Garry and the Spey, to Inverness, and from thence by Beauley, Dingwall, and Invergordon

The district of Ferrintosh, which is a portion of Nairnshire, is included in the boundaries we have given, but not in the statements of area and population.

Surface; Coast-line; Islands.—A general description of this district is given elsewhere [Great Britain, vol. xi., p. 402, col. 2], where it is described as 'the country south of a line joining Loch Broom and the Frith of Dornoch.' It is sufficient here to notice that, excepting the two peninsulas formed by the three friths Dornoch, Cromarty, and Moray, and the parts immediately adjacent to them, it consists of mountains irregularly grouped, with deep intervening glens or ravines. Ben Wyvis is 3720 feet above the level of the sea; Kea Cloch, near Little Loch Broom, 3600 feet; Ben Derag, one of the Ben More hills, near the head of Loch Broom, 3551 feet; Ben Lair, near Loch Maree, 3006 feet; Ben Attow, on the border of Ross-shire and Inverness-shire, is said to be nearly 4000 feet.

The three friths just mentioned are three branches of that great bay which penetrates Scotland from the north east, between Duncansby Head, the north-east point of Scotland, and Kinnaird's Head in Aberdeenshire. Dornoch Frith, the most northern of the three, extends about 24 or 25 miles inland to Bonar Bridge, on the road from Inverness to Wick and Thurso. It is about 10 miles across at its entrance between Tarbet Ness and Brora. Moray Frith extends about as far inland as Dornoch Frith, but is 14 miles across at its entrance between Tarbet Ness and Burg Head. Cromarty Frith is an inlet of Moray Frith. Loch Beauley is an extension of Moray Frith inland: we know not exactly where the line separating the loch from the frith is drawn, but there is a sheet of water extending 16 or 17 miles inland from Fort George, where Moray Frith is contracted to a narrow strait, and three or four miles broad at the widest part. There are cliffs on each side of the entrance of Cromarty Frith, and again at Tarbet Ness and some miles south of it.

The principal inlets on the western or Atlantic coast are Loch Enard, at the north-west extremity of the two counties: Loch Broom, Little Loch Broom, Loch Greinord, Loch Ewe, Loch Gairloch, Loch Torridon, Loch Carron, with Loch Kishorn, which is a branch of it; and Loch Alsh, with its branches, Loch Ling and Loch Duish or Duich. They occur in the order in which we have enumerated them from north to south. Loch Broom and Loch Carron extend about 15 miles inland, but are both narrow. Lochs Enard, Greinord, Ewe, Gairloch, and Torridon are not so long, but are wider. Loch Greinord is about four miles across at the mouth. There are cliffs on the shore of Loch Enard and at the headland of Ru-mone or Ru-more, at its western side, and on part of the shores of Loch Broom and Loch Carron. The islands along this coast are small. The western coast of Cromarty and Ross is described at considerable length in the second volume of MacCulloch's 'Highlands and Western Isles.'

The principal inlets on the coast of Lewis are Loch Carlowa, Loch Bernera, Loch Roig, Uig Bay, and Loch Resort, on the west side, occurring in the order in which we have enumerated them from north to south; and Loch Tua, Loch Gremishader, Loch Luerbost, Loch Hourn, Loch Shell, Loch Brolum, Loch Valumis, Loch Clay, and Loch Seaforth, occurring in the same order, on the eastern side. The three lochs Carlowa, Bernera, and Roig are three branches of one great inlet, about nine miles across at the entrance, and extending about nine miles inland: in the middle of it is the island of Bernera, five miles long from east to west and three miles wide, and a number of smaller islands. The boundary between Lewis and Harris is drawn across the island from the head of Loch Resort to the shore of Loch Seaforth, but not at the head of the Loch. There are cliffs at the northern extremity, and on a great part of the eastern and some part of the western coast of Lewis. It will be observed that these 'lochs' are not, as the name would seem to imply, lakes, but inlets of the sea. The headlands of Lewis are the Butt of Lewis at the northern extremity; Tolsta Head, near it; and Tiompan Head, at the extremity of the peninsula which forms the southern and eastern sides of Loch Tua, on the eastern side of the island; and Gallan Head, at the south side of the entrance to Loch Roig, on the western side. Lewis is as mountainous as the mainland, though the peaks are not so lofty: the mountains form a range extending north and south, with lateral branches. The Barvas Hills, near the centre of the island, are 780 feet high; and Suaneval, on the western side, between Loch Roig and Loch Resort, 2700 feet.

Hydrography and Communications.—The two counties have no very large rivers. The Oikel rises at the foot of Ben Mohr in Sutherlandshire, just on the border of Ross-shire, and flows for twenty-six miles along the border of the two counties till it unites with a stream from Loch Shin in Sutherlandshire. It then expands into a narrow lake five miles long, called the Kyle, which opens into Dornoch Frith. The Repath Water and Carron Water are one stream twenty-three or twenty-four miles long, which joins the Kyle at its lower end. A number of streams flowing eastward unite above Dingwall, just below which they fall into Cromarty Frith. The longest of these streams rises in the western part of the county, and has a course of forty miles to Dingwall, watering Strath Bran, and passing through several lakes, among which is Loch Luichart, nearly five miles long by one broad. Loch Fannich, eight miles long and a mile broad, is drained by another of these streams: it is near the centre of the counties. Loch Monar, five miles long by one mile broad, is drained by a stream which belongs to Inverness-shire; Loch Glass, five miles long, and many other lakes, most of them very small, are drained by streams flowing into the friths of the eastern coast. All the above-mentioned lakes have their greatest extension from east to west.

The streams on the western coast have a shorter course than those on the eastern. There are several lochs in this part. Loch Maree, the largest fresh-water lake in the counties, extending twelve miles in length, and two miles or two miles and a half across in the broadest part, is drained by the Ewe, which flows into Loch Ewe. Loch Na Shallag, three miles long; Loch Fair or Fuir, three miles long and above a mile wide; Loch Dambh or Damff, four miles long; Loch Lundie, three miles long; and Loch Clunie, partly in Inverness-shire, nearly four miles long, are drained by streams which flow into the sea on the west coast.

Lewis abounds in lakes; but they are all small, except Loch Langavat, which extends in length nearly ten miles from north to south, between Loch Seaforth and Loch Resort. The streams in Lewis have all a very short course.

The two counties have very few roads. The greater part of them, including those of chief importance, are on the east side, and lead to different places farther north. One leads near the coast from Inverness, by Fortrose, Cromarty, and Tain, to Dornoch, Wick, and Thurso, the communication being made in several places by ferries over the lochs and friths. Another road from Inverness to Wick and Thurso runs more inland, passing round the heads of Loch Beauley and the Frith of Cromarty, and through the town of Dingwall, which is at the head of Cromarty Frith: it crosses into Sutherlandshire by Bonar Bridge, which is thrown over the Kyle at the head of Dornoch Frith. There are several roads communicating between these two. A road from Dingwall leads across the country through Strath Bran to Loch Carron, a distance of 49 miles, sending off branches on the right to Ullapool on Loch Broom, to the heads of Loch Gairloch and Loch Ewe, by the side of Loch Maree, and to Loch Torridon. The road from Inverness to the Isle of Skye, with a branch to Loch Alsh and Loch Carron, runs through Rhiabuie and Glen Shiel, in the southern parts of the county of Ross; and that from Dornoch and the east coast to Loch Assynt just passes through the northern part of the same county. The greater part if not the whole of these roads are under the direction of the commissioners of Highland roads and bridges.

Soil; Agriculture.—The arable land of the two counties is almost entirely confined to the eastern part, comprehending the two peninsulas, 'An Oilean Dubh,' or the Black Isle, between Loch Beauley and Cromarty Firth; and Easter Ross, between the Cromarty and Dornoch friths, together with the comparatively low and level tract immediately adjacent to these. The central and western parts are 'wild, rugged, and mountainous, interspersed with lakes and narrow glens that afford pasture for sheep and black cattle.' (MacCulloch, *Statist. Acct. of Brit. Empire.*) Since the commencement of the present century, agriculture has improved in a most extraordinary manner. 'The fields were formerly detached pieces of land, ploughed irregularly, as the ground with the least labour suited. The carts generally used were of the poorest description, with a kind of tumbler or solid wheel, and wicker conical baskets; little or no lime was used for agricultural purposes.' 'I succeeded to a farm in this country about thirty years ago (says Major Gilchrist, of Opisdale, Sutherlandshire), when the working strength consisted of sixteen oxen and twenty-four small horses called garrons; this farm is now laboured by three pair of horses.' (*Appendix to Fourteenth Report of Commissioners of Highland Roads and Bridges; Parl. Papers* for 1828, vol. ix.) The individual who introduced the ploughing of land in regular ridges, and the division of fields into anything like systematic arrangement, was living in the employ of Major Gilchrist at the period of the above Report. 'The total amount of wheat then (viz., at the commencement of the present century) raised in the county was not equal to what is now produced on many single farms. It was not until 1813 that the first barley-mill north of the Cromarty Frith was erected, and in 1821 the first flour-mill (at Drummond, on the estate of Fowlis) by the same individual. To such an extent however has cultivation of late been carried, that the growth of wheat alone is now (viz. 1828) estimated at 20,000 quarters annually; and the exportation of grain to London, Leith, Liverpool, &c. during the last year amounted to upwards of 10,000 quarters; besides the supply of the extensive and populous pastoral districts of the county (of Ross), and the towns of Dingwall, Tain, Inverness, &c., to which places I am credibly informed upwards of 10,000 bolls of flour are now annually sent for the consumption of the inhabitants. Among other exports may be mentioned the produce of various extensive whiskey distilleries, situated in different parts of the county, and a considerable quantity of salted pork from the ports of Cromarty and Invergordon.' (*Appendix to Report*, as above.)

The soil in the peninsula of the Black Isle is various, and much of it poor. The cultivated portion consists chiefly of clayey loam, good black mould, and sandy loam. In Easter Ross there is a considerable extent of clayey loam and light sandy soil. Around Dingwall the soil is clayey. There are more than the usual number of gentlemen's seats and plantations in the cultivated part of the two counties. The usual fences are hedges and ditches, sometimes however stone fences are employed. There is some good timber in the hedgerows. Turnips are grown equal to those of more southern counties. The crops are clean, and for the most part rich. The houses of the principal farmers are neat and commodious, and the cottages of the peasantry have much improved of late years. Many of the mansion-houses are well situated, and surrounded by ornamental plantations, shrubberies, or fine timber-trees. Many of them have excellent gardens; and a spirit of horticultural improvement is very general. The gardens of the farmers, though small, are well stocked; and the cottagers are fond of having a garden, whenever they have a suitable piece of ground. Much, very much of the improvement in agriculture is to be ascribed to the improved communications formed and maintained by the government commission for Highland roads and bridges. In some parts indeed, ignorance, or prejudice, or perhaps poverty, has induced an adherence to antient practices and a sturdy rejection of improved methods.

'A marked improvement in domestic animals of every description has taken place in the northern counties since the improved communication with the south. I need hardly allude to the introduction of the Cheviot sheep, to the pains taken in improving the breed of cattle by the importation of the most improved sorts from the West Highlands and of cows from Ayrshire. Considerable attention has been recently paid to the breed of horses, both for the purposes of agriculture and draught; and, in some instances, those of the finest description have been successfully reared. Nor has the breed of pigs been neglected; several valuable species, both pure and crosses, having been introduced.' (*Appendix to Report*, as above.) The original native breed of cattle is hardy and compact, adapted to the climate. Cattle were formerly more numerous than at present, and were much employed in agricultural labour, but this use of them is now almost entirely given up. The diminution of their number is ascribed to the greater attention paid to sheep-farming.

The western side of the county, where it has not been thrown into large sheep-farms, is occupied by a poor class of tenants. They have some arable land, in which potatoes, barley, and oats are raised; but the number of acres under cultivation is not great, nor has planting been carried to any extent. The greater part of the country is an open waste. The houses of many of the peasantry, including the small tenantry and the cotters, are very poor; some are built of turf, others with stone, with or without mortar, and have a roof of turf with heather or fern above it. They are commonly destitute of chimneys; the fire is kindled by the wall, or a stone in the centre of the room; the smoke escapes, as it can, by roof, door, or windows, which last are closed at will with wooden shutters. The floor is made of mud or clay. In many houses the cattle dwell under the same roof, and even enter at the same door with the family, from which they are separated by a partition of boards, stones, or wattles, having a door in the middle. Some of the people are getting into the way of building separate sheds for their cattle. The food of the peasantry consists of potatoes, herrings, and oatmeal gruel. Those in better circumstances have, in addition, butter, cheese, oatcake; and in winter and spring, have broth and mutton, in place of herrings. Peat is the common fuel, but the better class of farmers have coal. There has been much improvement in agricultural implements. Iron ploughs, drawn by two horses, and directed by the ploughman without a driver, are now in use, instead of the old plough with four horses, a ploughman, a driver, and two other persons to keep down the plough in the ground and level the rigs. The crooked spade is still used where there is but little pasture for horses or where the ground is too rough and rocky for the plough. Along the coast the peasantry are to a considerable extent engaged in the herring fishery. Smuggling and illicit distillation were at one time common, but are now given up in most places. Poaching is comparatively rare. Deer are tolerably numerous in some places, not in others; roes and hares are not numerous. The fox, badger, polecat, weasel, marten, mole, rat, and mouse are common; as are the eagle, raven, and a variety of hawks and owls. Plovers are frequently met with; grouse are perhaps diminishing. The smaller tenants usually possess a considerable extent of grazing-ground, sometimes near their arable land, sometimes remote from it; they occupy the straths or valleys.

There are stone-quarries in some parts of the two counties, but these mineral productions are comparatively unimportant. They have limestone, but no coal.

The herring fishery is carried on along the eastern and western shores; but this branch of industry has declined on the western side. The salmon fishery is carried on in the rivers and æstuaries of the eastern coast.

Divisions, Towns, &c.—The two counties are divided into thirty-three parishes, two of which extend into the adjacent counties, viz. Urquhart, a portion of which (the district of Ferrintosh) constitutes a detached part of Nairnshire, surrounded on every side by Ross-shire; and Urray, of which a small portion is in Inverness-shire. The parishes are all large, as compared with the average extent of English parishes; but those on the eastern and more cultivated side are not by any means so large as the Highland parishes of the west, which have in some cases an extent of twenty, thirty, or even forty miles. There are four royal burghs, viz. Tain, Cromarty, Dingwall, and Fortrose, and one burgh of barony, viz. Stornoway, in the isle of Lewis.

Tain is on the shore of Dornoch Frith, in the north-east part of the county. The parish extends nine or ten miles in length from north-east to south-west, and above four miles in breadth. Tain appears to have been incorporated very early, it is said by Malcolm Canmore; but the earliest charter extant is of James VI., A.D. 1587. It was early celebrated for a chapel of St. Duthus, bishop of Ross, which had right of sanctuary. The sanctuary was violated and the chapel burnt, A.D. 1427 or 1429, by a Highland chieftain from Sutherland: the chapel was never rebuilt. The town is situated on a ridge or terrace chiefly composed of a stratum of red clay overlying the sandstone which forms the higher ground of the parish, and overlooking a low plain which extends from the foot of the terrace on which the town stands, to the present shore, a quarter of a mile distant. This low plain consists of a bed of peat, in which are observed the trunks of trees, chiefly oaks, the remains of a forest, the decay of which has formed the peat-bed; over which extends a bed of sand and shells, and over that a cultivable alluvial soil, on which the sea is gradually encroaching, and which is in some parts already converted into waste by the sea sand with which it has been overblown. One or two brooks rise near the town and flow through the plain into the sea, and on the east side of the town another stream, the 'Tain,' larger than these, flows also into the sea. Tain is ill paved, and is irregularly built, but has much improved of late years, the streets having been somewhat straightened and the more unsightly buildings removed. The houses are chiefly built of a fine white sandstone quarried in the upper part of the parish: the quarries are the common property of the burghers. There are a large substantial church, built in 1815, at the east end of the town; a handsome manse, or parsonage-house; an academy erected and endowed by subscription in 1813, one of the most tasteful edifices in the north of Scotland; a handsome town and county house; and a prison, serving for part of the county, but under the direction of the burgh magistrates.

There are the ruins of St. Duthus's or St. Duthac's chapel on the low plain east of the town, near the little river Tain; they are composed of granite cemented with lime, and are remarkable for the strength and simplicity of their architecture: a church dedicated to St. Duthus, and now deserted, stands in the centre of the town; it is a large Gothic building, and was erected, A.D. 1471, forty years after the destruction of the chapel. There are the ruins of an old prison tower with five spires, once the most conspicuous edifice in the town, but destroyed by fire some years ago.

The population of the parish, in 1831, was 3078, about one-sixth agricultural; a subsequent enumeration (*New Statistical Account of Scotland*, 1837) makes them amount to no more than 2915, of whom 1725 were in the town, 151 in the village of Inver, a fishing station in the eastern part of the parish, and 1039 in the country. The principal trade of the town consists in the supply of the surrounding parts of Ross, Cromarty, and Sutherland shires. There are an iron-foundry, a brewery, a saw-mill, a flour-mill, a carding-mill, and a dyeing-mill. Fishing, chiefly for haddocks and flounders, is carried on at Inver. The salmon-fishing and mussel-fishing are carried on by strangers, who purchase the right to them from the corporation. There are two weekly markets on Tuesday and Friday, and three fairs in the year, held at Lammas, Midsummer, and Michaelmas. The chief fuel is English coal and peat, which are frequently used together.

There are the parochial school, the academy, two female boarding and day schools, one of them supported by the burgh funds, two private English schools, and a private 'class' for young children of both sexes in the town, and a Gaelic Society school in or near the village of Inver, in the parish: the whole number taught in these schools, in 1837, was 302 boys and 184 girls; together 486. There is a library attached to the academy, and there is a public reading and news room. The Northern Missionary Society, which embraces in its operations the counties of Inverness, Ross, and Sutherland, has its seat at Tain; the yearly meeting of the Easter Ross Ladies' Missionary and Bible Society is also held here; and there are a society for the relief of the destitute sick, and three friendly or benefit societies. There are two coaches daily, the mail and another, to and from Inverness, and a mail-gig to Bonar Bridge.

The council of the burgh consists of a provost, two bailies, a dean of guild, a treasurer, and ten counsellors; in all, fifteen members. The burgh unites with Kirkwall, Wick, Dornoch, Dingwall, and Cromarty in returning a member to parliament.

Cromarty is on the south side of Cromarty Frith, near the entrance, on the peninsula of the Black Isle. The parish is from five to seven miles long, and from two to three broad. The eastern side of the parish is the highest, and it presents to the Moray Frith, by which it is bounded on that side, a range of lofty cliffs, in one part 300 feet high, composed of granitic gneiss, veined with white quartz rock, and lined with blocks of hornblende. Towards the centre and western parts of the parish these primitive rocks are overlaid with sandstones and other secondary formations, the latest being towards the west. East of the town is a large accumulation of peat, with trunks of trees embedded.

The name of Cromarty occurs early: Macbeth was thane of it. The town was peopled by lowlanders, who, from their advanced position, were exposed to frequent hostilities from the neighbouring highland clans, by a combination of which, early in the reign of James IV., it was plundered. It is likely that the admirable position of the town near the entrance of the Frith, which forms a secure and land-locked harbour, had caused it to be selected as a place of settlement by lowland merchants, and that the townsmen had early carried on trade with Flanders and France. After the union of the crowns it declined, but revived after the Revolution by means of the herring fishery. It appears to have again suffered after the Union, but since this depression has again revived.

The town stands on a low alluvial tongue of land jutting out into the Frith. 'It is irregularly built, exhibiting in its more antient streets and lanes that homely Flemish style of architecture characteristic of all our older towns of the north.' (*New Statistical Account.*) There are a plain church, a Gaelic chapel, and a town-house; the last a substantial building with a hall in the upper story and a prison in the lower, and surmounted by a dome or clock-tower. The harbour, formed by a pier, is near the extremity of the point on which the town stands. Vessels of 400 tons can come up to the quay.

The population, in 1831, was 2901, about one-fourth agricultural: the population of the town itself was 2215, that of the country part of the parish 686. There are a hempen-cloth manufactory which employs in all six hundred persons, two hundred of them in the factory itself, and a brewery. A considerable trade is carried on with England in salt provisions; and in 1831, about fifty men were engaged in the herring or white fishery. There are a branch bank and a post-office. Communication is maintained by an omnibus with Inverness, and by steam-boats with Leith and London. Some ship-building is carried on. There are a market on Friday and one yearly fair.

Cromarty was antiently a royal burgh, but was disfranchised at the request of the burghers, A.D. 1672, and was accounted only a burgh of barony. Its privileges as a royal burgh have been restored by the Scotch Burgh Reform Act, but the magistrates can effect little from the want of funds; the antient property of the burgh having been alienated before its disfranchisement. It unites with Kirkwall, Wick, Dornoch, Tain, and Dingwall to return a member to parliament.

Dingwall is at the south-western extremity of Cromarty Frith, 23 miles from Inverness by a circuitous road, and 178 miles (according to Chambers's *Gazetteer of Scotland*) from Edinburgh. The parish comprehends an area of above ten square miles, three-fifths of it moorland or upland pasture, and the remainder cultivated. Dingwall was probably a Danish settlement: it was erected into a royal burgh by Alexander II., A.D. 1227, and, by pavements and other traces of buildings which have been found, appears to have been more extensive than it is now. It was the principal residence of the powerful earls of Ross, and appears to have declined after the extinction of that earldom. Some traces of the antient castle of these earls, comprehending the earthworks and a small portion of the massive walls, may be seen on the north-east side of the town. In the early part of the last century Dingwall was in a deplorable condition from poverty and neglect, and the public tranquillity was repeatedly broken by the frays of hostile clans. Subsequently to the suppression of the rebellion of 1745 great improvements took place, and the town has especially improved of late years. It consists at present of one main street running east and west, and one or two smaller ones branching from it; the streets are paved, but either not lighted or very imperfectly so; and the police is too imperfect to enforce cleanliness, so that even in the main street dunghills are sometimes seen in the front of the houses. Cleanliness is however gaining ground, and there are some good houses and shops. The kirk is a neat and commodious building, just out of the town; near it is a pyramidal obelisk fifty-seven feet high and six feet square at the base, erected on a large artificial mound, by a former earl of Cromarty, to mark out the burial-place of himself and his family: the town-house, a curious old building with spire and clock, is near the centre of the town; and there is a small and wretched gaol and an episcopal chapel.

The population of the parish, in 1831, was 2139: about one-fifth agricultural. There are good roads, and a short canal from the frith enables vessels with coals and other merchandise to come quite up to the town. There is a coach communication daily with Inverness, and steam-boats weekly from Edinburgh, and every second week from London, touch at Invergordon, distant fourteen miles. There are a weekly market (on Friday) and three yearly fairs.

The burgh council consists of fifteen members, including a provost, two bailies, a dean of guild, and a treasurer; the burgh unites with Kirkwall, Wick, Dornoch, Tain, and Cromarty in returning a member to parliament.

There were, in 1837, a parochial school, an infant-school supported by subscription, and three other daily schools in the parish; also one large Sunday-school.

Fortrose is in the parish of Rosemarkie, and on the shore of Moray Frith, just within the narrow passage by which that frith is contracted opposite Fort George. It was antiently the cathedral town of the bishopric of Ross, and is still sometimes called Canonry or Chanonry of Ross; it was erected into a royal burgh by James II., A.D. 1444, and annexed to the previously existing and adjacent burgh of Rosemarkie. The present burgh consists of the two thus united. Fortrose is a small town, with little manufacture and very little trade; and Rosemarkie is an insignificant fishing-village; the two places are about three-quarters of a mile distant from each other. There are some remains of the antient cathedral at Fortrose, comprehending an aisle or chapel which was an appendage to the main part of the church; an antient building, probably a vestry, with an arched vault beneath; some tombs in niches in the walls, with effigies of the bishops, carved in stone, and much defaced; and an antient bell, now hung in a spire of modern erection. There are an episcopal chapel and a prison. The parish church is at Rosemarkie. For a long period the chief employment of the poor of Fortrose has been shoe-making; of Rosemarkie, weaving: the inhabitants are engaged also in fishing. There is a ropewalk at Rosemarkie, and a distillery at Fortrose. There is communication with Fort George by a ferry; and with Aberdeen, Dundee, Leith, and London by trading vessels.

The population of Rosemarkie parish, in 1831, was 1799. The burgh council consists of a provost, three bailies, a dean of guild, a treasurer, and nine other members; fifteen in all. The burgh unites with Inverness, Nairn, and Forres to return a member to parliament.

Stornoway, the only town in the isle of Lewis, is situated at the head of a bay on the east side of the island. The parish is extensive, extending sixteen miles in one direction and ten in another; with a population, in 1831, of 5422, of whom three-fifths were in the town or its immediate vicinity. Stornoway consists of several streets. The houses are in general good, with slate roofs, and many not only well but even elegantly furnished. There is a handsome kirk, built in 1794, and lately repaired; there are a neat custom-house, a town-house, and an assembly-room. The houses in the country parts of the parish are in general miserable and indescribably filthy habitations. The principal employment of the inhabitants of the parish is fishing. 'The season is divided between fishing, farming, and kelping, and most families have a share of a boat and a lot of land.' (*New Statist. Account of Scotland.*) Cod and ling are caught and cured, and shipped for Ireland or the manufacturing district round Glasgow. Haddocks are caught and cured for home consumption; and flounders, hakes, soles, tusks, and conger-eels, and occasionally whales, grampuses, and porpoises, are taken.

Stornoway was founded by James VI. of Scotland and I. of England, for the purpose of introducing civilization into the Highlands. The harbour is good and much frequented. Sixty-seven vessels, with an aggregate tonnage of 3059 tons, and fifteen hundred boats, belong to the port and its district. There are a corn-mill, a saw-mill, and a wool-carding mill, a ropewalk, and a large distillery. Kelp-making and the manufacture of coarse pottery are carried on. There is a well-frequented yearly fair for cattle. Sheriff and commissary courts, bailie, excise, and justice of peace courts, are held regularly. There are thirteen schools in the parish: viz. the parochial school, seven supported by the charity of societies or individuals, two 'supported by the country people,' and three without any extraneous support. There are a circulating library and two friendly societies.

Divisions for Ecclesiastical and Legal Purposes; State of Crime, and Education.—The thirty-three parishes in the two counties are comprehended in the five presbyteries of Tain, Dingwall, Chanonry (*i.e.* Fortrose), Lochcarron, and Lewis. The presbytery of Tain comprehends nine parishes, in or adjacent to the peninsula of Easter Ross; that of Dingwall, seven parishes in and round Dingwall; that of Chanonry, six parishes, in the peninsula of the Black Isle; that of Lochcarron, seven parishes, on the west coast (beside the parish of Glenelg, in Inverness-shire); and that of Lewis, four parishes, in the island of Lewis. The presbyteries of Tain, Dingwall, and Chanonry are in the synod of Ross; those of Lochcarron and Lewis, in the synod of Glenelg.

Sheriff courts are held at Tain and Dingwall, in the mainland of Ross-shire; in Stornoway, in Lewis; and at Cromarty in Cromartyshire. The two counties are under one sheriff. There are four prisons, viz. Tain, Dingwall, Fortrose, and Cromarty; they are all bad. Crime is not frequent in the two counties, and has diminished considerably within the last seventy or eighty years. Highway robbery and cattle-stealing, which were common for some time after the rebellion of 1745, have entirely disappeared; and violent assaults and child-murder, which continued to be common till a much later period, have become rare. Sheep-stealing still goes on; but the most common offences are minor assaults, committed under the influence of whiskey, and petty thefts. The diminution of crime is ascribed to the improved condition of the people, the spread of education, and the more efficient administration of justice. The most serious offences are usually committed by hawkers, tinkers, and other vagrants. The police, though improved, is still inefficient; and there is still a good deal of pauperism and mendicity. (*Inspectors of Prisons' Second and Fourth Reports*, 1836 and 1838; see *Parl. Papers* for 1837, vol. xxxii., and 1839, xxii.)

Ross-shire and Cromartyshire unite to return one member to parliament. The number of voters registered in 1834-5, was 594; in 1835-6, 621. Dingwall, Tain, and Cromarty unite with Kirkwall, Wick, and Dornoch to return a member; the number of electors registered for the district, in 1834-5, was 571. Fortrose unites with Inverness, Forres, and Nairn; the number of registered voters, in 1834-5, was 699, exclusive of those for Nairn, of whom no return had been received. (*Parliamentary Papers* for 1837, vol. xlix.)

Education has been greatly extended and improved of late years. In 1833-4 there were thirty-three parochial schools, with as many teachers, and one hundred and twenty-four schools not parochial, with one hundred and twenty-nine teachers; total, one hundred and fifty-seven schools and one hundred and sixty-two teachers. The greatest number of scholars in these schools during the year was 5118 boys and 2880 girls, together 7998 children; the least number, 1958 boys and 1043 girls, together 3001 children. The number of children under fifteen who could read or were learning to do so was 9718; the number who could write or were learning to do so, 3021. (*Parl. Papers*, 1837, vol. xlvii.) The schools established during the last few years, by the General Assembly, are in particular reported as working well. In these schools the improved system of teaching introduced among the poorer classes by Mr. Wood, of Edinburgh, is, it is said, generally adopted; so that the children, instead of being stuffed with a quantity of crude, indigestible matter, as heretofore, are now led to analyze and clearly understand all they are taught. Small libraries too are often appended to these schools. Tain appears to be distinguished for the increased attention paid to education. In addition to the regular parochial school, a public academy has been opened during the last few years, in which an education of a superior kind is given. A great many of the adult population are unable to read easily, or indeed to read in any way. On the western side of the county it is difficult to find a person forty years of age (of course, excepting the richer classes) who is able to read. Under these circumstances it is not surprising that there is in fact but little reading among the people at present, although the taste is on the increase. The only library for the labouring classes is a small one at Lochalsh, supported partly by the subscriptions of the members and partly by donations. (*Second Report of the Inspectors of Prisons.*)

History and Antiquities.—At the earliest historical period this country appears to have been inhabited—the western part by the Creones, the eastern part by the Cantæ (Κάνται), and the centre by the Caledonii (Καληδόνιοι) of Ptolemy; but it is impossible to assign the limits of their respective territories. The Bay Volsas (Οὐόλσας κόλπος) of the same geographer may be identified with Loch Broom. The æstuary (εἴσχυσις) of Varar (Οὐάραρ), or Varase, as it is in some editions of Ptolemy, which is mentioned also by Richard of Cirencester, was probably the Moray Frith. The Areæ finium Imperii Romani of Richard may perhaps be fixed on the ness or promontory of Tarbet, and the Abona æstuary of the same writer may be identified with Dornoch Frith.

Of this early period Ross-shire contains several remains. In Kincardine and Fearn parishes are some Druidical circles; and on the eastern shore of Loch Roig, in Lewis, are the very entire remains of a Druidical circle, the stones of which, some of them very large, stand on end, at a distance of five or six yards from each other, and are in a rough state as when taken from the shore. There are cairns in different places on the summits of hills. The Druidical origin of the circles is disputed by Dr. M'Culloch ('Highlands, &c. of Scotland,' vol. iii., p. 229, seq.). To the long period of darkness which extends over this part of the island after the departure of the Romans, may be assigned the duns, or dounes, or Picts' houses, as they are termed, which some suppose to be Danish forts, though some ascribe them to an earlier period than that of the Danish ravages. Stone coffins, vitrified ruins, stone obelisks, on or near the eastern coast, and the traces of habitations in the caves of the western coast, belong to early but unascertained periods.

At a subsequent period Ross became an earldom, which was united with the lordship of the isles (*i.e.* the Western Isles) by the marriage of Donald M'Donald, the lord of the isles, with the daughter of the earl of Ross. These honours were held, about the middle of the fifteenth century, by Earl John, who allied himself with Edward IV. of England (A.D. 1461), rebelled against the government of Scotland during the minority of the king James III., and proclaimed himself king of Ross and the Hebrides. He was supported by Donald Balloch, lord of Isla, and by the earl of Douglas, now in banishment. The rebellion was attended by the most dreadful atrocities; but Ross was assassinated in the course of it, in the castle of Inverness, and the rebellion came to an end without its chiefs having attained their object.

The succeeding earl appears to have inherited the turbulence of Earl John. He was involved in hostilities with the earl of Huntley, another powerful Highland chieftain, and, adhering to his predecessor's English alliance, rebelled against James III. But the extent of the king's preparations induced him to submit to the royal clemency (A.D. 1476). He was deprived of the earldom of Ross, the lands of Knapdale and Kintyre [ARGYLE, vol. ii., p. 313], and the hereditary shrievalty of Inverness and Nairn, which were all annexed to the crown. He was in return created a peer of parliament with the title of John de Isla, lord of the isles. During this period Ross gave title to a bishopric, erected by David I., king of Scotland; the cathedral was at Fortrose.

There are several remains of antient castles in Ross-shire. Lochlin Castle is on an eminence six miles east of Tain; it consists of two square towers sixty feet high, united at one corner of each, with a staircase at the point of junction, and large turrets raised upon the towers. Craighouse Castle, on the southern shore of Cromarty Frith, is an antient tower of five stories; the castles of Killcoy and Redcastle are on the shore of Moray Frith, or rather of Loch Beauley. There are some ruins of Cadbole Castle on the east coast, between Cromarty and Moray friths, and of Donan Castle, on the shore of Loch Alsh, on the west coast. There are also some ecclesiastical ruins. Lochlin Abbey (or Fearn Abbey) is near the castle of that name, east of Tain; and there are the ruins of a number of antient chapels in Lewis, especially of St. Mulvay's chapel, in the north part of the island.

In 1649 the M'Kenzies of Ross broke out into rebellion, to revenge the execution of Charles I., but were defeated. The last battle fought by the gallant Marquis of Montrose was in this county, at Craigchenichan (*i.e.* the rock of lamentation), in Kincardine parish, just on the northern border of the county, where he was defeated by Colonel Strachan; he swam over the Kyle into Sutherlandshire, was apprehended in Assynt, in that county, and afterwards executed at Edinburgh (A.D. 1650). The earl of Seaforth having forfeited his estates, which lay in the west side of the county, by his share in the rebellion of 1715, and the military not being able to penetrate into so inaccessible a district and levy the rents for the crown, the faithful clansmen regularly paid theirs to an agent, who transmitted them to the earl, then in exile. In 1718, Donan Castle was seized by the earl of Seaforth and one or two other Jacobite noblemen, who arrived on the coast in two Spanish frigates, with a small body of Spanish troops; a few Highlanders took arms and joined them, but they were defeated in Glenshiel by the government troops, and the leaders compelled to make their escape. 'Rob Roy' was engaged among the insurgents in this conflict.

(*New Statistical Account of Scotland*; Playfair's *Description of Scotland*; Forsyth's *Beauties of Scotland*; Chambers's *Gazetteer of Scotland*; Tytler's and Scott's *Histories of Scotland*; *Parliamentary Papers*.)

ROSS. [HEREFORDSHIRE.]

ROSTELLA'RIA. [STROMBIDÆ.]

ROSTELLUM, a botanical term applied occasionally to very different parts: 1, it is most frequently used as a diminutive of rostrum, to express any small beak-shaped process; 2, it is applied to the short beak-shaped process found on the stigma of many violets, as *Viola hirta*, *V. odorata*, and *V. canina*, &c.; and Orchideæ, as *Orchis*, *Spiranthes*, *Listera*, &c.; 3, some writers have also used this term to indicate the radicle or descending element of the embryo of the seed.

ROSTOCK, the largest town in the grand-duchy of Mecklenburg-Schwerin, is situated in 54° 5′ N. lat. and 12° 20′ E. long. It stands on an eminence, in a flat and very fertile country, on the bank of the river Warnow, which is there 2400 feet broad, and forms the harbour. The Warnow falls into the Baltic at Warnemunde, nine miles below the town.

Rostock consists of three parts, the old, the middle, and the new town, besides the suburbs, and it is surrounded with antient fortifications. A great part of the city is built in the old fashion of the free German cities, with the gable ends toward the street, but it has been very much improved within the last twenty-five years by the erection of many large and elegant houses. Most of the streets are straight and pretty broad, and well paved. On the whole the old town is the most irregular, the middle town the handsomest, and the new town the most regularly built. The principal public buildings are the grand-ducal palace, more remarkable however for its extent and its admirable situation than for the style of its architecture; the university, a very extensive building; the court of justice, and the town-hall, both modern edifices; the theatre, and the churches of St. Mary and St. Peter. The church of St. Mary is 300 feet long, 240 broad, and 96 feet high up to the cupola. It has one of the finest organs in Northern Germany. This church contains the tomb of Grotius. St. Peter's church, which was founded at the end of the twelfth century, is chiefly remarkable for its fine steeple, which, with the very lofty conical spire, is 420 feet in height. The university was founded in 1419. It has 23 professors, but only about 110 students. The library consists of above 80,000 volumes, including many very rare and valuable works, and has been much increased by the collection of Professor Tychsen, especially in Oriental and Spanish literature; likewise a cabinet of medals, a museum of natural history, a botanical garden, and an anatomical theatre. There are also a theological seminary, a Bible Society, and other useful institutions. The number of inhabitants is 18,200.

Rostock was a town of the Wends, or Vandals; it was taken in 1161, by Waldemar, king of Denmark, and burnt, with its celebrated idol. In 1323 it was annexed to Mecklenburg, joined the Hanseatic League in 1630, and was for a long time the next city in rank in the Baltic after Lübeck. Great privileges were granted it by the dukes of Mecklenburg, many of which it still retains, such as the right of choosing its own magistrates, the right of taxing itself, of coining money, the jurisdiction over all its inhabitants, and their estates in the country. Though its commerce is not so considerable as in the time of the Hansa, it is still the principal trading port of Mecklenburg: it has about 150 ships, which sail under its own flag, and the number of ships that arrive every year is about 600, the foreign vessels being mostly English, Russian, Swedish, and Danish. The exports are chiefly corn and wool. The imports are colonial produce, wine, and bay salt. There are manufactures of canvas, linen, baize, ships' anchors, soap and vinegar, and some breweries, distilleries, and sugar refineries.

(Cannabich, *Handbuch*; Stein's *Lexicon*; Stein's *Handbuch*, by Hörschelmann; Hempel's *Mecklenburg*.)

ROSTOU. [Yaraslow.]

ROSTRUM, or, more properly, **ROSTRA**, was a platform or elevated space of ground in the Roman forum, from which the orators used to address the people, and which derived its name from the circumstance that after the conquest of Latium the beaks (rostra) of the Antiatian ships were affixed to the front of it. (Liv., viii. 14.) The rostra was between the Comitium, or place of assembly for the Curiæ, and the Forum, properly so called, or place of assembly for the Comitia Tributa. Bunsen, in his work on the Roman Forum, quoted by Arnold (*History of Rome*, vol. ii., p. 165), judging from the views of the rostra given on two coins in his possession, supposes that it was a circular building, raised on arches, with a stand or platform on the top, bordered by a parapet, the access to it being by two flights of steps, one on each side. It pointed towards the Comitium, and the rostra were affixed to the front of it, just under the arches. Its form has been, in all the main points, preserved in the ambones, or circular pulpits, of the most antient churches, which also had two flights of steps leading up to them, one on the east side, by which the preacher ascended, and another on the west side, for his descent. Specimens of these old pulpits are still to be seen at Rome, in the churches of S. Clement and S. Lorenzo fuori le Mure. The orators appear to have walked up and down the rostra in addressing the people, and did not, like modern speakers, remain standing in one spot. Down to the time of Caius Gracchus even the tribunes in speaking used to front the Comitium; but he turned his back to it, and spoke with his face towards the Forum. (Niebuhr, *History of Rome*, vol. i., note 990; vol. iii., note 268.)

ROSTRUM, a botanical term applied to any rigid prolongation of remarkable length, or to any additional process at the end of any of the parts of a plant. Under this term are included most processes and long points of an irregular character, as the thin apices upon the operculum of the sporangium of many mosses, the lengthened tube of the calyx upon the achenia of Scabiosa, Tragopogon, Lactuca, and many other Compositæ, also of Scandix and Anthriscus, the remaining and often enlarged style upon many fruits, as of Brassica, Sinapris, Saxifraga, and many other prolonged points, as those upon the utriculate induvia of Careæ flava and C. ampullacea. The term *cornu* is often applied to parts similar to rostrum.

ROT, DRY. [Dry-Rot.]

ROTA'LIA. [Foraminifera, vol. x., p. 348.]

ROTATE, a botanical term applied to either the calyx or corolla, when the tube is very small or entirely wanting, and the petals or sepals are united and spreading. Examples are seen in the genera Anagallis, Lysimachia, Borago, Solanum, Verbascum, Galium, and Rubia.

ROTATION (*Rota*, a wheel). The popular conception of a body in rotation is vague, except only in the case in which the rotation is made about an immoveable axis. This subject has accordingly been usually treated by mathematical methods; and mathematicians, content with their results, and with their power of interpreting them, did nothing towards the improvement of the manner of presenting the elementary view of rotation. Within the last seven years however, a French philosopher of a truly remarkable genius for simplifying the elements of mechanics, M. Poinsot,* has presented the subject in a point of view which would excite wonder that ideas so simple should never have occurred to any one before, if it had not been so often seen that simplicity is not a fruit of the first growth. In this article it is to be remembered that we confine ourselves to notions connected with motion, independently of its producing force, reserving the latter for Theory of Couples: an arrangement dictated rather by our desire to keep in one article what may be accessible to the general reader, than by its own intrinsic propriety. For the mathematical part of the subject, so far as we enter into it, see Virtual Velocities.

There is this parallel between the conception we form of the simple motion of a point and that of a solid body, namely, that each has a case of peculiar simplicity, by which others are rendered more easy to describe. A point may move in a straight line, or may preserve its direction unaltered; a body may revolve round a fixed axis, or each point may preserve its circle of revolution unaltered. But, owing to the comparative simplicity of the motion of a point, it is easy [Direction] to carry with us, when it moves in a curve, the idea of its still having a different direction at every point of the motion, namely, that of the tangent of the curve. It is not so easy to see that whenever a body moves about a fixed point, no matter how irregularly, there is always, at every instant of the motion, some one axis which is, for that instant, at rest. This notion of an instantaneous axis of repose, not continuing to be such for any finite time—answering to that of an instantaneous direction in curvilinear motion, which does not continue for any finite time to represent the direction—must be first distinctly formed, before any satisfactory account of the rotation of a body can be given.

Let us suppose a uniform sphere, with a fixed centre, but otherwise free to move in any way. Let a succession of forces act upon it, gradual or not, in such a manner that it will never move round one axis for any finite time during the continuance of their action. At a certain moment, let all the forces cease entirely, leaving the sphere to itself. It is easy enough to see that from and after the moment of discontinuance, the sphere will move round an axis which remains unaltered; or, if this be not perfectly perceptible, the geometrical considerations presently to be given, will make it so. There must then, at the very moment of discontinuance of the forces, have been an axis which was for that moment at rest, namely, the axis on which the motion is to continue after the forces cease. In this way, knowing that curvilinear motion would become rectilinear the moment that the constraining forces are removed, we might form an idea, if we had not one otherwise, of the tangent of a curve, the line of direction for the time being, and which would continue to be the line of direction if the forces were removed.

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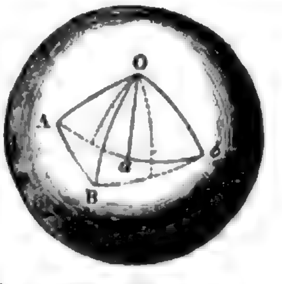
* In a Memoir read to the Academy of Sciences, May 19, 1834, of which only an extract, explaining general considerations and results, has been published. Paris, Bachelier, 1834.

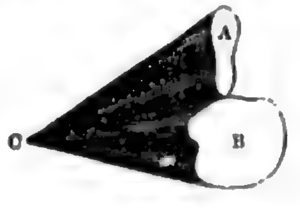
Now let the sphere, the centre being fixed, have moved from any one position (P) into any other (Q), but not round one axis. If a point were to move from A to B, however curvilinear the intermediate path might be, it *might* have moved from A to B in a straight line, the chord of the curve. Similarly, it may be shown that however *unaxical* the manner in which the sphere moves from position (P) to position (Q), it might have been changed from the one to the other by a motion of simple revolution. To show this, remember that, the centre being fixed, the positions of any two points of the sphere, not opposite, give the position of the sphere, so that, if any two such points chosen in the position (P) can be transferred to their places in (Q) by a simple revolution of the sphere round an axis, the whole sphere is transferred by that same revolution. Suppose that AB, an arc in the position (P), comes to *ab* in the position (Q). Bisect A*a* and B*b*, and let great circles drawn through the points of bisection meet in O. Then it is easily proved that OA = O*a*, OB = O*b*, whence AOB, *a*O*b*, are triangles with the sides of one severally equal to those of the other. Hence the angles AOB, *a*O*b*, are equal, whence the angles AO*a* and BO*b* are also equal. If then the sphere should revolve round an axis passing through O and the centre, A would be brought to *a* at the same moment at which B is brought to *b*; whence the change from (P) to (Q) can be effected, as asserted, by a simple axical revolution.



If then we suppose *ab* ever so near to AB in position, the same thing is still possible, and by placing *ab* infinitely near to AB, or finding the limit of the point O during a motion of the sphere which is diminished ad infinitum, the position of the instantaneous axis of repose may be determined at any point of the motion of the sphere. And if we suppose this sphere to be merely cut for convenience out of any solid body, with the fixed point of that body for its centre, the instantaneous axis of repose of the body may be found, being always that of the sphere.

One of M. Poinsot's remarkable propositions is the following:—Any motion of a system round a fixed point may be attained by cutting a cone (in the most general sense of the word) out of the body, with the fixed point for a vertex, and fixing in space another cone for it to roll upon, also with the fixed point for a vertex.

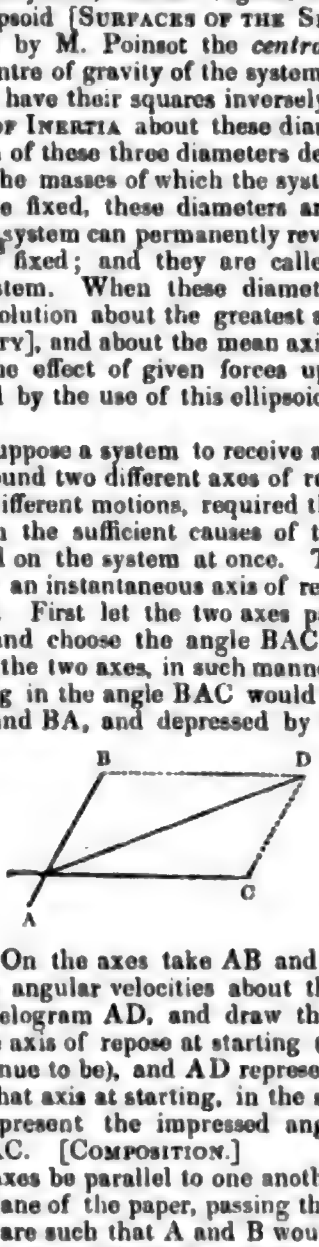
Thus, if in the adjoining diagram, the cone A be made to roll upon the cone B, both being supposed destitute of impenetrability, so that the contact of the curves of A and B can always be made, and if the system out of which A is cut be then restored (also without impenetrability), there will be a complete geometrical representation of one possible motion of the system about C. Moreover, there is no possible motion which might not be represented in the same manner by properly choosing the cones A and B, and the axis of repose for the instant is the line in which the two cones touch.



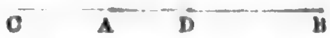
If we suppose no fixed point in the system, so that motion of translation, as well as of rotation, is possible, M. Poinsot has given another equally distinct notion of the state of the motion during an infinitely small time. The most simple notion which we can form of a combined translation and rotation is the screw-like motion, in which a uniform motion of translation is accompanied by a uniform motion of rotation round a line parallel to the motion of translation M. Poinsot has shown that every motion of a system must be, at any one instant, either a simple motion of translation, or one of rotation, or the screw-like motion above described. That is to say, at every point of time in the motion of a system there exists a line (whether internal or external to the *material* system matters not, as long as they are immoveably connected) along which the system is at that instant dropping, while all the rest of the motion at that instant is simple rotation about that *slipping axis*. There will perhaps be some difficulty in the first reception of these ideas; but when they are once understood, the precision they will give to the conception formed of the motion of a system will be found highly valuable.

In every solid system, whether regular or not, can be described an ellipsoid [SURFACES OF THE SECOND DEGREE] which is called by M. Poinsot the *central* ellipsoid. Its centre is the centre of gravity of the system; its three principal diameters have their squares inversely proportional to the MOMENTS OF INERTIA about these diameters as axes; and the position of these three diameters depends upon the distribution of the masses of which the system is composed. If the centre be fixed, these diameters are the only axes upon which the system can permanently revolve without the axis being also fixed; and they are called the principal axes of the system. When these diameters all differ in length, the revolution about the greatest and least axis is stable [STABILITY], and about the mean axis unstable. The conception of the effect of given forces upon a system is much facilitated by the use of this ellipsoid. [THEORY OF COUPLES.]

Let us now suppose a system to receive at the same time two motions, round two different axes of repose: that is to say, given two different motions, required the motion which will result from the sufficient causes of the two motions being impressed on the system at once. There will be at the first instant an instantaneous axis of repose, which it is required to find. First let the two axes pass through the same point A, and choose the angle BAC out of the four angles made by the two axes, in such manner that points of the system lying in the angle BAC would be elevated by the rotation round BA, and depressed by that round CA or *vice versâ*. On the axes take AB and AC, lines proportional to the angular velocities about those axes, complete the parallelogram AD, and draw the diagonal AD. Then AD is the axis of repose at starting (which however it may not continue to be), and AD represents the angular velocity round that axis at starting, in the same manner as AB and AC represent the impressed angular velocities about AB and AC. [COMPOSITION.]



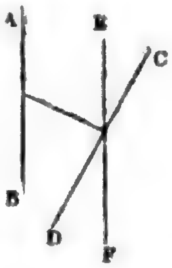
Next let the axes be parallel to one another, say perpendicular to the plane of the paper, passing through A and B. If the rotations are such that A and B would both rise, or both fall, on the paper, each by the rotation about the other, take a point C in AB continued, nearest to the axis about which the angular velocity is greatest (say that of A), and such that CA is to CB as the angular velocity about B to the angular velocity about A. Then the axis of repose at starting is a line passing through C parallel to the former axes, and the angular velocity is the difference of the angular velocities about A and B, and in the direction of the greater. In this case the directions of the rotations about A and B [DIRECTION OF MOTION] are different. There is one remarkable case, namely, when the rotations about A and B are equal. In this case the rule would lead us to a rotation equal to nothing



made about a point at an infinite distance—one of those extreme conclusions which require interpretation. The fact is that these two rotations give only a simple motion of translation = AB × Angular Velocity per second, and such as to make the system move upwards or downwards on the paper according as the separate rotations would make the points A and B move upwards or downwards. This particular case will be more intelligible when looked at with the help of the THEORY OF COUPLES.

But if the rotations be in the same direction, so that A will be lowered and B raised, or *vice versâ*, each by the rotation about the other:—Take a point D, dividing AB so that AD is to DB as the angular velocity about B is to that about A. Then will the axis of repose at starting be a parallel drawn through D to the axes passing through A and B, and the angular velocity will be the sum of the angular velocities about A and B, its direction being that which lowers A on the paper and raises B, or *vice versâ*, according as is done by the given angular velocities.

Lastly, let the axes be neither parallel nor intersecting, as AB and CD:—Through the point in which CD meets the common perpendicular draw EF parallel to AB, and at the instant at which the rotations round AB and CD commence, give a couple of equal and contrary rotations about EF, each equal to that about AB. This last pair produces no effect, so that the composition of the four rotations gives the same result as that of the two. Now, as above stated, the rotation round AB, and its equal and contrary round EF, produce nothing but a motion of translation, while the remaining rotation about EF, compounded by the first rule with that about AB, gives what would be an axis of repose, if it were not for that translation. The whole result then is, that the system begins to move about an axis, which axis begins to undergo a translation in space.



There is no work to which we can refer the reader for a simple demonstration of these rules, apart from higher considerations. But the student of mechanics who does not pay attention to the simple phenomena of translation and rotation, will rarely find himself able to attain a complete comprehension of the equations by which these phenomena are applied in physics.

ROTATION OF CROPS. It has been observed in a former article [ARABLE LAND] that a repetition of the same crops in succession has a peculiar effect on the soil, so that if grain of the same nature be sown year after year in the same ground, it will not produce the same return of the seed, even when abundantly manured. The reason of this is not satisfactorily explained, but the experiments which have been made by men of science lead us to conclude that the real cause will be gradually discovered; and considerable advances have been made towards a rational solution of the question. It has been observed that it is the formation of the seed which principally causes the deterioration of the soil; for if the crop be fed off in a green state, or mown before the seed is formed, the same may be safely repeated, and no diminution of the plants is apparent. Thus grasses in a meadow which are mown before the blossom is faded or the seed formed, will spring up again vigorously; but if the seed is allowed to ripen, the roots die away, and the best grasses gradually disappear. It is thus that when a meadow is mown year after year for hay, and the earliest grasses are allowed to ripen their seed, the crop will be later and later, and all the earliest grasses will disappear. Irrigation prevents this, and seems to restore to the land whatever the grasses require for their continuance. Feeding of the meadows does the same; and this leads to the conclusion that water restores the power of production; and that, the grasses not being permitted to run to seed, the deteriorating effect is not produced.

If it had been a mere exhaustion of the nutritious particles in the soil which caused the deterioration of the subsequent crops, some kind of manure might restore the fertility; but this is not the case. However judiciously the land may be manured, it is not practicable to raise a crop of wheat or clover, or of many other plants, on a soil which has shown that, as the farmers say, it is *tired* of that crop; but clover grows well after wheat, and wheat after clover, so that the same effect is not produced in the soil by these two crops. Experiments have been made by eminent chemists, particularly by Macaire of Geneva, at the request of De Candolle, which lead one to suppose that, in the formation of the seed or other nutritious parts of plants, the sap is digested, that it takes up certain elements and deposits others, which are the residue of the process: and these being no longer necessary to the formation of the seed, are rejected by the vital action of the plant, and exude by the roots. Thus certain inferior animals, which in many respects have some analogy with vegetables in their growth, as the polypi, take in nourishment by the same openings or pores by which the excrements are voided after digestion; and the different constitution of different animals enables one class to feed on the excrements of another; whereas no animal in a healthy state can derive nourishment from that which it has already digested and voided. Our ignorance of the functions of vegetable life prevents us from foreseeing the effects produced on the sap by the expansion of the blossom or the ripening of the seed; but experience leads us to perceive that certain plants thrive best after certain others; and that in this case they are always of distinct and different natures. A plant which has fibrous roots, and throws up a seed-stem with few leaves, thrives best after one which has a fleshy root and many succulent leaves on a branching stem. Thus, wheat thrives after beans, vetches, or clover; barley and oats after turnips, carrots, or potatoes. Independently of the manure which may be put into the ground, the crops will be better where the proper succession is attended to, than where plants of a similar kind are made to follow each other. To ascertain the cause of this, Mr. Macaire and some other scientific men observed the change which took place in the water in which wheat had been made to grow. They found a deposit in the water of the nature of a bitter extract; and this they concluded to be excrementitious. Whether these experiments were conclusive or not, they found that beans grew well in the water in which wheat had deposited this supposed excrement; and, on the other hand, wheat throve in the water in which beans had grown. This confirmed the well-known fact that heavy soils of a rich quality and well manured will bear alternate crops of wheat and beans without the intervention of a fallow for a long series of years, as is practised in some parts of Kent. The effect of fallowing land is explained on the same principle; the excrement is washed out by the rains, or is decomposed by the light and air to which it is exposed by the repeated ploughing. Thus the land is said to be *sweetened*, an expression very common among those farmers who adhere to the fallowing system.

If the chemical nature of the excrement of each plant cultivated could be accurately ascertained, artificial means might be discovered, by which the same effect might be expeditiously produced, which now requires a whole season of fallowing. But experience and observation have anticipated science, as is often the case: and a judicious rotation of crops has been found to prevent the bad effects of the change in the constitution of the soil which is caused by the growth of particular classes of plants; whether it be that they deprive it of peculiar salts, as some will have it, or deposit deleterious particles, according to others. However interesting it may be to the curious inquirer to ascertain the real cause, it is sufficient for the practical farmer to learn by experience what crops succeed best after each other, and how soon the same kind of seed may again be sown in the same ground with a reasonable prospect of its producing a good crop; and this after all can only be learned from actual experiment and observation.

In all countries where peculiar attention has been paid to agriculture, the most advantageous succession of crops is generally known; and if any deviation takes place, it is as an exception to the rule, and is not looked upon as a model for imitation, but rather as an experiment of a doubtful result. Certain general principles are commonly admitted as fully established; the chief of these is, that a plant with a naked stem and farinaceous seed should follow one with a branching stem and a fleshy root, which has been taken from the ground by mowing or feeding before the seed was ripe; or if all these conditions cannot be obtained, that some of these at least should be complied with. Wheat sown after clover, which is allowed to be the best succession on light soils, fulfils all the conditions: when it is sown after beans, the condition of the proceding crop not ripening its seed is given up; and consequently this succession is inferior to the other. Potatoes, at first sight, appear to fulfil all the necessary conditions; but although they do not often ripen the seed above ground, the bulbs of the roots contain so much farina, that in the formation of these the soil is notoriously deteriorated; and farmers well know that, except in peculiar cases which form exceptions, wheat never thrives so well after potatoes as it does after clover, even when the ground has been so richly manured as to contain more organic matter in a soluble state than there is in the roots of the clover.

A knowledge of the different plants which may succeed each other on the same land is of great importance in forming a judicious rotation, so as to obtain the most valuable produce from any given soil, in as quick recurrence as possible without the risk of failure. In the triennial system, which could only be profitable where much of the land remained in a state of pasture, two crops of corn were taken in succession after a complete fallow. But even here it was found advisable to have different kinds of grain, and not to repeat the same crop without a fallow intervening. In very rich soils wheat and barley were the usual crops after the fallow; and the manure was obtained by means of cattle or sheep kept on the pastures in summer and on hay and straw in winter. Repeated ploughings were indispensable; and the farmer who stirred his land the most was the most certain of good crops. But when pastures were broken up, this system soon exhausted the soil for want of manure, and it became indispensable to devote some portion of the land to raise food for the animals whose dung is required to keep up the fertility. Hence the introduction of roots and artificial grasses. It was soon observed that the crops of corn were much better on the land which had borne these roots and grasses, even with less manure, than after crops of grain; and a rotation was adopted in which green crops were raised between every two crops of corn. In process of time the fallows were found to be superfluous wherever green crops could be raised with advantage; and the land was kept clean by careful weeding and hoeing. The effect of a judicious rotation on the produce raised in a given time was so evidently advantageous, that it gave rise to a notion that in this alone consisted the whole art of the farmer, even to the neglect of manure; and clauses were introduced in leases prescribing the rotation to be strictly adhered to, often with detriment to the land and loss to the tenant, when the circumstances required a deviation from the rule.

In order to find the crops which may advantageously succeed each other in rotation, many circumstances must be taken into consideration. First of all the quality of the soil, and its fitness for particular crops; next the wants of the farmer and his family, and the maintenance of the stock required to produce a sufficient supply of manure. It is unreasonable to expect poor light land to produce wheat and beans, although by high cultivation these crops may be forced. Rye, oats, and roots may give the farmer a better profit, by being raised at a less expense than more valuable crops, which must be forced with manure, and at best are precarious in soils not adapted to their growth. In moderate loams wheat may recur every fourth or fifth year, whereas in very rich compact loams it may recur every third, and even every alternate year. Clover and many artificial grasses do not succeed well if they recur oftener than every sixth year, or with even a longer interval. Rape, flax, and potatoes require a still more distant recurrence on the same ground. All these considerations lead the farmer to the selection of the most advantageous rotation for the soil of his farm; and where the land in a considerable district is nearly of an uniform quality, experience soon establishes a course which no one finds it prudent to deviate from. It happens frequently however that a great variety of soils, very different in their nature and fertility, are intermixed; and then, unless the farmer can apply the true principles of rotations, he may greatly err by following the course, which may be very judicious for the prevailing soil of the district, but not at all suited to some of his fields. Here the old advice to a young farmer, to 'look over his neighbour's hedge,' may not be a prudent one to follow; and even if there were no difference in the nature of the soil, or in the state of fertility in which it is at the moment, a blind adherence to the practice of others will never lead to any improvement: for such improvement can only be effected by some knowledge of the reasons on which any practice is founded. Hence a knowledge of the crops suited to any particular soil, and the order in which these crops should succeed each other, is indispensable to the advantageous cultivation of a farm.

That which forms the food of man is always the principal object in the cultivation; and, excepting rice, which only grows in warm climates, there is no food more universally used than that which is made from wheat. Rye, barley, oats, and pulse are only substitutes where wheat cannot be raised in sufficient quantities. Next to grain comes meat, chiefly beef, mutton, and pork, of which the consumption increases with the wealth of a nation and the advance of its agriculture. Wheat and fat cattle are therefore primary objects with every good farmer; and he who can raise most wheat and fatten most oxen or sheep or pigs will realise the greatest profit.

Many circumstances may indicate a deviation from the course which, as a general rule, is most advantageous. The facility of purchasing manure from neighbouring towns may allow of more frequent crops of corn, and of nutritious roots which require much manure, such as potatoes, and which give no return to the land in the shape of dung. But we must lay down rules for those who are to rely on their own resources to recruit the land with manure, so that it may give the greatest produce without diminishing in fertility; and this can only be done by a judicious feeding of live-stock.

The simple rotation of wheat and beans alternately would be by far the most profitable in rich clay soil, as both these crops always obtain a good price in the market; but if a whole farm were so cropped, nearly all the manure must be purchased; for, after a few crops, the wheat-straw and bean halm would not produce half the manure required for the land. Hay and oats must be purchased for the horses required for the tillage, which might not be procured so readily or so cheap as they may be raised on the farm. On very light sands wheat or beans cannot be raised, except by a very expensive mode of cultivation; but rye, oats, peas, buckwheat, and roots for cattle must be substituted. On chalky loams the principal crops are barley and artificial grasses for sheep. In short, no particular rotation can be prescribed without a complete knowledge of the soil, the locality, and every circumstance connected with any particular farm. As the most universal rule, it may be laid down that every alternate crop should be consumed by animals on the farm, and that, as much as possible, the plants which succeed each other should be of different natural botanic families. Experience has generally shown the time that should be allowed to intervene between the recurrence of the same kind of crop, and we have only to form our plans accordingly.

In order to prove that the principles we have here said down are not formed on mere theory, we have only to show that experience and observation have led to the same practical results, and that those rotations which have stood the test of the longest experience have been gradually brought to a considerable perfection in consequence of the failures which generally followed any great deviation from the true rational course.

Of the old triennial course (fallow, wheat, barley or oats) it must be observed that the two corn-crops so rapidly deteriorate the soil, that a complete year of fallow is required to purify it, and a good manuring to keep the land in heart, and that all the industry of the farmer cannot keep up the fertility of the land without extraneous help, either from the manure made in towns, or in the farm-yard by cattle bred and kept in commons or pasture-grounds. This system, which prevailed so long, cannot be called a rotation; and no real improvement was introduced into agriculture until the notion of its perfection was exploded, and tenants were permitted to deviate from it. The rotations adopted in the place of this old system necessarily partook at first of its main defects. Green crops were introduced of necessity to supply the loss of the commons and pastures, which, as the population increased, were gradually cultivated as arable land: but the two white crops remained in succession, and even now, such is the force of habit and early impression, that one of the most difficult points to be gained with mere practical farmers is to make them have patience when their land is in a good state, and to prevent their sowing a white crop, which is immediately profitable and obtained at little or no expense, instead of a green crop, which will keep the land in heart and improve it for future crops, but which does not figure in the account of sales. Yet it can be clearly shown, that in most cases the second corn-crop is dearly purchased by the expense required to restore the land to the state in which it was when the seed was sown a second time; manure alone will not do this; fallowing and repeated ploughing can alone effect it: and whether you plough several times before a crop, or are forced to do so after it, there is no difference in the expense of labour, although there may be much in the value of the subsequent crops.

The Norfolk course (turnips, barley, clover, wheat), which is so well known and deservedly in repute for light sands, has only one defect, which is the too frequent recurrence of clover. Rye grass, the usual substitute in sandy soils, unless it be fed off young, is far inferior to clover as a preparation for wheat, and this accords with the theory; for wheat and rye grass are both of the natural family of the *gramineæ*. Tares or vetches are a good substitute in heavy soils, as well as beans, both of which are *leguminosæ*, but not well suited to light sandy soils. Peas are sometimes introduced; but they are apt to encourage weeds, unless the crop be very heavy, and then they exhaust the soil, and leave little vegetable matter behind them in their roots.

In many countries there are other vegetable products, which are required for the food of the inhabitants, or supply the raw materials of manufactures: these must be introduced into the rotations, according to their effect on the soil and the cultivation they require. Indian corn, or maize, and French beans, for their seed, are cultivated in more southern climates as field crops. Potatoes are now an essential product in some districts, and one which, after maize, produces the greatest quantity of food for man from a given portion of land. But potatoes require much manure, and cannot profitably be cultivated to a very great extent as a farm produce, nor repeated on the same land, for any length of time, oftener than once in eight or ten years; they should however always enter into the rotation in that portion of the land which is to be much worked, cleaned, and manured after a crop of corn. Flax, colsa, hemp, and many other plants are cultivated in various districts. By a little management a great variety of produce may be introduced with some regularity; and, as a specimen, we will give a rotation which is generally adopted in the neighbourhood of Lille in France, and was noticed in the 'Journal of the Royal Agricultural Society of England,' vol. i., part iii., page 292.

The quantity of land is 15 *bonniers* (about 60 imperial acres). Each bonnier is divided into 16 cents; each cent is consequently one-fourth of an acre.

Rotation of Crops for Four Years.

First Year.			Second Year.			Third Year.			Fourth Year.			
Bon.	Cent.		Bon.	Cent.		Bon.	Cent.		Bon.	Cent.		
0	12	Colsa plants	1	8	Oats	1	0	Clover				
0	6	Turnips				0	8	Flax				
0	6	Cow-cabbage										
			1	0	Tares							
			0	8	Rye							
			0	8	Winter barley	2	8	Colsa	4	8	Wheat	
			0	8	Clover							
			0	4	Potatoes							
4	8	Wheat	0	2	Beet-root	0	8	Beans				
			0	2	Carrots							
			0	12	Colsa plants							
			0	6	Turnips	1	8	Oats	1	0	Clover	
			0	6	Cow-cabbage				0	8	Flax	Wheat.
1	0	Clover										
0	8	Flax	4	8	Wheat	4	8	Tares, &c. (as in the second year)	2	8	Colsa	
2	8	Colsa							0	8	Beans	
0	8	Beans							1	8	Oats	
1	8	Oats	1	0	Clover							
			0	8	Flax							
1	0	Rye and tares										
0	8	Rye							4	8	Tares, &c. (as in second and third years)	
0	8	Winter barley	2	8	Colsa	4	8	Wheat				
0	8	Clover										
0	4	Potatoes										
0	2	Beet-root	0	8	Beans							
0	2	Carrots										
15	0		15	0		15	0		15	0		

The tares, rye, winter barley, and clover are mostly cut green for fodder.

In this rotation there are a great many different crops, but the chief is wheat, which occupies 18 acres in 60, and thus recurs nearly every third year on the same ground. It invariably follows clover, flax, colsa, and beans, all plants of different families from the *gramineæ*. After the wheat, various green crops follow, and, excepting a very small portion of winter barley and rye, which are generally cut green for the cattle, all these are likewise of different families from wheat. Then come colsa, beans, and oats, all but the last of different families from the two preceding; and it must be observed that the colsa plants raised to be transplanted are followed by beans, and the turnips and cow-cabbage by oats, while the colsa for seed comes after tares, rye, winter barley, and clover. This rotation is not a theoretical one, but actually and strictly adhered to by all those who are considered good farmers in the district where it has been the rule for a century and more. It is not the result of physiological theories, but it is most probably the parent of the theory which is now almost universally adopted by all scientific agriculturists.

Mr. Blackie, who may be considered as very good authority in modern British farming, was requested, when in Paris, to recommend a course of cropping or a rotation suited to the northern portion of France. Probably without any knowledge of what was actually the practice in a part of it, he composed a table of crops, which he considered as suited to a very rich soil in a very genial climate; and if we compare this with the foregoing rotation, we shall be surprised to find how nearly they agree in principle. It has been published in the 'Gardeners' Magazine,' vol. ii., and republished in a paper by Mr. Towers in the second part of vol. i. of the 'Journal of the Roy. Agr. Soc. of England,' and as it is an interesting agricultural document, we insert it in the following page.

It will be remarked in perusing this rotation, that the true principles are strictly adhered to:—wheat follows clover, vetches, beans, and potatoes; and after the wheat we have roots and green crops. The only remark which strikes a practical farmer is that ten acres of wheat are succeeded by potatoes, and these by wheat again. There is very little land in Great Britain which will bear so severe cropping, without much more manure than a farm of 100

Mr. Thomas Blackie's scheme of Rotation upon a Farm of 100 Acres, as proposed to the French government.

First Year. Acres.	Second Year. Acres.	Third Year. Acres.	Fourth Year. Acres.	Fifth Year. Acres.	Sixth Year. Acres.	Seventh Year. Acres.
30 wheat	5 turnips 5 cabbages 2½ field beet 2½ carrots 10 potatoes 3 vetches 2 beans .	10 oats . . 5 barley . 15 wheat .	15 clover . 5 turnips . 5 cabbages 2½ beet . 2½ carrot .	15 wheat . 10 oats . . 5 barley .	10 potatoes 3 vetches 2 beans . 15 clover .	30 wheat
15 clover .	15 wheat .	10 potatoes 3 vetches 2 beans .	30 wheat .	5 turnips . 5 cabbages 2½ beet . 2½ carrot .	10 oats . . 5 barley .	15 clover
5 turnips 5 cabbages 2½ beet . 2½ carrots	10 oats . . 5 barley .	15 clover .		10 potatoes 3 vetches 2 beans .	15 wheat	
10 oats . 5 barley .	15 clover .	15 wheat .	10 potatoes . 3 vetches . 2 beans .	15 wheat .	5 turnips . 5 cabbages 2½ beet . 2½ carrots .	10 oats 5 barley
10 potatoes 3 vetches 2 beans .	15 wheat .	5 turnips . 5 cabbages 2½ beet . 2½ carrot .	10 oats . . 5 barley .	15 clover .	15 wheat .	5 turnips 5 cabbages 2½ beet 2½ carrots
10 lucern .	10 lucern .	10 lucern .	10 lucern .	10 lucern .	10 lucern .	10 lucern*

*(To be ploughed up after seven years, and followed by wheat.)

acres can afford for a tenth part of it; but this is very easily modified by substituting a green crop for a portion (perhaps one-half) of the potatoes, and letting the potatoes be succeeded by barley or oats instead of wheat. The rotation will then be less scourging, and better adapted to land of moderate fertility, where extraneous manure cannot be depended upon. We give it as an example of the application of the true theory of rotations, and it is remarkable how nearly it accords with that which was the result of practice alone without theory. We have ourselves for many years adopted a rotation without being tied down to any positive rule, which has been suggested by circumstances, and in some measure regulated by our conviction of the truth of the theory we have attempted to elucidate. In a clayey loam on an impervious subsoil, but mostly completely drained, we have had turnips and Swedes on high ridges, tares, mangel-wurzel, potatoes, and a portion of rye to cut up green; succeeded by barley and oats sown with clover, rye-grass, and other biennial grass seeds. These were mown for hay the first year, and sometimes the second also, but generally depastured one year at least; then followed beans, and after these wheat. The green crops were put in after repeated and deep tillage, and with an ample allowance of manure. The whole of the layer was top-dressed with peat or coal ashes in the first year, and what manure could be got or spared was put on the second year before winter, when it was ploughed up. All the corn crops were put in upon one shallow ploughing. We have had no reason to repent of pursuing this course: but we allow that one year only in clover would probably be more profitable. The land is not sufficiently fertile by nature to bear wheat after the first year of clover, instead of feeding or making it into hay. This would bring it to some of the rotations adopted in rich alluvial soils. It is a rule which should never be transgressed, that after every crop reaped there should be a remnant of manure sufficient to ensure a good crop the next year; and that this should always be in the land, and considered as stock in trade or capital invested at good interest. By means of judicious rotations and tillage a much greater quantity of produce may be raised at a certain expense of labour and capital, than by any desultory and experimental mode of cropping. The farmer should find it his own interest to cultivate his land according to the most approved principles, and the landlord should impose only such restriction as will prevent the tenant from injuring himself by diminishing the produce of his farm.

ROTATION, INTERCELLULAR. [SAP.]

ROTATO'RIA. One section of the Infusorial animals is thus termed by M. Ehrenberg. It is arranged in the diploneurose division of the animal kingdom by Dr. Grant, a view which has been many times suggested to original observers, from the figure, division, and movements of the body. Ehrenberg's classification of these minute but often highly organised creatures is formed upon the same general model as that of the Polygastrica, there being in these the same double series of analogous nude and loricated forms.

General Character.—Swimming invertebral animals, apodal, often caudate, capable of executing rotatory movements by the aid of peculiar ciliated organs. No true heart, but a dorsal vessel, and transparent vessels in which no movements appear. No distinct branchiæ. Many nervous pharyngial ganglia (cerebral); in general a cervical nervous ring and an abdominal nerve. Very often eyes coloured red. Alimentary canal distinct and simple; sometimes a stomach, in other cases cœcal appendages; pharynx almost always armed with jaws, which often carry teeth. Sexual organs distinct, hermaphroditic; reproduction oviparous and viviparous, never fissiparous, as among Polygastrica.

Order 1. Rotatoria nuda.	Order 2. Rotatoria loricata.

Section I. Monotrocha.

Ciliary Circle simple and entire, and not variable.

Monotrocha nuda.	Monotrocha loricata
1st Fam. Ichthydina.	
A, No eyes.	
a, Body smooth.	
* Tail simple, truncated, and flexible. Gen. *Ptygura.*	
** Tail bifurcate and very short. Gen. *Ichthydium.*	
aa, Dorsal part of the body hairy. Gen. *Chætonotus.*	
B, Two eyes. Gen. *Glenophora.*	

Section II. Schizotrocha.

Ciliary circle simple, divided in parcels.

Schizopoda nuda.	Schizopoda loricata.
1st Fam. Megalotrocha.	1st Fam. Floscularia.
A, One eye. Gen. *Microdon.*	A, No eyes. The envelope of the body gelatinous.
B, Two eyes, which are effaced with age Gen. *Megalotrocha.*	*a*, Rotatory organs bilobate or quadrilobate. Gen. *Lacinularia*

aa, Rotatory organ multifid.
* Rotatory organ quinquefid, mandibles dentate.
Gen. *Stephanoceras.*
** Rotatory organ with 6-8 divisions, mandibles edentate.
Gen. *Floscularia.*
B, Two eyes, which are effaced with age. Envelope of the body membranous and granular. Rotatory organ bilobate or quadrilobate.
Gen. *Melicerta.*

Section III. Polytrocha.

Several small ciliary circles.

Polytrocha nuda.
1st Fam. Hydatina.
A, No eyes.
a, Mandibles dentate.
Gen. *Hydatina.*
aa, Mandibles edentate.
* Mouth direct, terminal.
Gen. *Euteroplea.*
** Mouth oblique, inferior.
Gen. *Pleurotrocha.*

B, A single eye.
b, Eye frontal, tail bifurcate.
Gen. *Furcularia.*
bb, Eye dorsal.
* Tail simple, hairy.
Gen. *Monocerca.*
** Tail bifurcate.
† Frontal ciliæ similar.
Gen. *Notommata.*
†† Frontal ciliæ dissimilar.
§ With ciliæ and styles.
Gen. *Synchæta.*
§§ With ciliæ and hooks.
Gen. *Scaridium.*

C, Two eyes.
c, Eyes frontal.
* Tail bifurcate.
Gen. *Diglena.*
** Tail simple, front with two cirri.
Gen. *Triarthra.*
cc, Eyes dorsal.
* Tail simple.
Gen. *Rattulus.*
** Tail bifurcate.
Gen. *Distemma.*
D, Three eyes.
d, One eye dorsal, and two frontal.
Gen. *Eosphora.*
dd, Three dorsal eyes.
Gen. *Norops.*
E, Several eyes.
e, Eyes in a circle on the neck.
Gen. *Cycloglena.*
ee, Eyes in two cervical groups.
Gen. *Theorus.*

Polytrocha loricata.
1st Fam. Euchlanidota.
A, No eyes.
a, Cuirass depressed. Tail bifurcate.
Gen. *Lepadella.*
aa, Cuirass compressed.
* Tail simple.
Gen. *Monura.*
** Tail bifurcate.
Gen. *Colurus.*
B, One eye.
b, Cuirass depressed.
* Tail simple.
Gen. *Monostyla.*
** Tail bifurcate.
Gen. *Euchlanis.*
bb, Cuirass swollen or angular.
* Tail hairy and simple.
Gen. *Mastigocera.*
** Tail bifurcate or trifurcate.
† No cornicle.
Gen. *Salpina.*
†† Corniculated.
Gen. *Dinocharis.*
C, Two eyes (frontal).
c, Head nude.
Gen. *Metopidia.*
cc, Head hooded.
Gen. *Stephanops.*

D, Four frontal eyes.
Gen. *Squamelia.*

Zygotrocha.

Two small ciliary coronæ.

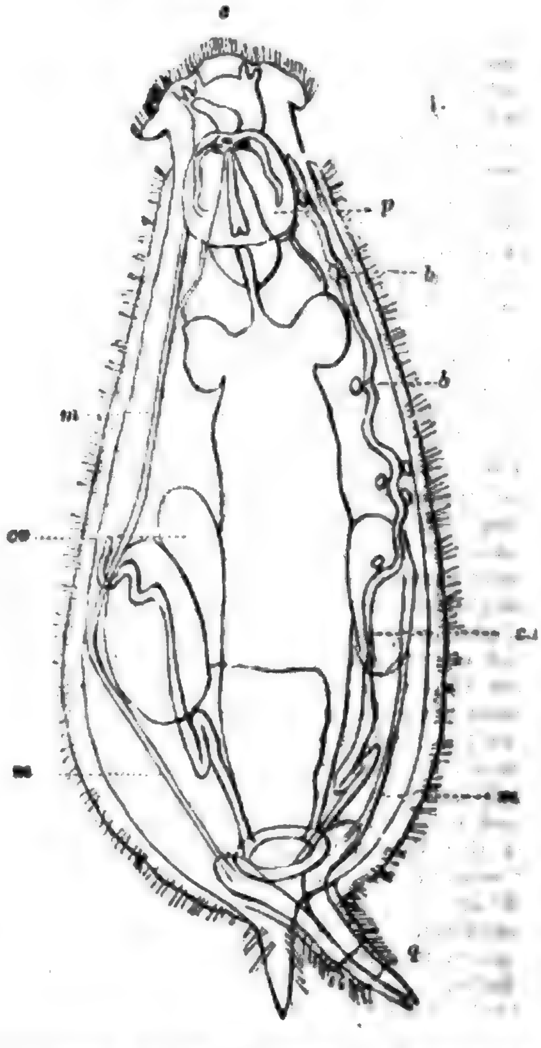
Zygotrocha nuda.
1st Fam. *Philodinæa.*
A, No eyes.
a, Tail bifurcate and corniculate (a frontal proboscis).
Gen. *Callidina.*
aa, Tail bifurcate, not corniculate.
* Rotatory organs, supported on frontal pedicles of great length (no frontal proboscis).
Gen. *Hydrias.*
** Rotatory organs sessile and lateral (no frontal prolongation).
Gen. *Typhlina.*
B, Two eyes.
b. Eyes frontal.
* Tail bifurcate, and with two pairs of horns (thus becoming six-pointed); a frontal proboscis.
Gen. *Rotifer.*
** Tail trifid, and with a single pair of horns (thus becoming five-pointed); a frontal proboscis.
Gen. *Actinurus.*
*** Tail bifurcate, and without horns; no frontal prolongation.
Gen. *Monolabis.*
bb, Eyes dorsal.
(Tail bifurcate, and with ten pair of cornicles; a frontal prolongation.)
Gen. *Philodina.*

Zygotrocha loricata.
1st Fam. *Brachionæa.*
A, No eyes.
Gen. *Noteus.*
B, One eye.
b. No tail.
Gen. *Anuræa.*
bb, Tail bifurcate, flexible
Gen. *Brachion.*

C, Two eyes (frontal).
Gen. *Pterodina*

In illustration of this classification, we present drawings of—

Notommata centrura, as an example of nude Polytrochous Rotatoria; and of—



Notommata centrura. The branchial apparatus (*b*, *c a*) omitted on the left side.

Brachionus urceolaris, as an example of loricate Zygotrochus Rotatoria.

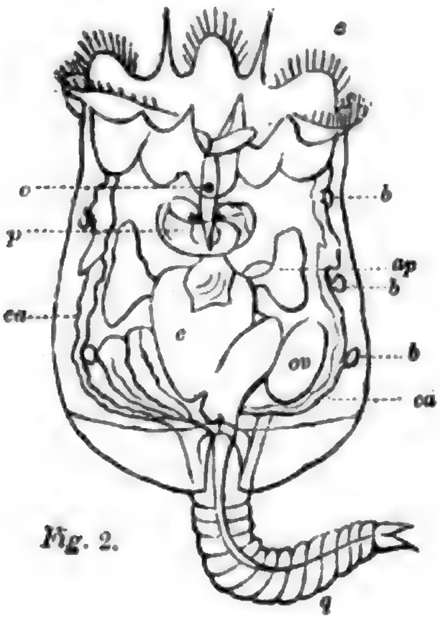


Fig. 2.

Branchionus urceolaris

c, ciliæ rotatoriæ. p, pharynx. e, stomach. a p, appendages to stomach. ov, ovarium. o, eye. m, muscles. q, tail. b b, internal branchiæ. c a, branchial canal.

ROTE, a musical instrument of former times, mentioned by the early French writers of Romance, and by Chaucer, as well as others among our early poets: it seems to have been similar to what the French call a *vielle*, and the English a hurdy-gurdy.

ROTELLA, a genus belonging to the *Turbinacés* of Lamarck. [TROCHIDÆ.]

ROTHER. [SUSSEX; YORKSHIRE.]

ROTHERHAM, a parish and market-town in the south-western part of the West Riding of Yorkshire, 6 miles from Sheffield, 12 from Barnsley, 12 from Doncaster, 160 from London by the road, and 171 by railway. The Don, after receiving the Rother at the eastern extremity of the town, takes a westerly direction, and Rotherham occupies an elevated situation which rises from the northern bank of the river. On the western side of the town the river bends to the north-west. The parish comprises an area of 12,810 acres (nearly 10 square miles), and consists of the townships of Rotherham, Kimberworth, Brinsworth, Catcliffe, and Dalton, and the chapelries of Tinsley and Greasbrough. The populous suburb of Masbrough is on the left bank of the Don, but is comprised in the township of Rotherham, with which it is united by a handsome stone bridge of five arches.

About a mile south of the town, on the south bank of the Don, there are some Roman remains, which consist of a rectangular encampment called Temple Brough; and, at a distance of 300 yards higher up the river, there is an earth-work, which it is conjectured formed part of a larger work. Roman coins, bricks, and pottery have been found on both these sites. The station 'Ad Fines,' on the great road from Little Chester to Castleford, is fixed at Temple Brough by the best authorities. There is however nothing to give Rotherham a claim to a Roman origin, but it probably originated very early in the Saxon period. The church at Rotherham was in that period the only ecclesiastical edifice in an extensive district, and tithe was paid to it from lands now forming the parishes of Ecclesfield, Sheffield, Handsworth, Treeton, and Whiston, in addition to those which are comprised within the parish at the present time. (Hunter's *South Yorkshire.*) A weekly market and annual fair were held before the Conquest; the Saxon lord of the manor had his corn-mill; and these were sufficient, with its ecclesiastical superiority, to render Rotherham a vil of some importance. The Saxon possessor of the manor being displaced at the Conquest, Nigel Fossard, a Norman, was subinfeuded under the earl of Morton. In the reign of Henry III. (13th century), the manor and church were granted to the monks of Rufford Abbey, in Nottinghamshire, with the rights which had been exercised by the former feudal possessors, such as regulating weights and measures, the assize of bread and beer, punishment of criminals, for which purpose they had a pillory, tumbrel, and gallows. In 1307, Edward I. granted the town another market and a second fair. The parish church was built in the reign of Edward IV. (15th century), and is one of the handsomest in the diocese. Thomas Rotherham, archbishop of York, a native of the place, born in 1423, lent his assistance towards rendering it a model of ecclesiastical architecture. There are several good engravings of the church. The living is a vicarage, and the average net income in 1829-30-31 was 170*l.* An old font, supposed to have belonged to the Saxon church, at present stands in the churchyard. To Archbishop Rotherham also his native town was indebted for the foundation of a college, the remains of which still exist, and are used as an inn. This college was founded in 1482 for a provost, three fellows, and six scholars, who were lodged at the college, and accommodation was at the same time provided for the several priests officiating in the different chantries in the church. Grammar, poetry, rhetoric, music, singing, writing, and arithmetic were taught in this college, which was suppressed in the reign of Edward VI. The bridge-chapel on the Don, which does not appear to have been endowed, is now used as the town gaol. The old road from London to Carlisle passed through Rotherham. Charles I. during the civil war passed a night in the town: to one of the inhabitants, who held the stirrup while he mounted his horse, he gave as a memorial a coin of Richard I., which is still in possession of the family of Clarke residing in Rotherham.

There is no single constituted authority for the purposes of municipal government. The 'feoffees of the common lands of Rotherham' are the most important local body. They consist of twelve inhabitants elected for life by the freeholders and rate-payers of the township, and they have the management of certain lands bought by the inhabitants of Queen Elizabeth. The total income at their disposal is at present about 600*l.* a year, a considerable proportion of which is expended in the improvement of the town and in other objects of public utility. Mr. Hunter states (*South Yorkshire*) that he has inquired in vain for the decree or patent under which the feoffees act. The town is lighted under a local act obtained in 1801. A gas-company was established in 1833, but is not incorporated, nor is the water-company, which was formed in 1827. The police is regulated by a general local act (3 and 4 Wm. IV., c. 90), and consists of a day and night watch, for which the township only is rated. The county magistrates sit in petty sessions every Monday, and offenders are committed temporarily to the town gaol. The Midsummer quarter-sessions for the West Riding are held at Rotherham. A court of requests was established in 1839, and its jurisdiction extends to places in the vicinity. Rotherham is the centre of a union under the Poor-Law Amendment Act. The expenditure for the relief of the poor averaged 2808*l.* for the parish, before the union, and in 1838 the expenditure was 1790*l.*

Great improvements have recently taken place in the general appearance of the town. Streets have been widened, old houses pulled down, and many good buildings erected. The materials for building are abundant, the town itself standing upon a mass of the old red-sandstone. Besides the parish church, there is a chapel at Tinsley, a small antient edifice; a church at Greasbrough, built in 1826, with the aid afforded by the Church-Building Commissioners and voluntary contributions; a new church at Thorpe; and a new church at Kimberworth will be completed in 1842. The oldest chapel for Protestant dissenters was built by the Presbyterians in 1705, and is now used by the Unitarians; it was repaired and enlarged in 1840. The Independent chapel, situated in Masbrough, was built towards the end of the last century, and has been once enlarged. The Wesleyan Methodist chapel, built in 1805, has been twice enlarged. A Primitive Methodist chapel has been opened since 1820. In 1836, a handsome Baptist chapel was erected; and within the last three years the service of the Roman Catholic church has been performed in a building formerly occupied as a theatre. The court-house, in which the Midsummer quarter-sessions are held, was built by the county in 1827, and is the most convenient in the Riding. The library, news-room, and dispensary occupy a plain substantial building erected in 1828. The dispensary was established in 1806, and affords medical aid to between 500 and 600 patients yearly. Almshouses for four poor unmarried women were founded in 1780 by Mrs. Mary Bellamy.

Rotherham possesses many important advantages calculated to encourage manufactures. Extensive beds of coal, of a quality suitable to manufacturing processes, exist in nearly every part of the parish, and iron-ore is also abundant. Leland notices, in the sixteenth century, that a mile from Rotherham 'be veri good pittes of coal;' and also that in the town 'be veri good smithes for all cutting-tools;' but it was not until about a century ago that any extensive manufacturing operations began to be carried on. In 1746, the Walkers established a work for the manufacture of cast-iron goods of all kinds; and at the large establishments which originated in their enterprise, great part of the cannon used in the navy during the American and French wars was cast, and for a considerable period nearly the whole country was supplied by them with cast-iron goods. The iron bridges at Sunderland, Yarm, Staines, and the Southwark-bridge over the Thames were cast at their works. After a period of inactivity which followed the close of the war, the various branches of the iron-manufacture are again carried on with great vigour, many new establishments have been commenced, and a greater variety of articles is produced. Stoves, fenders, engineering and millwork, and many kinds of hardware goods are now made. Glass, earthenware, starch, soap, naphtha, pyroligneous acid, are manufactured at Rotherham. There are two extensive ale and porter breweries, and vessels of 50 tons burthen are occasionally built in yards adjoining the Don. A flax-mill has been carried on for several years. The markets for corn and cattle are held on Monday: both are of great importance; but every alternate Monday the cattle-market is one of the largest in the county, and is attended by buyers from Manchester and other towns at a great distance. There is a covered stone building in the market-place for the accommodation of the dealers in butter, poultry, and eggs; and the feoffees are intending to render it more convenient by enclosing one of the sides. The shambles occupy the northern sides of the market, and were built by the feoffees. The fairs are for horses and cattle chiefly, and in November there is a statute fair for hiring servants.

Besides the various natural advantages which the manufacturers of Rotherham enjoy, there are few places possessing such extensive facilities for traffic. The Don was made navigable from Doncaster to Tinsley (the latter place situated between Rotherham and Sheffield) in 1720; and in 1820 the navigation was extended from Tinsley to Sheffield by a canal. The Don gives to the town the means of exporting and importing commodities by water to and from all the great manufacturing towns of Yorkshire and Lancashire, and it communicates with the Trent by the Stainforth and Keadby canal. The Sheffield and Rotherham railway was opened in 1838. It commences in West-gate, Rotherham, where a handsome station is building, is carried across the Don by a wooden bridge, receives a branch from the Greasbrough collieries, and another from the North Midland Railway, and terminates in the Wicker, Sheffield. Trains depart from each terminus every hour during the day; and the distance between the two towns, which is 5¼ miles, is performed in about fifteen minutes: the lowest fare is sixpence. Upwards of a million of passengers had been conveyed along the line in the two years ending October 1840. The Rotherham station on the North Midland Railway is one of the most important on the line, being used by Sheffield on the one hand, and by Rotherham and an extensive district eastward: it is a handsome stone edifice with a spacious waiting-room and offices. This railway, which connects Leeds, York, and Hull, and the counties of Durham and Northumberland, with the midland and western counties and the metropolis, passes through a considerable portion of the parish, and has greatly increased the value of property adjacent to it. At the Ickles, a hamlet in the parish, it is carried over the Don and the Sheffield road by a fine viaduct of twenty-five arches. The communication between London and Rotherham is effected in about 8¼ hours.

The population of the parish and township at the four periods when the census was taken, was as follows:—

	1801.	1811.	1821.	1831.
Township .	3070	2950	3548	4083
Total of parish	8418	8671	9623	10,387

The population of the parish is at present estimated at 12,000, and that of the township, at 5000: in the latter the rent of houses is rising, though many new houses have been lately built. The population of the different divisions of the parish, in 1831, was as follows:—Rotherham (as before stated), 4083; Kimberworth, 4031; Greasbrough, 1290; Tinsley, 368; Brinsworth, 229; Catcliffe, 196; Dalton, 187; Orgreave, 35.

The establishments for education at Rotherham are:—1, The Independent academy, situated in Masbrough, at which 25 young men are educated for the Independent ministry, under a tutor in theology and a tutor in classics: the institution is supported by voluntary contributions. 2, The grammar-school, founded in 1584: the classics are taught gratuitously to the boys of the town. The master has a house rent-free, and the total endowment is about 30*l.* per annum, to which the feoffees, who are the trustees, add a gratuity. The scholars have a claim to a fellowship and two scholarships in Emmanuel College, Cambridge, in case the same are not occupied from the free-school at Normanton; and there is a fellowship at Lincoln College, Oxford. 3, Hollis's School, founded in 1663, by Thomas Hollis, a Nonconformist, for the education of thirty children. 4, The Feoffees' school: 28 boys and 20 girls are educated and instructed in reading, writing, and arithmetic. 5, A school on the Lancasterian system, for 200 boys and 200 girls. 6, Boarding, common day, and dame schools. 7, Sunday-schools. We have no accurate information respecting the two latter classes of schools. Lending libraries are attached to the Sunday-schools of nearly each denomination. The public library was established in 1775, and contains about 3000 volumes, including the publications of the 'Record Commission.' There are nearly 90 annual subscribers. Rotherham was one of the earliest towns in establishing a subscription library, but there is neither a mechanics institute, mechanics' library, nor savings'-bank in the town. There is a small library of theology in the church, for the purchase of which the sum of 100*l.* was left a century ago.

ROTHERHITHE. [SURREY.]

ROTHESAY, or **ROTHSAY,** a burgh in Scotland, in the island of Bute, chief town of the county of Bute, 52 miles from Glasgow, or 19 from Greenock; in 55° 51′ N. lat. and 5° 1′ W. long.

Rothesay owes its origin to a castle erected here about A.D. 1098, by Magnus, king of Norway, to secure the Western isles of Scotland, which he then held. Under the protection of this castle a village was formed, and, under the patronage of the Stuart family, to whom it belonged, rose to importance. Robert III. raised it from being a burgh of barony to the rank of a royal burgh, and James VI., A.D. 1585, further augmented its municipal privileges. It suffered much in the wars of the middle ages, and was repeatedly taken and plundered by the English, the Norwegians, and the Lords of the Isles. It was seized by the Duke of Argyle in his invasion, A.D. 1685. In the early part of the last century many of the inhabitants left it, in order to settle at Campbelltown, and the town appeared like a desert, but since then it has much revived.

The town stands on the east side of the island, at the bottom of a small bay. It consists of several streets and lanes; and has been enlarged along the shore on each side of the old part of the town, by the addition of villas and lodging-houses for the accommodation of the bathers who resort here in the summer from Glasgow, and to whom the place is recommended by its mild and healthy climate and pleasant situation.

Rothesay Castle, a tall heavy-looking ruin, consisting of a circular enclosure with massive walls flanked with round towers built of red stone, stands in the middle of the town. The town-hall and county buildings, a handsome castellated structure with an elegant tower, and the prisons for the county, are adjacent to the castle. The kirk is a modern building about a mile from the town. There are two chapels-of-ease, one of them Gaelic; a third chapel-of-ease, of elegant architecture, has been built by the Marquis of Bute in the northern part of the parish. There are three or four dissenting places of worship in the parish. Close to the parish church are the ruins of the antient church of St. Mary, once the cathedral of the bishopric of the Isles: the walls of the choir, and one or two antient monuments, are standing.

The population returns of 1831 were as follows:—

	Inhabit houses.	Families.	Persons.
Burgh . .	549	1148	4817
Rest of parish .	208	242	1267
	757	1390	6084

About one-third of the population of the part of the parish not included in the burgh is agricultural. By a subsequent account carefully taken in 1837, the population was given at 4924 for the burgh, and 1165 for the rest of the parish; total 6089.

There are a cotton-mill and a power-loom factory, a tanyard, two boat-building yards, and several cooperages. The herring fishery is carried on. There are three banks, branches of the Greenock, the Renfrewshire, and the Royal Bank. The harbour was formed A.D. 1822, and has a slip and building dock, either now finished or in course of construction, adjacent to it. The exports are cotton yarn and cotton goods, herrings, fresh fish, barley, turnips, potatoes, rye-grass seeds, small timber, and leather; the imports are raw cotton, cotton yarn, hides, wheat, oats, flour, beans, bone-dust, lime, freestone, coals, salt, and barrel staves. There were, in 1837, 58 vessels belonging to the port, of from 15 to 300 tons, total registered tonnage 2950: men 255, employed in the coasting trade, foreign trade, or fishery. There is a communication by steam-boats with Glasgow. There is a weekly market, and there are three fairs of little importance. Port Bannatyne, a village in the parish, with a population of about 300 persons, has 25 small vessels engaged in the herring fishery.

The parish is in the presbytery of Donoon, in the synod of Argyle. There were, in 1840, fifteen schools in the parish, including one parochial school with three assistant teachers, two schools endowed by the Marquis of Bute, and three others which are partially assisted. The number of scholars in these schools, in the spring of 1840, was 921, nearly one-sixth of the whole population. The management of the schools is considered to be very good, and there is scarcely a young person brought up in the parish who cannot read and write. There are in the parish six public libraries and two public reading-rooms. A periodical publication, 'The Bute Record of Rural Affairs,' has lately been established: it is useful to agriculturalists. There are several friendly societies, and a savings' bank.

The burgh is governed by a provost, two bailies, a dean of guild, a treasurer, and twelve councillors. Burgh courts, sheriff and justice of the peace courts, and county meetings are held here. The burgh formerly united with Ayr, Irvine, Campbelltown, and Inverary in returning a member to parliament. By the Scottish Reform Act it was disfranchised as a parliamentary burgh, and added to the county of Bute; but by way of compensation, that county, which had previously returned a member alternately with Caithness, was allowed to return one constantly. (*New Statistical Account of Scotland; Parliamentary Papers.*)

ROTTBOELLA, a genus of the tribe Rottboelliaceæ, of the very natural and extensive family of grasses, named by Mr. Brown in honour of C. F. Rottböll, a Professor of Botany at Copenhagen, who died in 1797, and who published several works, one in particular on exotic species of Gramineæ and Cyperaceæ. The genus is distributed throughout Asia, especially India, New Holland, and the tropical islands, and extends also to Egypt. The species are usually tall, erect, and flat-leaved, with the spikes round and jointed; spikelets two in each joint, pressed close to or sunk into a hollow in the rhachis; of these one is sessile, the other stalked. The species are not relished by cattle, with the exception of R. glabra, of which they are said to be fond in India.

ROTTEN-STONE occurs massive. Fracture uneven. Colour greyish, reddish, or blackish brown. Dull, earthy, and opaque. Soft, soils the fingers, and is fetid when rubbed or scraped. Found near Bakewell, Derbyshire, in Wales, and at Albany in the state of New York.

It is employed in polishing metals, &c.

Analysis by R. Phillips:—

Alumina	86
Silica	4
Carbonaceous matter .	10
	100

ROTTENHAMER, JOHN, was born at Munich in 1564, and received instruction in the rudiments of painting from an obscure artist named Donhaur or Donower. Early in life he went to Rome, and became known for small historical compositions painted on copper in a style of most minute finishing. Emboldened by success, he undertook to paint for one of the churches of Rome a large altar-piece, representing several saints and a glory of angels, a work which, when completed, excited astonishment at the extent and versatility of his talents. This work he afterwards repeated for the church of Santa Croce at Mantua. He visited Venice, and studied the colouring of Tintoretto, whose style he imitated with great exactness. Whilst at Venice, he painted some pictures for the public edifices, two of which are mentioned by Lanzi, namely, a Santa Cristina at the Incurabili, and an Annunciation at San Bartolommeo; but that writer speaks in slighting terms of these works, and generally so of the talent of the painter. During his stay in Italy, which lasted several years, he was patronised by Ferdinand, duke of Milan, for whom he painted, amongst numerous works, a picture of Nymphs dancing, which was much admired.

He returned to his native country, and established himself at Augsburg, where he was much employed. For the emperor Rudolph II. he painted a fine picture of the Feast of the Gods, a composition of many figures, gracefully designed, and coloured with the splendour of the Venetian school. Many of his backgrounds were painted by John Breughel, and some by Paul Bril. He was partial to the introduction of gaudy accessories into his pictures, which he frequently enlivened by naked figures designed with taste and coloured with delicacy. His heads are expressive, but present too much sameness of appearance, and his design, though tolerably correct, is generally formal and mannered. There were eight of his important pictures in the gallery of the Louvre, which were removed in 1815, and returned to Prussia, Holland, and Austria, whence they had been taken. Though greatly employed, Rottenhamer died in poverty, and was buried by subscription at Augsburg, where he died in 1604, or, according to Bryan, in 1606. Lanzi says that he visited England, and that he died here, but this appears to be a mistake, as we find no mention of him in the 'Anecdotes of Painting,' and it is very improbable that so industrious an investigator as Mr. Vertue would have omitted in his memoranda any mention of an artist so generally known, if he had resided in this country.

(Bryan's *Dict.*; *Biographie Universelle*; Lanzi, *Storia Pittorica*, iii. 123.)

ROTTERDAM, the capital of the province of South Holland, in the kingdom of the Netherlands, is situated in 51° 55′ N. lat. and 4° 29′ E. long., on the north bank of the river Maas, about twenty miles from the mouth of that river, which here resembles an arm of the sea. It is in the form of a triangle, the base of which, about a mile and a half in length, extends along the bank of the Maas; it makes a very striking appearance, especially when it is approached by water from Dordrecht. It derives its name from the little river Rotte, which runs through the middle of the city, and falls into the Maas. The town is not fortified, but is surrounded by a moat, and has six gates towards the land and four towards the water. The part called the Binnenstad (*i.e.* the inner town) has many narrow streets, and is separated by the High-street from the outer town (Buitenstad), which contains the fine houses of the rich merchants, and is intersected by numerous canals connected with the river, on which the largest merchantmen can come up and unload at the very doors of the warehouses. Along the Maas are many fine quays, the handsomest of which, called the Boomtjes (from the rows of trees with which it is planted), consists of a long row of stately houses facing the river, with a broad and deep canal in the rear, parallel to the river. A canal from Helvoetsluys to Rotterdam was made in the years 1827 to 1830. The iron railway, already completed between Amsterdam and Haarlem, is to be prolonged to Rotterdam. The great church of St. Lawrence contains the tombs of admirals De Witte, Kortenaar, Brukel, De Liefae, and others, most of whom fell in the wars with England and France, between 1660 and 1674. Besides this church there are many churches and chapels of the Dutch and Scotch Calvinists, French Protestants, English Episcopalians, Presbyterians, Baptists, Roman Catholics, a Jews' synagogue, &c. The Exchange is larger and handsomer than that of Amsterdam. The other principal buildings are the town-house, a very antient edifice, the Admiralty, the Academy, the Dutch theatre, the magazines of the East India Company, and some manufactories. The commerce of Rotterdam extends to all parts of the world, and embraces almost every kind of produce and manufacture. In the year 1840 the number of ships that entered inwards was 1671, of which 1543 were with cargoes amounting to 321,308 tons, and 128 (of 8276 tons) in ballast. The number that cleared outwards was 1835, in all 354,334 tons, of which 1394 were with cargoes to the amount of 279,517 tons.

Rotterdam contains many valuable collections of works of art, an academy of sciences, a public library, and other useful institutions. Rotterdam is the birth-place of several celebrated men, among whom are the great painter Adrian van der Werf, and the learned Erasmus, a bronze statue of whom, ten feet high, stands in the great market-place. The population of Rotterdam has much increased of late years; in 1840 it amounted to 78,098, of whom 51,765 were Protestants, 23,295 Roman Catholics, and about 2800 Jews. (Stein; Hassel; Hörschelmann; *Dutch Official Journal.*)

ROTTERDAM, NEW, is one of the islands which constitute the group of the Friendly or Tonga Islands, and is situated in 20° 15′ S. lat. and 174° 48′ W. long. This island was discovered by Tasman (1643), and named New Rotterdam, but it is now better known as Annamooka, or Namooca, as Mariner writes it, which is the name given to it by the inhabitants. The island is about twelve miles in circumference, and in the middle there is a lagoon which is a mile and a half across. The island is low, and surrounded by a sea with regular soundings. At a distance of from two to three miles from the shore, the depth varies between 25 and 30 fathoms. On the north-western side there is a roadstead called Van der Luys by Tasman, on which Cook anchored in 1773 and 1777. As to its productions and inhabitants see FRIENDLY ISLANDS. (Cook's *Voyages*; Mariner's *Account of the Natives of the Tonga Islands*; Krusenstern's *Atlas de l'Océan Pacifique.*)

ROTTI. [TIMOR.]

ROTTLE'RA, a genus of plants named in honour of Dr. Rottler, a native of Denmark, who was sent out to India by the Church Missionary Society, and was distinguished there for his labours as a missionary for the space of nearly 50 years, as well as for his acquaintance with the Tamul language, on a dictionary of which he was long engaged, as also for the attention he paid to botany, having formed one of the knot of early botanists at Tranquebar, who, with Koenig, were the first since the time of Rheede to study that science in the peninsula of India. Dr. Rottler's extensive Indian Herbarium is deposited in the museum of King's College, London.

The genus belongs to the natural family of Euphorbiaceæ, but the same name was applied by Vahl to one of the Cyrtrandaceæ. It is characterised by having male and female flowers upon different plants. Male:—Calyx 3-5 partite. Corol none. Stamens 30 to 40, inserted into the convex receptacle. Filaments free or united at the base. Female:—Ovary 2-3-4 celled, each one-seeded. Style deeply, 2-3-4 partite, laciniated. Capsule 2, 3, or 4 coccous, each one-seeded. The genus, which is found in the tropical parts of Asia and throughout India, contains handsome moderate-sized trees. R. tetracocca grows in Silhet, and yields a hard and valuable timber. The capsules of R. tinctoria, a native of the Coromandel coast, and extending to the forests of Northern India, are covered with short stiff hairs, which, when rubbed off, have the appearance of a powder of a fine red colour, which is employed in India in dyeing silk of a scarlet colour, and therefore forms an article of commerce in that country. Dr. Royle, 'Illustr. Himal. Bot.,' p. 329, states that this strigose pubescence is also employed in India as an anthelmintic in the same way that cowhage is, and, like it, probably acts mechanically in expelling intestinal worms.

ROTUNDA, a term applied to buildings which are circular in their plan both externally and internally, or else to halls and other apartments of that shape, included within and forming merely a portion of the edifice containing them. The technical application of the term is however restricted to circular buildings whose height does not much exceed their diameter, for we should not describe a lofty cylindrical edifice, such as a round tower, by the term rotunda; while on the contrary it is frequently employed to designate polygonal buildings which approach in their general form to the circle: for instance, the Colosseum in the Regent's Park, London, might without any great impropriety be classed among rotundas, it being a polygon of sixteen sides, which accordingly form very obtuse angles.

We need not here repeat what has been said on the subject of circular plans in the article ROMAN ARCHITECTURE, and therefore proceed to remark, that notwithstanding their beauty, there are very few instances indeed of what can strictly be termed rotundas. In fact, such shape is utterly unsuited to buildings in general, whatever their particular purpose may be, unless it be one for which nothing more than a single spacious hall or area is required internally. It does not admit of being divided within into regular-shaped rooms, without very great loss of space, and therefore although plans of the kind have occasionally been attempted upon paper, they are to be looked upon chiefly as ingenious architectural exercises and experiments. We have however an instance of a plan of the kind being carried into execution at the Marquis of Bristol's seat at Ickworth, near Bury St. Edmund's, the body of the mansion (115 feet by 100) being an elliptical and therefore a round structure, though not perfectly circular; but striking as the external effect certainly is, too much is sacrificed to it. In the Rue de Pigalle, Paris, is a rotunda-house, about 50 feet in diameter, built by the architect Henry, in 1788. Even among public buildings there are very few for which the circle can with propriety be adopted as the figure of the entire plan: accordingly instances of it are very rare. It is applicable only where a large space is to be provided as a place of public rendezvous or assemblage, where it is desirable to have compactness and an area unobstructed by columns, which in a square one of the same superficial extent would be indispensable in order to support the roof. Therefore though it is well adapted for an Exchange, a market-hall, or similar places, and can hardly be made available for any others, it is nevertheless very rarely resorted to even for them. The Halle des Blés, or Corn-Exchange, at Paris, is almost the only example of the kind that occurs to us.

In ecclesiastical architecture circular and polygonal structures were by no means uncommon among the early Christians, especially for baptisteries and sepulchral chapels. The tomb of Theodoric, or what is now called Santa Maria Rotunda, at Ravenna, is a singular example, having a flattish or segmental dome (about 34 feet in diameter) cut out of a single block of stone. Of San Stefano Rotundo and Santa Costanza mention has been made under ROMAN ARCHITECTURE, and to them may be here added the Rotunda or Church of Santa Maria Maggiore at Nocera, a work of about the same period. While it greatly resembles Santa Costanza in plan, having coupled columns placed on the radiating lines from the centre, and with arches springing from them, it differs altogether in section from both those examples, there being no cylindrical wall or tambour above the colonnade, but the dome springs immediately from the columns, and the arches groining into it. Consequently the proportions are much lower, the diameter of the space enclosed by the columns being 39 feet, and the height to the top of the dome 42,—proportions differing very little from those of the Pantheon. The extreme internal diameter is 78 feet. The earlier edifices of this class are, for the most part, of moderate dimensions, but others were afterwards erected on a larger scale, and among them is the celebrated Baptistery at Pisa [BAPTISTERY], which is externally about 120 feet in diameter, and 100 in height, exclusively of the dome. Besides being remarkable on account of its style, this edifice presents other architectural peculiarities, one of which is that the central area is covered by a conical roof, the upper part of which is carried up so as to pierce the external dome, and, except that it has no openings, to appear like a lantern placed upon it. Woods therefore conjectures that the interior cone originally formed a spire, and that the external dome was an after addition to the structure. [BAPTISTERY.]

The rotunda became afterwards in a manner incorporated with or added to the cruciform plan, being raised aloft and placed over that part of it where the transepts intersect the body of the edifice. Nearly all modern cupolas may be described as rotundas elevated above the rest of the building and viewed by looking up into them from below. Thus supposing there was a floor at the level of the whispering gallery at St. Paul's, the dome and space beneath it would form a perfect and well proportioned rotunda, whose height and diameter would very nearly be the same.

In itself alone the rotunda form does not accommodate itself to the purposes of a church; it does not afford space for the processions and occasional ceremonies required by the Roman Catholic worship; nor is it better fitted for the Protestant service, since besides that nearly all its beauty would be destroyed by the floor being covered with pews, it requires an amphitheatrical arrangement of seats in concentric curves. Neither is it a form that can be enlarged to any required capacity, for 140 feet is almost the maximum of diameter that can be adopted for a space to be covered by a dome. Even the Pantheon at Rome, which may be taken as that maximum, is but of moderate size—an area scarcely at all exceeding the *core* of St. Peter's, the Duomo at Florence, &c., that is, merely the central part beneath the cupola. Rotundas are accordingly rare even in Roman Catholic churches, yet although such structures are necessarily limited by their form to a moderate size, they derive from it also a grandeur which would not be produced by the same scale according to any other plan. Neither grandeur nor beauty however results as matter of course from the plan alone, because whatever charm that possesses may be nullified by other circumstances. There is, for instance, nothing of the one and not very much more of the other in the rotunda interior of St. Peter-le-Poor's, London, the only instance we are acquainted with of such plan being adopted for a Protestant church. The arrangement of the pews and seats in parallel rows, strikes as a disagreeable contradiction to the shape of the building; besides which the vaulted dome, which is almost essential to such plan, is wanting, a cove and lantern with windows being substituted for it; owing to which the character of the whole becomes something different. A better example of a rotunda may be seen in that of the Bank of England.

Of late years one or two structures of the kind have been erected, viz. the church designed and built by Canova at his own expense at Possagno; that of San Francesco di Paola, by Bianchi, at Naples; the Madre di Iddio, Turin; and the new Catholic church at Darmstadt, by Moller. The first mentioned of these, the first stone of which was laid in July, 1819, ranks high among the few architectural works of importance which Italy has produced within the present century, and is remarkable for its portico being almost the only instance of the application of the Athenian Doric in that country, certainly the only one upon so large a scale. As a plan of the portico is shown in PORTICO, *fig.* 2, all that we need mention in regard to that feature is, that the columns are 35 feet in height; the entire height from the ground to the apex of the pediment, 79; and the breadth of the portico, 90; therefore the dimensions of the order are very nearly equal to those of the Parthenon, the difference in the height of the columns being only 10 inches. The rotunda itself is about 45 feet less in its internal diameter than the Pantheon, but is still sufficiently ample to be imposing. In its proportions, and in its coffered dome, the centre of which has a glazed opening to light the whole interior, it resembles the Roman structure; not so however in design, for the architecture errs as much in being too plain and cold, as that of the other building does in being broken into too many parts, and too much cut up by heavy ornament. Like the Pantheon, the plan is divided into eight compartments, all of which form as many arched recesses; that within which is placed the door, and the opposite one (forming a deep sanctuary for the high altar), being rather loftier than the rest. The arches themselves are quite plain, without either keystones or archivolts, and, except the tabernacles or altars within the recesses, the only decoration is that produced by the panels filled with sculpture, in the spaces between the arches. Nevertheless, taken altogether, it is a noble monument, especially when it is considered that it was raised by a private individual.

Instead of attempting to describe other examples of rotundas in a similar manner, we shall put our notices relative to them into a condensed form, and for convenience sake shall include those already mentioned, as their relative sizes can thereby be more readily compared.

Pantheon, Rome. External diameter 188 feet, internal 142, internal height 142. [PANTHEON.]

Temple of Minerva Medica. External diameter 110 feet. Interior a decagon 78 feet in diameter and 105 high.

Santa Costanza, Rome. Extreme internal diameter 140 feet; diameter of rotunda within the peristyle and beneath dome 70, height of dome 130.

Nocera, Santa Maria. Extreme internal diameter 78 feet, diameter of dome and peristyle 39, height 42.

Rotunda, Forum Caracalla. Exterior diameter about 100 feet. Corinthian portico hexastyle, triprostyle. Interior diameter 80 feet, height of order 48, entire height 90.

Rotonda at S. Pietro in Montorio, Rome. (Bramante.) Exterior enclosed by a Doric peristyle of 16 columns. Internal diameter 22 feet, height 48. This edifice is generally admired as a classical piece of architecture, but it has many striking defects, and the balustrade (without pedestals) over the peristyle is intolerable.

Madonna di Campagna, Verona. (Sanmicheli.) Exterior 74 feet in diameter, nearly surrounded by a low Doric peristyle of 28 columns, making the entire diameter below 118 feet. Interior an octagon 64 feet in diameter and 101 high.

Capella Pelligrini, Verona. (Sanmicheli.) Elegant in plan, but enormously disproportioned in section. External diameter 40 feet, internal 30. Two orders within. Height to spring of dome 46 feet, entire height 64.

La Maddelina, Venice. (Temanza.) Internal diameter 55½ feet, height to spring of dome 36, entire height 63, or 7½ more than diameter. Arrangement hexagonal, *i.e.* six arched compartments.

Halle des Blés, Paris. (De Mezières.) External diameter 228 feet, interior diameter of the rotunda beneath the dome 127, height to spring of dome 42½, to summit 105.

Possagno. (Canova.) External diameter 116 feet; width of portico 90, projection of portico 55, height of stylobate 10½, internal diameter 90, height 90.

Madre di Iddio, Turin. (Buonsignore.) A rotunda about 130 feet in diameter, with hexastyle, diprostyle, Corinthian portico. Internal diameter 74 feet, height 100; plan four semicircular tribunes, with two Corinthian columns in front of each, bearing the entablature continued over those spaces. Attic with a long panel over each of the four recesses.

Museum of the Vatican, Rotunda. (Simonetti.) Divided into ten recessed compartments: diameter 50 feet.

Berlin Museum, Central Hall. (Schinkel.) Diameter 67 feet, height of gallery supported by a peristyle of twenty Corinthian columns, around the lower part 21; height to spring of dome 42 feet, entire height 70.

Catholic Church, Darmstadt. (Moller.) Extreme internal diameter 135 feet, peristyle of twenty-eight Corinthian columns supporting dome; diameter of dome and peristyle 102 feet, height to spring of dome 48 feet, to summit 102.

Radcliffe Library, Oxford. (Gibbs.) Basement a polygon of 16 sides, and 104 feet in diameter. Extreme exterior height 140 feet, interior diameter 88, interior diameter of central space and dome 52, height 90.

ROUBAIX, a town in France, in the department of Nord, about 6 miles north-east of Lille, and 146 north-north-east of Paris. It is of no historical interest; it owes its prosperity to its manufactures, which were introduced under the ministry of Colbert. The town stands about midway between the Escaut or Schelde and the Lys, but at a considerable distance from both. It communicates however with the Lys by means of the canal of Roubaix, which opens into the Deule canal. [NORD.] The town consists of large, neat, and well-built houses. The population in 1831 was 12,443 for the town, or 18,187 for the whole commune. The staple business of the place is the cotton-manufacture, which is carried on in all its branches with considerable activity. Some woollens are also manufactured. Archil (or litmus), and azure (or finely powdered smalt), and machinery of various kinds are made; and dyeing and tanning are carried on. There are twenty-five fairs in the year. The manufactures of Roubaix render it a place of great resort for merchants, both of France and other countries. There are a chamber of manufactures and an hospital. The town long laboured under a want of water, but the deficiency has been supplied of late years by means of Artesian wells. The manufactures of Roubaix are exported to the French colonies and to South America.

ROUBILIAC, LOUIS FRANÇOIS, an eminent sculptor, born at Lyon in France, but long resident in England, where all the works by which he gained his reputation were executed. It is not known at what period Roubiliac came to this country. The earliest notice of him as an artist is that he was recommended by Sir Edward Walpole to execute several busts for Trinity College, Dublin. He was afterwards employed, through the same interest, on the monument of John, duke of Argyle, in which he was so successful, that his claims to the highest honours of his profession were at once admitted, and, as he became the fashion, his practice was soon greater than that of the most popular artists of the day. Rysbrach, who also was settled in England, and who, till Roubiliac and Scheemacker appeared, was employed in all important works in sculpture, was neglected, and his merits forgotten in the desire to do honour to the new favourite. Roubiliac's chief works are the above-mentioned monument of the Duke of Argyle, that of Sir Peter Warren, and of the Nightingale family, all in Westminster Abbey; those of the Duke and Duchess of Montague, in Northamptonshire; and one in memory of Bishop Hough, in Worcester cathedral. His principal statues are of George I., at Cambridge; of George II., in Golden Square, London; of Handel, the composer, in Westminster Abbey; and those of the Duke of Somerset and Sir Isaac Newton, both at Cambridge. His busts are very numerous.

Of the high merit of Roubiliac there can be no doubt. The monuments of Mr. Nightingale and his lady, the statue of Eloquence in the Argyle monument, the draped figure in Bishop Hough's monument, and the statue of Newton, are proofs of great power both in invention and expression, and are remarkable also for minute and careful execution. At the same time they are deficient in the repose, simplicity, unity, and breadth which are found to characterize the finest works in sculpture, and which alone can ensure the lasting reputation of productions in this art when the interest that may have been felt in the individual subjects, the fashion of the day, and the popularity of the artist, have passed away. In the absence of these principles we find sufficient reason for the (comparatively) low estimation in which the sculpture of the Rysbrach and Roubiliac schools is now held by all real judges of art.

The most striking defect in the Nightingale monument (to illustrate criticism by reference to a well-known work) is, that the limits which separate poetry and imitative art are transgressed, and the result is confusion and incongruity. The sentiment of a husband endeavouring to shield a beloved wife from the approach of death is just; it appeals to our sympathies, and the mind at once comprehends it; but the attempt to give form to this idea by representing a common-life figure, in modern dress, warding off a palpable and material dart about to be hurled by a grim *skeleton*—making that an agent which is the result or consequence of dissolution—is so obviously wanting in truth and keeping, that it is only necessary to refer to it to show its impropriety. The statue of Newton, though possessing great merits, is open to objections of another kind. The attitude is intended to express thought and calculation, and the action of the hands is finely conceived and perfectly in harmony with this feeling; but the impression is weakened by the general air of the figure, which, critics have justly observed, is not that of a grave philosopher; and the drapery, though executed with great mechanical skill, and with minute attention to correctness of costume, is equally wanting in the repose appropriate to the subject. The sacrifice of simplicity to attitude and flutter, and the ambition to display skill in mere execution—the sure indication of the decline of pure taste—also detract from the general merits of the statues referred to in the monuments of the Duke of Argyle and Bishop Hough. Roubiliac's faults are however the faults of the age; and artists, unfortunately, are too often tempted or driven, against their better judgment, to adopt the mode, however opposed to pure taste or sound principles, by which alone they can expect to gain public notice.

Roubiliac died on the 11th of January, 1762, and was buried in the parish of St. Martin's.

ROUEN, capital of the department of Seine Inférieure, 65 miles in a direct line north-west of Paris, 76 miles by St. Denis, Pontoise, and Magny, or 83 miles by Meulan, Mantes, and Vernon; in 49° 27′ N. lat. and 1° 5′ E. long.

The first mention of this town is by Ptolemy, who speaks of it as the capital of the Veliocasses, a Celtic people. The name is variously written: Rotomagus, Rothomagus, Ratomagus (in the Antonine Itinerary, probably by a transcriber's error, Latomagus); in the Peutinger Table, Rattumagus; and in Ammianus Marcellinus in the plural form, Rotomagi. This name remained when most other capitals had their own proper designation superseded by that of the people to which they respectively belonged, and was in subsequent times shortened into Rotomum or Rodomum, whence the modern Rouen. Under the Romans it was the chief town of the province of Lugdunensis Secunda. Some Roman antiquities, but of little importance, have been discovered at various times. In the early history of France, Rouen appears as the scene of some of the cruelties of Fredegonde. It suffered much from the incursions of the Northmen or Normans, whose capital it became, when, by virtue of the treaty between Rollo and Charles the Simple (A.D. 911 or 912), they settled in this part of France. [Normandie.] Under the dukes of Normandie, it increased on the south side, where ground for building was obtained by contracting the bed of the river. Louis d'Outremer, king of France, visited Rouen, A.D. 943, during the minority of Richard I. of Normandie, of whom he claimed to be guardian. In a subsequent dispute he was captured and imprisoned at Rouen, A.D. 945-6. In A.D. 949, being at war with Richard, he attacked it, but in vain. Guillaume, or William the Conqueror, died at Rouen, or close to it, A.D. 1087. In the year 1204 it was seized, with the rest of the duchy, by Philippe II. Auguste, king of France. The townsmen offered an obstinate resistance to the French, but were at last obliged to open the gates; and their submission determined that of the other towns and forts of the duchy. [Normandie.]

From this time till 1419 it continued subject to the kings of France, under whom it was enlarged on the north and west sides. It was at Rouen that Charles le Mauvais, king of Navarre, was seized by John II., king of France, A.D. 1355. In 1418-19 it was besieged by the English under Henry V. [Henry V.] The town was defended by a garrison of 4000 men, who were resolutely sustained by the townsmen, under their gallant commander Alain Blanchard. As the town militia mustered 15,000 men, the population of Rouen at the time may be estimated at not less than 50,000 or 60,000. Famine at last compelled the garrison to surrender, and Henry tarnished the fame of his victory by the execution of the gallant Blanchard. Two other citizens who had been excluded from the benefit of the capitulation escaped punishment by payment of money.

Rouen remained for many years in the possession of the English. In 1431 Jeanne d'Arc was burned to death [Arc, Jeanne d'] at Rouen. The Duke of Bedford, regent of France for the English party, died here, A.D. 1435. [Bedford, John, Duke of.] In 1449 the city was recovered by the French, under the king, Charles VII., in person [Charles VII.]; the town was taken in three days; the castle or citadel held out a fortnight longer, and then capitulated. In 1465 Rouen revolted from Louis XI., and took an oath of allegiance to his brother the Duke of Berry, to whom the duchy of Normandie was formally ceded the same year by the peace of Conflans; but it was recovered the next year by Louis, who severely punished some of his brother's chief adherents. In 1562 the Huguenot party succeeded in seizing the town, almost without resistance, and committed great excesses. They were almost immediately besieged by the Royalists, under the Duke of Aumale, whom they repulsed; but the siege was soon renewed by the royal army, at first under Antoine de Bourbon, king of Navarre, who was mortally wounded, and then under the Duke of Guise, who took the town the same year, and gave it up to pillage for eight days. [Charles IX.] The massacre of St. Bartholomew extended to this town, but the humanity of the governor somewhat checked the excesses. In 1591 the townsmen who had embraced the party of the League were besieged by Henri IV., but were relieved by the approach of the Duke of Parma, with a Spanish army, from the Low Countries. They did not recognise Henri's title to the crown till after his conversion. Since that period Rouen has few historical events connected with it. Famine led to some troubles in 1789, and the Revolution gave rise to others in 1792, 1793, and 1795; but Rouen suffered less from the excesses of that period than many other towns.

The city stands on the right or north bank of the Seine. Its form approximates to an oval, defined by the boulevards, which form a line of street adorned with trees, and occupying the site of the antient walls, except on the side of the river, where the city is bounded by a line of quays. The boulevards are far less frequented than those of Paris, and 'resemble in appearance, as well as effect, the public walks of Cambridge, except that the addition of females in the fanciful Norman costume, and the Seine and the fine prospect beyond, and Mount St. Catherine above, give it a new interest.' (Dawson Turner's *Tour in Normandy*.) Separated from the city by the boulevards, are the faubourgs or suburbs, viz., the Faubourg Cauchoise, on the west; Bouvreuil, on the north-west; Beauvoisine, on the north; St. Hilaire, on the north-east; Martainville, on the east; and Eauplet, on the south-east. South of the city, from which it is separated by the Seine, is the Faubourg St. Sever, the most important of the suburbs. Opposite the central part of the city the channel of the river is clear; and it was crossed in this part by a floating bridge, supported by nineteen large boats or barges, so as to rise and fall with the tide; but it is now taken away. Just below this may be seen, at low-water, the ruins of a stone bridge, erected in the twelfth century by the empress Matilda or Maud, daughter of Henry I. of England, and carried away by a flood, A.D. 1564. Opposite to the upper and lower parts of the city and suburbs are two long islands: the upper called 'Ile de la Croix or de la Moucque;' the lower, the 'Ile du Petit Gay.' At the western or lower end of the Ile de la Croix, a stone bridge crosses the river; it is divided into two parts by the point of the island, resembling in this respect the Pont Neuf at Paris. Each part has three arches, the centre one of more than 100 feet span, the side arches of 85 feet. On the point of the island between the two parts of the bridge is a circular area adorned with a column. This bridge was begun by Napoleon, but has been finished since his reign. Two small rivers, the Robec and the Aubette or Prefontaine, flowing from the east-north-east, traverse the eastern part of the suburbs and city by artificial channels, formed by the Cardinal Georges d'Amboise, archbishop of Rouen, and flow into the Seine, the Aubette above and the Robec just below the stone bridge. Another little stream flows from the north in a covered channel, and falls into the Seine some distance lower down. On the east side of the city, just above the bank of the Seine, between that river and the Aubette, rises the hill or mount of St. Catherine, a bold eminence 380 feet high, which presents to the city a steep side of bare chalk, except where spotted with patches of vegetation or with cottages. On the south bank of the Seine, along which it extends for about a mile eastward of the bridges, is the principal public walk, 'Le Grand Cours,' planted with four rows of fine elms.

The interior of the city is very disagreeable, more particularly in the eastern part. An English traveller thus describes it in 1818: 'The filth is extreme; villanous smells overcome you in every quarter and from every quarter. The streets are gloomy, narrow, and crooked; and the houses at once mean and lofty. Even on the quay, where all the activity of commerce is visible, and where the outward signs of opulence might be expected, there is nothing to fulfil the expectation. Here is width and space, but no trottoir; and the buildings are as incongruous as can well be imagined, whether as to height, colour, projection, or material. Most of them, and indeed most in the city, are merely of lath and plaster, the timbers uncovered and painted red or black, the plaster frequently coated with small grey slates laid one over another like the weather-tiles in Sussex Their general form is very tall, and very narrow, which adds to the singularity of their appearance; but mixed with these are others of white brick or stone, and really handsome, or it might be said elegant. The contrast however which they form only makes their neighbours look the more shabby, while they themselves derive from their association an air of meanness.' (Dawson Turner's *Tour.*) The frequent rains, by cleansing the streets, render the town less unhealthy than it would be; and beneficial changes introduced of late years have contributed to the same result. But the lank figures and pale faces of the inhabitants of the eastern part of the city show that much remains to be done. On the western side of the city and suburbs are some handsome straight streets lined with good stone houses. The squares and other open spaces are numerous, but for the most part very irregularly laid out; the 'Champ de Mars,' adjacent to the eastern boulevards, and the 'Place du Boulingrin,' used for the cattle and horse market, adjacent to the northern boulevards, are of more regular form. The Place St. Ouen, or Place de l'Hôtel de Ville, is large, and planted with trees.

The cathedral, the most remarkable building in Rouen, is a noble and spacious edifice, superior perhaps as a whole to most or all of the French cathedrals. It is a cruciform building, with two towers at the extremities of the west front, and a lofty tower and spire from the intersection of the nave and the transepts. The dimensions are given in French feet as follows:—length of the interior, 408 feet; width of ditto, 83; length of nave, 210; width of ditto, 27; width of aisles, 15; length of choir, 110; width of ditto, 35½; length of transept, 164; width of ditto, 25½; length of Lady-chapel, 88; width of ditto, 28; height of spire, 380; ditto of western towers, 230; ditto of nave, 84; ditto of aisles and chapels, 42; ditto of interior of central tower, 152; depth of chapels, 10. (The French foot is to the English in the proportion of 65 to 61, or nearly as 16 to 15.)

The general character of the architecture is what is termed by Rickman 'Early English.' The changes which mark the different epochs in the progress of Gothic architecture were introduced into Normandie earlier than into England. The west front, which opens upon a spacious close, is about 170 feet wide; the towers by which it is flanked are of dissimilar architecture, though of nearly equal height. The spire which surmounts the central tower, and appears over the centre of the west front, is of bold and light construction. The summit of the west front is crowned by a range of open screens, with the lightest and most elegant tracery. There are three doorways 'deep in retiring mouldings:' the central one, which is by far the largest, 'projects like a porch before the others, and is surmounted by a gorgeous pyramidal canopy of open stone-work, in whose centre is a great dial, the top of which partly conceals the rose window behind. This porch is adorned with numerous statues in niches, and was begun by the archbishop Georges d'Amboise, A.D. 1509. The side doorways are obtusely pointed, and are much older. The western towers flank the church so as to leave three sides free, and thus conduce to the great extension of the west front. The northernmost of these towers, called the tower of St. Romain or Romanus, is one of the oldest portions of the church; it has circular windows looking into the cloister court (the cloisters are nearly all destroyed), which are perhaps of the eleventh century. The southernmost of the towers is of very rich pointed architecture, and was built at a much later period by archbishop Georges d'Amboise. A great bell, 33,000 lbs. weight, cast by order of the same prelate and named after him, hung in this tower; it was of very inferior tone, and, after being cracked in 1786, was melted down at the time of the Revolution, and cast into cannon. The doorway in the northern transept, called the 'Portal of St. Romain,' is adorned with an endless variety of fanciful sculptures. The end of the northern transept is flanked by towers, and in the centre is a magnificent rose window. The southern transept bears a general resemblance to the northern, but has suffered more from the violence of the Huguenots and the Revolutionists. The central tower is of the year 1200; it is low and comparatively plain; the spire, the fourth by which it has been surmounted, was erected in 1824, in place of the former one destroyed by lightning: it is described as being much more elegant than its predecessor, which, though not elegant, was remarkable for the boldness of its architecture. The first spire was of stone, the second and third, and, we believe, the present one, of wood. The Lady-chapel and the roof of the choir were finished in the sixteenth century.

The interior of the cathedral contains twenty-five chapels, and many interesting monuments, including those of Rollo and his son Guillaume or William I. (Longue Epée), dukes of Normandie; but the effigies of these princes are of later date than their time. The tombs or cenotaphs of Henry the younger, son of Henry II.; of his brother Richard Cœur de Lion (whose heart was buried here); of Charles V. of France; of John, duke of Bedford; and others of interest, have been destroyed, partly by the religious and political troubles of subsequent ages, partly to make way for repairs and alterations in the building. The library was plundered during the Revolution; the staircase of the room which contained it is remarkable for its delicacy and beauty. The extensive palace of the archbishop, adjoining the cathedral, contains some good paintings.

The abbey church of St. Ouen is the noblest edifice in the pointed Gothic style in the city, and perhaps in France. Its beauty caused it to be preserved in the general destruction of the conventual churches at the Revolution, though it did not escape being plundered and desecrated. It had suffered much from the hands of the Huguenots in 1562. The abbey to which it was attached was founded in the sixth century, if not earlier; and the first church was dedicated to the twelve apostles, but afterwards transferred to the patronage of St. Ouen. The church was rebuilt in the twelfth century, but a fire having destroyed it and the rest of the abbey, except one tower, attached still to the present church, it was again rebuilt in the fourteenth and following centuries. It is a cruciform building, with a central tower, and two western towers, which jut out diagonally from the angles of the western front, and were intended to be connected by a porch of three arches, extending along the lower story of the western front: the towers have been raised only to about fifty feet, and are imperfect. The lightness and purity of the architecture; the flying buttresses, with crocketed pinnacles and unusually lofty shafts; the beautiful south porch; the large rose or circular windows; the balustrade of varied quatrefoils round both the body of the church and the aisles; the painted windows, the whole of which have been preserved; and the rich central tower, terminated by a smaller octagonal tower, entitle this church to the highest admiration. Its dimensions are as follows: they are little inferior to those of the cathedral itself, and in some respects surpass it:—Length of the church, 416 French feet; of the nave, 234; of the choir, 108; of the Lady-chapel, 66; of the transept, 130; width of the transept, 34; of nave without aisles, 34; of nave with aisles, 78; height of roof, 100; of tower, 240.

The church of St. Maclou is next in beauty to the cathedral and the church of St. Ouen. The churches of St. Paul and St. Gervais, insignificant in themselves, show some remains of the Norman style. Those of St. Patrice and St. Godard are in a vitiated intermediate style between Gothic and Roman. There are in all fourteen Catholic (six of them parish) churches, several of Roman architecture. There are also a Protestant consistorial church and a Jews' synagogue.

The Palais de Justice, or court-house, built in the 15th or 16th century for the parliament of Rouen, forms three sides of a quadrangle, of which the fourth side consists of an embattled wall and a gateway of elaborate architecture. It is, notwithstanding many faults, a fine specimen of Gothic architecture of a late period, in a style approximating to what in England is sometimes called the Tudor style. Several of the apartments are admirable for their noble dimensions, just proportions, or carved and ornamented walls and roofs. In the Place de la Pucelle is a house, l'Hôtel Folleville, of similar architecture to the Palais de Justice, but far richer. It is ornamented with bas-reliefs or tablets, one series representing the interview of Henry VIII. and François I. in the Field of the Cloth of Gold. There are a town-hall, formerly an abbey, a clock-tower, and several other Gothic buildings of less interest and importance: there are some remains of the antient castle, and a very few fragments of the town wall. The Caserne Martainville, or barrack of Martainville, in the square of the Champ de Mars, has an imposing front; the Hôtel Dieu, or great hospital, is spacious and airy; and the 'Halles,' or covered markets, are considered to be among the finest in France. They surround on three sides one of the public squares, and form several conveniently arranged and extensive apartments. The Mercery Hall, or Halle des Rouenneries, is 272 French or 290 English feet long by 50 French or 53 English feet wide; the corn-market is 300 French or 320 English feet long. A considerable number of fountains are distributed through the streets and squares of the city, two are Gothic, and of better architecture than the rest; the fountain of La Croix de Pierre resembles the crosses erected by our own Edward I. to the memory of his queen Eleanor; that of La Crosse is of smaller size and more recent date. The fountain of La Place de la Pucelle consists of a plain triangular pedestal, with dolphins at the base, surmounted by a statue of Jeanne d'Arc in military costume; it marks the place of her execution. There are mineral springs in two places: those of La Marquerie are resorted to by a number of people; they are chalybeate. La Bourse, or the Exchange, sometimes called La Bourse-à-couvert, from its being used only in unfavourable weather, the merchants at other times meeting in an uncovered enclosure adjacent to it, is a fine building on the quay.

The population of Rouen, in 1826, was estimated at 90,000; in 1831 it was 88,086; in 1836, 92,083. Rouen ranks next to Lyon among the manufacturing towns of France; it is the principal seat of their cotton-manufacture. Cotton-yarn is spun, but not the finest sorts. In fact, the manufactures of Rouen are chiefly designed to meet the wants of the middling and humbler classes. The spinning-machines are worked by manual labour, by horses, by water, or by steam. Weaving is actively carried on, and one class of the productions of the town is known by the name of *Rouenneries*, or Rouen goods; it comprehends chiefly checked and striped cottons for women's dresses, distinguishable usually by certain predominant colours, violet, lilac, rose, and more commonly red. Since 1810 the manufacture of nankeens has been introduced and carried to a great extent. Dupin, in 1827, estimated the quantity made yearly at 600,000 pieces, of 4½ mètres, or about 5 yards each. They are carefully made up to imitate the India nankeens, under which character they are sold. Kerseymeres are manufactured from dyed wool mingled with white cotton, so as to produce the shade of colour required. Dyeing cottons with Turkey and Indian red, dyeing woollens, calico-printing, and bleaching by chemical processes are carried on to a considerable extent. To the above manufactures may be added dimities, muslins, lace, bed-ticking, woollen hosiery, silk and cotton velvet, fabrics of mingled silk and cotton. From the increasing demand for labour, many of the Rouen manufacturers have been induced to send their raw materials into the departments of Somme, Pas de Calais, Aisne, and Nord, to be manufactured there. The products of the looms of Rouen are sent chiefly to the central parts of France. Paris, Lyon, Limoges, Bordeaux, Toulouse, and Marseille are the principal marts to which they are transmitted: from Lyon, Toulouse, and Marseille they are exported to Germany, Italy, and the Levant.

Besides the woven fabrics, confectionary of high repute, especially apple-sugar and apple-jelly, cards, pasteboard, paper-hangings, toys, hats, pottery, cards and combs, leather, glue, catgut, colours, chemical products, neat's-foot and seed oils, soap, brass wire, copper sheathing, small shot, sheet lead, and pitch are made. The western part of the city is the mercantile part; the centre is chiefly occupied by retail traders; and the eastern part is inhabited by the manufacturing population. The Faubourg St. Sever is also occupied by persons engaged in manufacture. In the northern part of the town, and in the Faubourg Cauchoise, on the western side, the gentry and persons not engaged in business chiefly reside. Ship-building is carried on along the bank of the Seine.

The river forms a commodious port, divided by the stone bridge into two parts; the upper devoted to the large boats which convey goods to Paris and other places higher up the river, the lower part to sea-borne vessels. The direct distance of Rouen from the sea is about forty-five miles, but the length of the navigation is almost twice that distance. The influence of the tide is sensibly felt at Rouen; and vessels of 250 or 300 tons can get up to the town. The ready communication of Rouen with the capital and with other towns, either by the navigation of the Seine, or by the roads, which are very good, has made it a place of considerable trade, independently of its manufacturing industry. The articles of trade are wine, brandy, cider, corn, fruits, &c. There are six fairs in the year, two of them of fifteen days each.

Rouen, besides being the capital of the department, and of an arrondissement, is the seat of an archbishopric, of a Cour Royale, of an Académie Universitaire, and of the head-quarters of the fourteenth military division. The archbishopric is of great antiquity: the diocese comprehends the department of Seine Inférieure; the archbishop has for his suffragans the bishops of Bayeux, Evreux, Séez, and Coutances, whose dioceses comprehend the departments formed out of the antient province of Normandie. The Cour Royale and the Académie Universitaire have jurisdiction over the departments of Eure and Seine Inférieure, and the fourteenth military division includes the departments of Seine Inférieure, Eure, Manche, Calvados, and Orne. Government offices, administrative, fiscal, or judicial, are numerous; they include, with others, a Cour Royale, a tribunal of commerce, a subordinate justiciary court, a mint, and a custom-house. The churches and other places of worship have been enumerated. There are two seminaries for the priesthood, a faculty of theology, a school of medicine, a royal college or school, with cabinets or museums of natural history and natural philosophy, schools of drawing, painting, and navigation, and forty elementary schools. There are two public libraries, one of them, which is deposited in the town-hall, was estimated several years since to contain 70,000 vols. and 800 MSS.; a gallery of paintings, some of them very good, also established in the town-hall; an excellent botanical garden, with much admired hothouses; a royal academy of science, literature, and art; societies of commerce, agriculture, medicine, pharmacy, a central society of agriculture, and a commission of antiquities. Among the charitable institutions are four hospitals, including one for the insane, and one for foundlings; a savings'-bank, and a Protestant Bible Society. There are, besides these institutions, a prison (the Bicêtre), comprehending three departments; three ranges of barracks, well kept public baths, and two theatres.

Rouen was the birth-place of Corneille, his brother Thomas Corneille, Fontenelle, the Jesuit Sanadon, Bo chart, Jacques Basnage, the painter Jouvenet, and the architect Blondel.

The arrondissement of Rouen has an area of 502 square miles, and comprehends 155 communes; it is divided into fifteen cantons or districts, each under a justice of the peace. The population in 1831 was 225,996; in 1836 it was 238,805.

ROUERGUE, a province in France, forming the eastern extremity of the military government of Guienne: it was bounded on the north by Auvergne; on the north-east by Gevaudan, a portion of Languedoc; on the east by the district of the Cévennes, also in Languedoc; on the south-east, south, and south-west by other portions of Languedoc; and on the west by Quercy, which, like Rouergue, was a part of Guienne. It was of considerable size, extending about ninety miles from the Cévennes in the east, to the town of St. Antonin on the Aveyron in the west; and seventy-eight or eighty miles from north to south. Its capital was Rhodez [RHODEZ], pop. in 1831, 8249; in 1836, 9685; and the other chief towns were Milhaud or Milhau [MILHAU], pop. in 1831, 9806; St. Affrique [AVEYRON], pop. in 1831, 6336; in 1836, 6421; and Villefranche [VILLEFRANCHE], pop. in 1831, 9540; in 1836, 8738. The population given is for the whole commune. The department of Aveyron comprehends nearly the whole of the province of Rouergue; the physical features are described in the article AVEYRON. Rouergue was subdivided into Le Comté (de Rhodez?) in the north, chief town Rhodez; La Haute Marche in the east and south, chief town Milhaud; and La Basse Marche in the west, chief town Villefranche.

Rouergue derives its name from the Ruteni, a Celtic people who inhabited it. A few Celtic or Roman towns are known to have been within its limits: as Segodunum, afterwards Ruteni, now Rhodez; Carentomagus, near Villefranche; and Condatomagus, somewhere on the south-eastern border, near the Cévennes. On the downfal of the Roman empire this part of France underwent various changes, the possession of it being contested by the Visigoths, Franks, and the Ostrogoths of Italy, under their king Theodoric. It was afterwards incorporated with the duchy of Aquitaine. [GUYENNE.] From the time of Charlemagne it was governed by counts of its own, who were a branch of the same family as the counts of Toulouse; their power was very considerable. The county was afterwards united to the dominions of the counts of Toulouse. [LANGUEDOC.] The county of Rodez, which comprehended about a third part of Rouergue, was held by a line of nobles, vassals of the counts of Toulouse; it was united early in the fourteenth century to the county of Armagnac. It was seized by Louis XI., and reunited to the crown about A.D. 1470.

ROUFFACH. [RHIN, HAUT.]

ROULERS, or **ROUSSELAER**, is situated in the province of West Flanders, in the kingdom of Belgium, on the Mandel, a small river which falls into the Lys. The chief occupation of the inhabitants is the linen manufacture and bleaching of linen: there are some sugar-refineries, and many persons are employed in the cultivation of flax in the adjacent country. The pasture-land in the vicinity is rich, and the breed of cattle is very fine. A considerable quantity of butter is exported. The number of inhabitants is about 9000. Roulers is eighteen miles south of Bruges. (Hörschelmann; Hassel; Stein.)

ROULOUL, the name of a bird whose position in the system has occasioned some difference of opinion among ornithologists.

Gmelin placed it among the pigeons, Sparrman among the pheasants, and Latham (the female) among the *Tetraones*. The form has been elevated to the rank of a genus under the names of *Cryptonyx*, Temm., and *Liponyx*, Vieill.

Cuvier arranges it between the pheasants and the great genus *Tetrao*, Linn.

Mr. Vigors observes that the groups which compose the *Tetraonidæ* are chiefly distinguished in modern systems from those of the *Phasianidæ* by their more simple appearance; by the absence, in fact, of those ornaments to the plumage, and those naked or carunculated appendages to the cheeks and head, so conspicuous in the latter family, but which are reduced in the *Tetraonidæ* to the mere space that encircles the eye. The still weaker conformation of the hind toe, he remarks, tends further to separate them. In the *Tetraonidæ* this member becomes shorter and gradually weaker, until it is completely lost in some of the groups. In this point of view he considers that the *Tetraonidæ* hold an intermediate station between the *Phasianidæ*, where the hind toe, although articulated high on the *tarsus*, is yet comparatively strong, and the *Struthionidæ*, where it is generally if not always deficient; and he is of opinion that the groups which compose the *Tetraonidæ*, corresponding with those which form the genus *Tetrao* of Linnæus, seem to be immediately united to the preceding family (*Phasianidæ*) by means of *Cryptonyx*, which resembles them in the similar appendage to the plumage of the head. This group, he adds, leads directly to *Coturnix*, Briss., and the true *Perdix*, where it has indeed been generally arranged, and from which it has been chiefly separated by the defalcation of a nail to the hinder toe. (*On the Natural Affinities that connect the Orders and Families of Birds*, in *Linn. Trans.*, vol. xiv.)

M. Lesson arranges the form as the first genus of the family *Tetraonidæ*, a position which it occupies in Mr. Swainson's method.

Mr. G. R. Gray (*List of the Genera of Birds*) places it in the subfamily *Perdicinæ*, between the genera *Ptilopachus*, Sw., and *Ortyx*, Stephens.

Generic Character.—Bill strong, stout, compressed, convex above, curved towards the point; nostrils longitudinal, placed in the middle of the bill, and covered by a naked membrane; orbits and lore naked; hind toe without any nail, not touching the ground; wings short; third, fourth, and fifth quills longest.

Geographical Distribution of the Genus.—India and its islands.

M. Lesson states that only one species is known; but Mr Swainson says that three or four species have been recently described—*Cryptonyx niger*, for instance.

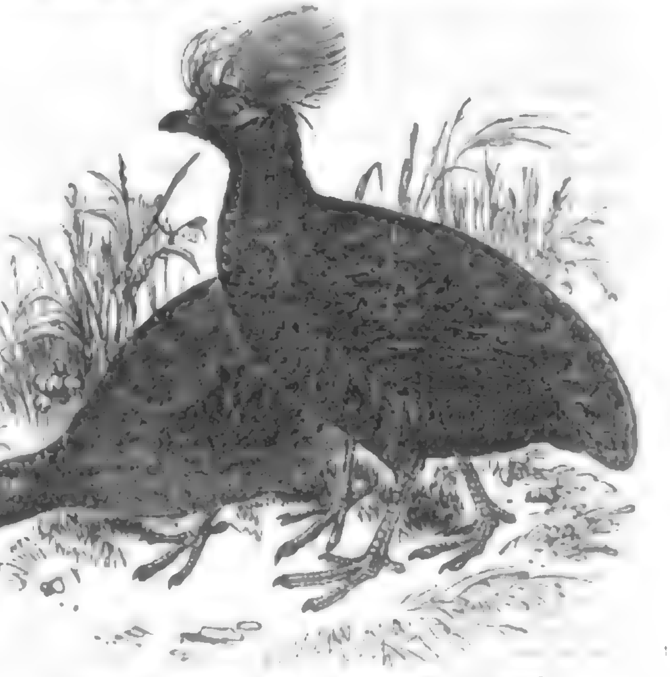
Example, *Cryptonyx cristatus* (*Cryptonyx coronatus*, Temm.).

This is the *Rouloul de Malacca* of Sonnerat. According to Mr. T. C. Eyton, the Malay native name is *Bestum*. (*Catalogue of a Collection of Birds from Malaya*, &c., in *Zool. Proc.*, 1839.)

Description.—*Male.*—On the front a few long and floating hair-like appendages. A thick crest directed backwards covers the occiput: at its origin it is pure white, and then becomes fire-red. Forehead and upper parts of the neck blackish-blue, on which the red patch round the eye and that of the commissure of the bill are well defined. Upper part of the body emerald-green, lower part rich azure-blue; wings ruddy-brown; bill lead-colour; and feet flesh-colour. Tail short and but little visible, its feathers black. Length about ten inches.

Female.—No crest, but only the isolated hair-like appendages of the forehead. Head and neck deep brown: the whole body uniform grass-green. Wings ruddy-brown, waved with brown.

Locality and Habits.—These beautiful birds haunt the great forests of Malaya, Sumatra, and Java. Wild and shy, they avoid the face of man, and are kept in captivity with great difficulty.



Cryptonyx cristatus. Male in the front; female behind.

ROUND (*rotundus*, from *rota*, a wheel) is a term which is indiscriminately applied in common language to everything which has no very sharp corners. A cylinder and a sphere, a wheel and a ball, are equally styled round. In geometry the sphere, cylinder, and cone, are sometimes denominated the three round bodies, and it would certainly add much to many persons' power of describing shapes if they would learn the meaning of the terms circular, cylindrical, conical, spherical, spheroidal, and annular, for all of which the term round is employed without any distinction.

ROUND, a short vocal composition in three or more parts, in the performance of which the first voice begins alone, singing to the end of the first part, then passes on to the second, and afterwards to the third, &c., the other voices following successively the same routine, till all are joined together, the round ending at the mark of a pause (𝄐) or at a signal agreed on. This is frequently, but most erroneously, called a *catch*, and sometimes, not less incorrectly, a 'Canon in the unison.'

ROUND TOWER. Numerous lofty towers, tapering from the base to a conical cap or roof, which crowns the summit, are found in Ireland, and are almost peculiar to that country. That they are of great antiquity appears from their having been considered antient even in the twelfth century, when the British connection with Ireland began. Had they been then in actual use, it is not probable that so accurate a writer as Giraldus Cambrensis, who had been in Ireland, and circumstantially describes them, should not also have mentioned to what purpose they were applied.

There are 107 of these towers, or of the sites where they once stood, now known, and there is reason to believe they were formerly more numerous. Some of them are still perfect, and preserve their conical roofs; but only one, the tower of Devenish, possesses the singular ornament of an obtuse crescent rising from the cone, and somewhat resembling what is called the trident of Seeva.

Ardmore tower, near Waterford, had also, within the memory of man, this finishing ornament. In the other towers, the conical caps are either more or less injured, or have altogether vanished. Some few are topped by battlements, but all these appear to be of more modern construction than the towers, except Kilree, in the county of Kilkenny, which seems to have been built originally with a battlement; but as the stone roof is completely destroyed, there can be no certainty upon this point.

The battlement on Tullsherin tower, in the same county, as well as the uppermost fifteen feet of the tower, is built in the early dove-tail style of masonry, of which the comparatively modern church in the same churchyard is built, and with precisely the same pattern of battlement, while the remainder of the tower is constructed of hammered stone, in the most perfect manner, each stone being an accurate segment of the circular courses of the building.

This low-browed church of Tullsherin was built by St. Kieran, early in the sixth century, at which time the masonic art was in a very degraded state, when compared with that which is shown in the erection of the tower. Kildare tower also terminates in a battlement, but that we know was added to it in the eighteenth century, as was the battlement on Cloyne tower in 1749.

Though most of these round towers were evidently divided into stories, yet Cashel tower is smooth, and even polished on the inside from top to bottom. That at Ardmore was plastered with a very fine white and durable cement. The divisions are usually formed by projecting ledges for the flooring joists, which however in some instances were inserted in square holes in the wall, where the ends were still visible not many years ago.

On each floor there is one very small window, and immediately below the conical cap four windows may be traced in the greater number of towers; in one there are five and in a few six windows; and so many as eight appear in one or two of the towers, but this is the largest number hitherto observed. In three or four of these buildings no windows appear in the upper story—only one small loop-hole—a convincing proof that they could not have been intended for campanili. In most of the towers the doors are at a considerable height above the ground, in one even twenty-four feet, in several fourteen, and in others only eight, seven, or six feet, but in none of them are there any traces to assist conjecture as to the mode of reaching those doors, except in those where the door is on the ground, or raised from it by a couple of steps.

The height of these towers varies greatly, one being only thirty-five feet, while the loftiest is one hundred and twenty, but the common range is between eighty and a hundred feet. Some stand on circular bases, which form one or two deep steps round the tower. Thus Donoughmore has a two-step base, each step or plinth being composed of very large blocks of stone. The basement of Kell's tower is square, and the stones are of great size. Kilree and Aghaviller, both in the county of Kilkenny, have circular plinths fourteen inches deep, projecting six inches, and resting upon a square base formed of great blocks of stone.

The tower of Clondalkin, about five miles from Dublin, stands on massive stone-work; and St. Columb's tower, at Londonderry, rises from a vaulted crypt. So also does that at Oughterard, in the county of Kilkenny.

In external character all the towers may be said to agree, since there is only one which does not taper, and in that case the tower is cylindrical throughout its entire height. It is nicely faced, inside and out, with coggle-stones, and filled up with rubble.

Though all bear to each other the strongest family likeness, there are many striking differences in the mason-work and in the minor details.

The stones in some are truly chiselled, and closely and beautifully laid in fine cement. Some are only coarsely hammered, others merely faced, and of various shapes and sizes, but still well fitted to each other. Some towers are built of round coggle-stones. In all the mortar is as hard as the imbedded stones.

The above and various other little diversities prove that these remarkable structures were erected by various workmen and at divers times, and, as Giraldus Cambrensis says, 'according to the manner of the country;' but this clearly implies that the æra of their erection must have prevailed through a very long period.

Their situation on hill or dale is equally variable, nor does any one circumstance respecting their situations seem to be common to all, except their immediate vicinity to a small and very antient church, though in some instances this antient building has been replaced by a more modern fabric.

It is a well known fact that the early missionaries usually chose the sites of Pagan places of worship for their churches, but it is not equally well known that the undoubted relics of Pagan places of worship remain in close association with these towers, and even in the same churchyard; the pillar stone of witness, the tapering sun-stone, the crombac, the fire-house, and the holy spring of sacred water necessary in the mystic rites, all these are found along with the tower, and the little antient church within the same narrow boundary.

The speculations of antiquaries as to the objects of rearing these mysterious towers have indeed been manifold—penitentiaries, the abode of anchorites, beacon-towers, alarm-posts, places of safety for goods, sepulchral stelæ, bell-towers, &c. All these theories have been nearly set at rest, and opinion seems now to vibrate between their being trumpet-towers, from whence, by means of the great brazen trumpet, the people were invited to worship; or fire-towers, where the sacred fires of Bel or Baal, who was undoubtedly worshipped in Ireland and Scotland, were kept alive, the tower itself being an emblem of the sun-beam or ray of heavenly fire.

A third idea indeed has been lately suggested by Oriental scholars, that they are Buddhic in their origin, and sepulchral in their immediate application, and that they have been erected over the bones or relics of saints.

Before closing this article, it should be mentioned that though these towers are almost peculiar to Ireland, there are two in Scotland, but in that district which, in the very early ages, was in close and constant connection with Ireland.

In other parts of the world, as Andalusia, the Caucasus, Persia, and part of India, towers of all sizes and shapes, and in various situations, have been discovered. As in all these there are some points of resemblance, they may all perhaps prove to be successive links of that long chain of evidence by which these mysterious buildings may be traced downwards from their origin to the pagan rites of the Scoti or Irish.

ROUNDHEADS, a name given to the republicans in England, at the end of the reign of Charles I. and during the

Commonwealth. The name seems to have been first applied to the Puritans because they wore their hair cut close, but to have been afterwards extended to the whole republican party. The Cavaliers, or royal party, wore their hair in long ringlets. [CAVALIER.]

ROUSSEAU, JEAN BAPTISTE, was born in Paris, April 6, 1670. His father, who was a shoemaker, furnished him with a liberal education. In 1688 he attended the French ambassador to the court of Denmark, and afterwards came to England with Marshal Tallard. On his return to Paris he devoted himself to poetry. His first productions consisted chiefly of satirical epigrams, most of which were pointed against contemporary writers. He thus created a number of enemies, and laid the foundation of that spirit of persecution which afterwards drove him from his native land. In 1694 his first comedy, 'Le Café,' was performed, with little success. This was followed, in 1696, by the opera of 'Jason, ou la Toison d'Or,' and, in 1697, by that of 'Venus and Adonis,' both of which were even more unsuccessful than his first comedy. His next dramatic effort was the comedy of 'Le Flatteur,' which was brought out at the Théâtre Français, and was received with considerable applause, but did not command more than ten representations. It was then in prose, but he afterwards put it into verse. He finished his dramatic career about four years afterwards with the comedy of 'Le Capricieux,' which met with an unequivocal condemnation, while Danchet's opera of 'Hesione,' which was brought out at the same time, was brilliantly successful. For some time previous to this, the Café Laurent, in the Rue Dauphine, had been and still continued to be frequented by La Motte, Saurin (Joseph), T. Corneille, Crebino, Boindin, Rousseau, and other literary men; and Rousseau, who seems to have thought that a cabal had been formed among them to ruin his piece and exalt the other, gave vent to his disappointed feelings in a satirical parody of some couplets of the prologue to 'Hesione.' The parody consisted of five couplets, confessedly by Rousseau, but they were followed by others still more calumnious, which were aimed at the frequenters of the Café Laurent, and these were also attributed to him by La Motte, Saurin, and others, who belonged to an opposite literary party. To this charge he made no other reply than that of stating to his friends that they were not written by him; but withdrew himself from the meetings at the Café; and there, for the present, the matter ended.

In 1703 we find Rousseau living in Paris with M. Rouillé, director of the finances, by whom he was taken to court, and introduced to the first society. About this time he began to write his 'Sacred Odes,' in accordance with the solemn piety, real or affected, which Louis XIV. had rendered fashionable at his court during the latter years of his reign. He is charged with composing licentious epigrams at the same time, to suit the taste of another class of his acquaintance. He was said to be

'Pétrone à la ville,
David à la cour.'

In 1710 the place left vacant by T. Corneille in the Académie Française was contended for by La Motte and Rousseau, and obtained by the former. The approaching death of Boileau however was expected soon to occasion another vacancy, and also to leave at the disposal of the court the pension which he had enjoyed, and which could only be bestowed upon an academician. Rousseau expected to fill the vacancy, and also aspired to the pension; La Motte, however, prepared to contend with him for the latter. Such was the state of the two literary parties which then divided Paris, La Motte and Saurin being leaders of the one, and Rousseau of the other, when a new series of couplets made their appearance, more calumnious and indecent than the former, in which the frequenters of the Café Laurent, and especially La Motte, were attacked. These couplets were immediately attributed to Rousseau by his enemies; but he indignantly disavowed them; and having discovered the man who dropped them about the streets, and drawn from him a confession that they were given to him by Saurin, he charged that gentleman before a court of law with having written them, but failed in establishing his charge by legal proof. Finding that he was now placed in a dangerous situation, he withdrew to Switzerland; and on the 7th of April, 1712, an arrêt of parliament, given 'par contumace,' condemned him to perpetual banishment from France. Rousseau denied to the last that he had anything to do with these couplets; and Boindin, to whom they were addressed, and who was much abused in them, always refused to believe that they were Rousseau's, and left a memoir, which was published after his death (Brussels, 1752, 12mo.), in which he accuses Saurin, La Motte, and a jeweller of Paris, of being the authors of them.

From this time Rousseau's life was passed in various countries of Europe. The Comte de Luc, the French ambassador to Switzerland, received him under his protection, and admitted him to an intimacy which was only terminated by the death of that nobleman in 1740. Rousseau accompanied De Luc to Baden in 1714, where he became known to Prince Eugene, who also took him under his patronage; and in 1715, when the Comte was appointed ambassador to Vienna, Rousseau went with him to that city, where he remained three years.

Rousseau had left powerful friends in Paris, among whom the Baron de Breteuil exerted himself with so much success as to obtain for him letters of recall, which were forwarded to him in February, 1716; but Rousseau refused to avail himself of them, on the ground that they were granted to him as an act of grace, whereas he required a public acknowledgment of the injustice of his sentence. In 1720 he went to Brussels, where he became acquainted with Voltaire, and they were very friendly for some time, but afterwards became bitter enemies. In 1721 he came to England, where he published a new edition of his works (1723, 2 vols. 4to.) which produced him about 2000*l*. This sum he unfortunately invested with the Ostend Company, which failed, and he again became dependent on his friends for support. He now returned to Brussels, and was received under the protection of the Duke d'Aremberg, who, when he quitted Brussels in 1733, settled a pension upon him.

In 1738 Rousseau became desirous of returning to France, and made interest to procure the same letters of recall which, more than twenty years before, he had indignantly rejected, but he could not obtain them. He however ventured to visit Paris *incognito*; but though the authorities shut their eyes to this infraction of the law, they gave him no hope of being recalled. After remaining a few months in Paris, he returned to Brussels, where he died, March 17, 1741.

The first collected edition of his works was published by himself, after his banishment, at Soleure, in Switzerland; the next was that of London, 2 vols. 4to., 1723, which was reprinted at Paris in 1743, and was again reprinted at Paris in 1757, with a 5th volume, containing the licentious epigrams, many of which were no doubt properly ascribed to him, and also the notorious couplets, engraved in imitation of the hand in which they were written. The most complete edition of his works (not including the licentious epigrams) was published at Brussels in 1743, under the superintendence of M. Seguy, 3 vols. large 4to., with the author's last corrections. It consists of his poems, his dramatic pieces, and a collection of his letters. There is a beautiful edition of his works, 5 vols. 8vo., Paris, Lefèvre, 1820. There are several other editions.

Jean Baptiste Rousseau stands indisputably at the head of the lyric poets of France. His poems consist of—'Odes Sacrées,' 1 book; 'Odes,' 3 books; 'Cantates,' 1 book, 'Epîtres,' 2 books; 'Allégories,' 2 books; 'Epigrammes,' 3 books; and 'Poésies Diverses,' 1 book. Rousseau's dramatic pieces, as may be inferred from the manner in which they were received by the public, are of little value. His epistles, allegories, and miscellaneous poems are perhaps not much inferior to Boileau in strong sense and elegance of versification, but are inferior to him in wit. His epigrams are neat and sparkling, and the satire is directed to its mark with an aim that seldom fails. His fame however rests upon his odes and his cantatas. His sacred odes are free imitations of the Psalms of David, not so close as translation nor so wide as paraphrase. Too many of his other odes are addressed to kings, ministers, and generals, and relate to events of temporary interest. His best odes however are distinguished by boldness and justness of thought; by simplicity of expression, by fullness and distinctness of imagery, without being overloaded with it; by an earnestness and enthusiasm which seem to spring spontaneously from the feelings of the poet; and by a splendour and harmonious richness of diction in which he seems to have no rival among French poets. His cantatas are a species of ode of which part is adapted for recitation and part for singing. They are beautiful compositions. Some of them may be said to approach the sublime, if they do not reach it;

and others, which are of a lighter character, are exceedingly graceful.

(*Biographie Universelle*; *Dictionnaire de la Conversation*; Auger, *Essai Biographique et Critique*.)

ROUSSEAU, JEAN JACQUES, born at Geneva in 1712, was the son of a watchmaker. While yet a child he lost his mother, and his father having married again, young Rousseau was removed from his paternal roof, and after remaining for some time at a village school in the neighbourhood of Geneva, was apprenticed to an engraver, a coarse man, whose brutal treatment tended to sour a temper naturally irritable and morose. The boy became addicted to idle habits, and to lying and pilfering. At last, through fear of punishment for some act of misconduct, he ran away from his master, and wandered into Savoy, where, finding himself destitute, he applied to the bishop of Annecy, on the plea of wishing to become a convert to Catholicism. The bishop recommended him to Madame de Warens, a Swiss lady, who, being herself a convert to Catholicism, had settled at Annecy. Through her kind assistance he obtained the means of proceeding to Turin, where he entered the college of the Catechumeni, and after going through a preparatory course of religious instruction, he abjured the Reformed religion and became a Roman Catholic. But as he refused to take orders, he was dismissed from the establishment, and left to his own resources. Accordingly he became a domestic servant, but his want of discretion and self-control rendering him unfit for his situation, he left Turin and recrossed the Alps. He found Madame de Warens residing at a country-house near Chambery, who received him kindly, and afforded him support and protection in her own house during the next ten years. Of his foolish, profligate, and ungrateful conduct during a great part of this period he has given an account in his 'Confessions.' After many absences and many returns, he quitted her finally in 1740, with letters of introduction for some persons at Lyon. He acted in succession as preceptor, musician, and private secretary to the French envoy to Venice, whom he followed to that city. From Venice he came to Paris, in 1745. On alighting at an inn, he became acquainted with a servant girl, Therese Levasseur, with whom he formed a connection which lasted for the rest of his life. He attempted to compose music for the stage, but he did not succeed in selling it. His next employment was as a clerk in the office of M. Dupin, fermier-général, where however he did not remain long. In 1748 he became acquainted with Madame d'Epinay, who proved one of his steadiest and truest friends. At her house he formed the acquaintance of D'Alembert, Diderot, and Condillac, and by them he was engaged to write articles for the 'Encyclopédie.'

One day he read in an advertisement that a prize was offered by the Academy of Dijon for the best essay on the question—'Whether the progress of science and of the arts has been favourable to the morals of mankind?' Rousseau determined to support the negative, and Diderot encouraged, but did not originate, his determination. He supported his position in a style of impassioned eloquence, and obtained the prize. His success confirmed him in his bias for paradox and exaggeration, and henceforth he seemed to have adopted as a general principle that the extreme opposite to wrong must of necessity be right. His opera, 'Le Devin du Village,' was played before Louis XV., at the Court Theatre of Fontainebleau. Rousseau was in one of the boxes with a gentleman of the court. The king, being pleased with the opera, expressed a desire to see the author, which being signified to Rousseau, his shyness took alarm, and he actually ran away out of the house, and did not stop till he reached Paris. He had neither easy manners nor facility of address, and his own acute feeling of these deficiencies tormented him throughout life, and tended to perpetuate and increase his natural awkwardness. In order to hide these imperfections, he affected disregard of manners, and put on the appearance of a misanthropist, which he in reality was not. He lived chiefly by copying music, and several persons who knew his straitened circumstances sent him work, for which they offered him three or four times the usual remuneration, but he never would accept anything beyond the accustomed price.

In 1753 he wrote his 'Lettre sur la Musique Française,' which sorely wounded the national vanity. His next publication, a letter to D'Alembert, 'Sur les Spectacles,' gave rise to a controversy between them. He wrote also a 'Discours sur l'Origine de l'Inegalité parmi les Hommes,' which was admired for its eloquence; but his usual paradoxical vein runs through the whole composition. Rousseau asserts that man is not intended for a social state; that he has a bias for a solitary existence, and that the condition of the savage in his native wilds is a true state of freedom, and the natural state of man, and that every system of society is an infraction of man's rights. He also maintains that all men are born equal, in spite of the daily evidence which we have of the inequalities, physical and moral, observable even in childhood. This idea of the equal rights of men, derived not from reason or religion, but from his favourite theory of man's equality in a state of nature, Rousseau afterwards developed more fully in his 'Contrat Social,' a work which, after leading astray a number of people, and causing considerable mischief, is now regarded by all sound thinkers as a superficial essay. [ROMAGNOSI.] It is a curious fact that Rousseau, after reading the works of Bernardin de St. Pierre, had observed that in all the projects of society and government of that writer there was the fundamental error of 'supposing that men in general and in all cases will conduct themselves according to the dictates of reason and justice, rather than according to the impulse of their own passions or wayward judgment.'

In 1756 Rousseau, at the invitation of Madame d'Epinay, took up his residence at her country-house called l'Hermitage, in the pretty valley of Montmorency near Paris. Here he began to write his celebrated novel, 'Julie, ou la Nouvelle Heloïse,' which he finished in 1759. It is of little value as a work of imagination or invention, but as a specimen of impassioned eloquence it will always be admired. Rousseau, while he wrote it, was under the influence of a violent attachment for Madame d'Houdetot, sister-in-law of Madame d'Epinay; and this passion, absurd and hopeless though it was, served to inspire him during the progress of his work.

'La Nouvelle Heloïse' has been censured as tending to render vice an object of interest and sympathy. The character of the hero is culpable, for he forgets the obligations of hospitality, and betrays the confidence reposed in him. But here we again perceive the influence of Rousseau's favourite paradox; for, in a state of nature, such as Rousseau fancied it, the relative position of St. Preux, his pupil, and her parents would not have been the same as in the novel, for they would have all been savages together, and the intimacy of St. Preux with Julie would have been a matter of course. Rousseau however, by the character which he has drawn of Julie after she becomes a wife, has paid a just homage to the sacredness of the marriage bond and to the importance of conjugal duties, which constitute the foundation of all society. Rousseau admired virtue and felt its value, though he did not always follow its rules. He says of himself, that after much reflection, perceiving nothing but error among philosophers, and oppression and misery in the social state, he fancied, in the delusion of his pride, that he was born to dissipate all prejudices. But then he saw that, in order to have his advice listened to, his conduct ought to correspond to his principles. It was probably in compliance with this growing sense of moral duty that at last he married the woman whom he had so long been living with, who had then attained the age of forty-seven, and who, as he himself says, did not possess either mental or personal attractions, and had nothing to recommend her except her attention to him, especially in his fits of illness or despondency. He also repented in the latter years of his life of having sent his illegitimate children to the foundling hospital.

Rousseau's 'Emile,' which appeared in 1762, contained a new system of education. He gives many good precepts, especially in the first part of the book, which was productive of a beneficial change in the early treatment of children in France: it induced mothers of the higher orders to nurse their children themselves; it caused the discontinuance of the absurd practice of swaddling infants like mummies; it taught parents to appeal to the feelings of children, and to develop their rational faculties rather than frighten them into submission by blows or threats, or terrify them by absurd stories. In these respects Rousseau was a benefactor to children, but as he proceeded in his plan for older boys, he became involved in speculations about religion and morality, which gave offence both to Roman Catholics and Protestants. The parliament of Paris condemned the book. The archbishop issued a 'mandement' against it. The States-General of Holland proscribed it; and the council of Geneva had it burnt by the hand of the executioner. The publication of his 'Contrat Social,' which took place soon after, added to the outcry against him, in consequence of which Rousseau left Paris and repaired first to Yverdun, but the senate of Bern ordered him to quit the territory of the republic. He then went to Neuchâtel, of which Marshal Keith was governor for the king of Prussia. Keith received him kindly, and Rousseau took up his residence at Motiers in the Val de Travers, whence he wrote a reply to the archbishop of Paris, and a letter to the magistrates of Geneva, in which he renounced his citizenship. In his retirement he wrote the 'Lettres écrites de la Montagne,' being a series of strictures on the political and ecclesiastical government of Geneva as it then was. This work increased the irritation against the author, a feeling which spread even among the villagers of Motiers, who annoyed their eccentric visitor in various ways, which however the suspicious temper of Rousseau probably exaggerated. He removed to the little island of St. Pierre in the Lake of Bienne, where he assumed, no one knows why, the Armenian costume. Being sent away from thence by an order from the senate of Bern, he accepted the kind invitation of David Hume, who offered him a quiet asylum in England. Rousseau arrived in London in January, 1766, and the following March went to Wootton in Derbyshire, where Hume had procured him a private residence in the house of Mr. Davenport. It was not long however before Rousseau quarrelled both with Hume and Davenport, and suddenly returned to France. A letter had appeared in the newspapers bearing the name of Frederic of Prussia, and reflecting severely upon Rousseau's moral infirmities. Rousseau accused Hume of being the author or planner of the pretended communication. In vain did Hume protest that he knew nothing of the matter. At last Horace Walpole acknowledged himself the author of the offensive letter. Rousseau however would not be pacified, and he continued to charge Hume with the blackest designs against him. The correspondence that passed between the parties has been published in the complete editions of Rousseau's works. Rousseau afterwards appeared to have acknowledged that during his residence in England he had been subject to fits of insanity.

After his return to France, Rousseau led an unsettled life, often changing his place of residence, till 1770. He published in the mean time a 'Dictionnaire de Musique,' which was considered to be both imperfect and obscure. He then returned to Paris, and took lodgings in the Rue Plâtrière, which has since been called Rue J. J. Rousseau. He was left undisturbed by the authorities, but he was cautioned, as there was still a prosecution pending against him on account of his 'Emile,' not to make himself conspicuous in public, an advice which seemed to produce the contrary effect upon his wayward temper. He now fell into a real or affected state of misanthropy, fancying that everybody was conspiring against him, and he complained at the same time of acute mental suffering. Byron, who in his mental bias had some points of resemblance with Rousseau, thus describes him:

'His life was one long war with self-sought foes,
Or friends by himself banished; for his mind
Had grown suspicion's sanctuary, and chose
For its own cruel sacrifice, the kind,
'Gainst whom he raged with fury strange and blind.
But he was phrenzied—wherefore, who may know?
Since cause might be which skill could never find;
But he was phrenzied by disease or woe,
To that worst pitch of all, which wears a reasoning show.

For then he was inspired, and from him came,
As from the Pythian mystic cave of yore,
Those oracles which set the world in flame,
Nor ceased to burn till kingdoms were no more.'

(*Childe Harold*, canto iii.)

One of Rousseau's grievances was that he thought the French ministers had imposed restrictions upon his writing. One of his friends applied to the duke of Choiseul on the subject. The duke's answer, dated 1772, is as follows: 'If ever I have advised M. Rousseau not to publish anything without my previous knowledge, of which fact I have no remembrance, it could only have been with a view to save him from fresh squabbles and annoyances. As now however I have no longer the power of protecting him (the duke had just resigned his premiership), I fully acquit him of any engagement of the sort.'

As Rousseau grew old and infirm, the labour of copying music became too irksome, and all his income consisted of an annuity of 1450 livres, not quite 60 pounds sterling. His wife was also in bad health, and provisions were very dear, and he found that he could not remain in Paris. The Marquis de Girardin, being informed of this, kindly offered Rousseau a permanent habitation at his château of Ermenonville near Chantilly. Rousseau accepted for his residence a detached cottage near the family mansion, whither he removed in May, 1778. In this new abode he appeared for once contented. He used to botanise in the neighbourhood with one of the sons of the marquis. On the first of July he went out as usual for the purpose, but returned home fatigued and ill. The next morning after breakfast he went to his room to dress, as he intended to pay a visit to Madame de Girardin, but he felt exhausted, and his wife coming in gave the alarm. Madame de Girardin came at once to see him; but Rousseau, whilst thanking her for all her kindness, begged of her to return to her house, and leave him for the present. Having requested his wife to sit by him, he begged her forgiveness for any pain that he might have caused her, and said that he died in peace with all the world, and that he trusted in the mercy of God. He asked her to open the window, 'that he might once more behold the lovely verdure of the fields.' 'How pure and beautiful is the sky,' observed he: 'there is not a cloud on it. I hope the Almighty will receive me there.' So saying, he fell with his face to the ground, and when he was raised, life was extinct. His death was purely natural, and not in consequence of suicide, as was said by some. He was buried, according to his request, in an island shaded by poplars, in the little lake of the park of Ermenonville, and a plain marble monument was raised to his memory.

He had begun to write his autobiography when he was in England, under the title of his 'Confessions.' This work contains many exceptionable passages; it ought to be observed however that he did not intend it for publication until the year 1800, judging that the persons mentioned in it would then be dead; but through an abuse of confidence on the part of the depositaries of his MS., it was published in 1788. Rousseau cannot be called a bad man. He did not, like Voltaire, sneer at religion and morality. He was sceptical, but had no fanatical hatred of Christianity; on the contrary, he admired and praised the morality of the gospel. 'I acknowledge,' he says in the 'Emile,' 'that the majesty of the Scriptures astonishes me, that the holiness of the gospel speaks to my heart. Look at the books of the philosophers; with all their pomp, how little they appear by the side of that one book! Can a book so simple and yet so sublime be the work of men? How prejudiced, how blind that man must be, who can compare the son of Sophroniscus (Socrates) with the son of Mary!' With such sentiments Rousseau could not long agree with Diderot, Helvetius, D'Holbach, and their coterie. They ridiculed him as a bigot. Voltaire, on his part, coarsely abused him on many occasions, it is believed from literary jealousy; but Rousseau never retorted. 'I have spent my life,' says Rousseau, 'amongst infidels, without being seduced by them: I esteemed and loved several of them personally, and yet their doctrines were insufferable to me. I told them repeatedly that I could not believe them. . . . . . . I leave to my friends the task of constructing the world by chance. I find in the very architects of this new-fangled world, in spite of themselves and their arguments, a fresh proof of a God, Creator of all.'

Through his deficient education, and his infirmities of judgment and temper, Rousseau was totally unfit to be a political writer. He set a pernicious example to many others, who were still less qualified by proper study to consider themselves as legislators and reformers. Rousseau by his eloquence misled the understanding: Voltaire by his sneers and ribaldry destroyed all moral feeling. Both writers exerted a great influence on the generation which they saw grow up, and which afterwards effected the great French revolution; and yet Rousseau might well disclaim all intention to contribute to such a catastrophe. While Helvetius maintained the principle that 'any action becomes lawful and virtuous in the furtherance of the public weal,' Rousseau says that 'the public weal is nothing unless all the individuals of society are safe and protected.' And elsewhere he says that if the attainment of liberty should cost the life of a single man, it would be too dearly bought. He also said, speaking of his 'Contrat Social,' that it was not written for men, but for angels. M. Angar one day introduced his son to Rousseau, saying that he had been educated according to the principles of the 'Emile:' when Rousseau gruffly replied, 'So much the worse for you and for your son too!' All these circumstances serve to show the real character of Rousseau's mind.

Rousseau set to music about one hundred French 'Romances,' some of them very pretty, which he published under the title of 'Consolations des misères de ma vie.' He was passionately fond of music, though he seems not to have attained a profound knowledge of the subject.

There have been several editions of Rousseau's works: those of Lefevre, 22 vols. 8vo., 1819-20, and of Lequien, 21 vols. 8vo., 1821-2, are considered the best.

The town of Geneva has raised a bronze statue to his memory in the little island where the Rhône issues from the lake, which is a favourite promenade of the citizens.

ROUSSILLON, a province of France, coinciding with the department of Pyrénées Orientales, under which it is described. It obtained its name from the town called by the Romans Ruscino, and afterwards Rosciliona, now Tour de Roussillon, near Perpignan. It was subdivided into Roussillon, properly so called, chief town Perpignan; Le Valespir, chief town Prats de Mollo; Le Conflent, chief town Villefranche; Le Capsir, chief town Puyvalador; La Cerdagne Française, chief town Mont Louis; and La Vallée de Carol, chief place Carol. [PYRENEES ORIENTALES.]

Its condition under the Romans is mentioned elsewhere. [PYRENEES ORIENTALES.] The country came afterwards into the hands of the Visigoths, the Saracens, and the Franks. In the ninth and tenth centuries it was united with the county of Ampurias in Spain; but towards the close of the tenth century they were separated. In 1173 this county was bequeathed, by its count Gérard or Guinard II., to Alphonso, king of Aragon. It was ceded by John II. of Aragon to Louis XI. of France, in pledge for the repayment of money borrowed; but restored by Charles VIII. to Ferdinand the Catholic. In the reign of Philip IV. of Spain, the inhabitants of this province joined the Catalans in their resistance to the Count-Duke Olivarez. The French, who had early fomented the rebellion, afterwards openly took part in it, and ultimately obtained possession of Roussillon, which by the treaty of the Pyrenees, A.D. 1659, was ceded to them.

ROUT. [RIOT.]

ROVERE'DO. [TYROL.]

ROVIGNO. [ILLYRIA; ISTRIA.]

ROVI'GO, *the Province of*, in the Lombardo-Venetian kingdom, is bounded on the north by the province of Padua, from which it is divided by the Adige; east by that of Venice, west by the provinces of Verona and Mantova, and south by the papal province of Ferrara, from which it is separated by the Po. The length of the province of Rovigo is 35 miles from east to west, and its greatest breadth is about 15 miles. The surface is flat, and is crossed by various canals, which communicate with the Po and the Adigo.

The principal towns of the province are:—1, Rovigo, the capital of the province, a bustling modern town, with about 7000 inhabitants, a collegiate church, the Palazzo del Podestà, or government-house, and church dedicated to the Virgin, with some good paintings. Luigi Celio Richeno, who took the surname of Rhodiginus, a learned man of the sixteenth century, and author of the 'Antiquæ Lectiones,' was a native of Rovigo. 2, ADRIA. 3, Badia, a small town, with a manufactory of fine pottery.

The province of Rovigo produces abundance of corn, hay, hemp, pulse, and fruits. Its population amounted to 135,000, by the census of 1833. (Serristori, *Statistica.*)

ROWAN-TREE, or **ROAN-TREE**, is a species of *Pyrus*, known also under the names of the Fowler's service-tree and mountain-ash. Its Latin name, *P. aucuparia*, and its various modern designations, have been given to it on account of the general use made of its fruit for the purpose of decoying birds into traps. It is much cultivated, both on account of its valuable wood and rapid growth. It is known from the other species of Pyrus by its slightly glabrous serrated leaflets and its globose fruit. It is found in most parts of Europe, in the north-west of Asia, in Nova Scotia, and other regions of the northern parts of North America, and in the island of Japan. It does not however attain equal magnitude in all climates. In its most northern localities and alpine situations it is a low shrubby bush; whilst in southern districts it forms a handsome tree, growing to the height of twenty or thirty feet. The finest trees in this island are found in the Western Highlands and on the west coast of Scotland. This tree has enjoyed from remote times a distinguished reputation. A belief in its power against witchcraft and evil spirits of all kinds seems to have been prevalent at a very early date; and, according to Lightfoot, in his 'Flora Scotica,' it was till a late period held in high reputation in Scotland as a charm against evil influence. It is through a hoop of this wood that sheep are made to pass night and morning as a preservative against evil spirits.

The rowan-tree is a graceful tree, with an erect stem and orbicular head. It grows very rapidly for the first three or four years of its existence, and, on this account, it is well adapted for planting with young oaks, which it protects till they grow above it, when it is destroyed by their shade. It also forms excellent coppice-wood, the shoots being adapted for poles and for making hoops. The bark is used by tanners. The leaves, when dried, have been sometimes used in the north of Europe as a substitute for wheat in times of scarcity. It is prized next to yew for making the bow. In Wales it is as religiously planted in churchyards as the yew is in England.

The rowan-tree will grow in almost any situation, being found on the sea-shore and the tops of mountains. Hence it is a valuable plant for growing in places exposed to the sea or in very open situations. It flourishes best in a free soil, near water, and in open airy spots, especially in a moist climate.

ROWE, NICHOLAS, an English dramatic poet, was born at Little Beckford in Bedfordshire, in 1673. His father was John Rowe, of an old Devonshire family, and a serjeant-at-law of some eminence in his day. The son was educated at Westminster under Busby, and chosen one of the king's scholars. At the age of sixteen he was removed from school by his father, and entered as a student of the Middle Temple. He studied law for about three years, when, being left his own master by his father's death, he began to turn his attention to poetry, and withdrew himself from the less attractive reading of his profession. When he was twenty-five years of age he produced a tragedy, called 'The Ambitious Step-Mother,' which was very well received; and in 1702 appeared 'Tamerlane,' in which play, according to the taste of the time, Louis XIV. and William III. are represented respectively by Bajazet and Tamerlane.

This tragedy obtained great popularity, from its connection with the politics of the day. In 1703 was published 'The Fair Penitent;' and in the interval between this date and his death he wrote 'Ulysses,' 'The Royal Convert,' a comedy called 'The Biter,' which proved a failure, 'Jane Shore,' written professedly in the style of Shakspere, though with little of Shakspere's manner, and lastly 'Lady Jane Grey.' In the mean time he had other avocations besides poetry: we find him in the office of under secretary for three years when the duke of Newcastle was secretary of state, and after having been made poet-laureate at the accession of George I., he was appointed one of the land-surveyors of the customs of the port of London. He was also clerk of the council to the prince of Wales, and was made secretary of the presentations by Lord Chancellor Parker, afterwards Lord Macclesfield. Rowe died December 6, 1718, aged forty-five, and was buried in Westminster Abbey. He was twice married, and had issue by both wives. Besides the plays enumerated, he wrote short poems, a translation of Lucan, and of Quillet's 'Callipædia.' He published an edition of Shakspere, in which there are, according to Johnson (*Life of Rowe*), some happy restorations of his author's text. In the composition of his dramas, Rowe shows little depth or refined art in the portraying of character, but he writes with the easy grace of a well-educated man of fashion, undisturbed by the cares of needy authorship, or the ambition of writing himself into notice at the expense of good taste. His versification is harmonious, and the language of his characters natural in the dialogues. 'The Fair Penitent' contains several passages which are well wrought and show great powers of imagination. His translation of Lucan has been much praised by Johnson for preserving the spirit of the original, though upon comparison it will often be found feebly diffuse. His other poems are not of sufficient importance to require a separate notice.

(Johnson's *Lives of the Poets*, who quotes a former Life written by Dr. Welwood, and prefixed to the early editions of his works.)

ROWLEY, WILLIAM, an English dramatic writer, of whose life hardly anything is known. He flourished during the reign of James I., and belonged to the royal company of players, and as an actor excelled most in comedy. The 'Maister Rowley, once a rare scholar of Pembroke Hall, in Cambridge,' mentioned by Meres (2nd part of 'Wit's Commonwealth,' 1598) is probably some earlier author. Rowley wrote many plays, of which the following are the best known: 'A new Wonder, a Woman never vext,' a comedy, 4to., 1632. A tragedy, called 'All's lost for Lust,' 4to., 1633. 'A Match at Midnight,' a comedy, 4to., 1633. 'A Shoomaker a Gentleman,' a comedy, 4to., 1638. 'The Witch of Edmonton,' a tragi-comedy (in this he was assisted by Thomas Deckar, John Ford, &c.), 4to., 1658. 'The Birth of Merlin,' 4to., 1662. Shakspere is said to have aided him in this play. The titles of others of his plays may be found in Watt's 'Bibliotheca Britannica,' and the 'Catalogue of the Library of the British Museum.' Rowley is a somewhat unpolished writer, hardly deserving a less obscure fate than he has met with. Hazlitt, 'Lectures on the Dramatic Literature of the age of Elizabeth,' says of him, 'Rowley appears to have excelled in describing a certain amiable quietness of disposition and disinterested tone of morality, carried almost to a paradoxical excess, as in the comedy of the "Woman never vexed," which is written, in many parts, with a pleasing simplicity and naiveté equal to the novelty of the conception.' (p. 78.)

Several of his plays are printed in Dodsley's collection. He is the author of a rare tract, noticed with extracts in the 'British Bibliographer,' iv., entitled, 'A search for Money; or, the lamentable complaint for the losse of the wandering knight Monsieur l'Argent; or, Come along with me, I know thou lovest money: dedicated to all those that lack money, by William Rowley,' London, 1609, 4to.; a composition full of the ribaldry and low wit of his time.

For notices of his life, see a copy of Langbaine's 'Dramatic Poets,' with MS. notes, in the British Museum, and some statements in Collier's 'Dramatic History.' Two extracts from his plays are given in Lamb's 'Specimens of English Dramatic Poets.'

ROXA'NA was the daughter of Oxyartes, a Bactrian prince, who fell into the power of Alexander (B.C. 327), on his conquest of a strong natural fortress in Sogdiana, where Oxyartes had placed his wife and daughters. Roxana was pronounced by the followers of Alexander to be the handsomest woman they had seen in Asia after the wife of Darius, and her beauty made such an impression on Alexander, that he resolved to share his throne with her. Roxana, who was with child at the death of Alexander, subsequently bore a son, to whom the name of Alexander was given, and who was acknowledged as partner of Arrhidæus Philip in the empire. Statira, the other wife of Alexander, was also supposed to be pregnant; and accordingly, Roxana fearing lest Statira's child should become a rival of her own son, invited her and her sister Drypetis to Babylon, where they were put to death with the concurrence of Perdiccas. Roxana and her son subsequently fell into the hands of Cassander, who kept them in close confinement in Macedonia. In the treaty of B.C. 311, made between the principal generals of Alexander, it was agreed that Cassander should continue military governor (στρατηγός) of Europe, till the son of Roxana came of age. Cassander however, to remove this obstacle to the throne, put to death the young king and his mother in the following year.

(Diod. Sic., xxi. 105; Droysen, *Geschichte der Nachfolger Alexanders.*)

ROXBURGH. [ROXBURGHSHIRE.]

ROXBURGH, WILLIAM, M.D., a native of Scotland, who proceeded to India in the medical service of the East India Company, and distinguished himself by his attention to the botany of that country. In the early part of his career his attention was confined to the peninsula, as he was stationed at Samulcottah from the year 1781, where he paid particular attention to the cultivation of pepper. Into the plantations established for this purpose he introduced the coffee, cinnamon, nutmeg, annotto, bread-fruit tree, sappanwood tree, and mulberry. He also endeavoured to introduce the culture of silk, as well as to improve the manufacture of sugar, and was remarkable throughout for the great attention which he always paid to the improvement of the resources of the country. He knew and corresponded with Kœnig, a pupil of Linnæus, who first gave an impulse to scientific botany in India. Dr. Roxburgh made large collections of plants in the Carnatic, but he had the misfortune to lose them all, with his books and papers, in an inundation at Injeram. He however recommenced making a fresh collection, and the Court of Directors sent him out a present of botanical books.

In the autumn of 1793, from his great merits, he was removed to Calcutta, where he was appointed superintendent of the botanic garden which had been established by Colonel Kyd. During his superintendence, which extended to 1814, few men have laboured with greater zeal, assiduity, and success, though he had very indifferent health; having been obliged to make three separate voyages for its re-establishment, once to the Cape and twice to Europe, on the latter of which occasions he died, in 1815. On one of these occasions Dr. Carey, the celebrated missionary and Orientalist, took charge of the garden, and published, at Serampore, Dr. Roxburgh's catalogue of the contents of the botanic garden at Calcutta. From Dr. Carey's preface to this catalogue we learn that the number of described species then in the garden amounted to 3500, of which 1510 were named and described by Dr. Roxburgh, besides 453 which, though described, had not then been introduced. Besides describing, he had been in the habit of having splendid drawings made of the various plants that he discovered; these, to the amount of 2000, were sent to the Court of Directors. At their request, Sir Joseph Banks undertook the general superintendence of the publication of a work in which a preference was given to subjects connected with medicine, the arts, and manufactures, and which is now well known as Roxburgh's 'Coromandel Plants,' in 3 vols. fol., with 300 coloured engravings. Dr. Roxburgh's general descriptive work of the plants of India, called 'Flora Indica,' was not published for many years after his death. An edition was commenced, to be published at Serampore, by Dr. Carey, with additions by Dr. Wallich, the first volume in 1820, and the second in 1824. A complete edition, in 3 vols., was published by Dr. Roxburgh's sons, in 1832.

ROXBU'RGHIA, a genus of plants named in honour of Dr. Roxburgh. The genus was first published in his own 'Coromandel Plants,' and hence a French author has chosen to say that Roxburgh is the only botanist who has named a plant after himself, but the preface to the work would have informed him that Dr. Roxburgh's MSS. and drawings, having been sent by him from India to the Court of Directors of the East India Company, were published by them under the superintendence of Sir Joseph Banks, and by him and Mr. Dryander this genus was named Roxburghia. Being considered peculiar in many points, it was thought by Dr. Wallich to be typical of a new order, and called Roxburghiaceæ, but it is accounted allied to and a tribe of Smilaceæ. The genus is characterised by having an eight-leaved corol-like perianth, of which the outer leaflets are broad and spreading, the inner ones elliptical, acuminate, and erect. Anthers four, ovary sessile, capsule one-celled, two valved, many seeded. There are only two species of the genus, R. gloriosoides, a native of the moist valleys of the Indian peninsula; and R. viridiflora, discovered in the Chittagong district by Dr. Hamilton, and said to have long trailing stems, sometimes one hundred fathoms in length. The same species seems to be found also in Siam, Cochin-China, and the Moluccas.

ROXBURGHSHIRE, a Scotch county situated on the south-eastern border, is bounded on the north by Berwickshire; on the east and south-east by the English county of Northumberland; on the south by the English county of Cumberland; on the south-west by Dumfriesshire; on the west by Selkirkshire; and on the north-west by Edinburghshire. Its form is very irregular: the greatest length is from north-north-east to south-south-west, from the banks of the Tweed between Kelso and Coldstream, to the banks of the Liddel Water at the junction of Dumfriesshire and Roxburghshire, 43 miles; the greatest breadth at right angles to the length is from the junction of Edinburghshire, Berwickshire, and Roxburghshire, to the Cheviot Hills on the Northumberland border, 30 miles. Its area is variously estimated; by Chalmers (*Caledonia*, vol. ii., table facing p 26), at 696 square miles; by Playfair (*Description of Scotland*), at about 700 square miles; and by M'Culloch (*Statistical Account of the British Empire*), at 715 square miles, or, including the area of its lochs, 715¼ miles. Roxburghshire lies between 55° 5′ and 55° 42′ N. lat., and between 2° 11′ and 3° 8′ W. long.

The population, in 1801, was 33,682; in 1811, 37,230;

in 1821, 40,892; and in 1831, 43,663, showing an increase in the last ten years of about 7 per cent.: there were, in 1631, 61 inhabitants to a square mile. In respect of size it is the thirteenth of the Scotch counties; in respect of amount of population, the sixteenth; and in respect of density of population, the twentieth (Ross and Cromarty being taken as one county). Jedburgh, the shire town, is on the Jed Water, a small brook flowing into the Teviot, about 333 miles from the General Post-office, London, by Stamford, Doncaster, Boroughbridge, Durham, and Newcastle, and 45 miles from Edinburgh by Dalkeith and Lauder.

Surface, Geology, Hydrography, and Communications.—The whole surface of the county is undulating; but in the northern and central parts the hills are of less elevation than along the English and Dumfriesshire borders. A range of lofty hills extends from the eastern extremity of the shire south-west along the border of Northumberland, to which the general designation of Cheviot Hills, properly applicable only to a part of the range, is sometimes given. Arkhope Cairn, Cock Law, Windygate Hill, Blackhall Hill, Musey Law, Fairwood Fell, Carter Fell (2020 feet), and Tronting Crag form part of this range, which separates the basin of the Tweed from the basins of the Coquet and the Tyne. From the head of the Jed Water the range of hills turns westward and runs through the county into Dumfriesshire, separating the basin of the Tweed from that of the Eden. From each side of the range, hills irregularly grouped overspread a wild pastoral district drained by the upper waters of the Teviot on the one side and the Liddel on the other. In the separating range are Need's Law, Fanna Hill, Windborough or Windburgh Hill (2000 feet), the Maiden Paps, Greatmoor Hill, Caldcleugh Hill, Tudhope Hill (1830 feet), Wisp Hill (1830 feet), and Pikethaw Hill. In the hills of Lidisdale, or Liddesdale (the country drained by the Liddel), are Peel Fell, the Lauriston Hills, White Know, Tinnis Hill, Loch Know, and the Mellingwood or Mildenwood Hills (about 2000 feet). In the northern part of the county, rising on the south bank of the Tweed near Melrose, are the Eildon Hills (1364 feet); and on the banks of the Teviot near the centre of the county are Ruber's Law (1419 feet) and Dunian (1120 feet) on the south side, and the Minto Crags (721 feet) and Minto Kame on the other. The altitudes are from Chalmers's *Caledonia*; Playfair's *Description of Scotland*; and the *New Statistical Account of Scotland*.

The eastern side of the county is chiefly occupied by the formations of the red-marl or new red-sandstone group; the western side by the grauwacke rocks; the Cheviot or border hills are chiefly of trap formations; and Liddesdale is occupied by the coal-measures. The red-marl formations extend westward along the valleys of the Tweed and the Teviot as far as a line drawn from the neighbourhood of Lauder in Berwickshire southward to Hobkirk on the Rule, and then east and north-east by Southdean, Old Jedburgh, Oxnam, and Yetholm to the border of the county; detached portions are found beyond this limit. The predominant if not the only rock of this formation is a sandstone, commonly red but sometimes white. It frequently occurs in strata of considerable thickness, and is employed as a good building-stone; for which purpose both the red and white varieties are quarried. It more commonly however occurs in thin horizontal beds, soft, brittle, and easily decomposing. Some of the beds have been supposed to be of the old red-sandstone formation. A small portion of the Northumberland coal-field extends into the county near the head of the Jed and the Kail waters, and overspreads the whole of Liddesdale. Scarcely any coal is dug in the county, except perhaps a little in Liddesdale. The western side of the county, from the boundary of the red-sandstone, is occupied by the grauwacke, which constitutes the mass of the hills separating Teviotdale and Liddesdale, on the southern slope of which hills the coal-measures rest. From Hobkirk the grauwacke occupies a narrow tract of country extending north-eastward, being covered by the red-sandstone on the north and west, and interrupted by the trap rocks on the south and east. The strata of the grauwacke are generally vertical, occasionally however varying from a vertical position by an angle of 30°. The whole of the district which this rock occupies is hilly; but some of the higher peaks are of trap or porphyry.

The trap and porphyritic formations of the border hills comprehend greenstone, basalt, trap tuff, amygdaloid, and especially a felspar porphyry of reddish-brown colour. In the red-sandstone district trap rocks, in dikes or other modes of occurrence, are frequent.

Limestone is procured in some parts of the county; in Liddesdale it is abundant.

The county belongs almost entirely to the basin of the Tweed. Liddesdale alone belongs to that of the Eden. The Tweed itself first touches the border of the county at the junction of the Ettrick Water; it flows eastward, sometimes within and sometimes upon the border, passing Abbotsford, Melrose, St. Boswell's, Makerston, Kelso, and Sprouston, between which village and the town of Coldstream (Berwickshire) it quits the county; that part of its course which belongs to Roxburghshire may be estimated at 27 or 28 miles.

The principal affluent of the Tweed is the Teviot, which flows through the county in nearly its whole extent, giving to the greater portion of it the name of Teviotdale. The Teviot rises in the hills on the south-western border toward Dumfriesshire, and flows with a very direct course to the north-east, past Hawick and Denholm, to Eckford, where it turns northward and joins the Tweed at Kelso; its whole course may be estimated at from 36 to 38 miles. It drains nearly the whole county, receiving the Allan, the Slitrig, the Rule, the Jed, and the Kail from the Northumbrian border, or from the range which separates Liddesdale from the rest of the county, and the Borthwick and the Ale from the border of Selkirkshire. The Ettrick, the Gala, the Leader, the Eden, and other small affluents of the Tweed have part of their course in this county. Liddesdale is drained by the Liddel and the Hermitage, a tributary of the Liddel, with some smaller streams, all of which belong to the basin of the Cumbrian Eden. The Liddel receives all the other streams of Liddesdale, and joins the Esk, which falls into the same æstuary as the Eden.

'The immediate banks of the Tweed are generally precipitous, on one side at least, sometimes on both, so that the river, flowing in a deep bed, is frequently invisible from the public roads, and many of its striking beauties are known therefore only to those who are familiar with the district. Everywhere however from the higher grounds, the views of the river, and of a richly wooded and highly cultivated country, are exceedingly fine.' (*New Statistical Account of Scotland.*) The whole course of the Teviot is beautiful; it flows in the bottom of a spacious open valley, the sides of which often rise to a considerable height; the banks are adorned with beautiful seats, and the stream is generally visible from the public roads. Above Hawick the valley is narrower, and becomes pastoral rather than agricultural.

None of the streams are navigable, except for ferry-boats or other very light boats.

The roads are generally very good. Those in the wilder districts of the country, which have been more recently made, are perhaps the best, from the greater skill and knowledge displayed in choosing their line and directing their construction. Several roads from London to Edinburgh pass through this county. One, through Newcastle, Morpeth, and Wooler, just crosses the north-eastern part through Kelso; another, branching from this at Morpeth, passes through Jedburgh and St. Boswell's; and a third, through Penrith and Carlisle, crosses the western side of the county through Dryden and Hawick to Selkirk in the adjoining county of Selkirk. A road from Hawick follows the valley of the Teviot, and then of the Tweed, through Kelso to Berwick in Berwickshire. There is coach communication along the Edinburgh roads, and also along the road from Hawick to Berwick.

Soil and Agriculture.—The soil in the western parts of the county, where the predominant rock is grauwacke, is generally a thin cold wet clay; capable, in some cases, where it has been intermingled with the ingredients of other rocks, and improved by underdraining, of producing good though late white crops. A poor sandy soil, intermixed in the higher grounds with peaty matter, usually characterises the districts occupied by the coal-measures. The red sandstone district, where the sandstone is finer grained, and more clayey and adhesive, is marked by a deep rich red soil producing its harvest rather early; but where the sandstone is more siliceous and loose, the surface is covered with a barren sand. The trap and porphyry district is usually covered by a loose, light, warm, and dry soil, except in the bottoms, where there is usually a deposit of rich strong clay loam. The highest parts of the trap district afford the finest sheep pasture in the county.

About one-third of the county is under tillage; of the remainder a small part is moor-land, and another small portion wood-land; but by far the greater part is occupied as sheep walks. It is supposed that the quantity of arable land has increased one-third within the last forty years. At the commencement of the present century, the arable land, except in the immediate vicinity of the rivers, was scattered in irregular patches, and was altogether unenclosed. But the great improvements which have taken place since that period by the introduction of the drill turnip husbandry; the use of lime, bone dust, and other foreign manures; a better system of draining, and the intermixture of the feeding and grazing of live stock with tillage, have immensely increased the productiveness of the soil, as well as induced the extension of cultivation. On the larger farms, the enclosures generally contain from twenty to forty acres; the fences on the older farms are usually quick hedges with trees interspersed, but in the newer farms they are commonly dry stone dykes or walls. A very common rotation is as follows:—1st year, turnips or potatoes; 2nd, barley, oats, or wheat; 3rd, grass; 4th, oats. Sometimes this 'four-year shift' is exchanged for one of five years, by giving two successive years to grass; and at other times peas or beans, drilled, are substituted for potatoes or turnips. The number of sheep is supposed to have increased one-third since the beginning of the century; and considerable attention has been shown of late years to the breeding both of cattle and sheep. The favourite breeds of sheep are the Cheviot for the hill pastures, and the Leicester or long-woolled for the lower grounds. A cross between these two is found to answer very well. The most common sort of stock is the Teesdale or short-horned, but the Ayrshire and the Highland kyloe are also kept; and the small farmers and married farm-servants have sometimes a mixed breed of milch cows, produced by crossing the Teesdale with the Ayrshire, or the Galloway with the Highland.

On the tops of the border hills heath is still found, but the quantity of it has been diminished by the extension of sheep-feeding. Some parts, where the soil is wet, are covered with coarse bent grass, which is used occasionally as fodder for cattle or sheep.

During the first American war, an attempt was made to introduce the cultivation of tobacco. The first trial was made in Melrose parish, and was successful even beyond expectation. The profit was very great, and the cultivation was beginning to extend, when it was put down by Act of Parliament. The plants grew best in a dry light soil well manured. (*Beauties of Scotland.*)

Swine are reared by cottagers, farm servants, tradesmen, and others, in considerable number; but they are not kept to any extent by the farmers. The pork is cured at Berwick, and sent up to the London market. Poultry are kept by the same classes of persons as pigs. There are some very productive orchards in the neighbourhood of Jedburgh, Kelso, and Melrose.

The rents of farms have increased during the present century from 30 to 50 per cent., and in some cases even more. Tillage-farms average from 400 to 600 acres; sheep-farms from 1000 to 3000; and farms partly arable and partly pastoral, from 600 to 1400. Leases are usually for fourteen or twenty-one years. The chief landowners are the dukes of Roxburgh and Buccleugh, the marquises of Lothian and Tweeddale, the earl of Minto, and the families of Ker, Scot, Elliot, Douglas, Pringle, Rutherford, Don, &c. Many of the farmers are enterprising and intelligent; and improved methods of cultivation are extending among them, though by no means so rapidly as is desirable. Farm servants very commonly reside in little cottages grouped together so as to form a hamlet in the neighbourhood of the farm-house and offices. Of these cottages, such as have been built of late years have been made much better than similar buildings were previously made; but the older ones are wretched hovels, worse than the sheds or houses appropriated to the cattle.

Divisions, Towns, &c.—The county is divided into four districts, as follows:—Castletown-Melrose district, in the north-west part of the county (except Castletown parish, which is in the south), containing six parishes and part of another (Galashiels, with Lindean, chiefly in Selkirkshire); Hawick district, in the west, containing four parishes and parts of three others (Ashkirk, Robertown, and Selkirk, all partly in Selkirkshire); Jedburgh district, central, containing eight parishes; and Kelso district, including eleven parishes and part of a twelfth (Stitchel, partly in Berwickshire), which constitute the eastern portion of the county making in all twenty-nine parishes wholly, and five partly in Roxburghshire. Of the five parishes which are only partly in this county, Stitchel, Robertown, and Ashkirk may be considered as belonging to Roxburghshire, the greater part of their population being within it.

There are five market-towns, namely, Jedburgh (the shire town, also a royal burgh), Kelso, Hawick, Melrose, and Castletown.

Jedburgh (colloquially Jeddart or Jethart) is on the Jed Water, which flows into the Teviot. The parish consists of two detached parts, the one in which the town is situated being near the centre of the county, the other on the Northumberland border: the whole area is about 38 square miles; and the population, in 1831, was 5647, of whom 3617 were in the town. The name of the parish was antiently written Gedworde, Jedworth, Jedwood, and Jedburgh: the first syllable, Ged or Jed, the name of the stream on which the town stands, has been supposed to embody the element of the name Gadeni (Γαδηνοι in the Greek geographers), by which the nation who inhabited this part of the kingdom were distinguished. The parish was celebrated in antient times for its woodland fastnesses, its castles and fortified dwellings, and the magnificence of its ecclesiastical establishments

At Old Jedworth, four miles from the town, are the slight ruins of a chapel, with its grave-yard; and on the south side of the present town are the more prominent remains of Jedburgh Abbey. This abbey (of canons regular, imported from Beauvais in France) appears to have been founded in the first half of the twelfth century, but the year is doubtful. Some persons suppose its foundation to have been much earlier. It suffered much during the wars with the English, was pillaged and burned by the earl of Surrey at the storming of Jedburgh in 1523, and again injured by the earl of Hertford (afterwards duke of Somerset) in A.D. 1545. The church alone remains: it is 230 feet long. The choir is much dilapidated, and the south transept has disappeared; but the nave, north transept, and central tower, 100 feet high, are in better preservation. The western part of the nave has been fitted up and is used as the parish kirk. The western end is a lofty gable, with a beautiful Norman door; and there is another beautiful Norman door, which once was the entrance from the cloisters. The architecture appears to be Norman, intermingled with Early English. On the south side of the choir is a chapel, formerly used for the grammar-school. Foundations of the monastic buildings are found extending to a considerable distance from the church, and the burial-ground is very spacious.

The town stands in a narrow valley on the left bank of the Jed. It consists of several streets, converging in the market-place in the centre of the town. There are several houses on the right bank of the river, forming a kind of suburb. There are three bridges over the Jed; and others over one or two small burns or brooks running into it, all in or near the town. The principal streets are sufficiently spacious; and though the houses have generally an air of antiquity, many of them are very good; and in the outskirts of the town are many pleasant villas. The county hall is near the market-place; and close to the southern end of the town, on an elevated site, is the county prison (including a gaol, bridewell, and debtors' prison, with a house for the governor), on a better construction than the generality of Scotch prisons. As it occupies the site of the antient castle of Jedburgh, it has retained the name of The Castle. There are three dissenting places of worship, two of them tolerably spacious. The dissenting interest is strong in and about Jedburgh.

The principal manufactures of the town are of woollens, such as blankets, flannels, tartans, shawls, shepherds' plaidings, hosiery, lamb's-wool yarn, and carpets: these branches give employment to between three and four hundred persons. There are an iron and brass foundry, and a factory for patent printing-presses. There are quarries of red and white sandstone in the parish and several corn-mills. Bread is made for the supply of the surrounding villages, and a great quantity is sent into the north of England. There are two branch banks. The markets are on Tuesday and Saturday; the Tuesday market is a well attended corn-market. There is a monthly cattle-market, and there are four horse and cattle fairs held in the year, besides a large sheep and wool fair at Rink, in a remote part of the parish. There is a post-office, and there is communication by coach daily with Edinburgh and Newcastle, and twice or three times a week with Hawick and Kelso.

Jedburgh is the seat of a presbytery, of the circuit court of Justiciary, and of Justice of Peace, Sheriff, and Small-Debt Courts. The corporate body of the burgh consists of a provost, four bailies, dean of guild, and eighteen councillors, four of whom are chosen from the deacons of the eight incorporated trades. The royalty or jurisdiction extends only over a part of the parish: it was somewhat enlarged for parliamentary purposes by the Reform Act. The burgh unites with Haddington, North Berwick, Dunbar, and Lauder to return a member. The business of the burgh courts is decreasing: the corporation have the management of part of the county prison.

There were, in 1834, fourteen day or evening schools in the parish, attended by 950 scholars, about one in six of the population; of these, 170 were attending the parochial school, with which the English school had been united. There are several excellent public libraries, one of them comprehending a valuable and extensive collection of books. There are two public reading-rooms and a reading society. There are a dispensary (for which the marquis of Lothian, in 1822, erected a commodious house, with baths and other accommodations), a savings'-bank, and some religious and charitable societies.

The neighbourhood is celebrated for the growth of apples and pears, an advantage which it owes to the excellence of the soil, and the care and intelligence of the monks of a former age. There are traces of a Roman camp, and of some other antient camps, of a Roman road, and some remains of the castles and towers of the middle ages, especially of Fernichurst or Firnihirst Castle on the Jed, about two miles above Jedburgh, the antient seat of the Kers, ancestors of the marquis of Lothian.

Kelso is 11 miles north-north-east of Jedburgh, on the north bank of the Tweed, which receives the Teviot just opposite the town: the Tweed is at their junction about 440 feet wide, the Teviot 200 feet. The parish had, in 1831, a population of 4939, about one-tenth agricultural: it comprehends what antiently constituted three parishes, or parts of three parishes, and includes a portion of the antient burgh of Roxburgh, with the ruins of Roxburgh Castle, for some time the residence of the Scottish kings, and before which James II. of Scotland was killed, A.D. 1460. Kelso was famous for its abbey of Tironensis (a class of Benedictines), founded by King David I. early in the twelfth century. The abbey was repeatedly burnt or otherwise much injured, especially in the English invasions of 1523 and 1545, led by Lord Surrey and the Earl of Hertford (afterwards duke of Somerset) respectively. The town, which was originally little more than a suburb of Roxburgh, acquired greater importance from the foundation of the abbey, and rose rapidly after the decay of Roxburgh; but it was nearly destroyed in Hertford's invasion in 1545.

The town consists of several streets converging in an open square, and extends for about half a mile along the river Tweed, to which the principal street is parallel. The old houses, with gables to the street, have very generally given way to more modern buildings of freestone, roofed with slate, giving to the town a very handsome appearance, which is improved by the picturesque scenery of the surrounding country.

The ruins of the Kelso Abbey church are of mingled architecture: the predominant character however is Norman, more or less decorated, with some portions of early English intermingled. The building was in the form of a cross 99 feet long (the nave being shorter than the choir), with a transept 71 feet long and 23 feet broad, with a central tower 91 feet high. The ruins are considerable, and have been in the course of the present century cleared from some incongruous additions made to them in order to adapt the nave to the purpose of a modern church, for which it was used until late in the last century.

There are two modern churches: the one lately erected on the north side of the town is one of the most chaste and beautiful on the border; it is in the Elizabethan style, with a tower 70 feet high. There are five places of worship for dissenters. There is a bridge over the Tweed 494 feet long, with five elliptical arches of 72 feet span; the piers are 14 feet wide: it was designed by the late Mr. Rennie. [RENNIE.] The town-house is a neat modern building on the east side of the square.

The manufactures of Kelso are not important; leather, linens, stockings, hats, woollen cloth, and tobacco are manufactured: but all these branches give employment to no more than 150 men. There are four branch banks and numerous good shops. There are a daily market for provisions, a weekly corn-market, and a monthly cattle and sheep market, besides five yearly fairs, including that of St. James, one of the best-attended on the border. Professional men are tolerably numerous. There are races at Kelso; and rural sports of various kinds are much practised in the neighbourhood.

Kelso is a burgh of barony with a peculiar constitution; the baron bailie has jurisdiction in small matters, civil and criminal. There is a small prison or lock-up-house. The police of the town is inefficient, especially as the population has been deteriorated by an influx of gipsies from the neighbouring parish of Yetholm, and by the settlement of some Irish. There is a good deal of petty crime.

There is a post-office at Kelso; and communication is maintained by coaches with Newcastle and Edinburgh daily, and with Berwick, Jedburgh, and Hawick twice or three times a week.

There were, in 1834, ten day-schools, two of them parochial, namely, an English and a grammar school, three supported by private charity, and five private schools. The number of scholars, in 1836, was 664; it had been diminishing for the previous three or four years. There were also six Sunday-schools. There are three joint-stock libraries, of 5000, 2000, and 1500 volumes respectively; and several other libraries, a book-club, a Physical and Antiquarian Society, and two news-rooms. Two newspapers are published in the town.

There are a dispensary, with a house for receiving patients, furnished with baths, &c.; and a savings'-bank. Pauperism has much increased at Kelso.

Hawick is about 10 miles south-west of Jedburgh, on the right or south-east bank of the Teviot, at the junction of the Slitrig, Slitterick, or Slitridge, which flows through the town. The parish contains about 24 square miles, and had in 1831, a population of 4970. Hawick suffered much in the border warfare of former days; and both in the town and the rural parts of the parish are several towers or houses whose strength shows they were designed for fortifications. Among these, on the left bank of the Teviot, three miles above Hawick, is Branxholm, rebuilt by Scott of Buccleugh, its owner, after being almost entirely destroyed by the English under the earl of Sussex, A.D. 1570: the building has been so altered and repaired as to have lost much of its antient appearance, but it is of interest as occupying the site of the Branxholm, or Branksome, of Sir Walter Scott's 'Lay of the Last Minstrel.' The town consists chiefly of one long spacious street along the bank of the Teviot, which is here crossed by a stone bridge. There are two bridges over the Slitridge, one of them very antient. There are in the whole parish eight bridges. The streets are well paved, and lighted with gas. The general appearance of the town has been much altered of late years by the laying out of new streets and the substitution of better dwelling-houses and shops for those previously existing. The parish-church was built in the middle of the last century; it is destitute of architectural beauty, but in a good situation. There are four dissenting meeting-houses, a town-hall, and a suite of rooms used occasionally for public meetings.

The manufactures are chiefly of woollen yarns, flannels, and other woollen under-clothing, plaiding, shawls, tartans, druggets, woollen-cloths of various descriptions, blankets, and lamb's-wool hosiery. In these branches, in 1838, 1788 workpeople were employed in and round the town; and the annual consumption of wool was estimated at 108,000 stones there were 11 extensive factories, 1209 stocking-frames, and 226 weaving-looms. A number of females were employed in sewing stockings. Machinery, candles, and gloves were also manufactured, and the tanning of leather and the dressing of sheep-skins were also carried on. There is a post-office. Mails to and from London and Edinburgh, by way of Carlisle, pass through the town; there are coaches to Edinburgh three times a week, and to Jedburgh and Kelso twice or three times. There is a weekly market on Thursday, and there are four yearly fairs for horses, cattle, sheep, and hiring servants, generally well attended.

There were in the parish, in 1839, a parochial school with a small additional endowment; a second parochial school at the village of Newmill; and ten private schools; besides twenty-four Sabbath-schools on the local system, connected with the establishment, and four Sabbath-schools managed by dissenters. The number of children in the day-schools was 802, viz. 427 boys and 375 girls; there is scarcely any person a native of the parish who is not able to read and write. There are a public library of 3500 volumes, a trades' library of 1200 volumes, three juvenile libraries, and a school of arts. There are a savings'-bank, and several religious and charitable institutions. The police of the town is very inefficient; petty thefts, embezzlements, and petty assaults are frequent. Pauperism has increased of late years with more than ordinary rapidity. Hawick is a burgh of barony; civil causes to any extent and criminal cases of minor description are tried before the burgh justices. There is a wretched prison of only one room.

Melrose is on the south bank of the Tweed, 11 miles north-west from Jedburgh. The parish has an area of 45 square miles, and had, in 1831, a population of 4339, rather less than one-third agricultural. This parish appears to have been the seat of a religious community in the time of the Saxon heptarchy; but the establishment was destroyed when the Scots obtained the district from the Northumbrian Saxons. Some monks afterwards made it the place of their temporary residence; and, in A.D. 1136, David I. of Scotland founded here a Cistertian abbey, the ruins of which yet remain. The original Saxon monastery was on a site nearly surrounded by the Tweed, three miles to the east of the ruins of the later abbey. These ruins are well known from the description in Sir Walter Scott's 'Lay of the Last Minstrel.' They are chiefly of the abbey church, which was in the form of a cross; the length of the nave and choir was 258 feet, the breadth 79 feet; the length of the choir alone about 50 feet; the length of the transept was 130 feet, the breadth 44 feet. The walls of the nave, choir, and transept are standing, and part of the central tower. There are traces of the cloisters and of the monastic buildings. The beauty and finish of the architectural decorations, and the majestic appearance of the ruins, altogether render Melrose an object of great attraction. There are a few other antiquities in the parish; the shaft of an antient cross in the centre of the village is surmounted by the crest of the earls of Haddington; there is a large barrow on the Eildon Hills, and a stone with an antient Latin inscription, evidently Roman, has been found.

The town of Melrose consists of a central triangular space with streets diverging from it, and contains about 700 inhabitants, chiefly retail shopkeepers, handicraftsmen, or labourers, with their families. The place has an air of antiquity; and some of the houses have in their walls stones with inscriptions derived from Catholic times. Some good modern houses have been built. The church is on an eminence a short distance west of the town; it is a plain modern building with a spire. There are two stone bridges over the Tweed in the parish, but neither of them near the town, and a suspension-bridge for foot-passengers and single horses. There are two dissenting meeting-houses, one in the town. There is a small prison or lock-up-house, consisting of a single cell, secure, dry, and tolerably well ventilated.

There is no manufacture but that of woollens. Some of the establishments connected with the manufacturing district of Galashiels extend into the western part of the parish. The linen and cotton manufactures, which flourished for awhile, have become extinct, and the fisheries have dwindled to nothing, but agriculture is conducted with spirit and skill. The farms are large, and the farm buildings commodious and substantial. There are three yearly fairs for cattle and sheep. There is a post-office, but no coaches through the town. The Edinburgh and Jedburgh road passes near it.

There are several schools in the parish; the parochial school, with 70 or 80 scholars, being in Melrose itself, the others in the surrounding villages and hamlets. Education is generally diffused, and is much valued. There is a subscription library at Melrose, and there are small religious libraries in the surrounding villages. There are a savings'-bank, three friendly societies, and two missionary societies. Melrose is a burgh of barony, but the powers conferred by the charter have never been exercised. The superior of the burgh (the duke of Buccleugh) nominates a baron bailie, whose deputy exercises a jurisdiction in trifling matters as a magistrate. Abbotsford, the residence of the late Sir Walter Scott, is in the parish of Melrose, two or three miles west of the town.

Castletown is in the southern part of the county. The parish is the most extensive in the south of Scotland, and comprehends a large part of Liddesdale. It is separated from the rest of the county by a range of hills, the ramifications of which, separated by narrow valleys, extend over the whole parish. The population in 1831 was 2227, about half agricultural. There are a number of antiquities; several circular enclosures, or antient British forts or camps, called 'Picts' works,' a druidical circle, several cairns, a stone cross, and the castle of Hermitage, with the ruins of the chapel near it. The castle is a massive border tower or fortress, nearly 100 feet square. The walls are entire, and have been lately put into complete repair. The town of Castletown consists of two long streets parallel to each other, lined with neat new houses, on the right bank of the Liddel, and contains a population of above 1000. The town was commenced in 1793, and has superseded the old village of Castletown (so called from a border fortress now demolished) higher up the vale. There are a weekly market established in the last two or three years, two yearly sheep-fairs, and three hiring-days. The parish church is at the junction of the Hermitage with the Liddel, above a mile from the town, and will contain 700 or 800 people. There is a dissenting meeting-house in the parish. There are four parochial schools, one principal and three auxiliary, besides two private schools, and a public subscription library. No public conveyance passes through any part of the parish.

The village of Yetholm, in the eastern part of the county, is remarkable as the usual abode of a gipsy colony, of which an account is given in 'Blackwood's Magazine,' vol. i., pp. 154-161. St. Boswell's, near Melrose, is celebrated for a great sheep-fair, the greatest in the county, held in July.

Divisions for Ecclesiastical and Legal Purposes.—Of the thirty-four parishes wholly or partly in Roxburghshire, nine in the north-east are in the presbytery of Kelso, nine along the north-western border are in the presbytery of Selkirk, one in the north (Smailholm or Smallholm) is in the presbytery of Lauder, and one on the south (Castletown) in the presbytery of Langholm. The remaining fourteen central parishes are in the presbytery of Jedburgh. The presbyteries of Kelso, Selkirk, Lauder, and Jedburgh are in the synod of Merse and Teviotdale; the presbytery of Langholm is in the synod of Dumfries.

The circuit court of justiciary and the sheriff-court are held at Jedburgh, where the county gaol is. There are six prisons in the county, viz.: the burgh and county prison at Jedburgh, and a small lock-up-house; and small prisons or lock-up-houses at Kelso, Hawick, Melrose, and New Castletown. 'There appears to be a good deal of crime in this county in proportion to the population. The offences consist chiefly of thefts (particularly sheep-stealing and embezzlement) and assaults . . . . The offenders as a class are said to be of drunken habits, and to be much below others in the same rank of life in education and intelligence. Many of the younger offenders have learned no honest means of getting a livelihood; and, as might be expected, their parents are themselves either positively bad, or at least very negligent of their children. The offences are chiefly committed by resident inhabitants; many however are by strangers. The police of Roxburghshire has been lately organised and greatly improved; but the procurator-fiscal is of opinion that about one-third part even of the offences which are of sufficient importance to be referred to the sheriff, are still committed without any clue being obtained to the parties concerned, or without sufficient evidence being obtained to warrant a prosecution.' (*Inspectors of Prisons' Third Report*, 1837.)

The county returns one member to parliament. Jedburgh is the principal place of election. The same burgh is united for the return of a member with Haddington, North Berwick, Dunbar, and Lauder. The constituency of the county amounted in 1834-5 to 1674, in 1835-6 to 1863, that of the burgh district in 1834-5 to 601.

History and Antiquities.—In the earliest period of authentic history the county seems to have been comprehended in the territories of two antient British nations, the Gadeni in the west, and the Otadeni in the east. Of these Celtic nations the cairns and barrows or tumuli, and other sepulchral antiquities which have been found, are supposed to be relics. Druidical stones, some of them arranged in circles, are found; and the Eildon Hills and other eminences are crowned with forts. On the conquest of this part of the island by the Romans, the county was comprehended in the province of Valentia, and Roman roads were carried across it, and Roman stations established within it. Some of these stations were formed by occupying the antient forts or hill-camps of the natives, and strengthening and adapting them by Roman skill and labour. The camp on the Eildon Hills was thus occupied. A chain of Roman posts may be traced by their existing remains, and there are traces of Roman roads. One, which was a continuation of Watling-street, may be traced from the Northumbrian border across the county near Jedburgh and Melrose, in the direction of Lauder. Coins, vessels of copper and brass, and other Roman antiquities have been discovered. The Trimontium of Ptolemy and Richard of Cirencester is fixed by some antiquaries at the camp on the Eildons near Melrose; but Chalmers places Trimontium at Birrenswork Hill in Annandale, Dumfriesshire, and makes the Eildon camp to be the Ad Fines of Richard of Cirencester, which others fix at Chew Green. Gadanica, mentioned by Richard, is fixed by some at Hawick. (See *Map of Antient Britain*, published by the Society for the Diffusion of Useful Knowledge.)

On the departure of the Romans this county was exposed to the attacks of the Angles, who founded the Northumbrian kingdom. The natives struggled long and gallantly, and it is to this period that Chalmers ascribes the construction of the Catrail, a vast ditch at least twenty-six feet broad, with a rampart eight or ten feet high on each side of it, formed of the earth thrown out of the ditch, extending from near Galashiels in Selkirkshire to Peel Fell on the border of Northumberland, forty-five miles, of which eighteen are in Roxburghshire. But the Angles gained ground, and before the end of the sixth century occupied Teviotdale, which became part of the kingdom of Northumbria. [NORTHUMBERLAND.] In the tenth century it was relinquished by the Anglo-Saxons to the king of Scotland, together with the rest of the Scoto-Northumbrian territory comprehended under the general name of Lothian. From this time the county was gradually strengthened by castles and towers against that hostility to which its situation on the border peculiarly exposed it. Jedburgh Castle was erected in the time of David I., in the earlier part of the twelfth century, and is the earliest in the county of which any distinct account can be given. Roxburgh Castle was perhaps of as early date, and at one time of greater importance. Hermitage Castle was built during the reign of Alexander II. (A.D. 1214-49); and in following years, but especially after the aggressions of Edward I. had embittered the hostility of the two nations, rose the various castles, towers, and peels, of which many ruins exist, and some of which have been brought into notice by the 'Minstrelsy of the Scottish Border,' and the poems of Sir Walter Scott.

Of Roxburgh Castle, now in Kelso parish; of Clintwood Castle, in Castletown parish; of Gossford Castle, in Eckford parish; and of Haliedean or Holydean Castle, in Bowden parish, the remains are very scanty. Of Delphiston Tower, in Oxnam parish, and Minto Tower, in Minto parish, there are rather more remains, also of Goldielands Castle near Hawick; but none of these call for particular notice. The ecclesiastical ruins, Kelso, Jedburgh, and Melrose abbeys, have been noticed already. There are remarkable caves at Jedburgh, Roxburgh, and Ancrum, which appear to have been used as habitations, probably as temporary retreats during the border wars. There are some remarkable remains of walls in Ancrum parish, forming a quadrangle, enclosing an eminence above which they rose; they are called the Maltan wall, and are supposed to be the remains of a building belonging to the Knights of Malta. Smallholm Tower is so conspicuous as to form a landmark for seamen entering Berwick harbour.

Roxburghshire appears to have been early established as a shire. Mention of the sheriff occurs in the reigns of Alexander I. (1107-1124) and David I. (A.D. 1124-1153). The chief fortresses in the shire were ceded to the English by William the Lion, to redeem himself from captivity, A.D. 1174, but restored A.D. 1189 by Richard I. When Edward I. seized Scotland into his own hands, he placed this county under a military administration; but the successes of Robert Bruce and his supporter Douglas, the latter of whom took Roxburgh Castle, A.D. 1313, restored the former mode of administration by a sheriff. The county was still however claimed, and at times successfully, by the kings of England, who occasionally appointed the sheriff, while in the intervals of English weakness and decline the Scottish princes exercised the right of appointment. In 1342 Roxburgh Castle, then in the hands of the English, was taken by Sir Alexander Ramsay of Dalwolsy, who was appointed by the Scottish king, David II., sheriff of the county. This appointment roused the jealousy of the great Douglas family, one of whom, Sir William Douglas of Liddesdale, seized the sheriff, and carrying him off to his castle of Hermitage, there starved him to death, A.D. 1343. In the interval between A.D. 1346 and 1384, in which year the Scotch again possessed themselves of the county, except the castles of Jedburgh and Roxburgh, Roxburghshire was in the power of the English. It was chiefly by the valour of the Douglas family that it was recovered, and the sheriffs were commonly chosen from that family, who came to regard it as their right, so that the appointment of Sir David Fleming of Biggar to the office, in A.D. 1405, led to his assassination by James Douglas of Balveny. The office of sheriff then became hereditary in the Douglas family, and continued so until the final abolition of hereditary jurisdictions. Roxburgh Castle was taken from the English, A.D. 1460, by Mary of Gueldres, widow of king James II., who had fallen during the siege; Jedburgh Castle had been recovered long before.

The calamities of war led to the ruin of the town of Roxburgh, which had, in the reign of David I., been the royal residence and the county town. On its downfall Jedburgh became, and has continued to be, the county town. The sheriffs appointed by the English made Hawick their residence. Liddesdale was possessed by various branches of the Douglas family, and passed by exchange, in 1492, to the earls of Bothwell. It was held by the notorious earl of Queen Mary's time, and she visited him when he lay wounded in his castle at Hermitage, in A.D. 1566. In the commencement of this unfortunate queen's reign, A.D. 1545, an English army, which had invaded the country under Sir Ralph Evers and Sir Bryan Layton, was here defeated with considerable loss by the earls of Arran and Angus. The county suffered materially in the succeeding invasions of the Earl of Hertford, afterwards duke of Somerset, A.D. 1545-1547; of Lord Gray, A.D. 1548; and of the Earl of Sussex, A.D. 1570.

(*New Statistical Account of Scotland*; Chalmers's *Caledonia*: Forsyth's *Beauties of Scotland*; Chambers's *Gazetteer of Scotland*; *Parliamentary Papers*.)

ROYAL ACADEMY OF ARTS IN LONDON. At the accession of George III., painting, sculpture, and architecture, notwithstanding there were eminent artists in all these branches, were in a lower state in Great Britain than in most parts of Europe. Foreign critics did not hesitate to assert, that the ungenial climate or the physical defects of the English presented insuperable obstacles to the attainment of excellence in the arts. Whether these opinions induced the young king to turn his attention to the subject, and endeavour to remove this national stigma, cannot now be known, but it is certain that he soon began to show a strong disposition to encourage the arts. The study of architecture under Mr. (afterwards Sir William) Chambers became his favourite recreation, and we have heard that his patriotic wish to advance the taste and refinement of the nation was strengthened by the representations and advice of Drummond, then archbishop of York. This prelate introduced to his notice Benjamin West, a young American artist just returned from his studies in Italy, to whom the king thenceforward allowed a liberal pension.

An institution which had been formed in 1754, called 'A Society for the Encouragement of Arts, Manufactures, and Commerce in Great Britain,' was the first which included among its objects the offering of rewards to the fine arts. Attempts were made about the same time by the principal artists to form a permanent academy for the cultivation of painting, sculpture, and architecture, which failed. In 1760 however, with the assistance of the above-mentioned Society, who liberally allowed the use of their great room for the purpose, the artists were enabled to open the first public exhibition, which though not entirely satisfactory to the promoters, attracted great attention, and was for several seasons successfully followed by a similar display of their talents. They were in consequence induced to apply to the king for a charter, which they readily obtained, and in 176 they were constituted a body corporate under the title of 'The Incorporated Society of Artists.' The way was thus paved for the institution of the Royal Academy; but its immediate cause was a schism which took place in the 'Society' soon after their incorporation. According to Edwards (whose 'Anecdotes of Painting' furnish the best accounts of the state of art at this period), 'Unfortunately they were scarcely collected when discussions arose which, in the course of three years, caused an irreparable breach, and in the end a total dissolution of the incorporated Society.' This event he attributes 'to the loose and unguarded manner in which the charter was composed: for it did not provide against the admission of those who were distinguished neither by their talents as artists nor their good conduct as men.' The number of members already amounted to a hundred and forty-one, of whom a large portion were artists of very inferior merits. 'It was now seen,' says another writer well acquainted with the facts, 'that no society of this kind could be lasting, unless it were more limited in its numbers and select in the choice of its members, and that it could have no national dignity without the avowed and immediate patronage of the sovereign.' Accordingly the principal artists withdrew, and endeavoured to obtain the protection and patronage of the king. W. Chambers, F. Coates, G. M. Moser, and B. West presented to him a memorial signed by twenty-two artists, the purport of which was to show the probability that with his royal sanction and encouragement, and by means of an annual exhibition of their works, they would soon be able to raise sufficient funds for the support of a gratuitous national school of art. The memorial stated, 'The two principal objects which we have in view are the establishing a well-regulated school or academy of design, and an annual exhibition open to all artists of distinguished merit; we apprehending that the profits arising from the last of these institutions will fully answer all the expenses of the first; we even flatter ourselves that they will be more than necessary for that purpose, and that we shall be enabled annually to distribute somewhat in useful charities.' The proposal was graciously received. The plan of a constitution was draw up by Mr. Chambers, and laid before the king, which he approved, and signed on the 10th of December, 1768. Thus was founded 'The Royal Academy of Arts in London, for the purpose of cultivating and improving the arts of painting, sculpture, and architecture.'

The artists who signed this memorial were: Benjamin West, Francesco Zuccarelli, Nathaniel Dance, Richard Wilson, George Michaël Moser, Samuel Wale, J. Baptist Cipriani, Jeremiah Meyer, Angelica Kauffman, Charles Cotton, Francesco Bartolozzi, Francis Cotes, Edward Penny, George Barrett, Paul Sandby, Richard Yeo, Mary Moser, Agostino Carlini, William Chambers, Joseph Wilton, Francis Milner Newton, Francis Hayman. These, with John Baker, Mason Chamberlin, John Gwynn, Thomas Gainsborough, Dominick Serres, Peter Toms, Nathaniel Hone, Joshua Reynolds, John Richards, Thomas Sandby, George Dance, Francis Hayman, William Hoare of Bath, and Johan Zoffani, composed the original thirty-six academicians. The number forty was not completed till 1780—by the addition of Edward Burch, Richard Cosway, Joseph Nollekens, and James Barry. Their first meeting was held on the 14th of December, when the following officers were elected, viz.: J. Reynolds, *President*; G. M. Moser, *Keeper*; F. M. Newton, *Secretary*; E. Penny, *Professor of Painting*; T. Sandby, *Professor of Architecture*; J. Wall, *Professor of Perspective*; Dr. William Hunter, *Professor of Anatomy*. The king appointed William Chambers *Treasurer*, and R. Wilson *Librarian*.

This list of the founders of the Royal Academy evidently includes the great mass of talent existing at that period in London.

The other academies of Europe which have been established for the advancement of the fine arts and the promotion of public taste, are supported entirely at the expense of their respective governments as *national* objects, and are usually under the control of some person of distinction. Such is the Royal Academy of Paris, founded just a century before. The Royal Academy of London is essentially different from these, inasmuch as it originated in the private munificence of the reigning king, and, since the first years of its existence, has been entirely maintained by the exertions of the artists themselves, unaided by a single national grant or public subscription.

The king's adoption of the artists was immediately followed by the most liberal and effective support. He caused apartments for the schools to be fitted up in his own palace of Somerset House, supplied the Society with rooms in Pall Mall for their exhibitions, and for several years made up every deficiency in their expenditure from his privy purse; with true and considerate benevolence he allowed them at the same time to reserve a hundred pounds a year to form a fund for necessitous members or their widows, and twice that sum to administer occasional relief to artists in distress, whether they were members of the Society or not.

George III. constituted himself the head of the Academy, and showed a personal interest in its success; he gave frequent audiences to its officers, confirmed its proceedings when his sanction was necessary, and attended to all its concerns as if it were part of his household. When Old Somerset House was purchased by the nation as a site for a number of public offices, the king took care to reserve a portion of the new building for his Academy.

In 1776 the plans of a new site were submitted to the approval of the president and council, and the apartments devoted to this purpose were fitted up with a degree of magnificence worthy of a royal palace, the talents of many of the principal members having been employed in its decoration. In July, 1780, the preparations being completed, the Royal Academy obtained possession of their new residence, by an order from the Treasury to the surveyor-general of the works, and their first exhibition in Somerset House took place in the following year. This friendly superintendence of its affairs and anxious desire to promote the welfare and utility of the Society continued till the year 1800, when the health of the king unfortunately became so much impaired as to prevent any further interviews between the Academy and its patron. But the institution had now acquired stability, and though its acts for some time remained unconfirmed, it continued to exercise its functions; and when the government was placed in the hands of the Prince Regent, he took the Academy under his protection, and approved of their proceedings. On his accession to the throne, in 1820, the position of the Academy had become somewhat changed. A gradual augmentation in the receipts of the annual exhibitions, aided by a judicious economy, had enabled the members to support the schools on an increased scale of expenditure, and to provide for the continuance of the establishment from its own resources, without the assistance of the king. On the death of George III., the Academy solicited his successor to honour them with the same patronage which they had received from his predecessor. George IV. readily consented to adopt the Royal Academy, and, in furtherance of the views of its founder, placed himself at the head of the institution, and thenceforward gave the sanction of his signature to such of their proceedings as required it

Though the Society did not derive any pecuniary assistance from George IV., they were on many occasions indebted to his munificent patronage. He honoured the president with a distinctive badge, a gold medal and chain, to be worn on all public occasions. He presented them with a magnificent lamp for their principal room, and greatly forwarded the utility of the schools by giving them a large and highly valuable collection of casts from the finest antiques, which were procured from Rome by the intervention of Canova.

On the death of George IV., his successor, William IV., immediately extended his patronage to the Royal Academy. He entered cordially into the views of his royal father, received the officers with promptness, and attended with great kindness to their wishes on all occasions.

In 1834, a proposal having been made by Lord Grey and the existing ministry to transfer the establishment from Somerset House to Trafalgar Square, where an edifice was proposed to be raised which would be large enough for a national gallery of paintings, and at the same time offer better accommodations to the Royal Academy, the king was appealed to on the subject. At first he seemed rather adverse to the removal of the Society from apartments which he considered to be his own, where they had been planted by their founder, and where they had carried on their operations with success for above half a century, but on being informed that it would probably conduce to the advantage of the arts that the Society should have better exhibition-rooms, particularly for works of sculpture, he consented, though with some reluctance, to the exchange proposed.

Plans of the new building were accordingly laid before the president and council, and the accommodation of the Academy was consulted as far, we may suppose, as circumstances would permit, but it appears that some inconveniences of a very serious kind could not be overcome. The apartments were put into their possession in 1836, in a very unfinished state, and wholly devoid of such decoration as might have been expected in an academy of the arts. The removal has been attended with great expense to the Society, and in many respects they have been disappointed in their expectation of improved accommodation.

Upon the accession of Her present Majesty, and a representation of the position of the Academy with relation to her royal predecessors, the queen adopted the Royal Academy, consented to become its head, to grant the same privileges of a private audience to its officers, and to sign such of their proceedings as require the royal sanction.

The Royal Academy consists of forty academicians, painters, sculptors, and architects. There is a second order of members, styled associates, twenty in number, from whom alone the vacancies that occur among the academicians are supplied. The body of academicians elect, but the approbation and signature of Her Majesty are necessary to make this election valid.

There are also six associate engravers. Associates are elected by the body of academicians, from a list of exhibitors who declare themselves candidates for this honour.

There are a treasurer and a librarian. A bye-law of the Academy requires that they shall be academicians. These offices are filled by Her Majesty's nomination.

There are also a keeper and a secretary. These offices are filled by election, with the approbation of Her Majesty.

There are four professors, academicians, elected by the general assembly, and approved by the queen, who read lectures on painting, sculpture, architecture, and perspective.

There is a professor of anatomy, elected by the academicians, with the approbation of Her Majesty.

There are three schools: a school for study from casts from celebrated works of antiquity; a school for study from living models; and a painting school. The first is under the care and direction of the keeper; and the other two are under the care of visitors, annually appointed.

The council consists of nine members, including the president, and has the management of all the concerns of the Society. All bye-laws of the Academy must originate in the council, and have the approbation of the general assembly, and the sanction of Her Majesty's signature to give them effect.

The president, council, and visitors are annually elected, and confirmed by Her Majesty's signature.

There are also several honorary members of the Royal Academy, namely, a professor of antient literature, a professor of antient history, a chaplain of high rank in the church, an antiquary, and a secretary for foreign correspondence, elected by the general assembly and approved by the queen.

Among the honorary members are the names of Samuel Johnson, Goldsmith, Franklin the translator of Sophocles, Gibbon, Mitford the historian of Greece, Barretti, Bennett Langton, Dr. C. Burney, Walter Scott, and others.

All persons are admissible as students of the Academy. Nothing but indication of talent and a respectable character are required from them. Their names remain unknown till judgment is passed on the specimens which they send in, and when admitted they receive a gratuitous education from the best masters.

All painters, sculptors, or architects, whose works show sufficient merit, are allowed to exhibit with the Academy, and, being admitted exhibitors, they are immediately eligible as associates. Many young artists whose great abilities have promised to contribute to the credit and support of the institution, have been chosen associates, and soon afterwards academicians, though they had scarcely left the schools.

The executive government of the Academy passes in rotation to all the academicians, and half the council retires, and is renewed annually.

The operations of the Academy are continued in regular succession throughout the year, excepting vacations of a month in September and a fortnight at Christmas. Unfortunately the necessity of giving up the only room fit for an antique academy to the annual exhibition of sculpture, renders the cessation of that school during the exhibition still unavoidable.

The schools of drawing, painting, and modelling are open daily from ten to three and from six to eight, under the direction of the keeper and visitors. A practical course of lectures on perspective is given during the spring. The lectures on anatomy are delivered before the Christmas recess; those on painting, sculpture, and architecture, are given twice a week, from January to the end of March. The library is open three times a week.

Prizes are annually given to encourage meritorious students, and those who have gained the biennial gold medal have from time to time an opportunity of being sent abroad to study for three years at the expense of the Academy.

Among the chief improvements in the practical working of the Academy, besides the professorship of sculpture, may be reckoned the institution of a school of painting, which is under the superintendence of a special officer. It is attended twice a week by visitors, who are appointed from among the academicians for that purpose, and premiums are annually awarded to the successful students. This school is from time to time favoured with the loan of some of the finest pictures from the royal collections, from the Dulwich Gallery, and from all the principal collections of the metropolis, which are during the greater part of the year placed before the students. For the furtherance of this object the Academy have purchased the finest copy extant of Leonardo da Vinci's celebrated Last Supper.

The library of the Academy is continually improving, and it now contains all the best works on art, besides a considerable number of modern prints and a valuable collection of engravings of the Italian school from the earliest period, formed by George Cumberland, for which they paid 600*l.* On the death of Sir Thomas Lawrence the Academy purchased his collection of architectural casts for 250*l.* (although their apartments could not accommodate them), and presented them to the British Museum, where they are well arranged for the benefit of students.

The question has often been raised, whether academies are calculated to advance the arts; but these institutions vary so much in their plan and character, that any answer to this question must depend on the precise meaning attached to the word. Academic education will probably be less effective than the education obtained under a master of eminence who is daily teaching his pupil by precept and example in his own studio; but an academy, considered as a school of art, is just as likely to stimulate genius as a private school, if it is well conducted. The great men who have been brought up in private schools would not have been less eminent if they had been reared in an academy, which term properly means a place of instruction, a school which offers every opportunity of study. If such schools cannot create genius, they have no tendency to stifle it. Sir J Reynolds always regretted that he had not had a more academic education. The school of the Caracci sent out a number of well-trained and excellent artists, though they had not the good fortune to produce a Raffaello. The fact is, that the true school of any country is in the mass of talent existing in it, and not in the studio of any particular artist.

It is only the elementary education that can be acquired in a school of any kind, but this is precisely the kind of education which a well-constituted academy can give better than any private master. The utility of such an establishment as the Royal Academy cannot therefore be doubted; and it must be from want of diligence or capacity, or both, if, with such numerous aids and advantages, the students do not acquire sufficient preparatory knowledge to enable them fairly to commence their profession.

If we look back to the general condition of painting sculpture, and architecture when the Royal Academy of Arts was established in 1768, they will be found to have made at least as great a progress here as they have made in any other country in an equal period. In many respects the English may vie with any modern school of painting; in colour and effect it confessedly stands alone, and has become a model to the rest of Europe. It is characterised by originality and a great variety of styles, and it has produced many works of first-rate excellence. In portraiture, familiar subjects, animals, and landscape it is unrivalled. In historical painting alone, from the want of national encouragement, it has not been so successful. This branch of art can only be kept alive by public encouragement, and by the decoration of churches, palaces, and other public buildings, a subject to which the government of this country have hitherto paid little or no attention. About two thousand students have been reared under the tuition and auspices of the Royal Academy. Among these the well-known names of Bankes, Flaxman, Nollekens, Deare, Bacon, Rossi, in sculpture; Soane, J. Wyatt, Wyatville, in architecture; Northcote, Opie, Hoppner, Lawrence, Westall, Stothard, and Hilton, in painting, are conspicuous. Some of these artists are entitled to be ranked with the best of any period of art, and others gave proof of powers which, if they had been employed in national works, might have raised English art to a still higher elevation. This list might be much enlarged if we could with propriety include in the enumeration the names of living artists. The creation of so large a number of well-trained students has tended to diffuse a love for the arts throughout the country, and given rise to institutions for their cultivation in many parts of the empire. Thus the public taste has been improved, and those branches of our manufacturing industry which require the aid of the art of design, have been indirectly encouraged by the establishment of the Royal Academy.

Among the benefits derived from the institution of the Royal Academy may be mentioned the various lectures and discourses which have been delivered there. The discourses of Reynolds are highly appreciated both at home and abroad; and the lectures of Fuseli, Flaxman, and other professors have established the theories of their respective arts on a sure basis.

The attention which the Royal Academy has uniformly shown to unfortunate artists in general, and the liberal assistance they have bestowed to such out of their funds, should not be omitted. It appeared in evidence before a committee of the House of Commons, in 1836, that the gross sum that they have expended in pensions to distressed members amounted to 11,106*l.*, and the donations to artists, not members, and their families, to 19,249*l.* With this generosity the Academy has combined a prudent degree of economy in the management of their funds, both for the purpose of providing against casualties and for the gradual improvement of the establishment. This is shown by the fact that they have already expended 240,000*l.* in carrying out the objects for which they were associated, and have still reserved for exigencies a sum of 47,000*l.* stock.

It will appear from what has been stated, that the Royal Academy owes its corporate existence entirely to the crown, and is neither supported nor aided by any public funds. It has also been shown in what manner it has become entitled to accommodation in the National Gallery. Though the exertions of the Academy have been directed to a public object—the improvement of the arts—it differs in no respect from any other body incorporated for literary or scientific purposes, such as the Astronomical Society for instance, and others, which support themselves by their own funds. Accordingly it is not easy to see on what grounds the House of Commons claim the right of inquiring into the receipts, expenditure, and general management of the Academy. The committee of the House of Commons on Arts and Manufactures, in 1836, did however inquire into the affairs of the Academy, and the printed evidence reported by the committee shows that every information was readily given to them. The result of the inquiry was in every way creditable to the institution, and the administration was proved to be strictly conformable to the purposes for which the Academy was instituted.

In the year 1834 the House of Commons had addressed the king, requesting him to direct the Royal Academy to furnish them with certain returns explanatory of the constitution of the body and its proceedings.

This was the first attempt to withdraw the Royal Academy from its immediate connection with the crown and to bring it under the control of the House of Commons. On this occasion the Academy, having first asked the permission of the king, William IV., gave the House all the information that was desired. But in 1839 an order was made to furnish the House with similar returns in continuation, as well as with the particulars of their domestic expenditure. These returns were not made, and a petition was presented to the House, in which the position and claims of the Royal Academy were fully and clearly explained. The petition produced its effect, and the order was rescinded.

We have purposely abstained from any notice of the various attacks made on the Royal Academy. Its constitution and administration are now so well known, that it is not very difficult to form a right judgment of what is said either for or against it. Those who find fault with its constitution, should show how it can be improved, and those who would deny that it has done service to the arts, must be prepared to dispute the truth of a large part of the petition just referred to. The administration of the finances of this body deserves unqualified praise. It has itself produced all the funds necessary for its support, and by a rare combination of liberality and economy it has expended large sums on proper objects, and yet is far from being poor. There are few public bodies of which the same can be said.

ROYAL EXCHANGE. Although there is no such building actually existing at present, we insert here some account of the one destroyed by fire in 1838, which was the second structure—the original one having met with a similar fate in the Great Fire of London in 1666. The first edifice, which was a brick building, was erected by Sir Thomas Gresham, for the accommodation of the merchants, entirely at his own expense. [Gresham.] Notwithstanding the general confusion and trouble occasioned by the calamitous conflagration, the new Exchange was commenced at the end of the following year, and was so far advanced in 1669, as to be publicly opened for business, on September 28: a rather curious circumstance, when it is considered that more than the same time has elapsed since the last fire, and the future Exchange can hardly be said as yet (March, 1841) to be actually begun.

The design of the late Royal Exchange had always been attributed to Wren, until Mr. Brayley claimed it for Mr. Edward Jerman, who was one of the city surveyors at that time, and who, it appears, was employed by the committee to conduct the works, which, however, is no proof whatever that he was the author of the design. On the contrary, as that point is left doubtful, the more plausible conjecture is that he was not; because, had he been so, his name would in all likelihood have been less obscure, if only on account of that single production, for it was certainly looked upon at one time as a splendid structure. It is for such reason alone that we call in question Jerman's title to be considered the real architect, since we are not at all solicitous to claim that honour for Wren, being of opinion that it was in many respects not a little barbarous in taste and that Ponz [Ponz], certainly not the most fastidious of critics, did not do it any very great injustice when he spoke of it, in his account of his tour in England, as being totally devoid of elegance in its decorations. The large order of four Corinthian columns, in the centre of the Cornhill front, was so managed as to disturb the whole design, for instead of its architrave being upon the same level as that of the smaller order on each side over the arcades, it was lower down; consequently, besides the disagreeable irregularity so occasioned, that portion appeared depressed, although made actually loftier than the rest by the attic and tower. Another very singular solecism was, that over the intercolumn on each side of the large central archway there was a segmental pediment most unmeaning in purpose and insignificant in effect, or rather, the only effect was to make us sensible of the omission of a central pediment in the design. Over the archway or middle compartment the clock-tower was carried up in three receding and diminishing stories or stages, in each of which was an arched window, and at the angles a Corinthian half-column grouped with a semi-pilaster on each side, similar to the small order over the arcades in the lateral divisions of the front; and so far there was some uniformity kept up between those portions of the design and the tower. There were also at one time two ugly octagonal lanterns with ogee domes, not at the extremities of the front, but over the extreme compartments where the arcades projected beyond the general plan. When those turrets were removed we have not been able to ascertain; but the larger tower was taken down, and a new one erected, about 1821, by Mr. George Smith, architect to the Mercers' Company, at which time other alterations were made in the upper part of the central compartment, and among them was that of substituting balustrades, with statues on their pedestals, for the two small pediments above mentioned. Immediately behind these balustrades rose an attic, containing a large pannel with bas-relief, flanking the loftier stylobate or lower story of the tower, to which succeeded a low octagonal base, with clock dials on its faces, supporting a circular Corinthian peristyle of eight columns, crowned by a dome. This arrangement seems to us much better than that of the first tower, with its three square chest-like stories dwindling upwards into insignificance. Still there were two circumstances which detracted considerably from the merit of the second or circular story of the last tower: one, the absurdity of introducing balustrades between the shafts of the columns when there was no passage behind them; the other, the introducing stumpy arched windows squeezed into all the intercolumns.

The chief merit of the inner quadrangle was, that it afforded a spacious sheltered ambulatory (28 feet wide) round the open area: in point of architecture it was poor, and in some of its features very offensive. The lower and much better half consisted of seven arches on each of the longer sides, and five on each of the shorter sides of the open area, springing immediately from the capitals of the Doric columns; those at the angles of the plan had clustered shafts. But the beauty of such a combined ordinance was materially injured by the great span of the arches in comparison with the height of the columns. This scantiness of the columniation, and consequent apparent fragility of the lower part, was rendered more offensive by the heavy superstructure over it. This last was of barbarous design, in proof of which it is sufficient to observe that the architrave was cut through by ugly little oval windows, just at the vertex of each arched compartment, where, if anything, there ought to have been some kind of keystone.[*]

These remarks have been more minute than may seem consistent with an article of this kind; yet the subject derives from circumstances far more interest just now than it would else possess. We shall not say anything with respect to the competitions for the new Exchange, except that the last, to which only six architects had been invited, was confined to Mr. Cockerell and Mr. Tite, and that the design by the latter was selected for execution. It would be altogether premature however to attempt any description of what will probably undergo considerable modifications in many parts, for it is said that the western portico (a Corinthian octastyle) is now to be extended so as to be *diprostyle*, instead of *monoprostyle*. [PORTICO.] It is singular that the opportunity should not now be taken of covering in the area where the merchants assemble, instead of forming, as before, a mere court with colonnades around it, where the open area at least must be exposed to the weather. Every edifice of the kind erected within the last century is covered in: the Royal Exchange, Dublin, the Bourse at Paris, the Exchange at Hamburg, that at New York (since destroyed by fire), and the Birzha or Exchange at St. Petersburg. Though small, the first of these is singularly elegant in its plan, the interior forming a rotunda within a square, having a circular peristyle of twelve Corinthian columns supporting a dome over the central part of the area below. For some account of the Bourse in that capital we refer to PARIS. The Birzha at St. Petersburg, on the contrary, calls for some little notice here: it is an insulated edifice surrounded by a Doric peristyle, forming nine intercolumns at each end and thirteen on each of the longer sides. As the *cella*, or body of the edifice enclosed by the colonnades, is carried up rather higher than these last, there are no pediments over the ends or fronts, though the ends of the cella terminate in a pediment outline, and have a large semicircular arch serving to light the interior or salle, which has also a lantern in the centre of its semicylindrical roof.

We here subjoin the dimensions of the late Royal Exchange, with those of the intended structure, &c.

Old Royal Exchange. Extreme external dimensions 210 by 175 feet. Interior quadrangle 155 by 118 feet, or 18,290 square feet. Open area of quadrangle 99 by 75 feet, or 7425 square feet.

Plan of New Exchange. (By Mr. Tite.) Extreme length from east to west, including portico, 293 feet; breadth at east end 175 feet; interior quadrangle 170 by 113 feet, or 19,210 square feet; open area of quadrangle 114 by 57 feet, or 6398 square feet.

Exchange, St. Petersburg. Built 1804-10. Exterior 330 by 246 feet. Salle 190 by 90 feet, or 17,100 square feet.

Bourse, Paris. Exterior 234 by 164 feet. Salle or interior covered area 108 by 59 feet, exclusive of galleries, or 6372 square feet.

ROYAL SOCIETY (*of London*), consists of a number of persons associated together for the purpose of promoting mathematical and physical science. At its formation the more particular object of the members was to assist each other in extending their knowledge of natural and experimental philosophy.

Philosophical societies for the cultivation or advancement of particular branches of human knowledge existed, both on the Continent and in this country, before the end of the sixteenth century. In Italy, the Florentine Academy and the Academia della Crusca had been founded with the view of improving the language and literature of that country. France had its Academy of Painting and Sculpture, and its Royal Academy of Inscriptions; and the Antiquarian Society in England was founded in 1572. With the exception of the persons connected with these institutions, who were engaged in the pursuit of letters, the fine arts, and antiquities, the learned world was in that and the preceding ages chiefly occupied with scholastic philosophy. But the discoveries of Galileo in astronomy and mechanics having opened a field for research in those sciences, men of learning began to turn to pursuits which, while they seemed to constitute a worthy exercise of human intellect, promised to lead to results of great practical utility.

England appears to have led the way to the formation of a body of men who sought by mutual co-operation to advance the *new philosophy*, as it was called; for Dr. Wallis, in an account of his own life, relates that in 1645, which must therefore have been while the civil war was raging in the country, several persons who then resided in London, at the suggestion of a Mr. Haak, a native of Germany, joined themselves into a club, in which, purposely excluding politics and theology, they agreed to communicate to each other the results of their researches in chemistry, medicine, geometry, astronomy, mechanics, magnetism, navigation, and experimental philosophy in general. Among those who first met for this worthy purpose, were Drs. Wilkins, Wallis, Goddard, Ent, and Glisson, and Messrs. Haak and Forster (the professor of astronomy at Gresham College); and the place of their meeting was generally at Dr. Goddard's lodgings, but they occasionally assembled in Gresham College or in its neighbourhood. This is supposed to be the club which Mr. Boyle, in a letter (1646), designates the invisible or philosophical society.

Before the year 1651, Drs. Wilkins, Wallis, and Goddard, having obtained appointments at Oxford, went to reside in that city, where, being joined by Drs. Seth Ward, Bathurst, Petty, and Willis (the last an eminent physician), and Mr. Rooke, they constituted themselves a society similar to that which they had left in London. They met at first at Dr. Petty's lodgings, which were in the house of an apothecary, where they had access to such drugs as they wished to examine; and as often as any of the members had occasion to visit the metropolis, they did not fail to attend the meetings of their former associates. When Dr. Petty went to Ireland in 1652, the meetings at Oxford appear to have been for a time suspended; for that gentleman, writing from Dublin to Mr. Boyle, in the beginning of 1658, expresses his gratification that the club was revived; and in the same year the members met either at the apartments of Dr. Wilkins in Wadham College, or at the lodgings of Mr. Boyle. It appears however that, in the beginning of 1659, all of them except the latter gentleman, who continued to reside at Oxford till 1668, came to London, where they rejoined the friends who had remained there, and where the united clubs were almost immediately strengthened by the accession of several new members. At that time the lectures on astronomy and geometry in Gresham College were delivered, the former by Mr. Christopher Wren, on every Wednesday, and the latter by Mr. Rooke (who had been appointed in 1652), on every Thursday; and these gentlemen, together with Lord Viscount Brouncker, Mr. Brereton (afterwards Lord Brereton), Sir Paul Neile, Mr. John Evelyn, Mr. Balle, Dr. Croone, and others, besides the Oxford members, used after the lectures to assemble for philosophical conversation in an adjoining room. This state of things did not however continue long, for during the same year, in consequence of the troubles which ensued on the resignation of the Protectorship by Richard Cromwell, the apartments which had been occupied for scientific purposes were converted into quarters for soldiers, and the members of the society were obliged to disperse.

We learn also from Dr. Wallis, that upon the restoration in 1660, the meetings were revived; and on the 28th of November in that year, the members came to a resolution that they would assemble during term-time in Mr. Rooke's chambers at Gresham College, and during the vacation at Mr. Balle's chambers in the Temple. It was further resolved that the members should constitute themselves a society for promoting physico-mathematical learning, similar to the voluntary associations of men for other branches of knowledge in foreign countries. At this time also a series of resolutions relating to the objects proposed by the society were drawn up, and of these the following is a brief outline: —It was agreed that records should be made of all the works of nature and art of which any account could be obtained; so that the present age and posterity might be able to mark the errors which have been strengthened by long prescription, to restore truths which have long been neglected, and to extend the uses of those already known; thus making the way easier to those which are yet unknown. It was also resolved to admit men of different religions, professions, and nations, in order that the knowledge of nature might be freed from the prejudices of sects, and from a bias in favour of any particular branch of learning, and that all mankind might as much as possible be engaged in the pursuit of philosophy, which it was proposed to reform, not by laws and ceremonies, but by practice and example. It was further resolved that the Society should not be a school where some might teach and others be taught, but rather a sort of laboratory where all persons might operate independently of one another. Lastly, it was resolved that each member should subscribe his name to an agreement that he would constantly attend the Society's meetings, if not prevented by illness or some indispensable business; that he should pay ten shillings on his admission, and that he should subscribe one shilling weekly while he continued to belong to the Society; but from this obligation he was to be freed if he chose to withdraw. At the same time Dr. Wilkins was chosen chairman, Mr. Balle, treasurer, and Dr. Croone, registrar. It was agreed to meet every Wednesday, from 3 to 6 o'clock in the afternoon.

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[*] 'That we do not borrow our opinion from Ralph, who is generally quoted as an oracle on the buildings of London, is evident, for he says that the quadrangle is 'laid out in a very good style, and finished with *great propriety of decoration*.' Another writer assures us 'there are many beauties in the architecture, and but few defects. The *four orders* (?) of the quadrangle are magnificent, and richly decorated with the basements (?), arches of the walks, the cornices over them, niches, statues, pillars, circular windows, entablature, pediments, and balustrade, *all in correct proportion and arrangement*.'

The revenue thus raised from the members was intended to enable the Society to accomplish the various objects for which it was instituted, and particularly to defray the expenses of the philosophical experiments which it was proposed to make. The intention was, that persons should be sent to travel abroad, for the purpose of collecting information, while others should remain in London, and present the results of their researches at the weekly meetings. It was determined that the members should be formed into committees for the consideration of the subjects which were to be illustrated by experiments, and that the performance of the latter should be assigned to persons who, by their particular talents, were best qualified for the duty. Some of the members also were to be appointed to examine all works on the natural history of foreign countries, that out of them they might prepare directions as a guide in making inquiries concerning the phenomena of the atmosphere and the currents of the sea, and in performing experiments on light, magnetism, &c. It was proposed to bring the results of the researches into one common stock, and to consign them in public registers for the benefit of future generations, without regard to any order in the arrangement; it being considered, that if subjects of a like nature were brought together, persons might be tempted too early to form general systems, which might be detrimental to the progress of philosophy. (Dr. Sprat, *History of the Royal Society.*)

Such were the plan and constitution of the infant Society, which was destined, in its maturity, to hold so distinguished a place in the annals of science. Its first recorded steps, which took place Dec. 5, 1660, consisted in appointing Mr. Wren, at the next weekly meeting, to perform an experiment on the vibrations of pendulums, and Lord Brouncker to bring in a series of instructions for conducting some experiments (relating to the temperature, moisture, &c. of the air), the performance of which on the Peak of Teneriffe it was intended to procure.

A week afterwards it was resolved that persons desiring to be admitted should be recommended by some member, and that the election should take place by ballot. No one below the rank of a baron was to be admitted without a scrutiny; and the number of members was to be limited to fifty-five, of whom twenty-one were to be a quorum for elections and nine for other matters. It was agreed also that the fellows of the Royal College of Physicians and the professors of mathematics and natural philosophy in both universities should, if they desired, be admitted as supernumeraries on paying the fees and lending their assistance when convenient. The restriction respecting the number of members was however soon afterwards taken off; and, at this time, candidates who were proposed on one evening were often admitted at the next, or at the second following meeting, though the practice respecting the interval between the application and the admission seems to have been very variable. The president or chairman held his post sometimes during the evening only, sometimes he was appointed for a month, and he was occasionally re-elected. Two persons were appointed to superintend the arrangements for performing the proposed experiments, and one of the members acted as a reporter at the meetings. An amanuensis for copying minutes, and an operator under the superintendents, were engaged as servants, and received salaries.

In that age, the constitution and qualities of material bodies being very imperfectly known, suggestions founded on ill-observed phenomena, and the marvellous relations of credulous travellers, were often thought deserving of consideration from the bare possibility that they might lead to the discovery of useful truths; and this circumstance may serve to account for the apparently absurd inquiries and experiments which appear in the notices of the Society's first labours. Thus, in 1661, Mr. Boyle was requested to ascertain the name of the place in Brazil where there was said to have been a kind of wood which attracts fishes; he was also desired to inquire into the truth of the circumstance mentioned by Schotter—that a fish suspended by a thread would turn towards the wind. And in the same year, the opinion that a spider could not get out of a space enclosed within a circle formed of powdered unicorn's horn was actually made the subject of an experiment. The philosopher will however forget these early occupations of the Society when he meditates on the works of a Newton and a Davy, which are also recorded in the pages of its history.

The Society having presented an address to the king (Charles II.) on his restoration, his majesty expressed much satisfaction that the institution had originated in his reign, and promised to support it with his influence. And, in 1662, by the concurrence, it is said, of Lord Clarendon, the chancellor, Sir Geoffry Palmer, the attorney-general, and Sir Heneage Finch, the solicitor-general, he granted a charter, by which the members were incorporated into a Society consisting of a president, council, and fellows, under the name of the Royal Society. In this they were declared capable of holding lands, tenements, &c. in perpetuity or otherwise, and of suing or defending in any court of law; a coat of arms was given them, and they were allowed to have a common seal for their use. William Viscount Brouncker was appointed president, and twenty-one persons were appointed by name to form a council. It was further regulated that the president should be elected annually on St. Andrew's day, and that ten of the council should, at the same time, be replaced by ten other persons chosen from among the fellows. (Birch, *History of the Royal Society*, vol. i.) This charter being found not sufficiently explicit, in the following year another was obtained, in which the president and fellows are designated the President of the Council and the Fellows of the Royal Society of London for promoting natural knowledge; and in which, after declaring that the Society might hold lands, &c., there is added 'Statuto *de alienatione in manum mortuam* non obstante.' (Birch, *ut sup.*) Between 1661 and 1664, the king made several visits to the Society, and on those occasions experiments were exhibited, for the preparation of which committees of the members were appointed. In 1663 his majesty bestowed a mace on the Society, and in 1664 he signed himself, in the Charter-book, its founder: at the same time the duke of York (afterwards James II.) signed himself a fellow.

The Royal Society of London may now be said to have been completely formed, and it must be considered as the oldest of its kind in Europe, if we except the Academy of the Lyncei at Rome. The Académie Française, which, in 1635, had been established by Richelieu, had for its object only the improvement of the French language; and though, in 1657, a number of learned men, among whom were Descartes, Gassendi, and Roberval, were accustomed to assemble at the apartments of Père Mersenne in Paris, for the purpose of making philosophical experiments, and of reading the solutions of such mathematical problems as, according to the general practice of that age, had been proposed to them, yet it was not till 1666 that Louis XIV., at the suggestion of M. Colbert, founded what was then called the Royal Academy of Sciences for purposes similar to those which engaged the attention of the Royal Society. To the latter therefore belongs the honour of having proceded the former in time, and probably that of having in some measure led to its formation. It must also be considered as having been the parent of the numerous scientific institutions which have since been formed in the British Isles as well as on the Continent.

It is observed by Hume, that its patent was all that the Society obtained from the king, who, though a lover of the sciences, animated them by his example alone, not by his bounty; and the historian contrasts the conduct of the English king with that of his contemporary Louis XIV., who fell short of Charles in genius and knowledge, while he exceeded him in liberality. There may be truth in this, but it ought to be remembered that, in 1667, the Society received from the crown a free gift of what was then called Chelsea College, which it afterwards sold for its benefit.

From the time of the charter being granted, the business of the Society assumed more importance, and in 1664 Mr. Hooke was appointed curator, with a salary of 80*l.* per annum. The west gallery of Gresham College was appointed as a repository for the instruments which were under his charge, and for a museum of natural curiosities which had been given by Mr. Colwal, one of the members. Sir John Cutler also settled on Mr. Hooke 50*l.* per annum, in consideration of his delivering a course of lectures on the History of Nature and Art, under the regulation of the Society; and the latter, in the same year, formed itself into seven committees for the purpose of considering the different subjects of which it was cognizant. These were mechanics, astronomy and optics, anatomy, chemistry, agriculture, the history of trade, natural phenomena; and there was, besides, a committee to manage the correspondence. The Royal Society early received many tokens of approbation from foreign nations, as well as from the nobility and the learned in this country. It corresponded frequently with the scientific men in France, and it was invited by Prince Leopold, the brother of the grand-duke of Tuscany, to keep up a mutual communication with the philosophers of Florence. The Germans published in their books favourable testimonials of its labours, and foreigners of distinction often attended its weekly meetings.

The first portion, or number, of the 'Philosophical Transactions,' as the work which the Society published was designated, appeared on Monday, March 6, 1665. It contained sixteen quarto pages, with an introduction by the secretary of the Society, Mr. Oldenburg, who was considered as the editor; and it was intended that one such number should be published on the first Monday of every month. After the fifth number came out (June, 1665), the public meetings of the members were discontinued on account of the plague which then raged; but it appears from a letter written by Mr. Boyle, at Oxford, to Oldenburg, who remained in London, that several of the members were then in the former city, and that they met and made experiments at his lodgings. From these experiments and the communications made by some of the members, there were formed three more numbers of the 'Transactions;' these were published at Oxford; but the ninth and all the succeeding numbers came out in London. The title of the work was changed in 1679 to that of 'Philosophical Collections,' when Dr. Hooke became the editor; but the former title was restored in January, 1683, with No. 143, which was published by Dr. Plot, who was then the secretary.

The council met again in Gresham College, in February, 1666, but the public meetings of the Society did not take place till June in that year. In the same year the great fire, which laid nearly all London in ashes, having compelled the authorities of the city to take possession of the rooms hitherto occupied by the Society, the latter gratefully accepted the offer of apartments in Arundel House, and it met there for the first time in January, 1667. The munificent owner of the mansion, Mr. Henry Howard of Norfolk (afterwards earl marshal of England), at the same time presented the Society with the library which had been purchased by his grandfather, Thomas, earl of Arundel, and which had formerly belonged to Matthew Corvinus, king of Hungary. This valuable library, consisting of several thousand printed volumes and numerous manuscripts, thus became the property of the Society, which immediately took measures to put it under the care of its own officers, and it has been subsequently greatly increased by donations and purchases. Being probably anxious to trespass as little as possible on the hospitality of the noble family to whom the mansion belonged, the Society proposed (November, 1667) to raise, by subscription among its members, money to build a college for itself; and by May in the following year 1000*l.* were subscribed. Mr. Howard at the same time generously promised to give the ground for the purpose. The same gentleman also offered a design for the building, and both Dr. Christopher Wren and Mr. Hooke gave plans; but it does not appear that the project was carried any further. In October, 1674, at the invitation of the Gresham professors, the Society returned to its former apartments in that college, which had now the name of the Royal Exchange. The west gallery was cleared out for the Society as a repository, and the long gallery as a library for the reception of the books, which had till then remained at Arundel House.

Soon after this time the prosperity of the Society seems to have suffered some diminution. In 1667, when Dr. Sprat's 'History' was published, there were nearly 200 members; in 1673, it appears that the number was only 146, and of these, 79 were persons who had long neglected to pay their subscriptions. This great number of defaulters gave much uneasiness to those who wished well to the Society; and the latter, besides making pressing applications for the arrears, seriously contemplated an attempt to enforce payment by legal processes. It does not appear that this last measure was ever put in practice, and the council adopted a more effectual means of promoting the welfare of the Society in charging themselves with the duty of delivering lectures on philosophical subjects, and in providing a number of good experiments. The first lecture, in pursuance of this plan, appears to have been delivered in 1674, by Sir William Petty, and it was ordered to be printed. The president (Lord Brouncker) also proposed, in 1668, that a silver medal, worth about twenty shillings, should be given to any fellow, not a curator, who should make before the Society any particularly meritorious experiment.

Dame Lady Sadleir, the relict of Dr. Croone, one of the earliest members, left by her will, in 1706, a sum of money for the purpose of founding a lecture *for the advancement of natural knowledge*, to be read before the Royal Society; this did not however come into operation till 1738, when the first was delivered by Dr. Stuart. The Bakerian lecture on electro-chemistry was founded in 1774, and the first was delivered in 1775, by Mr. Peter Woulfe.

In the infancy of the Society a due attention to the characters of the persons admitted as fellows does not appear to have been always given; and, in consequence, many joined who neither paid the fees nor contributed any information at the meetings, and, at the same time, the number of those who were excused the payments was found to bear too great a proportion to the whole. In order to remedy these evils, in 1682, the president, Sir Christopher Wren, brought in the draught of a statute in which it was provided that any person proposing a candidate for admission should give his name to some member of the council; at the next or at some following meeting of the council, it was to be considered whether the proposed candidate was likely to be useful to the Society or not; if the members were satisfied on this head, the candidate was to be formally proposed at the next meeting, and afterwards balloted for as usual. On his election he was to sign the statute book, and on or before being admitted, he was to pay the prescribed fees. In the same year it was agreed that none except foreigners should be exempted from the payments It is to be presumed that the persons who were excused the payment of the admission-fees or the weekly subscriptions were such as, from the pressure of their circumstances, were unable to incur the expense, or such as, from the services which they rendered to the Society, might justly claim the exemption; but it must be regretted that, among those who petitioned to be excused on the former ground, is to be found the name of Newton. This great man, who was elected in January, 1672, though he was not admitted till February 1675 (probably on account of his residence being at Cambridge), cannot certainly be considered as one whose income did not enable him to make an annual payment of fifty-two shillings.

It was proposed, in October, 1674, to refuse to strangers the permission, which had been before granted, to be present at the meetings of the Society, from an opinion that members might be unwilling to bring forward their communications in the presence of such persons. And at the same time it was proposed that the members should bind themselves not to divulge what passed in their meetings, it being thought prejudicial to the interests of the Society that the particulars of the experiments and communications should be made known before they appeared in the printed 'Transactions.' We read that, on one occasion only, a lady was permitted to be present at the meetings of the Society; this was in 1667, when the duchess of Newcastle, having expressed a wish to that effect, it was agreed to invite her grace, and some experiments, which had been prepared for the purpose, were repeated in her presence.

In 1667 Dr. Sprat (afterwards bishop of Rochester) published the first edition of his 'History of the Royal Society;' and in that work, while the object of the Society is distinctly declared to be the promotion of philosophy by experiment and by the observation of natural phenomena, an effort is made to remove the misapprehensions respecting the tendency of its proceedings, which appear to have been generally entertained. It was objected that the members of the Society neglected the wiser and more discerning antients, and sought the guidance of their own unassisted judgments; and that, by admitting among them men of all countries and all religions, they endangered the stability of the established church. It was urged moreover that a philosophy founded on experiment was likely to lead to an overthrow of the Christian religion, and even to a denial of the existence of a Deity. Among these bigots were Henry Stubbe, a physician, at Warwick, and the Rev. Robert Crosse, of Somersetshire; both these persons wrote pamphlets, in which they attacked the Society with great virulence and scurrility of language, charging the members with bringing contempt on antient and solid learning, with undermining the universities, destroying Protestantism, and introducing popery in its stead. In his apology for the Society, Dr. Sprat asserts that it in reality reverences the footsteps of the antients, and that it willingly subscribes to their opinion in matters purely probable; but he claims for it the privilege of judging from facts, and he justifies this liberty by the practice of the Greeks, who, he observes, readily received the learning of the Egyptians, while they entirely rejected their superstitions. He further adds that the conversation of the learned men who first met at Oxford served to form a race of young students whose minds became imbued with a taste for natural knowledge; and that, by their influence, the discipline of the university was preserved from the spiritual frenzy which then prevailed in the kingdom. The Society also found an able apologist in Mr. Glanville, who, in 1668, published a pamphlet, entitled 'Plus Ultra, or the Progress of Knowledge since the days of Aristotle.'

By the death of Dr. Wilkins (then bishop of Chester), one of the earliest members, the Society obtained a legacy of 400*l*., which, in January, 1675, was laid out in the purchase of an annual income of 24*l*., from certain fee farm rents at Lewes in Sussex; and in January, 1682, the college and lands in Chelsea, which had been granted to the Society, were sold to the king for 1300*l*.; this sum was soon afterwards vested in African and East Indian stock; and from that time the Society began to possess a permanent revenue. Till the year 1668 no fixed salary was allowed to the secretary, but Mr. Oldenburg, who had long held that post, received 50*l*. occasionally; and in that year it was agreed to allow him 40*l*. per annum. After his death (1677) two secretaries were appointed, with salaries; but in 1685, Mr. Aston and Mr. Robinson declining on a sudden to serve the Society, the council resolved, in order to avoid the inconvenience of being so deserted in future, to have two honorary secretaries; it was agreed also to have a secretary with a fixed salary to transact the business, and the qualifications required in the person who should fill the latter post are stated at length in Birch's 'History,' vol. iv. Of the former, Sir John Hoskyns and Dr. Gale were the two first; and in January, 1686, Mr. Edmund Halley was appointed the paid secretary, at 50*l*. per annum.

In 1701 the Society, which till this time had continued to hold its meetings in Gresham College, removed to a spacious house which it purchased in Crane Court, Fleet Street. It had long been felt that the college was too remote from the dwellings of many of the members; and, as early as 1666, it had been proposed to obtain a house in Westminster. The house in Crane Court afforded room for the meetings, for the library, and for the museum of curiosities; and here the reading of papers and the exhibition of experiments took place, as before, till the year 1782, when the government assigned to the Society the apartments which it now occupies in Somerset House. On removing to the latter place, it became necessary to dispose of the museum for want of room; but this inconvenience has since been obviated, as in 1826 the rooms formerly used by the commissioners of the lottery were given up to the Society. The library is now very extensive, and a catalogue of the scientific books, lately made at a great expense, forms a thick octavo volume.

In 1703 Sir Isaac Newton was appointed president of the Society, and this honourable post was held by the greatest of philosophers till his death, which happened in 1727. The experiments of Newton on telescopes and on light and colours were amongst the first subjects which gave a value to the 'Transactions' of the Society; and the latter showed its sense of the honour which it derived from being able to number him among its fellows, by publishing, at its own expense, in 1686, the first edition of the 'Principia;' though its pecuniary circumstances could not then have been flourishing, since at the end of the following year it had incurred debts, for the payment of which it was obliged to sell part of its East India stock.

The service rendered to the cause of science from the beginning of the eighteenth century has earned for the Society the respect and gratitude of every man to whom the advancement of the human intellect is an object of high consideration. The Society numbers among those who are and who have been its members, some of the brightest ornaments of philosophy and human nature; and it may be said that most of the discoveries by which the face of science has been changed have been made known to the world through the papers published in the volumes of its 'Transactions.' In proof of this we may refer to Dr. Thomson's 'History of the Royal Society,' in which the subjects of the papers are reduced under the heads of natural history, mathematics, mechanical philosophy, and chemistry, besides some miscellaneous matters; also to the volumes of the 'Transactions' which have been published since 1800, when the above-mentioned 'History' terminates, and which contain, among others of great value, the papers of Sir Humphry Davy, with those of Faraday, Young, Kater, and Wollaston.

It has been said above that the 'Philosophical Transactions' were at first published in monthly numbers: these were afterwards collected into volumes, and, from the commencement in 1665 to the year 1800, the work consisted of 90 volumes. From that time a volume has come out annually, and, up to the present year (1841), 131 volumes have been published. It appears that, till the 47th volume was published, the printing of the Transactions was entirely the act of the several secretaries, the Society never interesting itself further in that matter than by occasionally recommending the revival of the publication, when from any circumstance it appeared to be suspended. But in 1752 a committee was appointed to consider the papers which were read before the Society, and to select such as should be judged most proper to appear in the future Transactions; and this practice has ever since been followed. The Society however constantly declares that it never, as a body, gives its opinion on any subject, whether of nature or art, which comes before it; the facts and reasonings stated in their papers resting entirely on the credit and judgment of their respective authors.

Honorary recompenses have been liberally bestowed by the Society on persons distinguished by their discoveries in pure science or in philosophy. The first occasion on which the Society became possessed of the means of so rewarding merit arose from a bequest of Sir Godfrey Copley, one of its members; this gentleman, at his death in 1709, left 100*l*., the interest of which, or five pounds, was to be given annually to the person who, in the course of the preceding year, had written the best paper on any subject relating to experimental philosophy. The donation has since been put in the more liberal form of a gold medal, and it is awarded indifferently either to foreigners or Englishmen, for the sake of encouraging an honourable competition among the philosophers of all countries.

In 1796 Sir Benjamin Thomson (Count Rumford) presented to the Society 1000*l*. in the 3 per cent. stock, for the purpose of forming, with the interest for two years (60*l*.), a biennial prize to be given for the most important discovery or the most useful improvement made during the two preceding years on heat or on light. The prize is given in the form of a gold and a silver medal, both of which are struck in the same die. During several of the biennial periods no opportunity occurred of awarding the prize, and at these times the interest was added to the principal sum. The interest of this additional sum is always given with the two medals; and the first who received the prize was Count Rumford himself, in 1800; and the second was Professor Leslie (1804). In 1825 his majesty George IV., for the purpose of further promoting the objects and progress of science, made to the Society an annual grant of 100 guineas in order to establish two prize medals, which are to be presented to the persons who during the year shall make the most important discovery in science or art; and in 1826 the medals were awarded to Mr. John Dalton and Mr. James Ivory.

On delivering to a gentleman the medal which had been awarded to him for his discoveries in science, Sir John Pringle, who held the office of president from 1772 to 1778, made it a rule to deliver a speech, in which, after touching on the history of that branch of philosophy to which the discovery or communication referred, he stated the particular points in which the individual had distinguished himself. The first of these speeches was made on presenting to Dr. Priestley the gold medal for his paper entitled 'Observations on the different kinds of Air,' which had been read before the Society, in March, 1772. Five other speeches were delivered by the same president on similar occasions; and all the six are considered elegant compositions, as well as learned and critical dissertations. This liberal practice, by which the value of the testimonial to the receiver is so much enhanced, is still continued; and it is also become customary, at every anniversary meeting, to notice, in an appropriate speech, the principal circumstances in the life of any distinguished member who may have died during the year. When the council, in 1826, had awarded the royal medals to Mr. Dalton of Manchester and to Mr. Ivory, the President, Sir Humphry Davy, took occasion to state that the first was for the development of the chemical theory of definite proportions, commonly called the *atomic theory*, and for various other labours in chemical and physical science. He further observed that Dalton's discovery had laid the foundation for future researches respecting the sublime and transcendental part of corpuscular action; and he compared the merits of the discoverer, in this respect, to those of Kepler in astronomy. The president also stated that the second medal was awarded to Mr. Ivory for his papers on the laws regulating the forms of planets, on astronomical refractions, and for other mathematical illustrations of important points in astronomy; and he paid at the same time some high compliments to Mr. Ivory for his disinterested pursuit of objects of science which have no immediate popularity. One of the Copley medals had been on the preceding year awarded to M. Arago and another to Mr. Barlow, for their discoveries in magnetism. On the same occasion the president mentioned with particular notice, among the foreign members deceased, Scarpa, the celebrated anatomist of Pavia, and Piazzi, the astronomer, who discovered the planet Ceres; and, among the home members, Mr. Taylor Combe and Sir Stamford Raffles.

The nobleman who now occupies the chair of the Royal Society, following the example of his illustrious predecessors, delivered at the last anniversary meeting (November 30, 1840) an eloquent address which has been printed at the request of the Fellows. On this occasion the royal medals were presented to Sir John F. W. Herschel for his discoveries in optics and chemistry, and to Professor Wheatstone for his solution of the phenomena of double vision. One of the Copley medals was presented to Professor Liebig for his researches in chemistry, and another to M. Sturm for his mathematical labours; and lastly the Rumford medal was presented to M. Biot for his researches on light.

It is perhaps impossible that, in a large body of men engaged in similar pursuits, differences should not arise; and the Royal Society has not been entirely free from the evils attending disagreements among its members. In 1778 a dispute about the comparative advantages of blunt and pointed conductors for protecting buildings from the effects of lightning arose to such a height that the president, Sir John Pringle, felt himself compelled to resign. [PRINGLE, JOHN.] At a later period Sir Joseph Banks was accused of partiality in the disposal of the medals and even in the election of members; and, under the impression that his government was arbitrary, scientific men were deterred from making communications to the Society. Even the awards of the medals to Dalton and Ivory by Sir Humphry Davy were made subjects of animadversion, on the ground that the discoveries of the former had been indicated by another person, and that the researches of the latter were not immediately useful to man. In the first instance mentioned above, the president may have erred in putting himself at the head of a party in the Society; but it is probable that most of the grievances subsequently complained of originated only in the disappointed expectations of ambitious individuals. If at any time however the complaints have not been without foundation, the elevated character of the papers which within the last twenty years have been published in the 'Transactions,' shows that the interests of science have been generously placed above every private consideration.

According to the present statutes of the Society, every candidate for admission must be recommended by a certificate in writing signed by six or more Fellows, of whom three at least must certify that the recommendation is from personal knowledge; and the name, qualifications, &c. of the candidate must remain in the meeting-room of the Society during five ordinary meetings before he can be put to the vote. The votes are taken by ballot, and the person cannot be elected unless two-thirds of the number present vote in his favour. The person elected must appear for admission on or before the fourth ordinary meeting of the Society after his election; and previously to such appearance he must pay the sum of 10*l.* for admission money: he must also pay 4*l.* per annum as long as he continues a fellow of the Society; but the annual payments may be compounded for by paying at once the sum of 60*l.* Fellows are entitled gratis to a copy of the 'Philosophical Transactions,' commencing with that volume which is published next after their admission. Any Fellow disobeying the statutes or orders of the Society or council, or defaming the Society by speaking, writing, or printing, or doing anything detrimental or dishonourable to the Society, will be ejected from it.

A prince of the blood, a peer of the United Kingdom, a member of the Privy Council, any foreign sovereign prince, or the son of such prince, may be proposed at one of the ordinary meetings of the Society, and voted for on the same day; notice having been given of such proposal at the preceding meeting of the Society. Foreign members are exempted from the obligations which ordinary fellows are enjoined to perform; but their number is not to exceed fifty.

The council and officers for the ensuing year are elected on the 30th November; the latter consist of the president, treasurer, principal secretaries, and foreign secretary. The new council consists of eleven members of the existing council and of ten fellows who are not so. These are nominated previously to the anniversary meeting.

The president presides at the meetings, and regulates the debates of the Society, the council, and the committees; he states questions, calls for reports and accounts, checks irregularities, and observes that the statutes of the Society are executed. The treasurer receives all money due to the Society and disburses all sums payable by it; he also keeps accounts of the receipts and payments. He has charge of the title-deeds of the Society's estates, the policies of insurance, &c. The secretaries attend all meetings of the Society, the council, and the committees of papers; on such occasions, when the president has taken the chair, the senior secretary reads the minutes of the preceding meeting, and afterwards takes minutes of the business and orders of the present meeting; these are to be entered by the assistant-secretary in the books to which they relate. They have also charge (under the directions of the committee of papers) of printing the 'Philosophical Transactions.' The assistant-secretary is not a fellow of the Society, and is paid for his services. He enters all minutes in the journal-books, and makes an index to each; he has the custody of the charter-book, statute-book, &c., and of all papers and writings belonging to the Society. The librarian attends at the library every Monday and Thursday, from 11 A.M. to 4 P.M., for the accommodation of such fellows as come to read the books and MSS.

The ordinary meetings of the Society are held once a week, from November till the end of Trinity term, at half past 8 P.M., in the apartments at Somerset House.

In the introduction to Dr. Thomson's 'History of the Royal Society,' there is given a list of all the presidents, from Lord Brouncker, who was appointed in 1663, to Sir Joseph Banks, who was elected in 1778, and who held the chair till his death (1820). The succeeding presidents were:—

Sir Humphry Davy,	elected in	1820,
Mr. Davies Gilbert,	„	1827,
H. R. H. the Duke of Sussex,	„	1830,
The Marquis of Northampton (who continues)		1838.

The offices of principal Secretaries have been successively filled, since 1807, by Sir H. Davy, Dr. Wollaston, Mr. Combe, Mr. Brande, Sir John Herschel, Mr. Children, Major Sabine, Dr. Roget, and Mr. Christie: the two last named of whom are the present Secretaries. Mr. Daniell is the present Foreign Secretary.

During many years the Royal Society may be said to have been the depository of nearly all the science of the country; but that science became at length too extensive to be adequately cultivated by one body of men, and then separate and independent societies formed themselves, each having in view the promotion of one particular branch of the philosophy of nature or one branch of the arts. The labours already accomplished by these associations are such, that the Royal Society may be justly proud of them as the works of her children; and the high place which she continues to hold, in the promotion of the sciences generally, cannot fail to inspire the societies themselves with reverence for the body from whence they diverged.

The important part which the Royal Society has performed in advancing the objects of the British Association in the present expedition to the antarctic regions of the earth for scientific objects, deserves to be particularly mentioned in this place. The lords commissioners of the Admiralty having requested the president and council of the Society to communicate for their information any suggestions concerning the subjects to which they might wish the attention of Captain James Ross to be directed, the council formed itself into five distinct committees, consisting of members particularly conversant with the several branches of science comprehended in the observations and experiments proposed to be made during the voyage. The result of their labours is a series of reports on the several objects of scientific inquiry in physics, meteorology, geology and mineralogy, botany and zoology: and the report on physics and meteorology, which has been printed, contains a course of instruction relating to the use of the instruments to be employed, and to the manner of making the necessary observations for terrestrial magnetism, the figure of the earth, the tides, meteorology, the distribution of temperature in the sea and on land, currents, the depth of the sea, variable stars, refraction, and eclipses. It may be objected that the details of all the subjects of inquiry are too numerous to be accomplished in the time allowed for the voyage, but it ought to be observed that the instructions profess to have been drawn up not only as a guide for the persons employed on the present expedition, but also to enable scientific persons in general to co-operate in promoting the same objects.

The Royal Society of Göttingen was established by George I. in 1751, and it has published several volumes of Transactions.

The Royal Society of Edinburgh was incorporated by a charter in 1783; though, under the name of the Philosophical Society of Edinburgh, the association had existed since 1739, in which year it was formed by the influence of Mr. Maclaurin and other learned men in the metropolis of Scotland. In 1811 the Society obtained a new charter, by which it was impowered to form a library and a museum. A volume of its 'Transactions' comes out as often as the number of papers which are thought worthy of being printed are sufficient to make one; and up to the present year (1841) fourteen volumes have been published. A medal of the value of 60*l.*, arising from a part of the interest on 100*l.* which had been left by Mr. Alexander Keith, in 1819, for advancing the sciences and arts of Scotland, is awarded as a biennial prize for the most important scientific discoveries which may be communicated to the Society and published in its 'Transactions.' This Keith medal was adjudged, for the first time, to Dr. (Sir David) Brewster in 1828.

ROYALTY. The French words *roi* and *royal* correspond to the Latin words *rex* and *regalis*; and from *royal* has been formed *royalté* (now *royauté*); whence has been borrowed the English word *royalty*. The corresponding Latin word is *regalitas*, which occurs in the Latin of the middle ages. (Ducange, *in v.*)

Royalty properly denotes the condition or *status* of a person of royal rank, such as a king or queen, or reigning prince or duke, or any of their kindred. [KING.] The possession of the royal *status* or condition does not indicate that the possessor of it is invested with any determinate political powers; and therefore *royalty* is not equivalent to *monarchy* or *sovereignty*. A royal person is not necessarily a monarch; or, in other words, does not necessarily possess the entire sovereign power. The powers possessed by persons of royal dignity have been very different in different times and places; and have varied from the performance of some merely honorary functions to the exercise of the entire sovereignty. The *kings* (ἄνακτες, βασιλῆες) of the Homeric age were properly a governing class of nobles. (See Müller, *Hist. of Liter. of Greece*, ch. 4, § 1.) Thus Telemachus says that there are many kings in Ithaca, both old and young, besides himself (*Od.*, i. 394); and Alcinous says that he rules over the Phæacians, with twelve other kings (*Od.*, viii. 390). As popular institutions were developed in Greece, the office of king became, in several states, merely honorary, and was particularly connected with the performance of certain antient religious rites. Thus, at Athens, the king-archon (ἄρχων βασιλεύς) was an annual officer, who had the superintendence of religious affairs; his wife was called, during the year of office, *βασίλισσα*, or *queen*. (Compare Hermann, *Gr. Ant.*, § 56.) Rome likewise retained, after the expulsion of its kings, a high sacerdotal officer, named the *king of the sacrifices* (rex sacrificulus), who performed the sacred rites which had formerly been performed by the kings. In like manner the Teutonic kings were only the chiefs of the military and sacerdotal aristocracy of the tribe, and did not possess the entire sovereign power ('nec regibus infinita ac libera potestas,' says Tacitus, *Germ.*, 7. See Grimm, *Deutsche Rechtsalterthümer*, p. 229-65). In more modern times, the kings of England, France (since 1815), Holland, Belgium, Bavaria, Saxony, Wirtemburg, Spain, and Portugal (since the late revolutions) have possessed only a share of the sovereign power.

On the other hand many kings have possessed the entire sovereign power, and have therefore been monarchs properly so called. Such were the kings of antient Persia, and the kings of France and Spain in the seventeenth and eighteenth centuries, and such are the kings of Prussia.

From the preceding observations it results that the name of king or the possession of the royal *status* does not determine the political powers of the person indicated (as would be the case if he were called monarch or sovereign); but that *king* is a title of honour which may be borne by persons having very different amounts and sorts of political power. 'Titles of office,' says Mr. Bentham, 'are aggregates of dissimilar parts, which cannot be compared until we know the nature of their constituent elements. If these elements were determined, they would form the basis of a universal political language. But as it is, how can the powers of the officers of a government be described except with reference to the actual institutions of some given state? What relation is there between the First Consul of France and the consuls of Rome, or the consuls of trade? between the king of England, the king of Sweden, and the king of Prussia? between the emperor of Germany and the emperor of Russia? between the antient *duc et pair* of France, the English duke, the grand-duke of Russia, the grand-duke of Tuscany? between the mayor of Bordeaux and the mayor of London? A volume would not suffice to state all these discrepancies.' (*Traités de Législation*, tom. i., p. 309.)

In popular discourse *royalty* is made equivalent to *monarchy* or *sovereignty*; and a king is called monarch or sovereign without any reference to the fact whether he possesses the entire sovereign power or only a portion of it. The principal causes of this confusion are stated in MONARCHY. The confusion is attended with important consequences both in speculative and practical politics.

It may be added, that the attribute of royalty is sometimes transferred metaphorically to certain animals or species of animals, in order to denote pre-eminence. Thus the principal bee in the hive is called the *queen-bee* [BEE, vol. iv., p. 151] (called the *king-bee* by the Romans: Virg., *Georg.*, iv., 68. 75, 95, 106, 212); the lion is known (particularly in fables) as the king of animals; and a species of tiger is styled the *royal tiger*. [TIGER.] Compare SOVEREIGNTY.

ROYDSIA, an Indian genus of plants allied to the natural family of Capparideæ, named by Dr. Roxburgh in compliment to Sir J. Royds, one of the judges of the supreme court of Bengal, whom he describes as an eminent benefactor to the science of botany. The genus consists of a single species indigenous in the forests of Silhet, where, with a stout stem and numerous branches, it climbs over the trees to a great extent, and flowers in the month of March, diffusing a strong but pleasant odour from its numerous blossoms, arranged in axillary racemes or terminal panicles. The leaves are alternate, oblong, coriaceous, smooth on both sides, and without stipules. The calyx is six-partite and of a pale yellow colour. Corol none. Stamens numerous, with the filaments inserted on the apex of a short column. Ovary pedicelled, three-celled, with two rows of ovules in each, attached to the axis. Drupe berried, of the size of a large olive, orange-coloured. Pulp abundant and yellow. Nut oblong, single-celled and three-valved. Seed solitary, conformable to the nut. The plant is figured in Roxburgh's 'Coromandel Plants,' p. 289, and is well suited to the hothouses of this country.

ROYE. [SOMME.]

RO'YLEA, a Himalayan genus of plants, of the natural family of Labiatæ and tribe Ballotese, named by Dr. Wallich in compliment to Dr. Royle, author of the 'Illustrations of the Botany of the Himalayan Mountains and of Cashmere,' who first found it on the Sirmore Mountains. The plant forms a handsome shrub, with many branches and an abundance of pale-green glaucous leaves. It is characterised by having the calyx ovate, tubular, 10-nerved, and semi-quinquefid; corol shorter than the calyx, two-lipped, lips unequal; stamens 4, didynamous, ascending under the upper lip; anthers bilocular; style bifid.

R. elegans, the only species known, is called *putkuroo* by the natives of the mountains, where it is indigenous, and is employed by them as a febrifuge. It is suited to the shrubberies of this country.

ROYSTON. [HERTFORDSHIRE.]

ROYSTON CROW, the common English name for the *Hooded Crow*, *Corvus Cornix*, Linn.

Description.—Male.—Head and the whole body fine grey-ash colour; throat, wings, and rounded tail black with browned reflections; bill and feet black; iris brown. Length about 22 inches.

Female.—Less than the male; the black on the throat not so extensive in front as it is in him; reflections of the wings and tail less vivid; and the grey of the body more clouded with rusty hue.

The *young* assume the colour of their parents at an early period.

This is the *Mulacchia, Munacchia, Cornacchia,* and *Corvo palumbino* of the Italians; *Corneille sauvage* and *Corneille mantelée* of the French; *Kraka* of the Swedes; *Grau-krähe* and *Nebel-krähe* of the Germans; and *Brunyr Jwerddon* of the antient British.

Habits, Food, &c.—The sea-shore and the banks of tidal rivers are the favourite haunts of this species, though they are frequently found far inland, and animal substances are preferred by them as food. Sand-worms, shell-fish, crustaceans, and other animal matters left by the retiring tide seem to be most welcome to them. They appear to be both knowing and affectionate. Mr. Selby repeatedly observed one of these birds to soar up to a considerable height in the air with a cockle or muscle in its bill, and then drop it upon the rock in order to obtain the included fish. Pennant tells a painful story of its affection. 'One,' says he, 'which had been shot and hung by its legs on a tree adjacent to the nest, was discovered by its companion on returning from forage. It perched over the dead body and surveyed it attentively, as if in expectation of its revival; at length, on a windy day, the corpse being put in motion, the survivor, deceived by it, descended, fluttering round for a considerable time, endeavouring to release its mate and uttering a melancholy scream; at last, finding its efforts to be in vain, it retired without ever returning to its usual haunts.' The same author however gives the species a very bad character for mischief, worse even than that of the *Carrion Crow*, and says that they pick out the eyes of lambs, and even of horses when bogged; whence they are proscribed in many places, and a price set upon their heads. He adds that for want of other food they will eat cranberries and other mountain-berries.

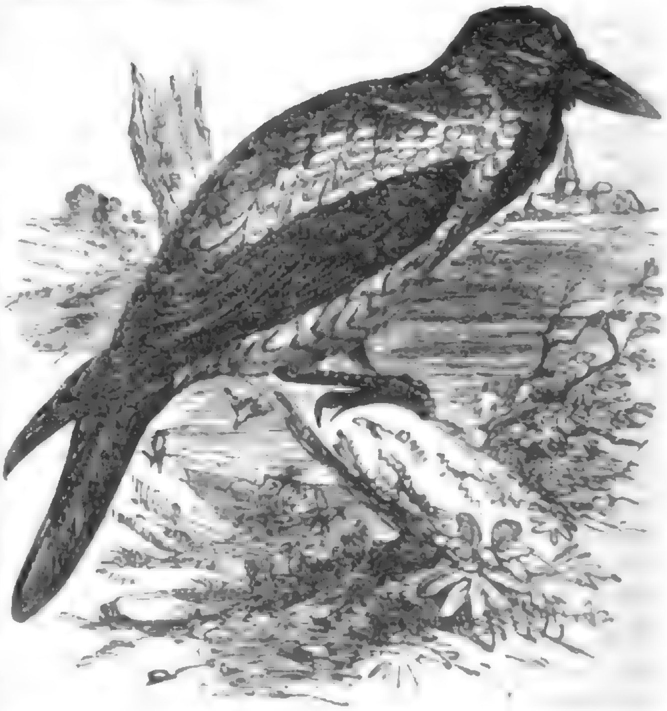
The nest is generally built in trees; but in their absence, among rocks and deep chasms in hill sides. Mr. Salmon, who found it in the last-mentioned localities in Orkney, describes the outside of the nest as composed of withered heather and large roots or stalks, and the lining as being of wool and hair: the three young in one nest which he looked into, were of the same colours as the parents. The eggs, four or five in number, are greenish mottled with dark brown.

The Hooded Crow is said to be more docile in learning to speak than the Carrion Crow. In the *Portraits d'Oyseaux* the following quatrain appears under a very fair cut of this species:—

'Ceste Corneille est dite emmantelée,
Qui seulement en hyver se peut voir.
Sa couleur est cendrée avec le noir,
Comme un manteau; dont elle est appellée.

Geographical Distribution.—Extensive. In Europe it is widely spread. Denmark, Sweden, Norway, Germany, Holland, our own islands, Italy (where it is permanent according to the Prince of Canino), and France possess it. It is found at Iceland, in Russia, and Siberia, but not beyond the Lena. It is common in Smyrna, according to Mr. Strickland. The Grecian Archipelago generally possesses it, and it occurs in the countries between the Black and the Caspian seas. Latham states that it is very common in some parts of India. Sonnerat saw it in the Philippine Islands. Temminck states that it swarms in Carinthia and Croatia, and that it is very common in Japan.

In the southern parts of this island the Hooded Crow is a winter visitor, arriving about the time of the appearance of the Woodcocks, and departing northward in April. There are instances on record of these birds breeding as far south as King's Lynn in Norfolk. In the north and west of Scotland, the Hebrides, and the Orkney and Shetland Islands the species is permanent throughout the year. The English visitors are supposed to come from Sweden, Norway, and other countries to the north-east. In the north of Ireland this crow is indigenous. In the Faroe Islands it breeds in considerable numbers.



Corvus Cornix.

Varieties.—Sometimes entirely white; at others entirely black or blackish.

HYBRIDS.

There are several instances on record of a fertile union between the Carrion Crow (*Corvus Corone*) and the Hooded Crow.

Mr. Williamson says, 'The Hooded Crow has been known to breed near Scarborough on two or three occasions. In one instance a female Hooded Crow was observed to pair with a Carrion Crow on a large tree at Hackness, where they succeeded in rearing their young. The Carrion Crow was shot by the gamekeeper, but the following year the Hooded Crow returned with a new mate of the same sable hue as the former one to her old nest. The Carrion and young Crows were again all shot; the old female by her vigilance escaped all the efforts of the keepers to destroy her, and a third time returned with a fresh mate; she was not however again successful, but was shot, and is now preserved in the Scarborough Museum. The young birds varied, some resembling the Hooded and others the Carrion Crow in their plumage.' (*Zool. Proc.*, 1836.) Mr. Selby has noticed such a union at Fowberry. (*Address to the Berwickshire Naturalists' Club*, 1834.) The same ornithologist mentions that Sir W. Jardine observed a similar pairing in Dumfriesshire. Temminck also observes that a mixed breed between the Hooded Crow and Carrion Crow sometimes occurs in the northern countries, where the latter is scarce.

'For four successive years,' says a correspondent in the *Field Naturalist*, 'I had opportunities of witnessing the pairing of the Carrion Crow and the Hooded Crow in some large beech-trees which surround my house in Forfarshire. They never occupied the old nest, nor did they always build their nest on the same tree; nor was I positively certain that it was the same individuals who returned every year to these trees, though it is probable they were, for they were never molested. Knowing the predatory propensities of the Carrion Crow on hen's eggs, young ducks, and even Turkey poults, I would have shot them had they been a pair of Carrion Crows; but I was anxious to mark the result of what appeared to me at the time to be a remarkable union. Judging from the manners of the two birds, the almost constant incubation, and carefulness exhibited, I should say that the Hooded Crow was the female, though the Carrion Crow did frequently sit upon the eggs. After the young of the first year took wing, I perceived that the one was a Carrion and the other a Hooded Crow; and this distinctive character was maintained in the young which were hatched every year as long as I remained in the country. I shot the first young pair, and ascertained that the Hooded one was the female, and the Carrion was the male, which confirmed me in my conjectures of the sexes of the parents. Ever after young and old were unmolested by me; but notwithstanding the increase of number every year after the first one, only one pair came annually to build on these beech-trees. In Atkinson's *Compendium of the Ornithology of Great Britain*, the pairing of a male Hooded Crow with a female Carrion Crow at Aroquhar on Loch Long is recorded. Their nest, which was like that of a Carrion Crow, was built in the fork of a tall pine, and the union lasted for three or four years.

RUBEFACIENTS are external agents which cause redness of the part to which they are applied. If long continued, they may, according to their nature, produce inflammation and some of its consequences. In such circumstances they are termed BLISTERS, or ESCHAROTICS. It is however a degree of action short of what entitles them to these appellations which is now contemplated. Thus friction with the hand or warm cloths often relieves spasmodic or neuralgic pains; and a hot poultice or warm fomentations lessen inflammation of superficial or even deep-seated parts. Embrocations, when of a stimulating kind, act as rubefacients; and blisters kept in contact with the surface for a short time only, cause redness of the part, and some remote secondary effects of a very beneficial kind. Many cases of fever in the sinking stage may be recovered by a succession of flying blisters, as these temporary applications are termed, placed on different parts of the body, particularly over parts where the skin is thin. Their action may be expedited by previously rubbing the part with proof spirit or oil of turpentine, or by using a portion of linen steeped in the acetum cantharidis instead of the common blister. By diligent employment of such means many valuable lives may be saved. (See Dr. Graves, in Johnson's 'Medico-Chirurg. Review,' for Oct. 1835, p. 529.) Rubefacients are also very usefully applied to the spine in many nervous diseases.

RUBELLITE. [TOURMALINE.]

RUBENS, PETER PAUL, the most celebrated painter of the Flemish school, was born at Cologne, on the 29th of June, 1577. His father, John Rubens, who was one of the échevins of Antwerp, had taken refuge at Cologne with his family, in consequence of the disturbances prevailing in the Netherlands. In that city he died, in the year 1587. His widow shortly afterwards took advantage of the restoration of Flanders to the Roman Catholic faith by the victories of the Duke of Parma, and returned to Antwerp. In his 16th year Peter Paul Rubens was placed as a page in the household of the Countess of Lalaing, but the life did not suit him, and he soon returned home. At his own desire he became the pupil, first of Tobias Verhaegt, a landscape painter, and then of Adrian van Oort, who was celebrated as a colourist. His next master was Otho van Veen, or, as he is commonly called, Otho Venius, court painter to the Infanta Isabella and the Archduke Albert. In the year 1600, when Rubens was 23 years old, he was advised by his master to visit Italy. He was already thoroughly conversant with all the technical and general knowledge which would enable him to reap the full benefit from such a journey, and he had executed some considerable pictures. He proceeded first to Venice, and thence to Mantua, where his letters of recommendation from the Archduke Albert secured him the favour of the Duke Vincenzio Gonzaga. At his court Rubens accepted the place of gentleman of the chamber, and availed himself of the opportunity thus afforded him of studying the frescoes of Giulio Romano and the other works of art then belonging to the family of Gonzaga. In 1601 he went to Rome for a short time, and after returning to Mantua, visited Venice, and devoted himself to the study of the pictures of Titian and Paul Veronese. The works of these two masters probably exercised the strongest influence in the full development of his natural genius for colour. The Archduke Albert commissioned Rubens to paint three pictures for the church of Santa Croce in Gerusalemme, at Rome, and he returned thither for that purpose, and with the object of copying some celebrated pictures for the Duke of Mantua, and he probably visited Florence in his way back. In 1605 the Duke Vincenzio Gonzaga sent him on a special mission to Spain with a present for Philip III. That king received him most graciously, and after painting a large number of portraits of persons connected with the court of Madrid, he returned to Mantua. He paid a third visit to Rome, where he was joined by his elder brother Philip, and in 1607 went through Milan to Genoa. In the latter city he executed many works, and a great number of his pictures still remain there. In 1608 he received news of his mother's illness, and returned immediately to Antwerp, where however he arrived too late to find her alive.

The wishes of Albert and Isabella induced Rubens to abandon his project of returning to Italy; and in 1609 he married his first wife, Elizabeth Brant, and settled at Antwerp. The beautiful picture in the Munich gallery, representing himself and his wife seated in a garden, was probably painted shortly after his marriage. The outline is more precise and the style more true and homely than in most of his works. The best account of its characteristic merits is to be found in a note of Mrs. Jameson's to Dr. Waagen's 'Life of Rubens' (Translation, p. 21). In the year 1620 Rubens was commissioned to paint the series of pictures now in the Louvre which represent the principal events in the life of Maria de' Medici. He went to Paris, and received his instructions for these works, but the pictures themselves were executed at Antwerp, for the most part by the hands of his numerous pupils. In fact, as they were placed in the Luxembourg in 1625, it was physically impossible that he should have painted them himself. The original sketches, now in the Munich gallery, are very far superior to the finished pictures. During his last residence at Paris, Rubens became acquainted with the Duke of Buckingham, who purchased his collection of statues and other works of art for 60,000 florins, or according to De Piles, for 100,000. In 1626 Rubens lost his wife, and he shortly afterwards made a journey, in which he visited the principal Dutch painters of that time.

Rubens had been highly esteemed by the Archduke Albert, and after the death of that prince he continued in the favour of his widow the Infanta. On her return from the siege of Breda, in company with Spinola, in 1625, she visited Rubens's house; and in 1627, when Charles I. declared war against France, Rubens was entrusted with some negociations with Gerbier, Charles's agent at the Hague. In the autumn of the same year he was dispatched to Madrid. During his stay in Spain he executed several very fine pictures, and gained the favour of Philip IV. and the Count-Duke of Olivarez. In 1629 Rubens was sent by the Infanta as ambassador to England. The painter succeeded as a diplomatist, and his merits in procuring Charles's acquiescence in the peace were recognised by the court of Spain. Whilst in England, he stood high in the favour of Charles I., whose feeling for the fine arts seems to have been of the strongest kind. The allegory of War and Peace, now in the National Gallery, was painted as a suitable present to the king, on the occasion of these negociations. After the breaking up of Charles's matchless collection, this picture was transferred to Genoa, but was purchased during the French revolution from the Doria family, and thus restored to this country. The ceiling of Whitehall was sketched during Rubens's stay in England, but painted at Antwerp at a later period. For the latter work he is said to have received 3000*l*. In 1631 Rubens married his second wife, Helena Forman, a beautiful girl of sixteen. Her portrait often recurs in his pictures. He was again employed on a mission to Holland in 1633; and in December of that year, his patroness, the Infanta Isabella, died.

Rubens's fame now stood very high, and the commissions he received could only be executed by the aid of his numerous and able pupils. In 1635 he became subject to gout in the hands, which disabled him from painting with ease on a large scale. At the request of the authorities of Antwerp, he executed sketches for the decoration of the arches to be erected on the entry of the Cardinal Infant, Don Ferdinand, the new regent of the Low Countries. In 1540 the disease under which he had suffered caused his death. He expired in the 63rd year of his age, and was buried in the church of St. James at Antwerp.

Rubens's personal appearance was prepossessing, and his manner and conduct such as to make him generally beloved. Towards other artists he acted with the greatest generosity, and he is said to have relieved the poverty of Vandyck by purchasing all the pictures which that artist had in his studio.

His own character and merits as a painter have been the subject of much controversy, and will probably always furnish matter for discussion.

In all questions of literature and art, we are never satisfied without constantly comparing things which are in themselves utterly dissimilar. The source of pleasure from works of art is obscure, and the nature of the pleasure itself is little capable of definition, but men think to obtain greater precision, and to arrive at the reason why they are pleased, by this process of comparison. To a certain extent perhaps we may succeed, but in general such comparisons have a tendency to narrow our field of enjoyment, and to lead us to dogmatise on what cannot be reduced to fixed rules. A man may derive greater satisfaction from the works of Perugino or Francesco Francia than from those of Rubens or Teniers; he may feel the beauty of the Parthenon more than that of Strasburg cathedral; but he is not therefore justified in saying that Rubens was a bad painter, or that Erwin of Steinbach was an indifferent architect.

The principal sources of pleasure in painting appear to be form, composition, colour, and, the highest of all, the expression of human character and action. The subdivisions of this last branch are of course infinite, and comprise the higher and holier feelings, as well as those which are more properly a portion of our animal nature. In those parts of his art which act immediately on the senses, Rubens was without doubt a great master. He understood the perfect management of light and shade, of composition, and of colour. If his merits are disputed, it is with reference to the subjects which he painted and to his mode of treating them, not to his technical skill. Before his visit to Italy he had acquired an individual character as an artist. The fruit of his labours there was not a crude mass of detached imitations, but, whilst he carefully studied the great masters at Venice and elsewhere, his vigorous genius assimilated and appropriated to itself all that it took up or borrowed. The excess of individual peculiarity in Rubens certainly amounts to *manner* in the narrower sense of the word. That peculiarity of feeling too did not dwell on the forms which are best fitted for expressing the tranquil and devotional sentiments which prevail in early Christian art, but still, such as it was, it was eminently characteristic of a *great painter*. Sculpture exceeds painting in its power of expressing form, and equals it in that of portraying fixed character; but painting only can express the tumult and energy of human action in full power and motion. In this Rubens excelled, and it is surely no mean excellence. We are ready to grant that his Madonnas are, for the most part, clumsy and undignified; that their forms are unfitted for the being whom they represent; and that exaggeration sometimes disfigures scenes where quiet and holy feelings would be more in place. Notwithstanding all this, the stronger human passions and actions have an intense interest for mankind. The animal energy and the sensual characteristics of man are a part of that complex whole which we call human nature, although they are not the most elevated part. If art is to represent man as he is, these elements cannot be wholly overlooked. The Greek drama displayed them too glaringly in the olden comedy, and Greek sculpture embodied them in its fawns and satyrs. An acute sense of beauty indeed generally softened the more disgusting features, and we might wish that Rubens had been oftener touched with similar scruples. We must take him however as he is; with all his technical excellence, and with all the incomparable energy and heartiness which animates his best works. In them there is none of that idle filling up of vacant corners, or that insertion of cold academic figures wholly unconcerned with the scenes portrayed, which we find in works of the same kind by other masters. If we look at Rubens's Village Fête, in the Louvre, the ring of peasants wheel round in the dance with a drunken merriment which seems in actual motion before us. The smaller picture of the Last Judgment, at Munich, is just as wonderful for this quality of movement, as for its glorious colour and execution. His Battle of the Amazons, in the same collection, conveys, in a most wonderful degree, the struggle and energy of a combat. Action and life he never failed to represent as no other painter has done before or since, and this alone, in our opinion, entitles him to a place in the very foremost rank of artists.

In landscape, Rubens's facility of execution and gorgeous colour produce a marvellous effect. His hunting-pieces and portraits are equally celebrated. The picture commonly referred to as the chef-d'œuvre of Rubens is the Descent from the Cross, at Antwerp. The best of his works are in the Munich gallery (principally derived from the Düsseldorf collection) and at Blenheim and Vienna. Many fine pictures by him remain in Spain, and many of course at Antwerp.

His principal pupils were Vandyck, Jordaens, Van Thulden, Krayer, Diepenbeck, and Quellin, but most of them imitated the outward characteristics of their master without catching his fire and energy. The engravers of his school, such as Pontius and Bolswert, succeeded admirably in conveying the general character of those pictures which it would seem most difficult to translate into mere black and white.

We may conclude by saying that Rubens did that for his country which has rarely if ever been accomplished for any other land. At the time of John and Hubert van Eyck, the school of Flanders had obtained the highest pitch of excellence. Those artists united a diligent and minute observation of nature to the finest technical skill and the most successful delineation of character and feeling. At a later period this excellence had vanished, and given way to the crude and affected imitation of the Italian masters which we find in Mabuse and Van Orlay. Rubens however a second time placed the Low Countries in the first rank, and by his own genius restored to them a reputation different indeed in kind, but perhaps equal in degree to that which they had formerly enjoyed.

(*Peter Paul Rubens, his Life and Genius*, translated from the German of Dr. Waagen, by Robert R. Noel, edited by Mrs. Jameson, London, 1840, whence the greater part of the information contained in this article is taken; *Edinburgh Review*, No. 146.)

RU'BIA, a genus containing about forty species, found both in Europe and Asia. It belongs to the very large natural family of Rubiaceæ, to which it gives the name which it itself derives from *ruber* (red), in allusion to the red colour yielded by many of the species. This genus is characterised by flowers monopetalous, superior; tube of the calyx ovate globose, limb scarcely any; corol sub-campanulate, rotate, 5-partite; stamens 4-5, short; styles two, short; berries two, one-seeded. Amongst the numerous species several are employed in medicine and in the arts; in the latter for the sake of the colouring matter, which is contained in the roots. R. tinctorum, madder, has been long known, and was employed in medicine even in the time of Hippocrates, but is valued chiefly as a dye. It is a native of Europe and Asia Minor, but is now extensively cultivated in Holland and France; the culture has likewise been attempted, and successfully, in this country, but the English madder could not be sold so cheap as the foreign; it is therefore still largely imported, chiefly from Holland, France, Italy, Turkey, though since cochineal has become cheaper, it is much used for the same purposes. It is employed by dyers and calico-printers as a red and scarlet dye. It has also the singular property of turning red the bones and secretions of fowls and other animals fed on it.

R. cordifolia (*Munjista*), the *Munjeet* of India, a native of Nepaul, &c., possesses very similar properties, and is imported into England from Calcutta. The root is used as a substitute for that of R. tinctorum; it is known in commerce under the name of East Indian madder, and is also employed in medicine. Like madder, munjeet was probably known from very early times, as *rodeen* is given as the Greek name in Persian works on Materia Medica. R. chilensis and R. Relbun, both natives of South America, are also esteemed there as dyes.

RU'BICON. [Cæsar, C. J.]

RUBLE. [Money.]

RUBRIC (from the Latin *ruber*, red), a name given to the titles of chapters in certain antient law-books; and more especially to the rules and directions laid down in our Liturgy for regulating the order of the service. These, in both instances, were formerly written or printed, as the case might be, for distinction's sake in red characters, and have retained the name though now printed in black.

RUBUS (the Latin *rubus*, a bramble), a genus of plants belonging to the natural order Rosaceæ, and to the section Potentilleæ of the suborder Rosaceæ proper. This genus, like that of Rosa, has proved a source of difficulty and difference amongst botanists. Some writers on the British Flora have described upwards of twenty-five species, whilst others have reduced them to four or five, or even two.

The following excellent description of this genus from Hooker's 'British Flora' has been drawn up by Mr. Borrer, who has investigated the British species with more success than any other botanist:—

'*Shrub-like* plants or *herbs*, with perennial *roots*. The latter offer nothing very peculiar. In some species of the former the *stem* is upright, or merely curved at the top; but in the greater number it is either prostrate, or, as is more generally the case, assurgent, arched, and decurved; and the ends of the shoot and of the side branches, if it produce any, unless prevented by circumstances from reaching the ground, take root in the latter part of the year. In the winter the shoot is partially destroyed, the part next to the original root surviving to produce flowering branches during the ensuing summer, and usually dying after the fruit has been perfected; young shoots meanwhile springing up by its side. The rooted ends also become distinct plants at various distances from the parent root, often many yards. This mode of growth adds much to the difficulties in the discrimination of the species; since an acquaintance with both the leafy shoot and the floriferous stem, formed in the second year from its remains, is necessary. The best characters are found in the figure, the arms, and the leaves of the former. The *leaves* in all the British species of this division are, occasionally at least, quinate, and, with one exception, digitate, or somewhat pedate from a partial junction of the stalks of the two lateral pairs of leaflets; the margins serrated, for the most part unequally and irregularly; the prickles on the leaf-stalks more curved than than those of the stem. In some species the *inflorescence* is remarkable, but in general the panicle varies so much as to afford no good distinction, nor can the arms of the calyx nor the form of its segment be depended on. The *petals* in all are delicate and crumpled, and in several species very considerable in size and width. There are some differences in the *fruit*, but they are rarely discriminative. In examining the figure of the leaves, the central leaflet is to be regarded; the lateral ones are always smaller and of a narrower proportion. In several species the leaves occasionally survive a mild winter, and are found the next season subtending flowering branches. The leaves of these branches are of less determinate figure; the number of their *leaflets* is reduced as they approach the inflorescence, and their place is supplied in the upper part of the panicle by first trifid and then simple *bracteas*, formed by the coalescence of the *stipules*. These last are usually long and narrow, entire, or sometimes toothed or jagged, and issue from the petiole, for the most part, a little above its base. They afford no distinguishing characters.' This description applies equally to the foreign species as to those of Britain. The essential characters of the genus are:—calyx 5-cleft; petals 5. Fruit superior, of several single-seeded juicy *drupes*, placed upon a protuberant spongy receptacle. The species are universally diffused over the mountainous and temperate regions of the Old and New World.

As a group of plants this genus is more interesting to the botanist than the horticulturist, but at the same time several species are cultivated both as ornaments and on account of their agreeable, acid, and astringent fruit.

One hundred and forty-seven species of this genus are enumerated by Don, in Miller's 'Dictionary,' which are divided according to the character of their leaves. The first division is known by the plants having pinnate leaves and from three to seven leaflets. The most remarkable of these is the *Rubus Idæus*, Common Raspberry, or Mount Ida bramble, well known for its crimson edible fruit. [Raspberry.] The whole plant is villose, stem round, with slender recurved prickles; leaves pinnate, with 5 or 3 ovate serrated leaflets, tomentose beneath; flowers drooping, petals obovate, wedge-shaped, entire, conniving shorter than the calyx; carpels numerous, tomentose. It is a native of woods in Europe, from Norway and Sweden to Spain and Greece. It is found also in Asia on the Himalaya, in the North of Africa, and in America from Canada to Pennsylvania. It is found abundantly in almost every part of Great Britain and Ireland. The fruits are called raspberries, and are very generally eaten. They enter into the composition of different syrups, jams, jellies, ratafias, and ices, and are preserved either alone or with currants. Raspberry-wine is much used in Poland. Raspberries are sometimes dried in ovens for winter use. Raspberry-vinegar is not only an agreeable beverage, but is said to act as a febrifuge. They are amongst the most agreeable of garden fruits when properly cultivated, and when ripe may be eaten in almost any quantity with impunity.

Rubus suberectus, Upright Bramble, is known by its nearly upright, not rooting, obsoletely angular stem, uniform few and small prickles, lower pair of leaflets sessile or nearly so, and panicle nearly simple. The stems are between three and four feet high. The fruit consists of a number of small dark-red aggregated carpels, which have something the flavour of the raspberry, and hence recommended for cultivation. It is a British species, and grows on boggy heaths, by the sides of streams, &c., chiefly in mountainous districts of the North.

Rubus micranthus, Small-flowered Bramble, has an upright, round, branched stem, pinnate leaves, with 5-7 oblong, ovate, doubly serrate, tomentose beneath, and green above leaflets, with small reddish-purple flowers arranged in corymbs, and black fruit. It is a native of Nepaul, and one of the most gigantic of the genus, attaining a height of eight or nine feet. It is easily distinguished by its nearly erect, strong, smooth, dark mahogany-coloured shoots, and very long pinnate leaves. The shoots sometimes attain a length of 20 feet. There are two other species, *R. distans* and *R. asper*, found with this in Nepal, which have been grown in this country.

R. occidentalis, the Western Bramble, is a native of Canada and the West Indies, and was introduced into this country in 1696. It has umbellate flowers, and fruit like the raspberry, but black, and grows to the height of 4 or 6 feet.

The second division is known by the plants having digitate leaves, with from three to five leaflets.

The Grey Bramble, or Dewberry (*Rubus cæsius*), is known by the following characters:—Stem trailing, round or nearly so, glaucous; prickles straight, unequal, passing insensibly into setæ, the length of the largest rarely equalling the diameter of the stem; leaves digitate, of 3 or more rarely 5 ovate leaflets, the outermost sessile; calyx embracing the fruit. It is a native of Europe and the North-East of Asia, in woods and hedges. Many of the species described by botanists may be referred to this; the most important of these are *R. Sprengelii*, *R. dumetorum*, *R. foliolosus*, *R. flagellaris*, *R. corylifolius*. The last, the Hazel-leaved Bramble, is admitted as a species by most British botanists. It is known by its stem being decurved and roundish, prickles straight, passing into setæ; leaves digitate, with 5 ovate leaflets; fruit spreading or reflexed. It is generally a much larger and stronger plant than *R. cæsius*. Dr Lindley refers several of the species of the German botanists Weihe and Nees, to the *R. corylifolius*, which he admits as a genuine species.

Rubus spectabilis, Showy Bramble, is one of the handsomest of the genus. It has a glabrous stem, not bearing prickles; leaf of three ovate, acute, doubly and unequally serrated leaflets, downy beneath; flowers of an agreeable purplish colour, on terminal peduncles. It is an elegant shrub, growing to the height of four or five feet. It flowers in April and May, and has a large dark-yellow fruit, of an acid and astringent taste. It was brought from the banks of the Columbia river, in North America, by Mr. Douglas, in 1827, and is very deserving of cultivation.

Rubus fruticosus, Shrubby Bramble, or Common Blackberry, is one of the most common species of the genus. It has a 5-angled erect stem, rather tomentose, bearing recurved prickles, 3-5 leaflets, each on a secondary petiole; rose-coloured or white flowers arranged on a panicle; reflexed sepals, almost without prickles; purplish black fruit. It is a native of almost all Europe, in hedges, thickets, and woods. There are not less than ten generally admitted varieties of this species, and some botanists make many more. The fruit of this species and its varieties are well known as blackberries, or bumblekites, and also scald-berries, from their supposed power of giving scald-head to children. Wherever they grow, they are picked by the children of the district on account of their agreeable acid flavour. Sometimes they are employed in making an inferior wine, and also for the distillation of a spirit. They are frequently used by the inhabitants of rural districts for making tarts. The red muscat of Toulon is coloured by their juice. Medical properties have been attributed to them, but they are not now used. Both the fruit and leaves are employed in the arts, for colouring and dyeing. The *R. fruticosus* is a good plant for growing on loose dry ground for the purpose of fixing it previous to planting forest-trees. The shoots are used by thatchers for binding their straw, and also for making bee-hives. It is sometimes cultivated in order to produce a picturesque effect in gardening.

One of the most diminutive plants of the genus is the *R. arcticus*, the Arctic Bramble. It has three glabrous obtusely-serrated leaflets, no runners, stem bearing only one flower, and without prickles, the petals notched. It is a native of the mountainous and colder regions of Europe. Its stem never attains a greater height than six inches, and is furnished with from three to four leaves, with a single large deep rose-coloured flower, which is succeeded by a purplish red fruit highly prized for its flavour among the Swedes.

A third division of the brambles have their leaves singly lobed, not digitate or pinnate. A well known species of this division is *R. odoratus*, the Sweet-scented Bramble. It has an upright stem, with large showy red flowers, numerous ovate velvety carpels, and red fruit. It is a native of North America, in the woods of Canada, and the Alleghanies. It grows to the height of four or five feet, and is called *odoratus* on account of the fragrance of its foliage. Another American species, resembling the last, is the *R. nutkanus*, the Nootka-Sound Bramble. It flowers from May to October. Its flowers are white, succeeded by large red berries.

Rubus chamæmorus, the Cloud-berry, is known by its diœcious flowers, simple-lobed leaves, and herbaceous single-flowered stem without prickles. It grows in great abundance on the Scotch Highlands, and, under the name of roebuck-berries and knot-berries, the fruit is gathered in great quantities by the inhabitants of those districts. They have an agreeable flavour, and form a useful article of diet where they grow in sufficient number to be worth gathering. This plant is one of the smallest of the genus, never growing more than eight or ten inches high. It is the badge of the clan of M'Farlane.

Further information on the genus Rubus is contained in Hooker's 'British Flora;' Lindley's 'Synopsis of the British Flora;' Don's 'Miller's Dictionary;' Weihe and Nees' 'Rubi Germanici;' and Loudon's 'Arboretum.'

RUBY. [CORUNDUM.]

RUD or RED EYE. [LEUCISCUS.]

RUDBE'CKIA, a genus of plants dedicated by Linnæus to the memory of his predecessors the Rudbecks, father and son, in the botanical chair at Upsal. It belongs to the natural order Compositæ, and possesses many species. Some of these are well known in gardens. They are herbaceous, biennial, and perennial. All the sorts may be raised from seeds, which should be sown in April, and when the plants are two or three inches high they may be pricked out into nursery-rows till autumn, when they should be planted out where they are to remain. They may also be increased by offsets.

RUDDER. [SHIP.]

RUDDIMAN, THOMAS, was born in October, 1674, at Raggel, in the parish of Boyndie and county of Banff, Scotland. He was instructed in Latin in the parish school of Boyndie, where he made a rapid progress. At the age of sixteen he obtained, at King's College, Aberdeen, the first exhibition or bursary of the year, on account of his superior knowledge of Latin. Here he studied four years, and then took his degree of master of arts, at which time he was well read in the Roman classics. Soon after this he engaged himself as tutor in a private family, and in the course of another year he became schoolmaster of the parish of Lawrence Kirk. He remained here three years and a half, and then, through the interest of Dr. Pitcairne, he was appointed assistant-keeper of the advocates' library at Edinburgh. In this office, though he had good opportunities of becoming known, and of reading and teaching for his further improvement, yet his pecuniary advantages were so small that he was obliged, in 1707, to commence auctioneer. In the same year he published an edition of Volusenus's 'Dialogue on Tranquillity of Mind,' with a Life of Volusenus, of Wilson, prefixed. In 1709 he published Johnston's Latin 'Poetical Paraphrase of Solomon's Song' and Johnston's 'Cantica.' He was next invited by the magistrates of Dundee to be rector of the grammar-school there, but he declined the offer. In 1713 his friend Dr. Pitcairne died, and Ruddiman, being still an auctioneer, managed the sale of his library, which was purchased by Peter the Great, emperor of Russia. In 1714 he published his 'Rudiments of the Latin Tongue,' a book which is well known, and is still used in most of the schools in Scotland. In 1715 he published an edition of Buchanan's works, in two volumes, folio, and in the same year he commenced printer, in partnership with a brother who had been brought up to the business; and some years afterwards he was appointed printer to the University of Edinburgh. He published, in 1725, the first part of his 'Grammaticæ Latinæ Institutiones,' which treats of etymology; and in 1732, the second part, which treats of syntax. He also wrote a copious treatise on prosody, but published only an abridgement of it. After this time he was made principal keeper of the advocates' library. In 1739 he published Anderson's 'Diplomata et Numismata Scotiæ.' During the latter part of his life he was engaged very much in controversy with different persons. However in 1751 he found time to put forth an edition of Livy, in four vols. 12mo., which Dr. Harwood pronounces one of the most accurate editions ever published. About this time he resigned his post of keeper of the advocates' library, and was succeeded by David Hume.

Ruddiman died at Edinburgh, January 19, 1757, in the eighty-third year of his age. He was author or editor of some other publications, besides those above mentioned, and among them 'The Caledonian Mercury,' from which he is said to have derived more profit than reputation. A Life of Ruddiman was published by Mr. George Chalmers, 1794, 8vo.

(Chalmers's *Biographical Dictionary*; *Biographie Universelle*.)

RUDGELEY. [STAFFORDSHIRE.]

RUDING, ROGERS, was born at Leicester, August 9, 1751. He was the second son of Rogers Ruding, Esq., of Westcotes, a member of a highly respectable family, of which notices may be found in Nichols's 'Leicestershire.' This gentleman was receiver-general for the county, and as such came to London to pay the identical money that he received into the Treasury. A friend, to whom Ruding mentioned this circumstance, suggests the possibility that this primitive mode of transacting business may have contributed in some degree to direct the mind of his son to the subject of money transactions. The subject of this article was educated at Merton College, Oxford, of which he was some time Fellow, and by which he was presented, in 1793, to the vicarage of Maldon and Chessington, two small adjoining parishes in Surrey, which are always held together, if not legally united. He took the degrees of B.A., 1771; M.A., 1775; and B.D., 1782. Mr. Ruding married a cousin of the same name, and by her had three sons, none of whom survived him, and two daughters.

Ruding's attention appears to have been early directed to the defects of our monetary system, and in 1798 he published a pamphlet, entitled 'A Proposal for restoring the antient Constitution of the Mint, so far as relates to the expense of Coinage; together with a plan for the improvement of Money, and for increasing the difficulty of Counterfeiting.' In 1812 he issued proposals for his great work, which was published in 1817, in four quarto volumes, under the name of 'Annals of the Coinage of Britain and its dependencies, from the earliest period of authentic history to the end of the fiftieth year of his present majesty King George III.' The whole of the first edition being sold within six months, it was shortly followed by another, in octavo, which brought down the history to the middle of the year 1818; the additional matter being also printed in the form of a supplement to the first edition. This important work, on the compilation of which Mr. Ruding bestowed no ordinary amount of laborious research, contains a chronological history of the monetary affairs of this country, the constitution of the Mint, the process of coinage, and the numerous and often ineffectual measures adopted to prevent the deterioration and counterfeiting of the money. It also embraces an account, geographically arranged, of all the Mints and Exchanges formerly existing in various parts of the kingdom; and a description of the coins, illustrated by a series of more than a hundred plates, including those previously published as tables of English gold and silver coins, by Martin Folkes, Esq., which were lent by the Society of Antiquaries for the purpose.

Viewed simply as an historical work, Ruding's 'Annals of the Coinage' is a book of great value and interest, embracing as it does the result of the author's diligent investigation of a subject to which very few could devote sufficient attention; but the work had another object, which may be explained by an extract from the author's preface. He observes, 'Had these materials been collected for no other purpose than the amusement of antiquarian curiosity, I should have held myself blameable for the misapplication of much precious time. But this work is given to the world with a higher and more important view. Its object is to show, from the experience of ages, the inadequacy of punishment, however severe, to prevent the commission of the crime of counterfeiting the money, whilst the temptation to it remains so powerful, and the execution of it so easy. The long succession of penal statutes, and the innumerable lives which have been forfeited to them, seem to prove that the system is radically defective, and that the crime can be prevented only by counteracting and weakening the force of the temptation.' Ruding considered his theory to be supported by the great re-coinage of 1816 and 1817, at which time the weight of the coins was so far diminished as to remove the temptation to melting them down, while the coarseness of the workmanship afforded such facility to imitation, that the real coins and the counterfeits were ready for delivery almost at the same instant. A new edition of this important work, extended to the commencement of the reign of Victoria, has lately been published by Mr. Hearne, in three volumes, quarto. It is edited by J. Y. Akerman, Esq., aided by other numismatists; and, while the text of Ruding is preserved unaltered, it is enriched with many additional notes and tables, and upwards of forty new plates of coins.

Mr. Ruding communicated many papers on coins, &c. to the 'Gentleman's Magazine,' and memoirs on the trial of the pix and the office of cuneator (which were, in fact, little more than chapters of his larger work, perhaps put forth in that form to excite interest on the subject) to the 17th and 18th volumes of the 'Archæologia' of the Society of Antiquaries, of which he was a fellow. He was also an honorary member of the Antiquarian Society of Newcastle-upon-Tyne. He died at Maldon, on the 16th of February, 1820, in his sixty-ninth year.

RUDOLPH of HABSBURG. [HABSBURG, HOUSE OF.]

RUDOLPHINE TABLES. [KEPLER.]

RUDOLPHUS, Schumacher's name for the *Monoceros* of authors. [ENTOMOSTOMATA, vol. ix., p. 458.]

RUDOLSTADT. [SCHWARZBURG.]

RUE'LLIA, a genus of plants of the natural family of Acanthaceæ, which was so named by Linnæus in compliment to J. Ruelle, physician of Francis I., who wrote commentaries on Dioscorides, as well as some other botanical works. The genus, as formerly constituted, embraced a great many Indian species, which are now distributed among some other genera, as Adenosma, Hygrophila, Dyschoriste, Chætacanthus, Petalidium, Calophanes, Buteræa, Strobilanthes, Æchmanthera, Goldfussia, Asystasia, Leptocanthus, Ætheilema. The genus is distributed through the tropical parts of Asia, including the tropical and subtropical parts of New Holland. It includes many highly ornamental plants, as are also those which have now been excluded from it, all are easily cultivated, and often to be seen in our hothouses. Some of the species which have now been removed to other genera are found at considerable elevations on the sides of the Himalayan Mountains; of these the most remarkable is Æchmanthera, formerly Ruellia gossypina, which has its stems covered with a thick coating of white tomentum, which probably enables it to withstand a greater degree of cold than most others of the family.

RUFI'NUS, also called **TORANUS**, a priest of Aquileia, and, according to some writers, a native of that place, was born about the middle of the fourth century. He embraced a monastic life, and lived at first in a monastery at Aquileia, where he devoted himself to the study of the Scriptures and of the Greek and Latin fathers. During this time he became acquainted with St. Jerome, who was for a long time most sincerely attached to him. Rufinus subsequently visited Egypt, where he formed the friendship of St. Melania, who was celebrated in the church for her works of charity and love. He afterwards went to Palestine, where he encountered the opposition of the Arians, who banished him to the most desolate part of the country. He was ransomed however by Melania, and returned with her to Jerusalem, where he built a monastery on Mount Olivet, and lived for many years. During his stay at Jerusalem he translated some of Origen's works, by which he offended his former friend Jerome, who attacked him in his 'Apology.' To this work Rufinus replied, in which he maintained his own orthodoxy and defended himself by appealing to the example of Jerome, who had formerly praised and also translated some of Origen's works. This controversy excited a great stir at the time, as both writers were of high reputation and had many partisans. The Western church however was generally opposed to Rufinus, and on his return to Aquileia he was cited by Anastasius, the bishop of Rome, to appear before him; and on his not doing so, his writings were condemned, and he was deprived of his rank as presbyter at Aquileia. He subsequently retired to Sicily, where he died about the year 410.

Rufinus translated into Latin the works of Josephus; the 'Ecclesiastical History' of Eusebius, to which he added two books continuing the history to the death of Theodosius; the books of Recognitions attributed to Clement, several of Origen's works, with the first book of Pamphilus's 'Apology' for Origen, the 'Orations' of St. Gregory Nazianzen, the ascetical rules of St. Basil, and a few other smaller treatises of the Greek fathers. The translations of Rufinus are rather paraphrases than strict and literal versions. Besides these translations, Rufinus wrote two books in reply to St. Jerome, which have been already mentioned; an 'Apology' to Anastasius, bishop of Rome; an 'Explanation of Jacob's Blessing,' a 'Commentary upon Hosea, Joel, and Amos;' and an 'Explanation of the Apostle's Creed,' a work which is considered by modern theologians of considerable importance, as it contains a complete catalogue of the books of the Old and New Testament.

The opinion of Du Pin upon the literary and theological merits of Rufinus is just and impartial: 'It must be acknowledged that Rufinus, though very ill used by St. Jerome, was one of the ablest men of his time. Perhaps he had not so much learning as St. Jerome, but his temper was better and less violent. He doth not write such good Latin, but his style is more even. It cannot be denied that the Latin church is indebted to him for the knowledge of the most considerable among the Greek authors, and particularly of church history. Though he was accused of divers errors, yet he was convicted of none, and he justified himself sufficiently from the reproachful objections made against him.'

The works of Rufinus were published by Sonnius, in one volume folio, Paris, 1580.

(Du Pin, *A New History of Ecclesiastical Writers*, vol. iii., pp. 107-111, transl.; Lardner, *Credibility of the Gospel History*, vol. iv., p. 482, Lond., 1831, and the references there given.)

RUFUS, or **RUPHUS** (Ῥοῦφος), commonly called Rufus Ephesius, from the place of his birth, is said by Abulfaraj (*Hist. Dynast.*, p. 59) to have lived in the time of Plato, about four hundred years before Christ; John Tzetzes calls him the physician to Cleopatra, who died B.C. 30 (*Chil.*, vi.; *Hist.*, 44, v. 300, p. 104); but Sprengel (*Hist. de la Méd.* and most modern authors follow Suidas in placing him in the reign of Trajan, about the beginning of the second century after Christ. He is sometimes confounded with Menius Rufus, the inventor of several compound medicines, who however must have lived long before the reign of Trajan, as he is quoted by Andromachus (Galen, *De Compos. Medicam. sec. Loca*, lib. vii., tom. xiii., cap. v., p 92), who was archiater to the emperor Nero. Nothing is known of the events of his life, except that he wrote several works, of which the titles are preserved by Galen and Suidas, and three are still extant.

The first consists of three or four books,* entitled *περὶ ὀνομασίας τῶν τοῦ ἀνθρώπου μορίων*, 'De Appellationibus Partium Corporis Humani,' which are chiefly valuable for the information they impart concerning the state of anatomical science before the time of Galen. His principal object in this work was to give a general idea of anatomy, and particularly to prevent the medical students of his time from making mistakes in reading the antient authors, who do not always call the same parts of the body by the same name. From what Rufus says in this book (p. 33), we find that all the anatomical demonstrations were made upon beasts. (Compare Theophilus, 'De Corp. Hum. Fabr.,' lib. v., cap. ii., who says. 'choose an ape for dissection, if you have one; if not, take a bear; and if you have not a bear, take any animal you can get.') He considered the spleen to be absolutely useless. (p. 59.) We find also in the same book, that the nerves now called *recurrent* were then quite recently discovered. 'The antients,' said Rufus (p. 42), called the arteries of the neck *καρωτίδες*, or *καρωτικοί*, because they believed that when they were pressed hard, the animal became sleepy and lost its voice; but in our age it has been discovered that this accident does not proceed from pressing upon these arteries, but upon the nerves contiguous to them.' He shows that the nerves proceed from the brain, and he divides them into two classes, those of sensibility and those of motion (p. 36), though, like Celsus (*De Medic.*, lib. vii., cap. 18, p. 413, ed. Argent.), he reckons (p. 41; compare p. 43) among them the cremaster muscle. (Julius Pollux, himself a contemporary of Galen, gives also the name of *νεῦρα* to the ligaments which unite the bones: *Onomast.*, lib. ii., cap. 5, segm. 234, p. 265.) According to Sprengel (*Hist. de la Méd.*), he was the first to describe, though very imperfectly, the commissure of the optic nerves at the height of the infundibulum, and the fibres which they receive from that part of the brain. (p. 54.) He clearly describes the capsule of the crystalline lens by the term *ὑμὴν φακοειδής*, *lenticular membrane*. (p. 37.) He considered the heart to be the seat of life, and noticed that the left ventricle is smaller and thicker than the right. (p. 37.) This work was first published in a Latin translation, by J. P. Crassus, with Aretæus, Venet., 1552, 4to.

The next work of his that remains is a valuable little treatise, *περὶ τῶν ἐν νεφροῖς καὶ κύστει παθῶν*, 'De Renum Vesicaque Morbis,' in which however there is nothing that requires particular notice here. The third is a fragment, *περὶ τῶν φαρμάκων καθαρτικῶν*, 'De Medicamentis Purgantibus.'

These three works were first published in Greek, by J. Goupyl, Paris, 8vo., 1554. There is an edition by Clinch, Greek and Latin, Lond., 1726, 4to., which is not of much value. The most complete is that by Matthæi, Mosq., 1806, 8vo., Græce, in which he has supplied, from a manuscript at Moscow, several fragments that had never before been published. A Latin translation of Rufus is inserted in the 'Medicæ Artis Principes,' by H. Stephens, Paris, 1567, fol. Some Greek fragments are to be found in the fourth volume (pp. 198-200) of the collection of 'Classici Auctores è Vaticanis Codicibus editi,' published by Angelo Mai, Romæ, 8vo., 1831. C. G. Kühn published, Lips., 1831, 'Rufi Ephesii de Medicam. Purgant. Fragm. è Cod. Paris. descript.;' and F. Osann wrote a dissertation, 'De Loco Rufi Ephes. Med. ap. Oribasium servato, sive de Peste Lib.,' Giss., 1833. There are also several fragments preserved by Oribasius and Aëtius and among the rest the formula for the composition of a celebrated medicine called *Hiera* (Oribas., *Synops.*, lib. iii., pp. 121, 122), which appears to have been a common name among the antients, for what may be called patent medicines, as Aëtius has inserted in his compilation (Tetrab. i., serm. 3, cap. 114) the formula of one called, after the celebrated Archigenes, 'Hiera Archigenis.'

Haller is inclined to attribute to Rufus (*Biblioth. Botan.*, tom. i., p. 108) an anonymous fragment of one hundred and ninety Greek hexameter verses, *περὶ βοτανῶν*, 'De Viribus Herbarum,' which was first published in the Aldine edition of Dioscorides, Venet., 1518, 4to., p. 231, &c., and which is inserted by Fabricius, with Greek scholia and a Latin translation and notes, by J. Rentorf, in his 'Bibliotheca Græca, tom. ii., pp. 629-661 (old edit.). Fabricius and others have also been of the same opinion. Hermann, on metrical grounds (*Orphica*, Lips., 1805, 8vo., pp. 717, 750, 761, &c.), determines the writer to have lived some time between Manetho, the author of the *ἀποτελεσματικά*, and Nonnus, the author of the 'Dionysiaca;' but this date is sufficiently vague. Rufus certainly composed a poem in Greek hexameters, *περὶ βοτανῶν*, in four books, which are mentioned by Galen (*De Facult. Simplic. Medic.*, lib. vi., Præfat., tom. xi., p. 796, ed. Kühn), and of which he quotes a few lines (*De Compos. Medic. sec. Loca*, lib. i., cap. 1, tom. xii., p. 425); but this is supposed by Choulant (*Handbuch der Bucherkunde für die Aeltere Medicin*, 8vo., Leipzig, 1828) to have been quite a different work from the fragment now spoken of, chiefly on the ground that so scientific and sensible a physician as Rufus would not have written anything so full in popular superstitions and absurdities. The fragment treats of thirteen different plants in as many chapters, in which, says Haller, 'Medicarum virium adest farrago verarum et falsarum.'

RUGBY. [WARWICKSHIRE.]

RÜGEN is the largest of all the islands belonging to Germany, and, together with several small adjacent islands, forms the circle of Bergen in the government of Stralsund, of the province of Pomerania. This island has an area of 340 square miles and was formerly much larger: a part of it, probably above one half, was swallowed up in the middle ages by the sea. It is separated from the continent, with which it is supposed to have been formerly joined, by an arm of the sea at least a mile broad. Its shape is very irregular, being deeply indented by the sea in various directions, so as to look like a number of peninsulas united by a comparatively small nucleus in the centre. On the east side the peninsula of Jasmund is connected with the mainland by the steep ridge called Prora, and by a long, narrow, and high wall of flint, granite, and porphyry boulders. In this peninsula is the Stubbenitz, a considerable beech-forest, containing the Berg or Black Lake, an oval spot surrounded with a high wall, which is believed to be the place where the goddess Hertha was worshipped. (Tacitus, *Germ.*, c. 40.) The whole island abounds in grotesque and romantic scenery. On the west it is level, but rises in the interior, and the northern coasts consist in general of rugged steep chalk cliffs. One of the most considerable eminences in the island is Mount Rugard, on which the residence of the princes formerly stood. On the north point of Jasmund is the Stubbenkammer, a lofty chalk cliff, which rises perpendicularly from the sea in the most irregular forms. The highest point, 565 feet (some say 543 feet) above the sea, is called the Königstuhl (the king's chair, or King Frederic William's chair), from which a flight of 600 steps cut in the rock leads down to the strand. Jasmund is connected by a narrow strip of alluvial soil with the peninsula of Wittow, a level tract with a rich soil, terminating in the promontory of Arkona, the most northern point of Germany. Arkona contained a very strong fortress, which was taken in 1168 by Waldemar I., king of Denmark, who destroyed the chief temple of the god Swantewic, who was highly revered by the heathens of the north. Large tumuli (called Hünengräber), are seen in several parts. The whole island, especially the peninsulas of Wittow and Jasmund, is much more fertile than the continental part of the government of Stralsund, and produces much corn. The number of cattle is considerable, and the fisheries productive. The inhabitants amount to 29,000; they are very industrious, expert sailors and fishermen, and very hospitable. The nobility are very numerous. Bergen, the capital of the island, has 2600 inhabitants. Rügen is much frequented by travellers on account of its beautiful scenery, and for the benefit of the sea-bathing. This island was ceded to Prussia in 1815, as a part of Swedish Pomerania.

(Hassel's *Geography*, vol. iii.; *Conversations Lexicon*; Stein; Cannabich, &c.)

RU'HNKEN, DAVID, was born in 1723, at Stolpe in Pomerania. His parents, who were in good circumstances, soon discovered the promising talents of the boy, and, after a course of elementary instruction, they sent him to the gymnasium of Königsberg (Collegium Fridericianum, or Friedrichs-Collegium). Here he commenced his acquaintance with the classical writers of antiquity, and conceived that love for them which distinguished his whole life. He also made great progress in the fine arts, particularly in music and drawing. After finishing his studies at the gymnasium, it was the wish of his parents that he should become a student of theology; but this was contrary to his own inclination, and he obtained permission to go to Göttingen, where he anticipated great benefit from the instruction of J. M. Gesner. On his journey thither he passed through Wittenberg, and the kindness and hospitable reception which he experienced in the houses of two distinguished professors of that university, Berger and Ritter, induced him to stay at Wittenberg, where he remained for two years, and applied most indefatigably to the study of antient literature, history, and jurisprudence. On the occasion of taking his degree, he published his inaugural dissertation, 'De Galla Placidia Augusta' (Wittenb., 1743), a work which raised the greatest expectations of the young scholar. Ernesti, who happened to be at Wittenberg at the time, advised Ruhnken to go to Leyden, and finish his studies under the auspices of the great Hemsterhuis. This advice coincided with Ruhnken's own wishes; and having provided himself with letters of introduction, he went to Leyden. To Hemsterhuis he had no introduction, but he nevertheless, immediately after his arrival, paid a visit to this renowned scholar, who received him with the utmost kindness. Ruhnken now began his studies afresh, following the suggestions and advise of his great master, and continued his studies under him for six years, during which he read almost all the Greek writers with the greatest care and attention. But notwithstanding his severe application, he was fond of amusements: musical entertainments, the conversation of ladies, and hunting, were now, and remained during his whole life, his favourite recreations; and often, after returning from hunting, he would sit down all night at his writing-table, and make up for the time spent on his amusements. Hemsterhuis had from his first acquaintance with him discovered the great abilities of his pupil, and was anxious to keep him at Leyden; but as there was at the time no prospect of a professorship becoming vacant in the university, he advised him to resume his former study of the Roman law. Ruhnken, who was accustomed to follow the advice of Hemsterhuis like that of a father, complied with his request, and soon made such progress as to gain a considerable reputation as a jurist. But he did not neglect his favourite pursuits, and made preparations for a new edition of Plato. With this view he collected the scholia on Plato, and published a very valuable edition of Timaeus, 'Lexicon Vocum Platonicarum,' with a commentary, Leyden, 1754. (A new and much improved edition appeared in 1789.) But as he had no appointment in Holland, his friends in Germany urged him to return and apply for a professorship in some university in his own country. His attachment however to his friend and master, and his love of the mode of life at Leyden, induced him to wait there until a vacancy should occur. In 1755 he went to Paris, where he spent a whole year in examining the MSS. of the Royal Library and those of the library at St. Germain. About the time when he was preparing to set out for Spain, he received the intelligence that Hemsterhuis had succeeded in gaining for him the appointment of lector (reader) in the university of Leyden. In this capacity he was the assistant and colleague of his former master. Ruhnken returned to Holland, and, in October, 1757, he opened his course of lectures by a discourse, 'De Graecia Artium et Doctrinarum Inventrice' (printed at Leyden in 1757, 4to.). Ruhnken filled this place for four years, and his zeal, his success, and his erudition soon gained him the reputation of being one of the most eminent scholars of Holland.

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* There are in fact only *three* books, as the second is a sort of *alter primus*, or later edition of the first.

In 1761 Oudendorp died, and Ruhnken was appointed his successor as professor of eloquence and history. In the same year J. M. Gesner of Göttingen died, and Ruhnken was invited to take his chair; but he refused this honourable offer, and recommended Heyne in his stead. This proof of his attachment to the university of Leyden was rewarded by a considerable increase of his salary. At the age of forty Ruhnken married a beautiful and accomplished young lady, with whom he lived very happily; but in the year 1769 his wife began to suffer from apoplexy, which first deprived her of speech, and afterwards also of sight, and in this deplorable state she survived her husband. In 1767, two years before this calamity, Hemsterhuis had died, and Ruhnken, then rector of the university, delivered a noble eulogium on his late friend and patron. This eulogy is known under the name of 'Elogium Tiberii Hemsterhusii,' printed at Leyden in 1768, in 8vo.; a second edition, accompanied by two letters of R. Bentley to Hemsterhuis, appeared in 1789. About this time Ruhnken conceived the plan of making a new and complete edition of the great works of Fabricius, the Bibliotheca Graeca and Latina, but this plan has never been realized, and other works, of which we subjoin a list, occupied almost all his attention. In 1774 Ruhnken succeeded Gronovius in the office of librarian to the university, in which capacity he enriched the library with a great many valuable books and MSS.

The life of Ruhnken henceforward presents scarcely any incidents: his time was divided between the discharge of his official duties and his literary occupations, by which he acquired a reputation equal to that of his master Hemsterhuis. To his suffering wife he always showed the greatest affection, and all the leisure hours which he could spare he devoted to her. The only thing which in some degree interrupted his quiet pursuits were the disturbances which broke out in Holland in the year 1787. He died on the 14th of May, 1798, leaving two daughters, the younger of whom had from her childhood always been in bad health. The city of Leyden purchased his valuable library, and granted to his widow an annual pension of 500 florins.

Ruhnken was one of the most eminent scholars and critics of the 18th century. With a refined taste and great acuteness, he combined an extraordinary memory and immense erudition. His critical sagacity and his grammatical knowledge were not inferior to those of any modern philologist, and his works are still an inexhaustible source of information, though it has, perhaps not unjustly, been observed, that Ruhnken, as a critic, is more refined and elegant than profound. As a Latin writer Ruhnken has scarcely been excelled by any modern author. In teaching he was very successful; the most distinguished among his pupils was Daniel Wyttenbach, to whom we are indebted for an eloquent Life of his master (Leyden, 1799, 8vo.). This Life was reprinted at Leipzig in 1822, and edited by Lindemann, together with the Elogium Hemsterhusii, under the title 'Vitae duum Virorum Tib. Hemsterhusii et D. Ruhnkenii.'

Besides his edition of the Lexicon of Timaeus, Ruhnken wrote, in 1754, a commentary on the title in the Digest and Code, 'De Postulando, sive de Advocatis et Procuratoribus.' He also edited the second volume of Alberti's Hesychius, with notes and emendations, Leyden, 1766, fol.; Rutilius Lupus, 'De Figuris Sententiarum et Elocutionis,' Leyden, 1768 (a new edition of this work was published at Leipzig in 1831 by Frotscher); Velleius Paterculus, 2 vols., Leyden, 1779 (a separate edition of Ruhnken's commentary was published at Hanover, in 1815, by Cludius); 'Homeri Hymnus in Cererem,' with a Latin translation and commentary, 1780 (a second edition appeared in 1782, in which a fragment until then unknown, was added); 'Mureti Opera,' 4 vols. 8vo., Leyden, 1789. Besides these editions of antient authors by Ruhnken himself, he communicated to Ernesti his remarks on Callimachus (Leipzig, 1761), and on Xenophon's 'Memorabilia' (Leipzig, 1773), and to Schweighaüser those on Polybius and Appian. Besides his three original compositions already mentioned (viz. on 'Galla Placidia Augusta,' 'De Graecia Art. et Doctr. Inventr.,' and the 'Elogium Hemsterhusii'), Ruhnken wrote 'Epistolae Criticae: prima in Homeridarum Hymnos et Hesiodum' (Leyden, 1749); 'secunda in Callimachum et Apollonium Rhodium' (Leyden, 1751); 'Oratio de Doctore Umbratico,' 1753, 4to; 'Dissertatio de Vita et Scriptis Longini,' 1766, 4to. (reprinted in Toup's edition of Longinus). These discourses and essays were collected and published by Ruhnken himself in 1797, in 2 vols., under the title 'Ruhnkenii Opuscula Oratoria, Philologica, Critica, nunc primum conjunctim edita.' A new edition, with some additional dissertations, was edited by Bergmann, in 2 vols., Leyden, 1823. Some parts of the correspondence of Ruhnken with his learned friends have likewise been published. J. A. H. Tittmann has edited 'Ruhnkenii, Valckenarii, et aliorum ad J. A. Ernesti Epistolae; accedunt Ruhnkenii Observationes in Callimachum,' &c., Leipzig, 1812. Mahne has edited 'Ruhnkenii et Valckenarii Epistolae mutuae,' Vliessingen, 1832, and 'Ruhnkenii Epistolae ad Diversos,' Vliessingen, 1834.

RULE, RULER. In a mechanical sense these words are both used for a straight piece of wood, brass, or ivory, from which a straight line is drawn on paper by guiding a pen or pencil along the edge. These rules or rulers are convenient for the laying down of scales, on which point see SCALE; SECTOR; SLIDING-RULE.

The word rule, in its more common sense, means a set of directions for the attainment of any required object, and various rules will be found in this work, scattered under many heads. The word rule is generally dropped; thus we do not speak of the rule of addition, or the rule of subtraction, but simply of addition or subtraction. In some isolated cases the word rule is most usually retained, as in the rule of three [THREE, RULE OF] and the rule of false. [FALSE POSITION.]

A rule differs from an algebraical formula only in the language employed; both the former and the latter indicate processes to the mind. The rule describes its data at length, and requires many more signs than the formula, which however is much more intelligible than the rule, as soon as its symbols are well understood. For example, when it is known that *a*, *b*, *c* are the units in the sides of a right-angled triangle, the formula for determining *c* is—

$$c = \sqrt{(a^2 + b^2)}:$$

the rule is—To find the hypothenuse of a right-angled triangle, multiply the number of units in each side by itself, add the products, and extract the square root of the sum: this square root is the number of units in the hypothenuse required. It might perhaps be thought that the preceding rule might have been expressed more briefly, but the practice of abbreviating the language of rules is almost sure to destroy the sort of advantage which, in one point of view, they possess over a formula. A rule should embody a description of the object to be gained, and the process by which it is to be gained; it should also point out the step at which it is gained, and everything necessary to describe the result. It should even specify the case in which the rule is to be used, or that in which it becomes necessary rather than any other; and should be so complete in itself, that any reader of that class to whom the book is addressed might learn all it teaches (that is, everything but the demonstration) by reading only what comes between the word RULE and the full stop at the end of it. Thus, though we have described the preceding rule in words which some persons may think too many, we should say that they are not too many for the student who is somewhat of a mathematician, and too few for the beginner. For the latter we should state as follows:—To find the hypothenuse of a right-angled triangle of which the two sides are given, reduce the two sides to the same denomination if necessary (feet and decimals of a foot, inches and decimals of an inch, &c., as most convenient), multiply the units in each side by itself, add the results, and extract the square root of the sum: this square root is the number of such units in the hypothenuse as were used in the expression of the sides.

If however many rules are to be learned, it would in all probability be found more easy to learn the symbols of algebra, that is, to learn to read an algebraic expression, and to use formulæ, than to recur frequently to rules.

RULE OF THREE. [THREE, RULE OF.]

RULE (*in Law*) is an order of one of the three superior courts of Common Law. Rules are either general or particular.

General rules are such orders relating to matters of practice as are laid down and promulgated by the court for the general guidance of the suitors. They are a declaration of what the court will do, or require to be done, in all matters falling within the terms of the rule, and they resemble in some respects the Roman edict. The power of issuing rules for regulating the practice of each court is considered to be incident to the jurisdiction of the court. By a recent and very important act of parliament (3 & 4 Will. IV., c. 42), the judges were authorised within five years from the date of it (1833) to make rules of a more comprehensive nature, relating especially to pleading in civil actions. These rules, after being laid before both houses of parliament within certain times mentioned in the act, were to have 'the like force and effect as if the provisions contained therein had been expressly enacted by parliament.' In exercise of this authority, a number of rules, generally called 'The New Rules,' have been promulgated, which have introduced very material changes in the mode of pleading. [PLEADING.] (Stephens *on Pleading*; Chitty *on Pleading*; Jervis *on the New Rules*.) Formerly each court of common law issued its own general rules, without much consideration as to what was the practice in other courts. Of late the object has been to assimilate the practice in all the courts of common law.

Rules not general are such as are confined to the particular case in reference to which they have been granted. Of these, some, which are said to be 'of course,' are drawn up by the proper officers on the authority of the mere signature of counsel, without any formal application to the court; or in some instances, as upon a judge's fiat or allowance by the master, &c., without any signature by counsel; others require to be handed in as well as signed by counsel. Rules which are not of course, are grantable on the application, or, as it is technically termed, 'the motion,' either of the party actually interested or of his counsel. Where the grounds of the motion are required to be particularised, the facts necessary to support it must be stated in an affidavit by competent witnesses. After the motion is heard, the court either grants or refuses the rule. A rule, when granted, may, according to the circumstances, be either 'to show cause,' or it may be 'absolute in the first instance.' The term 'rule to show cause,' also called a 'rule nisi,' means that unless the party against whom it has been obtained shows sufficient cause to the contrary, the rule, which is yet conditional, will become absolute. After a rule nisi has been obtained, it is drawn up in form by the proper officer, and served by the party obtaining it upon the party against whom it has been obtained, and notice is given him to appear in court on a certain day and show cause against it. He may do this either by showing that the facts already disclosed do not justify the granting of the application, or he may contradict those facts by further affidavits. The counsel who obtained the rule is then heard in reply. If the court think proper to grant the application, or if no one appears to oppose it, the rule is said to be made 'absolute.' If they refuse the application, the rule is said to be 'discharged.'

Rules may be moved for either in reference to any matter already pending before the court, as for a change of venue in an action already commenced, or for a new trial, &c.; or in respect of matters not pending before the court, as for a criminal information, a mandamus, &c.

A copy of a rule obtained from the proper officer is legal proof of the existence of such a rule. (Tidd's *Practice*; Archbold's *Practice*.)

RULE in SHELLEY'S CASE. [REMAINDER.]

RUM, a spirit distilled from the sugar-cane, that is, 'from cane-juice, or the scummings of the juice from the boiling-house, or from the treacle, or molasses, or from 'dunder,' the lees of former distillations.' (Edwards's *West Indies*, vol. ii., p. 279.) As the entire juice of the cane is not necessary for making rum, the distillation is carried on in conjunction with the manufacture of sugar. The best rum is made from the uncrystallized syrup called molasses [MOLASSES.] The proportion of molasses made in crystallizing a cwt. of sugar varies from 50 to 90 gallons, and depends both upon the climate and the season, being lowest in the Leeward Islands, which have a dry climate, and highest in Demerara and Trinidad, and it is in the latter that in fine seasons the proportion reaches 90 gallons per cwt. Nearly one gallon of proof rum may be made from one gallon of molasses. The value of the raw material for a gallon of rum has recently been as high as 1*s.* 10*d.* in the West Indies; the cost of distillation averages about 8½*d.* per gallon; and for an additional 8½*d.* for freight and other charge the spirit may be brought into the English market, where, since June, 1830, it has been subject to a duty of 9*s.* per gallon. This is 1*s.* 6*d.* higher than the duty on English spirits, the distillers of the latter claiming to be protected on account of the corn-laws raising the raw material above its natural price. On the other hand rum is protected by heavy duties on foreign spirits; and rum the produce of the West Indies has hitherto been protected against East India rum by a different rate, the duty on the latter being 15*s.* per gallon.

The rum consumed in the United Kingdom is entirely the produce of the West Indies, and to a great extent of the island of Jamaica, which is of a superior quality. For many years the home demand has not taken off the whole supply, and the surplus, which consists chiefly of the Leeward Islands rum, and other kinds of inferior quality, is exported. The consumption of rum in this country has been long declining, and the imports and exports have both fallen off. In 1839 the number of gallons of rum on which duty was paid in England was 2,739,363; Scotland, 75,337; Ireland, 15,663: total, 2,830,363 gallons. In 1840 the quantity consumed was 2,510,668 gallons. In 1826 there were 5,051,966 gallons of rum in bond; 3,585,386 gallons in 1836; 2,573,627 gallons in 1838; and 3,007,563 in 1839, of which rather more than one-half was bonded in London, and the remainder at the outports. The proportion of rum consumed is now less than one-tenth of the total consumption of spirits in the United Kingdom, but in 1820 the proportion was about one-fifth. British spirits are said to be extensively sold for rum, the flavour being imitated by the rectifier.

At the present time (April, 1841) a Bill, introduced by the Government, has passed through the Commons, the object of which is to equalize the duty on East and West India rum by reducing the former. Rum made from the date or palm-tree, as well as from the sugar-cane, will be included in this measure, but not if made from any other material. The equalization of the duties on East and West India sugar, by 6 Wm. IV. c. 26, rendered it expedient to give a practical equality to all the products of the sugar-cane, without which the cultivation of sugar-plantations in India could not have been so profitably extended, as the molasses would have been comparatively wasted. The Government measure equalizes the import duty on rum in the colonies as well as in the United Kingdom. Great improvement in East India rum is anticipated from its admission to the English market. In December, 1836, the Lords of the Admiralty rescinded an order which confined the navy contracts to West India rum. The imports of East India rum in 1837 amounted to 67,761 gallons; in 1838, to 45,212 gallons; in 1839, to 170,380 gallons; but none of it was entered for home consumption, in consequence of the high duty.

1. Average quantities of rum annually imported from the West Indies, and Demerara and Berbice, from 1821 to 1838 inclusive, for periods of six years each :—

	1821-1826. Galls.	1827-1832. Galls.	1833-1838. Galls.
Jamaica	2,876,468	3,154,866	2,510,728
Demerara	996,500	1,616,944	1,500,808
Berbice	44,904	173,000	92,968
Trinidad	14,688	21,415	4,875
Tobago	355,188	393,070	297,045
Grenada	264,136	300,247	216,717
St. Vincent's	91,734	163,224	144,254
Barbadoes	862	5,853	1,128
St. Lucia	3,544	17,985	4,659
Dominica	15,[illegible]60	31,129	18,014
Antigua	42,[illegible]13	90,773	35,909
St. Kitt's	61,409	153,023	51,387
Nevis	16,229	47,213	15,020
Montserrat	24,327	33,113	14,707
Tortola	3,113	96	3,716
Total	4,147,659	6,351,957	4,933,164

2. Average quantities of rum annually imported into the United Kingdom, re-exported, consumed, and used as ships' stores and in the navy, in two periods, from 1827 to 1839 inclusive:—

Annual Average.	Imported. Galls.	Re-exported. Galls.	Consumed. Galls.	Ships' Stores. Galls.	Navy. Galls.
1827–33	7,188,188	1,756,478	3,581,257	377,654	320,891
1834–39	6,065,800	1,449,024	3,316,498	366,594	308,998

3. Quantities of rum imported into the United Kingdom, distinguishing the imports from the British West Indies, also the quantities consumed and re-exported, in each year from 1833 to 1839:—

Years.	Imported.		Paid Duty for Consumption.	Re-exported.
	Total (from all places).	From the Brit. W. Ind.		
	Galls.	Galls.	Galls.	Galls.
1833	5,146,877	5,109,975	3,492,133	1,834,206
1834	5,158,489	5,112,399	3,345,177	1,642,282
1835	5,540,170	5,453,317	3,416,966	1,678,374
1836	4,993,942	4,868,168	3,324,749	1,279,845
1837	4,613,095	4,418,350	3,184,255	1,174,273
1838	4,912,227	4,641,212	3,135,651	1,134,436
1839	5,477,669	4,021,821	2,830,263	1,155,753

In addition to the above, the quantity of rum delivered for the use of the navy and for ship's stores averaged 743,305 gallons annually, all of which (with the exception of 3978 gallons in 1838, and 87,998 gallons in 1839, from the East Indies, admitted into the navy contracts) was the produce of the West Indies.

The duty on rum averaged 1,593,685*l.* for the years 1831-2-3; for the years 1834-5-6 it amounted to 1,399,912*l.*; and for 1837-8-9 it was 1,372,540*l.* In 1840 the gross receipt was 1,154,544*l.*

The exports of rum are chiefly to Germany, Prussia, Holland, Italy, and the Australian colonies.

RUM, Island. [ARGYLESHIRE.]

RUMEX, the name of a genus of plants, from *rumex*, a sort of spike, spear, or halberd, which the shape of its leaves resembles. It belongs to the natural order Polygonaceæ. Most of the species of this genus are well known as troublesome weeds to the agriculturist, under the name of docks and sorrels. Some of them have been used in medicine, but their incomplete flowers and inelegant appearance have caused their almost entire neglect in the garden. The essential characters of the genus are: Calyx with six sepals, the outer three slightly coherent, the inner ones enlarged after flowering; stamens six; styles three, reflexed; stigmata three and cleft; fruit a three-cornered nut, with a lateral embryo and superior radicle. In the descriptions of this genus by botanists, the three inner sepals are often designated as corolla, but it is more consistent with what we know of the general structure of the order Polygonaceæ to refer it to the apetalous or incomplete subclass of Exogens, and thus to consider the flower of Rumex as destitute of corolla. Rumex is nearly allied to Rheum, but may be distinguished from that genus by its three-cornered carpels not having wings, and by the embryo of the seed being lateral, not central as in Rheum. The wings that are observed upon the fruit of some species of Rumex are produced by the calyx.

The species of Rumex that have been chiefly used in medicine are the *R. acetosa* and *hydrolapathum*. *R. acetosa*, common Sorrel, is known by its granular valves, diœcious flowers, oblong awl-shaped leaves, with converging (often notched) lobes. It is indigenous in this country, and it is also common in meadows and grassy pastures throughout Europe, from Lapland to Greece. It flowers early in June. *R. hydrolapathum*, Great Water-Dock, is distinguished from other species, and the foregoing, by the following characters: Sepals petaloid, nearly entire, unequally tuberculated; lanceolate leaves acute at each end; almost leafless whorls. It is found growing in marsh-land ditches, stagnant waters, and the margins of great rivers throughout Europe, as well as in North America from Pennsylvania to Virginia. It is by far the largest and most conspicuous of our indigenous docks; flowering from July to August. This seems to have been the plant known under the name of *Herba Britannica* to Pliny (xxv., c. 3. 8), Galen, and others, and which was employed, on account of its astringent properties, in various diseases in which those remedies are indicated. (Martingius, *De vera Antiquorum Herba Britannica*, Amst., 1681.)

RUMFORD, BENJAMIN, COUNT, was born at Woburn, New England, in 1752. His family name was Thompson. By his marriage he was raised above the necessity of acting as a teacher, in which capacity he had employed himself, and when the Revolution commenced he was a major of militia, and for his services to the king's cause obtained an appointment in the Foreign Office. During the contest he returned to New York, and raised a regiment of dragoons, of which he was appointed colonel. In 1784 he returned to England, was knighted, and is said for some time to have acted as one of the under-secretaries of state. It was subsequently, while in the service of the king of Bavaria, that he prosecuted his most useful labours; amongst which were plans for the suppression of mendicity and for relieving poverty and elevating the poor, besides various civil and military reforms, for which several orders of knighthood were conferred upon him, and he was made a lieutenant-general and created a count. Towards the close of the century he once more came to England, and devoted his time to experiments on the nature and economical application of heat, and assisted in founding the Royal Institution. In 1802 he went to reside at Paris, and married the widow of Lavoisier, the chemist, but soon afterwards separated from her. He then retired to Auteuil, a village near Paris, and having a handsome pension from the king of Bavaria, devoted his time to rural pursuits and to chemistry and natural philosophy. He died in August, 1814.

The plans of Count Rumford for improving the arts and conveniences of domestic life have rendered his name well known in England. An account of these will be found in his 'Essays, Political, Economical, and Philosophical.' Several of these essays were published separately, and effected much good at a time when the amelioration of the condition of the poor was attracting great attention. His views are enlightened as well as benevolent, and on the whole he appears to have been in advance of his time. Two volumes of the 'Essays' were collected and published in 1798, and a third in 1802. In the latter year also was published a volume of 'Papers on Natural Philosophy and Mechanics.' Some of these had been read before the Royal Society, in whose 'Transactions' they are also printed.

RUM-ILI', a large division of European Turkey, which comprehends the central part of it, namely, the countries of Albania, Macedonia, Thessaly, and part of Mœsia. It is bounded on the north by the eyalets of Silistria and of Bosnia; on the east partly by the province of Gallipoli, which belongs to the eyalet of Jezayr, and partly by the Ægæan Sea; on the south by the kingdom of Greece, and on the west by the Adriatic. Rum-ilí is an eyalet, or general government under a beglerbeg, who ranks above all other pashas of Europe, and who has under him the following livas or pashaliks:—1, Monastir, which is in general the residence of the beglerbeg himself; this province includes the western and southern parts of Macedonia. The capital, Monastir, called also Bitolia, near the site of the antient Heraclea, not far from the banks of the river Erigonus, an affluent of the Axius, and on the borders of Albania, is a considerable town, with about 15,000 inhabitants; 2, Salonichi, which occupies the eastern pass of Macedonia [THESSALONICA]; 3, Ghiustendil, which embraces the northern part of Macedonia, as far as the sources of the Strymon. It has some rich copper-mines and some copper-works. 4, Uskub, which corresponds to the antient Pæonia. The head town, called Uskub, or Scopia, on the Axius, is the seat of a Greek archbishop; it has some leather manufactories, and about 10,000 inhabitants. 5, Prisrend, or Perzerin, north of Mount Scardus. 6, Krukovatz, or Aladja Hissar, north of Prisrend, as far as the borders of Servia, embracing a part of the former Roman province of Mœsia Superior. 7, Scutari, or Eskanderié, in North Albania. 8, Ochrida, south-east of Scutari. 9, Avlona, in Central Albania. 10, Yanina, or JOANNINA. 11, Delviné, along the southern coast of Albania, opposite Corfu. 12, Trikhala, which embraces the whole of antient Thessaly.

A general description of the whole region is given under TURKEY. For particular accounts of its great divisions, see ALBANIA, MACEDONIA, and THESSALY.

RUMINANTS, *Ruminantia*, Cuvier's name for his eighth order of *Mammifères*, the PECORA of Linnæus.

Cuvier remarks that this is perhaps the most natural and the best defined of the class; for these animals have the air of being nearly all constructed on the same model; and the camels alone present some small exceptions to the common characters. [CAMEL; LLAMA.]

The first of these characters, observes the great French zoologist, is the possession of incisor teeth in the lower jaw only, and these are nearly always eight in number. They are replaced above by a callous rim (bourrelet). Between the incisors and the molars is a wide space, where are found, in one or two genera only, one or two canines. The molars, nearly always six in number on each side of the upper and lower jaws, have their crown marked with two double crescents, the convexity of which is turned inwards in the upper and outwards in the lower teeth.

The four feet are terminated by two toes and two hoofs, which oppose to each other a flattened surface, so that they have the appearance of a single hoof which has been split; whence these quadrupeds have obtained the name of animals with divided or bifurcate hoofs, &c.

Behind the hoof there are sometimes two small processes or spurs, the vestiges of the lateral fingers. The two bones of the metacarpus and the metatarsus are united into a single one, the cannon bone, but in some species there are also vestiges of the lateral metatarsians and metacarpians.

The name *Ruminants* indicates the singular faculty possessed by these animals of masticating a second time their food, which they return into the mouth after a previous deglutition, a power which is the result of the structure of their stomachs, four of which they always have. Of these stomachs the three first are so disposed that the aliment can enter at the will of the animal into any one of the three, because the œsophagus terminates at the point of communication.

The first stomach or paunch (*rumen*, *penula*, *magnus venter*, *ingluvies*—*la panse* of the French) is much the largest in the adult animal; but not so in the recently born calf or lamb. It is divided outwardly into two bag-like appendages at its extremity, and it is slightly separated into four parts on the inside. The internal coat of this stomach is beset with innumerable flattened papillæ. Here are received the masses of herbage rudely broken up by the first mastication, and here it is (though they sometimes, but seldom, occur in the second) that the morbid concretions of a globular or elongated, but rounded, figure are generally found. These concretions are composed of three sorts of substances—of hairs, of the fibrous parts of plants, or of stony matter. The first of these are formed, particularly in the cow, by the animal's own hair, or that of another cow or ox licked off and gradually accumulated in the stomach. Sometimes these are hairy externally, but generally they are covered with a dark polished coat. The *Ægagropilæ* found in the Chamois consist of vegetable macerated fibres. The stony concretions have received the name of *Bezoar stones*. [BEZOARS.]

The herbage in the state above noticed is transmitted into the second stomach, honey-comb bag, bonnet, or king's-hood (*reticulum*, *ollula*—*bonnet* of the French), the walls of which are furnished with laminæ somewhat resembling the cells of bees: this, which is small and globular, may be considered as an appendage of the first stomach or paunch, but is distinguished from that by the elegantly arranged polygonal and acute-angled cells, forming superficial cavities on its internal coat. Here the herbage is arrested, imbibed, and compressed into small masses or balls, which are thence returned successively into the mouth for remastication. During this operation, the animals remain in a state of repose,

> 'Some ruminating lie,'

until all the herbage swallowed has undergone the action o the molar teeth a second time. The aliment thus remasticated is transmitted into the third or smallest stomach, the *manyplus* (manyplies)—(*echinus*, *conclave*, *centipelho*, *omasus*, *psalterium*—*feuillet* of the French). This stomach is distinguished from the two former, both by its form, which has been fancied to resemble a hedgehog rolled up (whence the name *echinus*), and its internal structure, the longitudinal laminæ of its walls resembling in some degree the leaves of a book (whence the name *feuillet*). These numerous and broad duplicatures of its internal coat lie lengthwise and vary in breadth in regular alternate order, amounting to some forty in the sheep, and about a hundred in the cow.

From the third stomach the food is transmitted into the fourth, the *red* (*abomasus*, *faliscus*, *ventriculus intestinalis*—*caillette* of the French), which is next in size to the first stomach or paunch, of an elongated pyriform shape, and with an internal villous coat similar to that of the human stomach, with large longitudinal wrinkles. This last is, so to speak, the true organ of digestion, analogous to the simple stomach of ordinary animals.

We will now proceed to inquire how this complicated machine is connected together, and how it acts.

Blumenbach observes that the three first stomachs are connected with each other, and with a groove-like continuation of the œsophagus, in a very remarkable way. The latter tube enters just where the paunch and the second and third stomachs approach each other; it is then continued with the groove, which ends in the third stomach. This groove is therefore open to the first stomachs, which lie to its right and left. But the thick prominent lips which form the margin of the groove admit of being drawn together so as to form a complete canal which then constitutes a direct continuation of the œsophagus into the third stomach. The functions of this very singular part will vary according as we consider it in the state of a groove or of a closed canal. In the first case, the grass, &c. is passed, after a very slight degree of mastication, into the paunch as into a reservoir. Thence it goes in small portions into the second stomach, from which, after a further maceration, it is propelled, by a kind of antiperistaltic motion, into the œsophagus, and thus returns into the mouth. It is here ruminated and again swallowed, when the groove is shut, and the morsel of food, after this second mastication, is thereby conducted directly into the third stomach. During the short time which it probably stays in this situation between the folds of the internal coat, it is still further prepared for digestion, which process is completed in the fourth or true digestive stomach. (Lawrence's Blumenbach.) In notes to the same work it is stated that the shutting of the groove when the food is again swallowed after rumination supposes a power of voluntary motion in this part, and indeed, it is added, the influence of the will in the whole affair of rumination is incontestable. It is not confined to any particular time, since the animal can delay it according to circumstances when the paunch is quite full. It has been expressly stated of some men, who have had the power of ruminating (instances of which are not very rare), that it was quite voluntary with them. 'I have known,' continues Blumenbach, 'two men who ruminated their vegetable food: both assured me that they had a real enjoyment in doing this, which has also been observed of others; and one of them had the power of doing it or leaving it alone according to circumstances.'

Whilst the Ruminants remain at the teat and live upon nothing but milk, the fourth stomach is the largest of all. The first stomach or paunch only develops itself into its enormous volume in proportion as it receives supplies of herbage.

The intestinal canal of these animals is very long, but little enlarged or sacculated in the great intestines. The cæcum is moderately long and smooth.

In the museum of the Royal College of Surgeons the following preparations in the physiological series will be found highly illustrative of the function of the machinery above noticed:—No. 555 consists of the stomach and small intestines of a fœtal calf (*Bos Taurus*, Linn.); and No. 556, of portions of the four cavities of the stomach of a calf. The description of these two preparations will be found in the article Ox [vol. xvii., p. 75]. No. 557 is the stomach of a goat (*Capra Hircus*, Linn.). The greater portions of the *rumen*, *reticulum*, and *abomasus* have been removed; but the *psalterium* left entire, showing the different characters of their inner surfaces, and their several communications with each other and with the œsophagus. The inner surface of the rumen is beset with elongated villi, spatulate at the extremity; these become shorter as they approach the reticulum, and gradually blend with the alveoli of that cavity. The communication of these two cavities is so free as to lead to the belief that food, when first swallowed, passes into both cavities. The muscular sphincter bounding the canal which conducts the re-masticated food from the œsophagus to the *psalterium* is also clearly shown in this preparation, and the necessary result of its contraction in shutting out the *rumen* and *reticulum* from the œsophagus may be as readily understood. A bristle is placed across the commencement of the *abomasus*, showing the width of the orifice leading from the *psalterium*. No. 558 is a portion of the rumen of a sheep (*Ovis Aries*, Linn.). The villi are flattened and dilated towards the extremity. No. 559 and 560 are noticed in the article Ox (*loc. cit.*). No. 561 is a small portion of the *rumen* of a reindeer (*Cervus Tarandus*, Linn.), showing the form of the villi, which are longitudinally plicated. No. 562 is a small portion of the *rumen* of a sheep. A part of the cuticle with which this cavity is lined is turned down; and the stomach has been injected, to show the vascularity of the subjacent mucous membrane. No. 563 shows a portion of the *rumen* and *reticulum*, uninjected, of a sheep, with part of the cuticular lining reflected. No. 563 A is a portion of the *reticulum* of a reindeer, with the cuticular lining partially removed. The cells remarkably shallow. No. 564 is a portion of the reticulum of a goat, with the cuticular lining partially reflected. The cells partially divided into smaller cells. The descriptions of Nos. 564 A and 564 B will be found in the article Ox (*loc. cit.*). No. 565 is a portion of the reticulum and psalterium, injected, of a lamb. The latter cavity has been divided transversely, showing the longitudinal disposition of the laminæ, and how nearly they occupy the whole cavity. Their different sizes and relative proportions are also well shown by this section. Bristles are inserted in the interspaces of the different laminæ. No. 566 is the remainder of the *psalterium* and the *abomasus* of the same stomach. The chief characteristic of the fourth cavity, viz. its vascular villous lining membrane, is well shown in this preparation. This tunic is thrown into large oblique rugæ, at what may be termed the cardiac end. The pylorus is protected by a valvular protuberance. In its shape and function this cavity resembles the stomach of carnivorous quadrupeds. No. 566 A is the stomach of a wapiti fawn (*Cervus Canadensis*, Briss.) six days old. At this period the food, consisting of milk only, is conveyed directly to the fourth stomach to be digested: as it requires no preparation in the preceding cavities, they are accordingly collapsed, and of comparatively very small size. The descriptions of Nos. 566 B, 566 C, 566 D, and 566 E, will be found in the article Llama [vol. xiv., pp. 69, 70]; and those of Nos. 567, 568, and 569, in the article Camel [vol. vi., p. 189]. No. 569 A is a portion of the *psalterium* and *abomasus* of a llama, showing the same structure as exists in the camel, but on a somewhat smaller scale. A comparison of this preparation with No. 566 B shows that the laminæ characterising the *psalterium* are not developed in the fœtal stomach of the llama. In the ox, the laminæ of the *psalterium* preserve the same proportions in the fœtal as in the adult state (No. 555). No. 569 B exhibits the pyloric end of the *abomasus* and the commencement of the *duodenum* of a llama. This preparation was made for the purpose of showing the form, position, and structure of the valvular protuberance at the pylorus. It has been divided by a longitudinal incision, and seems principally composed of an accumulation of the sub-mucous cellular texture, the cells of which are large, and, being filled with fluid, must render the part elastic. No glandular follicles are perceptible, nor any conspicuous orifices in the mucous membrane covering the protuberance; yet it has been called glandular. (Home's *Comparative Anatomy*, i., p. 173.) Daubenton however terms it simply 'boursuflure,' without hinting at its use. Its office seems to be merely mechanical: if pressed on by any mass of undigested matter, it would shut up the pylorus, and prevent the passage of such matter into the duodenum; while substances sufficiently comminuted and digested would pass beneath the protuberance, through the semilunar pylorus, into the duodenum. This gut forms at its commencement a capacious reservoir, a small part of which only is preserved in this preparation. No. 723 B is part of the small intestines of a wapiti fawn injected, dried, and put into oil of turpentine. It shows the limited extent of the convolutions of the intestines arising from the shortness of the mesentery, and the mesenteric artery forming in consequence only a single series of arches. No. 735 is a portion of the intestinal canal of a small deer (*Moschus*), showing similar concentric folds of the colon. This disposition occurs in all the Ruminants. (*Cat.*, vol. i.)

Pallas describes and figures, in his 'Spicilegia Zoologica,' the third stomach, with its manyplies, of *Moschus moschiferus*.

The fat of the Ruminants, when cold, after death, becomes harder than that of other animals, and even brittle: it is called tallow and suet (*suif* of the French). The mammæ of this order are situated between the thighs. The general osseous structure may be seen in the articles Bison, Deer, Moschidæ, and Ox. There is a fine series of skeletons of Ruminants in the museum of the College of Surgeons; and among the skulls of oxen, a remarkable pug-nosed variety which is now wild on the pampas of Buenos Ayres.

The fœtus of the Ruminants is developed by the aid of a placenta, divided into numerous detached lobes or cotyledons, the various forms of which are shown in the preparations, numbered from 3481 to 3528 inclusive, in the physiological series of the Hunterian Collection. The camel tribe however here again deviate from the true Ruminants, having no cotyledons, but only a general villous condition of the chorion, as in the mare.

The genera placed by Linnæus under his order Pecora will be found under that head.

Cuvier makes the Ruminants consist of two divisions:—1st, those without horns; 2nd, those with horns.

The 1st division embraces the camels (*Camelus*, Linn.), or the *Camels* properly so called, and the *Llamas*; and the *Chevrotains* (*Moschus*, Linn.). 2nd. All the rest of the Ruminants, of the male sex at least, have two horns or prominences, more or less long, projecting from the frontal bones, which is not found in any other family of mammals.

In some these prominences are covered with a case of elastic substance, composed, as it were, of agglutinated hairs, which grows in layers, and during the whole life of the animal. The name *horn* (*corne*) is particularly applied to the substance of this case, which is termed a *hollow horn*

The bony prominence or core which this case envelops, grows, like it, during the whole life of the animal, and is never shed. Such are the horns of oxen, sheep, goats, and antelopes. (See the several articles.)

In others the prominences are invested only with a hairy skin, which is continued from that of the head, and is never destroyed during life. These prominences are never shed. Such is the modification of horn possessed by the GIRAFFE, the sole genus of this subdivision.

Finally, in the great genus *Cervus*, Linn. [DEER], the prominences covered during a certain period with a hairy or velvety skin resembling that of the rest of the head, have at their base a ring of bony tubercles, which, as it increases, compresses and obliterates the nutrient vessels of that skin, which, when the horn is complete, dries and is removed. The naked bony prominence separates in due time from the skull, to which it grew, falls, and the animal becomes defenceless. But new horns soon begin to bud, ordinarily, and while the animal is in the vigour of life, larger than the preceding ones, and destined to fall in their turn. These horns, purely osseous and subjected to periodical changes, are termed by the French *bois*, and are known in England by the name of antlers.

Mr. G. R. Gray makes his fifth order consist of the *Ungulata* of Ray (*Bruta*, *Pecora*, and *Belluæ*, Linn.). Of this order, his first family, *Bovidæ*, comprises the whole of the ruminating animals. [Ox, vol. xvii., p. 89.]

Col. Hamilton Smith, whose researches and method form the groundwork of most of the treatises on ruminating animals since the appearance of his work,* which should be carefully perused by every zoologist, is followed so closely by Mr. Swainson, that the arrangement of the latter is in fact, with slight change of position, the arrangement of the former. Mr. Swainson indeed places the Camels as the ruminating form among the *Solipedes*; but still they stand between the Camelopards and the Horse. He makes the Bovidæ, or Oxen, the typical family; but adopts the names given by the Colonel to that and the other families, with the exception of the *Antelopidæ*, which are equal to the *Capridæ* of Smith; Mr. Swainson making the Antelopes the typical form.

Mr. Swainson's fourth order, *Ungulata*, is divided into the following five tribes: *Pachydermes*, *Anoplotheres*, *Edentates*, and *Solipedes*.

The Ruminantes are thus arranged:—

1. *Sub-typical group.*—Horns sheathing; form gracile, slender.

Fam. Antilopidæ. (Sw.——*Capridæ*, Smith.)

Genera.—Dicranocerus, Sm.; *Aigocerus*, Sm.; *Oryx*, Sm.; *Gazella*, Sm.; *Antilope*, Sm.; *Redunca*, Sm.; *Tragulus*, Sm.; *Raphicerus*, Sm.; *Tetracerus*, Leach; *Cephalophus*, Sm.; *Neotragus*, Sm.; *Tragelaphus*, Sm.; *Nemorhædus*, Sm.; *Rupicapra*. *Ant.*, Sm.; *Aplocerus*, Sm.; *Capra*, Auct.; *Ovis*, Auct.; *Damalis*, Sm.; *Acronotus*, Sm.; *Boselaphus*, Sm.; *Strepsicerus*, Sm.; *Portax*, Sm.

2. *Typical.*—Horns sheathing; form heavy, robust.

Fam. *Bovidæ*, Sm.

[Ox, vol. xvii., p. 89.]

		Genera and Subgenera.
3 Aberrant . . Horns solid, deciduous. *Cervidæ*, Sm., *Cervus*, Linn.		1. *Alce*, Sm. (Subgenera, *Rangifer*, Sm.; *Dama*, Sm.) 2. *Cervus*, Lin., Sw. (Subgenera, *Rusa*, Sm.; *Axis*, Sm.) 3. *Capreolus*, Sm. (Subgenus, *Mazama*, Sm.) 4. *Subulo*, Sm. 5. *Stylocerus*, Sm.
	Horns wanting; forelegs shorter than the hinder. *Moschidæ*, Sw.	1. *Moschus*, Linn.
	Horns very short, covered with a skin. *Camelopardæ*, Sw.	1. *Camelopardalis*, Antiq.

The tribe *Solipedes*, which immediately follows the Camelopards, consists of the genera *Camelus*, *Auchenia*, and *Equus*. Thus the Camels and Llamas, with which Colonel Smith, following Cuvier, commences the Ruminants, are placed by Mr. Swainson at the conclusion. With the exception of this and a few other modifications, the two arrangements are similar.

Mr. Ogilby, in his interesting paper, written with a vie of pointing out the characters to which the most importance should be attached in establishing generic distinctions among the *Ruminantia*, read before the Zoological Society, in December, 1836, commenced by observing that it has been justly remarked by Professor Pallas, that if the generic characters of the *Ruminantia* were to be founded upon the modifications of dentition, in accordance with the rule so generally applicable to other groups of Mammals, the greater part of the order would necessarily be comprised in a single genus; since the number, form, and arrangement of the teeth being the same in all, except the Camels and Llamas, these organs consequently afford no grounds of definite or general distinctions. Hence, Mr. Ogilby observes, naturalists have resorted to other principles for regulating the distribution of ruminating animals, and the form, curvature, and the direction of the horns, selected for this purpose at a period when an extremely limited knowledge of species permitted the practical application of such arbitrary and artificial characters without any very glaring violation of natural affinities, still continue to be the rule adopted by zoologists in this department of mammalogy. But Illiger, he remarked, forms a solitary but honourable exception; for he first introduced the consideration of the muzzle and lachrymal sinus into the definitions of the genera *Antilope*, *Capra*, and *Bos*: his labours however were disregarded by subsequent writers, or his principles only applied to the genus *Antilope*. 'It is obvious,' continued Mr. Ogilby, 'that as the knowledge of new forms and species became more and more extensive, the prevailing gratuitous rule above mentioned, founded as it is upon purely arbitrary characters which have no necessary relation to the habits and economy, or even to the general external form of the animals themselves, would eventually involve in confusion and inconsistency the different groups which were founded upon its application; and such has long been its acknowledged effect. The genus *Antilope* in particular has become a kind of zoological refuge for the destitute, and forms an incongruous assemblage of all the hollow-horned *Ruminants*, without distinction of form or character, which the mere shape of the horns excluded from the genera *Bos*, *Ovis*, and *Capra*; it has thus come to contain nearly four times as many species as all the rest of the hollow-horned *Ruminants* together; so diversified are its forms, and so incongruous its materials, that it presents not a single character which will either apply to all its species or suffice to differentiate it from conterminous genera.

'To meet this obvious evil, MM. Lichtenstein, De Blainville, Desmarest, and Hamilton Smith have applied Illiger's principles to subdivide the artificial genus *Antilope* into something more nearly approaching to natural groups; the reform thus effected however was but partial in its operation; the root of the evil still remained untouched, for none of these eminent zoologists appear to have been sufficiently aware of the extremely arbitrary and artificial character of the principal group itself, which they contented themselves with breaking up into subgenera, nor of the actual importance and extensive application of the characters which they employed for that purpose. By mixing up those characters moreover with others of a secondary and less important nature, the benefit which might have been expected from their labours has been in a great measure neutralized; and even the subdivisions which they have introduced into the so-called genus *Antilope* are less definite and comprehensive than they might otherwise have been made.

'The truth is however that the presence or absence of horns in one or both sexes; the substance and nature of these organs, whether solid or concave, permanent or deciduary; the form of the upper lip, whether thin and attenuated, as in the Goat, or terminating in a broad, heavy, naked muzzle, as in the *Ox*; and the existence of lachrymal sinuses, and interdigital pores, are the characters which really influence the habits and economy of ruminating animals, and upon which, consequently, their generic distinctions mainly depend. These, with the assistance, in a very few instances, of such necessary characters as the superorbital and maxillary glands, the number of teats, and the existence of inguinal pores, are sufficient in all cases to define and characterise the genera with the strictest reference to logical precision and zoological simplicity.'

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* See Griffith's 'Cuvier.'

Waiving the discussion of the value of these characters, or a statement of the reasons which induced him to adopt them in preference to those more generally employed in this department of mammalogy, Mr. Ogilby contents himself with observing, 'that the presence or absence of horns in the females regulates, in a great measure, the social intercourse of the sexes; that upon the form of the lips and muzzle, the only organs of touch and prehension among the *Ruminantia*, depend the nature of the food and habitat, making the animal a *grazer* or a *browser*, as the case may be; and that the existence or non-existence of interdigital glands, the use of which appears to be to lubricate the hoofs, has a very extensive influence upon the geographical distribution of the species, confining them to the rich savannah and the moist forest, or enabling them to roam over the arid mountain, the parched karoo, and the burning desert.'

Mr. Ogilby then arranges the *Ruminants* under the following families: 1, *Camelidæ* (observing that they form what Mr. MacLeay would call an aberrant group). 2, *Cervidæ* (comprising the genera *Camelopardalis, Tarandus, Alces, Cervus, Caprea* (type, Roebuck), and *Prox* (type, Muntjak). 3, *Moschidæ* [MOSCHIDÆ, vol. xv., p. 430]. 4, *Capridæ* [GOAT, vol. xi., pp. 285, 286]. 5, *Bovidæ* [OX, vol. xvii., p. 89].

There is no order of animals that ministers so freely to the wants and comforts of man as the Ruminants. They form the great staple of the food and clothing of civilised and generally of savage life. Their milk, their flesh, their wool, their leather, their tallow, their horns, in short almost every portion of these quadrupeds is made available; and many of them are of high utility as beasts of burthen.

FOSSIL RUMINANTS.

Ruminants, Oxen and Deer especially, occur in a fossil state in the tertiary series of strata, and most abundantly in the third and fourth divisions of the fresh-water deposits (Pliocene period of Lyell). Bones of the Ox have indeed been found in the second or Miocene system of deposits, as at Georgensgemünd in Bavaria; but in the Pliocene period the Ruminant remains are to be numerously traced, with extinct species of existing genera of *Pachydermata*, viz. Elephant, Rhinoceros, Hippopotamus, and Horse, together with the extinct genus Mastodon. The bone-caverns and the osseous breccia in the limestone fissures contain them plentifully; and they are widely spread over the face of the globe. A more detailed account will be found under the different articles which treat of the several families and genera of this order.

Dr. Lund, in his *View of the Fauna of Brazil*, &c., remarks, that of Ruminants there is only one genus in Brazil, that of *Cervus*, which contains five species, whereof one, of the size of the musk, is undescribed. This animal, he observes, does not penetrate into the limestone caverns; but when their entrances form a spacious chamber, its slot may be frequently seen there. Only in Lappa Nova de Maquiné did Dr. Lund discover the remains of a single individual of that genus (*Cervus rufus*). He had since observed, in many caves that lay near to the habitations of men, the uninjured skeletons of several domestic animals, especially oxen and goats, the examination of which clearly explained to him the cause of their introduction; namely, that those creatures, whose footsteps he had often traced in the mouth of caverns, had undoubtedly visited them for the purpose of licking the saltpetre, crystals of which cover the surface of the floor; and that they had lost themselves in the labyrinthine passages.

The poverty of genera in the family of Ruminants did not characterise the antient fauna of Brazil; for besides the genus *Cervus*, Dr. Lund had discovered two others belonging to that period. He refers them to two species, of which one is about the size of *Cervus simplicornis*, Ill., the other nearer to *Cervus campestris*. The genus *Antilope* had left remains of one species, *Ant. Maquinensis*, as large as a buck, with short bow-shaped horns curved backwards. It was gregarious, like its congener, which is now confined to the Old World.

Of the genus *Camelus* Dr. Lund possesses the remains of two species; one exceeding a horse in size [MACRAUCHENIA?], the other a little less. To which of the two subgroups of this genus the fossils belong, that is, whether to the modern inhabitant of the warm regions of the Old World, *Camelus*, Ill., or to that now found in the chain of the Andes, *Auchenia*, Ill., Dr. Lund's insufficient means of comparison would not allow him to decide.

Dr. Lund concludes his account of the *Ruminants* with a small group that does not exactly coincide with any of its existing genera. This genus, he tells us, which in the lightness of its form rivals the most agile of the Antelope tribe, departs far from that group in the details of its structure, as also from the goat, sheep, ox, and camel. In some isolated points it approaches the genus *Cervus*, while in others it differs from it more than do any ruminants from each other. He proposes the name of *Leptotherium* for this extinct genus, of which he possesses the remains of two species, one less than the roe, the other bigger than the stag.

'If now,' continues Dr. Lund, 'we take a comparative view of the genera and species of this family, in the former and present periods, we must remark, in the first place, the much greater abundance of generic forms that distinguished the ancient creation, inasmuch as their numbers are in the proportion of four to one: of these four, *Leptotherium* is entirely extinct; with regard to the genus *Camelus*, I have already observed that the insufficiency of my means of comparison prevents me from deciding whether the fossil species belong to those of the Old World, or to the sub-group of this continent; but if I might be allowed to venture a speculation on this subject, I should declare for the latter opinion, on the strength of a rule which we shall, in the sequel, see confirmed by many examples, namely, that the animal species of the antient world exceeded in size the corresponding species of the existing races; and we have seen that the fossil species of *Camelus* are considerably inferior to those of the old continent, while they somewhat surpass those of the New World.

'In regard to the genus *Antilope*, it is well known that, in our times, the warmer portions of Africa and Asia constitute its dwelling-place. At the same time I must observe, that one of the latest travellers in Chili, M Gay, believes that he has recognised a species of Antelope in the descriptions given to him of an animal that inhabits the inaccessible regions of the Andes. Should this supposition prove correct (at which we should not be surprised, when we remember that other animals, more likely to attract man's attention, such as the tapir and the bear, had escaped the observation of naturalists in those very same mountains, until a very recent period), we are then brought back to this remarkable result, that two genera, which are at present restricted to the highest chain of the South American coast, were in the age of our fossil remains extended over its plains.

'The discovery of an animal form, now usually considered as peculiar to the Old World, among the purely American forms, such as the extinct fauna of this quarter has hitherto produced, being a fact of great importance, I thought it right to allude to this novel information, while I reserve myself from giving any positive judgment until further inquiries shall have enabled M. Gay to verify or disprove this report.

'But not only the number of genera, but also the total amount of species was greater in those days than now. There are now five species (all, as before mentioned, belonging to the genus *Cervus*) that inhabit this district, while I already reckon seven species of the four fossil genera. The great number of species which the genus *Cervus* now contains within this region inclines us to suspect that our knowledge of the fossil species is very far from being complete. The circumstance of these animals living solitary, or at most in small herds, together with their rapidity of flight, secures them from the attacks of predatory beasts, much more than animals that either live in large societies, like the *cloven-footed* generally, or which are bad runners, as the *Tardigrada*, and this accounts for our finding their remains so seldom in the caves of wild beasts, in comparison with those of the other classes. Therefore, as the main result of our inquiry respecting this family, we see that of the four genera of which it was composed in that former period, only one still continues to exist in this same district, two must be sought for in the higher chain of the Andes (or perhaps only in the warmer zones of the Old World), and finally, one has entirely disappeared from the surface of the earth.' (*Transatl. Magazine of Nat. Hist.*, New Series, 1840.)

RUMINATION. [RUMINANTS: STOMACH.]

RU'MPHIA, a genus named by Linnæus in honour of George Eberhard Rumph, who was born at Hanau, and went as physician to Amboyna, where he subsequently became chief magistrate and president of the mercantile association, and died there in 1706. He paid great attention to the natural products, especially the plants, of the Spice Islands. Many of these are figured in his 'Herbarium Amboinense,' in 696 plates, each with often two plants, published by Burmann, in six volumes, from 1741 to 1751, with a supplemental one in 1757. The genus which has been named after him is only known from a figure of Rheede, published in his 'Hortus Malabaricus, vol. iv., t. 11, who describes it as being found in Parabaroo and other provinces of Malabar. It has not been seen by any modern botanist. It is usually referred to the natural family of Terebinthaceæ and to the suborder Bursereæ. It has a tubular trifid calyx, three oblong petals of the corol; stamens three, equal to the petals, and exserted. The ovary is single, three-cornered. Style one. Drupe coriaceous, turbinate, three-furrowed, with the nut three-celled, three-seeded. But Messrs. Wight and Arnott remark, that as each apparent stamen may be composed of several filaments, this doubtful genus would be brought near Byttneriaceæ.

RU'MPHIUS. [RUMPHIA.]

RUNCORN. [CHESHIRE.]

RUNIC LETTERS is the name given to an antient alphabet peculiar to the Teutonic nations, especially the Scandinavians and Germans. The time when this alphabet began to be used, is only matter of conjecture, and while some, notwithstanding the statement of Tacitus (*Germ.*, c. 19: 'literarum secreta viri pariter ac fœminæ ignorant'), have advanced the opinion that the Runic characters were used by the Germanic nations long before the commencement of the Christian æra, others suppose that they were an invention of a much later age. The alphabet consisted only of sixteen letters, most of which bear a great similarity to the Greek and Roman characters. This similarity seems to support the opinion of Fr. Schlegel (*Lectures on Antient and Modern Literature*) and others, that the alphabet was originally introduced among the inhabitants of the coasts of the Baltic by Phœnician merchants, and that, with some modifications, it was kept a secret by their priests, and applied to various magic purposes, so that Tacitus would have been perfectly justified in saying that writing was unknown to the Germans.

The earliest Runic characters are found cut on stones, which were either sepulchral monuments or land-marks. Such stones are found in Norway, Sweden, Denmark, Northern Germany, and in some parts of France and Spain, in short in almost all countries where nations of the Teutonic race took up their abodes during the fourth and fifth centuries of our æra.

All Runic letters have been divided into three great classes: 1, the Northern or Scandinavian; 2, the German (in the limited sense of the word); and 3, the Anglo-Saxon Runes. Grimm is of opinion that the German Runic characters are only a late modification of the Scandinavian Runes, as the Anglo-Saxon are of the German. In Scandinavia however the Runes seem to have been in use longer than in any other country, and we find that they were written there down to the middle of the fifteenth century, although the common alphabet was known there long before that time. Several Scandinavian MSS. are written in Runic letters, but none of them appear to be older than the thirteenth century, and the most recent were written before the year 1450. The number of stones covered with Runic inscriptions which have been discovered in Sweden and Denmark, is very great. The characters consist almost invariably of straight lines, in the shape of little sticks either singly or put together. Such sticks were in early times used by the Germans for the purpose of ascertaining future events. The sticks were shaken up, and from the figures that they formed a kind of divination was derived. Hence the mysterious character of the Runes (Rûna itself signified secret or mystery), and hence also the word *buchstabe*, the German name for letter, which signifies a stick of a beech-tree. In their zeal for discovering stones with Runic characters, antiquarians have frequently been deceived, and led to consider figures on stones as Runes which were never made by human hands, but were produced by natural circumstances. (Klemm, *Germanische Alterthumskunde*, p. 194, &c.) The word Runes is derived by some from the verb *runen*, to slit or scratch; by others from *raunen*, to whisper.

(For further information the reader may consult Adelung, *Aelteste Geschichte der Deutschen*, p. 373, &c.; Brynjulf, *Periculum Runologicum*, Copenhagen, 1823; Legis, *Fundgruben des alten Nordens*, Leipzig, 1829; Liljegren, *Run-Lära*, Stockholm, 1832, with plates; Schmitthenner, *Kurzes Deutsches Wörterbuch*, under 'Rune;' and more especially W. C. Grimm's work, *Ueber Deutsche Runen*, Göttingen, 1821, 8vo.)

RUNN. [HINDUSTAN, pp. 213, 214.]

RUNNER. [STEM.]

RUNNYMEAD. [JOHN.]

RUPELLA'RIA. [LITHOPHAGIDÆ, vol. xiv., pp. 47, 48.]

RUPERT, PRINCE ROBERT, of Bavaria, better known by the title of Prince Rupert, was born in 1619. His mother, Elizabeth, the eldest daughter of James I. of England, married Frederic V., elector palatine, who was banished and deprived of his estates in consequence of his unsuccessful attempt to seat himself upon the throne of Bohemia. Rupert, an exile from his youth, received little education; his disposition was active; he had a taste for military pursuits, and as the civil wars in England presented an opportunity for employment, he offered his services to Charles I., who put him in command of a regiment of cavalry. He took Cirencester, Hereford, and Lichfield, and was engaged in the battles of Worcester, Edgehill, and Chalgrove Field; but he was remarkable rather for his rash courage and impetuosity than for prudence or military knowledge. He gave strength however to the king's cause: his resolute vigour compensated in part for his want of judgment as a leader, and the king continued to employ him, endeavouring to ensure a continuance of his services by creating him a Knight of the Garter and Duke of Cumberland. He took Bristol, dispersed the parliamentary army at Newark, and was afterwards successful in the north; but at Marston Moor his indiscretion ruined the king's hopes: his want of concert with the marquis of Newcastle and the hasty withdrawal of his troops from the field of battle are gravely censured by Lord Clarendon. Had Prince Rupert 'stayed with the army he marched away with, at any reasonable distance, it would have been long before the jealousies and breaches which were between the English and Scotch armies, would have been enough composed to have agreed upon the renewing the siege.' As it was, in two days after the battle they returned to the posts they had occupied before it took place. (*Hist. Rebel.*, vol. iv., 512.) The king's confidence in him however did not diminish: on the contrary, Rupert, who had been commander only of the horse, was soon after appointed general of all the king's forces, with which he forced Sir Robert Pye to surrender Leicester, after a gallant defence. He gave the first charge in the battle of Naseby, and repulsed the troops with which he was engaged. After the day was lost, he accompanied the king and some remnants of their forces to Hereford, the king hoping to join Gerrard, who had a body of royalist troops in South Wales, and thus to muster a new army. At Hereford, before it was agreed what should be done next, Rupert left the king, and went hastily to Bristol that he might put that city in condition to resist an attack, which there was reason to expect would soon be made upon it. The reverses that the king had lately sustained rendered his continuing in possession of Bristol a point of the most vital consequence. Rupert wrote so confidently of his operations, that the king marched to Chepstow with the intention of joining him. He was dissuaded however; fortunately, as it proved, for after a short defence, Rupert surrendered the city to the parliamentary army. This pusillanimity justly disappointed and irritated the king, who signified his pleasure to the lords of the council that they should require Prince Rupert to deliver his commission into their hands. He likewise wrote the following letter to him, depriving him of his command:—

'Nephew,—Though the loss of Bristol be a great blow to me, yet your surrendering it as you did is of so much affliction to me, that it makes me not only forget the consideration of that place, but is likewise the greatest trial of my constancy that hath yet befallen me; for what is to be done, after one that is so near me as you are, both in blood and friendship, submits himself to so mean an action? (I give it the easiest term) such—— I have so much to say, that I will say no more of it: only, lest rashness of judgment be laid to my charge, I must remember you of your letter of the 12th of August, whereby you assured me that, if no mutiny happened, you would keep Bristol for four months. Did you keep it four days? Was there anything like a mutiny?

More questions might be asked; but now, I confess, to little purpose: my conclusion is to desire you to seek your subsistence, until it shall please God to determine of my condition, somewhere beyond the seas; to which end I send you herewith a pass; and I pray God to make you sensible of your present condition, and give you means to redeem what you have lost; for I shall have no greater joy in a victory than a just occasion, without blushing, to assure you of my being your loving uncle and most faithful friend, C. R.'

'Hereford, September, 1645.'

(Clarendon, *State Papers;* and Oxford edit. of Clarendon's *Hist. Rebell.*)

Rupert rendered an account of his conduct before the king at Belvoir Castle, and removed the imputation of disloyalty and treason, but not that of indiscretion. He was unpopular throughout the country, and had the misfortune, says Lord Clarendon, 'to be no better beloved by the king's party than he was by the parliament.' He did not resume his military command; nevertheless the king could not long do without him. He sought the appointment of commander of that portion of the fleet which still adhered to the king, and as there was no other person to whom the king could readily confide the charge, Rupert obtained the post (1648). His services were immediately required on the Irish coast. Lord Ormond and the Royalist party in Ireland needed assistance, and Rupert, in order to give them aid, anchored in the harbour of Kinsale. Here Blake, with the Parliamentary squadron, blockaded him, until (October, 1649) he resolved to force his way out, which he did, with the loss of two or three ships, and steered for Lisbon. He was pursued by Blake, who demanded the surrender of his fleet in the name of the Commonwealth, but the king of Portugal, who was in alliance with Charles I., not only protected the king's fleet, but fitted out a squadron to assist Prince Rupert, and so induced Blake to withdraw his fleet.

Rupert now sailed to Carthagena, and again Blake pursued him, and requested that the prince's ships might be given up to him, but the king of Spain, being in amity with England, a refusal was given on similar grounds to those alleged by the king of Portugal. From Carthagena he sailed to Malaga, where he was so ill-advised as to sink and capture some English merchantmen. Informed of this transaction, Blake immediately followed him, and in January, 1651, attacked Rupert's squadron, without reference to the Spanish authorities, burnt and destroyed all but four or five ships, with which the prince escaped to the West Indies, where he supported himself by capturing English and Spanish merchantmen. Prince Maurice, who accompanied his brother, was cast away, and Rupert contrived, with two or three ships, to return to France, where he sold them, on behalf of Charles II., to the French government.

On the restoration of Charles II., Rupert left France and returned to England, where he was made a privy counsellor, and received other honours. By this time the impetuosity of his youth had diminished, and he judged with more consideration and calmness. When therefore there was a commencement of hostilities with the Dutch, the appointment of Rupert to serve under the duke of York was looked on without dissatisfaction. During the expedition he acquitted himself with credit, which was in no way diminished when, in the following year, he commanded the British fleet in conjunction with Lord Albemarle. In 1673 he was again charged with the command of the fleet, which was actively engaged with the Dutch; but he found this squadron so ill-equipped, and, what was worse, so weakly manned, that he returned home. The king expressed some coolness at the manner in which he conducted some of his latter engagements. He had now finished the active part of his life; he was governor of Windsor Castle, and there spent a great portion of his time, occupied for the most part with mechanical and chemical experiments, with painting and engraving; in the latter art he was an adept, though not the inventor of mezzotinto, as has often been erroneously stated. [MEZZOTINTO.] He died at his house in Spring Gardens, on the 29th of November, 1682. His collection of pictures was sold after his death, and his jewels, which were of considerable value. He had illegitimate children, but was never married.

Rupert was endowed with good natural abilities, had a quick perception, was vigorous, active, and energetic; he could readily change employments and pursuits, acquiring quickly such a knowledge of that which he undertook as to prevent miscarriage. He was impetuous, rash, impatient of control and advice, and wanting in most qualities which constitute a great man. His conduct with the king's troops in Yorkshire, at Marston Moor, and at Bristol, and his piracies in the West Indies, have been very justly censured.

(Clarendon, *Hist. Rebel.*; Ludlow's *Memoirs*; Whitelock's *Mem.*; *Mémoires de Grammont*; Campbell's *Lives of the Admirals*; *Biog. Univer.*, &c.)

RU'PICOLA. RUPICOLINÆ. *Rupicola* is also used by M. Fl. de Bellevue to designate a bivalve shell. M. de Blainville divides the *Anatinæ* [PYLORIDIANS, vol. xix., p. 142, 143] into three sections:—

A. Inequivalve species.

Example, *Anatina myalis.*

B. Equivalve, regular species.

Example, *Anatina subrostrata.* [PYLORIDIANS, vol. xix., p. 143.]

C. Equivalve, terebrating species.

Example, *Anatina Rupicola*, Lam. (genus *Rupicola*, Fl. de Belv.).

RUPICOLI'NÆ, a subfamily of Insessorial Birds allied to the *Manakins* and generally arranged under the family *Pipridæ*. Mr. Swainson places both *Calyptomena* and *Rupicola* in the subfamily *Ampelinæ*, or *Typical Chatterers*; and *Rupicola*, in his arrangement, immediately precedes the subfamily *Piprinæ*, *Manakins*, which he considers as subtypical. Mr. G. R. Gray (*Genera of Birds*) places *Rupicola* and *Calyptomena* at the head of the *Ampelinæ*, the fourth subfamily of the *Ampelidæ* in his method.

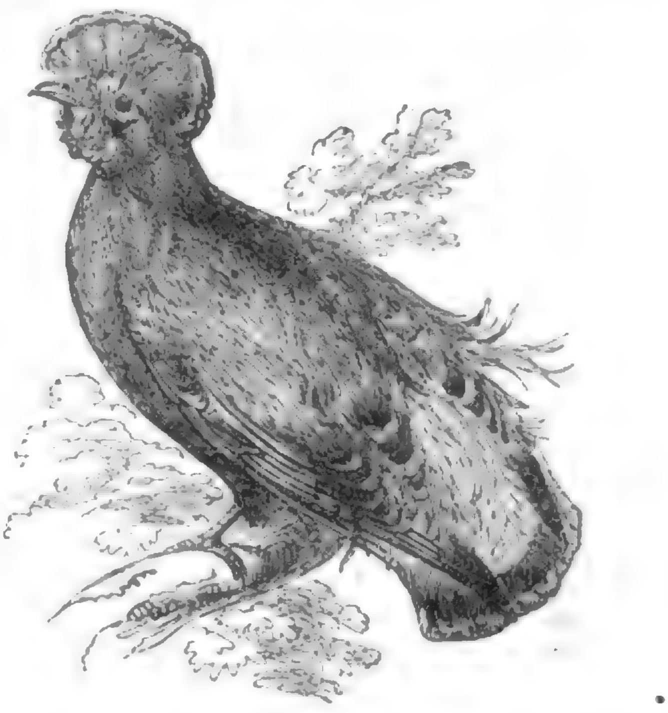
Rupicola, *Briss.* (Cock of the Rock.)

Generic Character.—Bill moderate, robust, rather vaulted and curved at the point, upper mandible as wide as it is high, compressed at the base and notched at the point, lower mandible shorter, straight, and sharp; nostrils oval, lateral and hidden by the feathers of the elevated crest which covers the head. *Feet* large, strong, tarsi partially clothed with feathers, feet syndactyle, outer toe connected with the middle toe beyond the first joint, hallux very strong and armed with a crooked nail. Wings short, rounded; fourth and fifth quills longest.

Geographical Distribution.—Central and South America.

Examples, *Rupicola aurantia*, Vieill., and *Rupicola Peruviana*, Dumont.

Rupicola aurantia.



Rupicola aurantia.

Description.—Male.—Size about that of a Ring Pigeon (*Columba Palumbus*), very bright orange-yellow; a crest, which is compressed and elevated, rises from the head with a helmet-like air, and is varied at the summit with brown and bright yellow; there is some white at the bend and on the middle of the wing, which is filiform at the first quill: the tail-feathers are short, reddish-black bordered with yellow; bill and feet rosy-white.

Female rather smaller, and with a less elevated crest; colour entirely dirty bistre-brown.

This is the *Pipra Rupicola* of Linnæus, *Rupicola Cayana* of Swainson, *Rupicola elegans* of Stephens, and *Rock Manakin* and *Cock of the Rock* of English ornithologists.

Locality.—This beautiful bird inhabits Guiana, especially about the rocks which border the small river Oyapock, and is becoming daily more rare.

Habits, &c.—The Cock of the Rock flies swiftly and is a very shy bird. The nest is made of twigs and dry herbage; and there the female lays two white eggs about the size of those of a pigeon. The food consists of the smaller wild fruits.

Mr. Swainson considers this bird to be the Rasorial type of the true Chatterers.

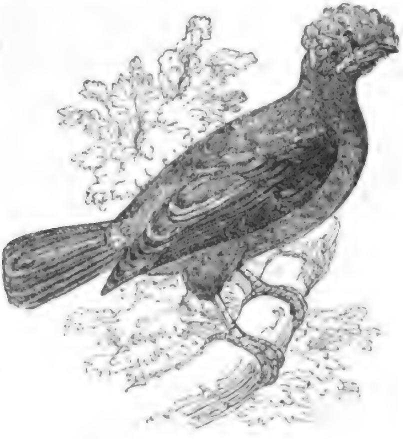
Rupicola Peruviana.

Description.—Male.—Bright orange, like the preceding, but the quills and tail-feathers are deep-black and the middle wing-coverts are bright grey ash. The crest is of a uniform colour, wanting the deeper coloured semicircular line, and not of a helmet-like contour. The tail-feathers are long.

The Peruvian Cock of the Rock was for some time considered to be a mere variety of *Rupicola aurantia*, but it differs in being of larger size, in colour, in the length of the tail-feathers, in the absence of the filiform wing-feathers, and in the crest, which is not circular as in the preceding species.

This is the *Chiachia lacca* of the Mexicans.

Locality.—Supposed to be the interior of Peru and Mexico: has been brought to Europe from Lima.



Rupicola Peruviana.

Calyptomena, *Raffles*. (*Rupicola*, Temm.)

Generic Character.—*Bill* depressed and wide at the base, curved or hooked at the point, and nearly hidden by the feathers of the erect and compressed crest. *Wings* large and very broad, first quill shortest, third longest, lesser quills notched at their tips. *Tail* and *feet* very short, hind-toe as long as tarsus, outer and middle toe connected up to the second joint.

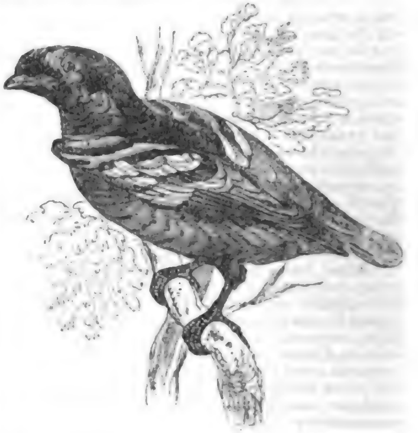
Example, *Calyptomena viridis.*

Description.—'This very singular and beautiful bird is about six inches and a half in length. Its colour is a brilliant green like that of the Parrots. The head is rather large, and its feathers are directed forwards from each side, in such a manner as nearly to conceal the bill, giving the face a very peculiar appearance. A little above and before the eyes, the feathers are of a deep velvet-black at their base, and only tipped with green, but crossed on the coverts by three velvet-black bands; the primary feathers, as well as the whole under side of the wings, are dusky, approaching to black, with the exception of the outer margins of some which are edged with green. The tail is short, rounded, composed of ten feathers, which are green above and bluish-black below. The whole of the under parts are green: this colour is lightest on the sides of the neck and round the eyes. The bill is short, wide, much depressed at the base, deeply cleft, and hooked at the point. Nostrils oval, at the base of the bill, and concealed by the filiform feathers that project over them. The eyes are rather large; the irides bluish. Legs bluish-black; a few feathers come down over the upper part of the tarsi. Feet gressorial; outer toe not much shorter than the middle one, with which it is united as far as the last joint. The female does not differ in appearance from the male.' (Raffles.) This is the *Burong Tampo Pinang* of the Malays.

Locality.—Singapore and the interior of Sumatra.

Habits, Food, &c.—Sir Stamford Raffles states that this species is found in the retired parts of forests, and as it is of the colour of the leaves, and perches high, it is not easily procured. He further tells us that the stomach contained nothing but vegetable substances, chiefly wild grains.

Dr. Horsfield observes that the bill greatly resembles that of the genera *Rupicola*, *Pipra*, *Phibalura*, *Pardalotus*, *Platyrhynchus*, and *Procnias*. 'All these birds,' continues Dr. Horsfield, 'have further a natural resemblance in the structure of their feet, which consists in a union of the toes, particularly of the outer and middle toe, existing in different degrees, but perhaps most strongly in *Calyptomena*. The genera above mentioned are arranged, nearly in succession, by the celebrated Temminck, in his extensive order of *Insectivores*: it remains therefore still to be determined by future inquiries, whether, when more accurately known, they will not be found to constitute a distinct family among the *Passeraux* of Cuvier, connecting the family of *Dentirostres* with that of *Syndactyles*.' (*Zoological Researches in Java.*)



Calyptomena viridis.

RUPPE'LLIA, the name given by M. Milne Edwards to a genus of Cancerians (*Canceriens Arqués*) established on the *Cancer tenax* of the German zoologist and traveller Rüppell, and considered by M. Edwards as the type of the small group which leads to the genera *Ozius* and *Eriphia*.

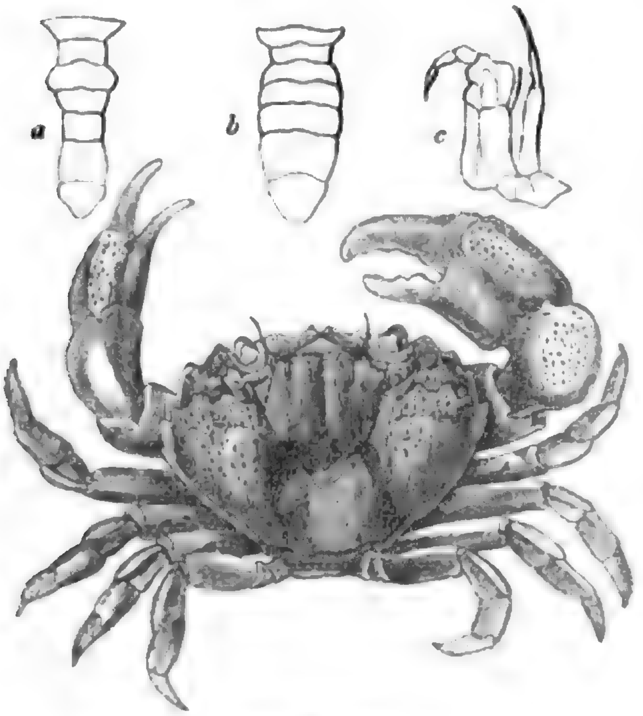
Generic Character.—Form of the *Carapace* approximating closely to that of *Xantho* and *Ozius*; dorsal buckler slightly curved, and about once and a half as wide as it is long. *Front* much wider than the buccal frame, but not occupying, with the orbits inclusive, half of the transversal diameter of the carapace. Latero-anterior borders of the carapace shorter than its latero-posterior borders, with which they are continued without forming any remarkable angle: they terminate towards the edge of the genital region, and are armed with large but not greatly projecting teeth. The *orbits* are nearly circular, and are directed upwards and forwards; their lower border is united to the external angle of the front, so as only to leave at this point a simple fissure, and not a considerable space, as in other cancerians. The result of this disposition is, that the external antennæ are completely excluded from the orbits; their basilary joint, which is large and placed obliquely, reaches, nevertheless, near the external canthus of the eyes; it is soldered to the front by its superior border, which is very wide, and which carries, towards its middle, the moveable stem of these appendages, which is extremely small. The *internal antennæ* bend back directly outwards, as in *Xantho*, &c. The prelabial space is canaliculated, as in *Ozius*, and the third joint of the jaw-feet leaves, between its anterior border, which is very oblique, and the border of the buccal frame, a space which corresponds to the extremity of the efferent canal of the respiratory apparatus. (M. E.)

M. Milne Edwards remarks that, in the rest of their organization, these Cancerians do not much differ from *Xantho* and *Ozius*.

Example, *Ruppellia tenax, Cancer tenax*, Rüppell.

Description.—Upper border of the orbit marked by two fissures separated by a small tooth; there is a fissure at its external angle, and two teeth at its lower borders. The carapace is embossed and slightly granulous forwards, but smooth and slightly convex backwards. Front armed with six rounded and nearly equidistant teeth: of these the external ones are less projecting than the others, and occupy the angle of the superior border. The latero-anterior borders of the carapace are armed with 4 or 5 flattened teeth, which are very wide but hardly projecting. The anterior border of the third joint of the external jaw-feet is notched in the middle. The anterior feet are stout, and very unequal in the two sexes; the hands are granulous, and the pincers like those of *Carpilius*. Length about two inches. (M. E.)

Locality.—The Red Sea.



Ruppellia tenax.

a, abdomen of male; *b*, abdomen of female; *c*, pedipalps.

Two other species, *Ruppelliæ annulipes* and *venosa* (locality unknown), are also recorded by M. Milne Edwards, who thinks that *Cancer Calypso* of Herbst ought perhaps to be referred to this genus, which is placed by M. Edwards between *Pilumnus* and *Pirimela*.

RU'PPIA, a genus of plants belonging to the natural order Alismaceæ. This genus was named by Linnæus after Henry Ruppius of Giessen, an active botanist and author of 'Flora Jenensis.' There is only one species belonging to this remarkable genus, and that is a native of Great Britain. *Ruppia maritima*, Sea Ruppia, is found in salt-water pools and ditches; it has a slender filiform leafy stem, with linear leaves, which are furnished with sheaths sometimes narrow and small, at other times inflated. Its flowers, which are two in number, and green, are seated one above another on opposite sides of a short spadix, which is included in a sheath or spathe; it has large sessile anthers 1-celled: the ovaries are four minute grains seated in the centre between the stamens, which are sessile and two in number. When the plant has flowered, the spadix lengthens to the height of five or six inches or more, and becomes spirally twisted, as if to bring the fruit to the level of the water, in which the flowers are always immersed. After this the ovaries begin to swell, and their base is elongated into a footstalk, as the fruit ripens, one or two inches long. When the fruit is perfectly ripe, it becomes an ovate acuminated drupe. Sometimes the drupe is more beaked than at others, and the leaf-sheaths are a little dilated, when the plant answers to the description of the *R. rostellata* of Roch and Reichenbach.

RUPPIN, NEW, the capital of a district in the province of Brandenburg and government of Potsdam, in the kingdom of Prussia, is situated in 52° 56′ N. lat. and 12° 55′ E. long., on the west side of the great lake of Ruppin, which receives the Klappgrüben, that comes from the Katerbow lake, and flows through the town. By means of the Rhine, the Ruppin canal, and some lakes, it has a communication with the Havel, and so with the Elbe. The town is surrounded by walls, and has five gates. It was nearly destroyed by fire in 1814, but is now a regularly-built and cheerful place: the streets intersect each other at right angles, and there are four handsome squares. Among the public buildings are two churches, two hospitals, a very large building for exercising the troops, the Frederic-William gymnasium, a lunatic asylum, the barracks, the custom-house, and the council-house. There are very considerable manufactories of woollen cloth, flannel, tobacco and snuff, and household furniture: likewise tanneries, breweries, and distilleries. The inhabitants are also partly engaged in agricultural pursuits and in the fisheries, and have some trade. The population is about 8000, besides the garrison, which consists of three battalions of infantry.

(Von Schlieben, *Neuestes Gemälde der Preussischen Monarchie;* Müller, *Geog.-Stat. Topog. Wörterbuch des Preussischen Staates.*)

RUPTURE. [Hernia.]

RURAL DEAN. [Dean.]

RUREMONDE (otherwise *Roermonde*) is the capital of a district in the province of Limburg, in the kingdom of the Netherlands. It is situated in 51° 12′ N. lat. and in 6° E. long., on the right bank of the Maas, which flows past the town in a westerly direction, and is here joined by the Roer or Ruhr, which comes from the north. It is surrounded with a rampart and ditch. The inhabitants, about 5000 in number, have woollen and other manufactories, and carry on a considerable trade. This town is tolerably well built, and has a spacious public square. A productive toll on the Maas is levied here. Ruremonde was the birthplace of the geographer Gerard Mercator, who died in 1594. (Hassel; Stein; Cannabich.)

RUSCUS, the name of a genus of plants belonging to the natural order Smilaceæ, known by the common name of Butcher's Broom. The species of this genus are evergreen, and on this account are frequently introduced for undergrowth in shrubberies. The genus is known by its diœcious flowers, of which the barren flowers have a perianth of 6 single leaves, 3-6 anthers with the filaments combined at the base; in the fertile flowers the same perianth with a tubular nectary, single style, fruit superior, 3-celled, cells 2-seeded. One of the species, *Ruscus aculeatus*, common butcher's broom, is found wild in Britain.

RUSH, the common name of the species of *Juncus*, a genus of plants belonging to the natural order Juncaceæ. This genus is distinguished by its inferior perianth, composed of 6 glumaceous leaves; its 3-celled 3-valved capsules, the seed-bearing dissepiments of the valves being in their middle. The species are numerous, and are found mostly in moist boggy situations, in the colder parts of the world: several are however inhabitants of tropical regions. The *Juncus effusus*, the soft rush, and the *Juncus conglomeratus*, the common rush, are used in many parts of the country for plaiting into mats, chair-bottoms, and for constructing small toy-baskets. The wicks also of the candles known as rush-candles are made from the pith, or, more properly speaking, the soft inner portion of the stem of the same species, which is chiefly composed of cellular tissue.

Rushes of various kinds form frequently very troublesome weeds in agriculture. They grow best on rich land that is wet and cold. They may be destroyed by covering them over with dry materials of various kinds, as ashes, lime, and drift from roads. But the best mode of getting rid of them is to fork them up by the roots in the summer, and after letting them lie for a fortnight or three weeks to dry, to burn them. This however will be found only a temporary mode of getting rid of them, unless the ground on which they grow is well drained.

RUSH, BENJAMIN, was born in the neighbourhood of Philadelphia, in December, 1745. His ancestors had followed William Penn to America in 1683. His father and his grandfather each combined the business of a farm with the occupation of a gunsmith. Losing his father early, he was indebted to the care of an excellent mother for his early education; and he passed five years in the grammar-school of his maternal uncle, the Rev. Dr. Finley, afterwards president of the college of Princeton, to which college Rush was removed at the age of fourteen. Here he became distinguished by his application, his acquirements, and the possession of a fluency of expression for which he was ever after remarkable. At fifteen he obtained the degree of bachelor of arts; and commenced his medical education with Dr. Redman, then an eminent practitioner in Philadelphia. His early attachment to the writings of Hippocrates, as well as his classical acquirements, were evinced, when he was only seventeen, by his translating the aphorisms from the Greek into English, a task which Dr. Hosack, one of his biographers, justly supposes to have influenced the habits of his mind and the character of his subsequent writings. Even at this early period his diligence and method were such, that his notes of the yellow-fever at that time prevalent in Philadelphia contain records of considerable value. At the age of twenty-one he repaired to Europe, and studied two years at Edinburgh, where Monro, Gregory, Cullen, and Black then held chairs. His inaugural dissertation, on taking his degree in 1768, is entitled 'De Coctione Ciborum in Ventriculo,' and contains an account of several experiments made on himself, and some by a fellow-student, to prove the acid changes undergone by the food in the process of digestion. After passing some time in attendance on the London hospitals and lectures, and paying a visit to Paris, Dr. Rush returned to Philadelphia, in the spring of 1769, and commenced the practice of physic, for which he appears to have been eminently qualified not only by the liberal plan of his previous studies, but by his gentleness of disposition and by great humanity. His punctual industry was such, that he is said never to have omitted his duties at the hospital, or those of his private practice, even for a single day, except in the case of illness: and it is added that his love of order was exemplified by his never being ten minutes behind the time when he was expected. He was very soon elected professor of chemistry; and in 1789 he succeeded Dr. Morgan in the chair of the theory and practice of physic. The College of Philadelphia and the University of Pennsylvania becoming united in 1791, he was appointed professor of the institutes of medicine and clinical practice; and from the year 1805 to the end of his life he held the united chairs of the theory and practice of medicine and of clinical practice. His popularity as a lecturer was evinced by the number and the attachment of his pupils, and the celebrity which his reputation mainly imparted to the medical school of Philadelphia. At a late period of his life he still warmly expressed the pleasure he had derived from 'studying, teaching, and practising medicine.' But the times in which he lived were too full of events to permit him to pay that undivided attention to medical science which he subsequently regretted had ever been impeded by public events. In the Congress of 1776 he held a seat as a representative of the state of Pennsylvania; and he subscribed the declaration of independence. He was appointed physician-general of the military hospital of the middle department in 1777; and chosen a member of the state convention for the adoption of the federal constitution ten years afterwards. A few years later, in 1794, he describes himself as having 'lately become a mere spectator of all public events;' from which period he seems to have devoted himself almost exclusively to medical studies and pursuits: he held however the office of treasurer of the United States Mint during the last fourteen years of his life. On different occasions he received medals from the king of Prussia and the queen of Etruria, for information communicated to them in answer to inquiries concerning the yellow-fever; and in 1811 the emperor of Russia sent him a diamond ring as a testimony of respect for his medical character. His useful life was terminated, after a short illness, on the 19th of April, 1813.

The character of Dr. Rush exhibits a combination of nearly every quality appropriate to a physician; industry, temperance, benevolence, uprightness, public independence, piety, were in him united with learning and general knowledge, and a profound acquaintance with almost every branch of medical science. By habits of early rising, and a wise economy of time, he was enabled, in the midst of arduous and continual duties, to treasure up and to communicate a variety of observations peculiarly stamped with utility; and all his exertions were animated by a philanthropy which caused him to devote one-seventh of his receipts to purposes of charity, and dictated his memorable last injunction to his son, 'Be indulgent to the poor.' In the year 1793, when Philadelphia was ravaged to an unexampled extent by the yellow-fever, his services were so much in request that his exertions nearly cost him his life. His house was filled at all hours with applicants for relief, and his carriage beset in the streets.

The life of physicians actively engaged in the study and practice of their profession seldom offers much of private interest. Dr. Rush's life may be said to have been devoted to mankind; and his history is that of his public duties, his professional toils, and his writings. He married, in 1776, Miss Julia Stockton, daughter of Judge Stockton, who is described as a lady of amiable disposition and cultivated mind. Dr. Rush was survived by nine of thirteen children, the fruits of this marriage.

The number of Dr. Rush's works is considerable; they include a history of the yellow-fever as it appeared in Philadelphia in 1793, and of other epidemics of different years. One of his latest works was a 'Treatise upon the Diseases of the Mind.' His last was a letter to Dr. Hosack on the subject of hydrophobia, which terrible disease he considered to be principally seated in the blood-vessels. In 1787 he published an 'Inquiry into the Effects of Public Punishments upon Criminals and upon Society,' to which the mitigation of the Pennsylvanian code is attributed. He also edited the works of Sydenham, Cleghorn, Pringle, and Hillary.

The principal papers published at various times by Dr. Rush are collected and comprised in two volumes of 'Medical Inquiries and Observations.' The first of these was published at Philadelphia in 1788; the second in 1793. Of these volumes, four editions appear to have been published in four years. Their contents consist of about thirty separate essays, all on subjects of medical interest; each distinguished by the philosophical character of the author, and not a few interesting to general readers, to moralists, and to statesmen. The essays 'On the State of Medicine among the Indians;' 'On the Influence of the Military and Political Events of the American Revolution upon the Human Body;' 'On the Influence of Physical Causes upon the Moral Faculty;' and 'On the State of the Mind and Body in Old Age,' are strongly indicative of the observing and reflecting habits of the author. The account of the climate of Pennsylvania presents a model of medical topography, a subject at that time little cultivated. Several of the essays on separate diseases, as the Scarlatina Anginosa, the Cholera of Infants, the Influenza, &c., are distinguished by accuracy of remark and a well exercised judgment. The essay 'On the Effects of Spirituous Liquors on the Human Body' contains the strongest original arguments that could be employed by the most zealous advocate of temperance; and in the 'Inquiry concerning the Causes and Cure of Consumption' we recognise the doctrine of the general or constitutional origin of that fatal disorder, subsequently supported by Dr. Beddoes, but more recently and more distinctly and ably illustrated by Sir James Clark. The celebrated doctrine so often and so eloquently expounded by the late Mr. Abernethy, of the 'Constitutional Origin of many Local Diseases,' is very perspicuously announced in Dr. Rush's 'Inquiry into the Causes and Cure of Sore Legs.' There are indeed few volumes in medical literature which will better repay the perusal of the student than those of Dr. Rush. Large and enlightened views of the causes of disease, minute observations of its phenomena, and sagacious principles of cure, are contained in all the writings of this distinguished physician, combined with indications of his having possessed all the virtues that could animate and adorn the profession to which he belonged.

(Thomson's *Annals of Philosophy*, vol. i.; *Encyclopædia Americana*, vol. ii.; *Diss. Phys. Inaug.*, *De Coctione Ciborum*, &c., Edin., 1768; *Amer. Med. and Philos. Register*, vol. iv.; Chalmers, *Biog. Dict.*, vol. xxvi.; *Dict. des Sciences Médicales : Biog. Med.*, vol. vii.)

RUSH-BEARING, another name in some parts of England for the country wake. It appears that in antient times the parishioners brought rushes at the Feast of Dedication, wherewith to strew the church, and from that circumstance the festivity itself obtained the name of Rush-bearing. The country wake occurs by this name in the glossary of the Lancashire dialect, and Rush-bearing is still the common name in many villages in Lancashire for this annual festivity. In the parish accompts of St. Margaret's, Westminster, is this item, under the year 1544:—'Paid for rushes against the Dedication Day, which is always the first Sunday of October, 1*s.* 5*d.*' Notices of the custom of Rush-bearing, as still used in various parts of Derbyshire, will be found in Glover's 'History and Gazetteer' of that county, vol. i., pp. 259, 260. (Brand's *Popular Antiq.*, vol. i., p. 436; Nares's *Glossary*.)

RUSHES are well-known plants which appear in all soils, especially those which are fertile, when the water which cannot be evaporated remains in a stagnant state under the surface. They are most common on moist meadows with a retentive subsoil; and as they not only occupy a space which might produce good herbage, but also greatly deteriorate the hay with which they are mixed, every means to destroy them are employed by industrious farmers. Formerly in this, as in most other instances of defect in the soil, only a temporary remedy was generally thought of. The rushes were mown down at particular times of the year, alkaline ashes and salt were spread over them, and, in some cases, they were destroyed by pouring boiling water on the roots. But all these only killed the individual rushes, without removing the immediate cause of them, or correcting the stagnation of water which invariably reproduced them. The only effectual cure for rushy grounds is a complete system of draining. The truth of this assertion is so generally admitted, that it is unnecessary to dwell upon it. Wherever the land can be effectually under-drained, rushes will generally disappear as by magic. If they are strongly established in the soil, it may take some time before they completely die away, even after drainage, at least in pastures which are not broken up; but if the land is ploughed and has a proper tillage, they will not survive the first year. In rich old meadows, which it would not be prudent to plough up, they may be destroyed by mowing them when they are in bloom, and immediately spreading ashes or salt over the place where they grew. This repeated twice will clear the ground entirely, and the draining will prevent their reappearing.

In heavy grounds which have been laid up in high stitches without thoroughly draining the land, and sown with grass-seeds to remain in pasture two or three years, it is not uncommon to see every interval between the stitches filled with rushes, especially if the land be reduced in fertility by overcropping. This indicates a wet subsoil, and suggests under-draining; but the rushes are often caused by the very roundness of the stitches, which is supposed to keep the land dry, but which accumulates the water in the furrows. If the land had been laid quite flat, it might have been too wet to produce good crops of wheat, but rushes would not have appeared. In very flat meadows rushes are only found where the land lies very low, with an impervious subsoil, or a want of inclination in the surface to carry off the superfluous water. What might at first sight be considered as an anomaly, is yet perfectly true—no rushes are found in the best water-meadows, although they are for a considerable portion of the year entirely soaked in water; but the water is never allowed to stagnate for a moment, and is always kept running on and off.

The great advantage which has been obtained by the system of thoroughly draining compact soils, or those which rest on impervious subsoils, has induced proprietors and farmers of land to employ their capital in this most certain of all improvements, and the consequence will be, that in a few years the question as to the mode of destroying rushes will no longer be heard; and they will only be seen in those low and unprofitable spots from which the water cannot be drawn off by drains, and where they will supply some small resource to the maker of mats and the repairer of rush-bottomed chairs.

RUSHWORTH, JOHN, is said by Anthony Wood to have been born in Northumberland about 1607, of a good family, and to have studied for a short time at Oxford, where however he did not remain long enough to be matriculated. Coming up to London, he entered himself of Lincoln's Inn, and was called to the bar; but it does not appear that he ever practised. So early at least as the year 1630, he began, according to his own account (in the preface to the first volume of his *Historical Collections*) to attend in the Star Chamber, the Court of Honour, the Exchequer chamber, the council, and other places, whenever any matter of importance was in question, and to take notes of the proceedings; and in this way his time seems to have been wholly occupied. When the first parliament of 1640 assembled, he eagerly embraced the opportunity of being present at the debates and conferences of the two houses; and after its dissolution he proceeded to the north, the scene of the Scottish invasion, where he witnessed the fight of Newburn, and afterwards found admission to the meetings of the great council at York and of the commissioners at Rippon. When the Long Parliament met, in November, Rushworth was appointed assistant to Henry Elsynge, Esq., clerk to the house of commons; and by the opportunities which he enjoyed in this situation, he was enabled to make ample collections relating to all the most interesting public transactions of the time. It appears to have been his practice to take down in a species of short-hand whatever was said in the house which he thought worth preserving. Thus, he tells us himself, that on the evening of the day on which the king made his attempt to seize the five members, 'his majesty sent for Mr. Rushworth, the clerk, whom he observed to take his speech in characters, requiring a copy of it; who pleading in excuse how Mr. Neville was committed to the Tower for telling his majesty what was spoken in the house, he smartly replied, "I ask you not to tell me what was said by any member, but what I said myself;" upon which a copy being transcribed, it came out in print next morning, by the king's order.'

But besides his services as clerk and reporter, after the king had left London, Rushworth (being, it would appear, a good horseman) was the person usually employed to carry addresses and other communications from the house to his majesty; and Wood records that on those occasions he was wont to perform the journey to York in twenty-four hours. At a somewhat later date he appears to have been in like manner entrusted to convey the messages of the house to their general, Essex. On the 14th of June, 1643, the house ordered 'That the mare and young horse belonging to Mr. Endymion Porter, lately brought up from Enfield to London, be forthwith delivered to Mr. John Rushworth, to be employed in the service of the parliament in sending messages between this house and the Lord-General.' On a subsequent day it was further resolved that he should be recommended to the committee of the house for excise, and to the treasurers and commissioners, to be employed in some office or place suitable to his condition and the recommendation of the house, 'towards a recompense of the several services he hath done for the kingdom.' It is not known however that he derived any substantial benefit from this vote.

In 1643 he took the covenant with most of his party. In 1645, when the command of the parliamentary forces was given to Sir Thomas Fairfax, who was his near relation, Rushworth was appointed his secretary; and from this time he was principally with the army, till Fairfax's resignation of his command in 1650. Being at Oxford in Fairfax's suite in 1649, he received from the university the degree of M.A. Having returned to London and taken up his residence in Lincoln's Inn, he was, in 1652, appointed one of the committee for the reform of the common law. The next time we hear of him is as one of the members for Berwick in Cromwell's last parliament, which met in January, 1658; and he again sat for the same borough in that which restored Charles II., in April, 1660. The overthrow of the Protectorate however was fatal to Rushworth's rising fortunes. We have seen the zeal with which he served the republican party; and there can be no doubt that this was the side to which he was heart and soul attached; he had submitted the first volume of his 'Historical Collections,' in manuscript, to Oliver Cromwell; and when it appeared in print it was ushered in by a dedication in very high-flown terms to the new Protector Richard. When the king came back, Rushworth withdrew this unlucky dedication; and he also made a modest attempt to conciliate Charles by presenting to him some registers of the Privy Council which had fallen into his hands. Thanks were formally returned to him in the king's name for the books, but he received no encouragement to expect any further evidence of the royal favour.

Rushworth had not, like many of his party, taken advantage of his opportunities and of the appointments he had held, to secure a fortune to himself out of the misfortunes of his country, and he was now probably in rather straight ened circumstances. When Sir Orlando Bridgeman was made lord keeper however, in 1677, he appointed Rushworth his secretary; and we find him sitting again for Berwick, both in the parliament which met in March, 1679, and also in that which met at Oxford in 1681. But after this, it is stated, he lived in retirement and obscurity; till, in 1684, he was arrested for debt and sent to the King's Bench prison, where he remained till he died, on the 12th of May, 1690. He had latterly taken to drinking to drown care, and his mind and memory were nearly gone for some time before he died.

Rushworth left several daughters, 'virtuous women,' says Anthony Wood, 'of which one was married to Sir Franc. Vane, of the North.'

The first part, in one volume folio, of Rushworth's 'Historical Collections of Private Passages of State, Weighty Matters in Law, and Remarkable Proceedings in Parliament,' embraces the space from 1618 to 1629, and was published in 1659. It was reprinted clandestinely in 1675, and also again in 1682. Part second, in two volumes, extending from 1629 to 1640, appeared in 1680; and that same year Rushworth also published, in one volume folio, his account of the Trial of the Earl of Strafford, which is now considered as forming the eighth volume of his 'Historical Collections.' The remaining parts of that work were left ready for the press at his death; and part third, in two volumes, extending from 1640 to 1645, appeared in 1692; part fourth, also in two volumes, and coming down to 1648, in 1701. All the seven volumes, together with Strafford's Trial, were reprinted in 1721. Rushworth's intention, as he states in the preface to his second volume, had been to bring down the work to the dissolution of the Long Parliament in 1653.

Of the importance of this active and industrious compiler's labours, and of the value of what he has bequeathed to us, there can be no doubt. His collection contains an immense number of papers and notices now nowhere else to be found, and many which never were to be found elsewhere. And it may also be admitted that the promise of perfect impartiality with which he sets out, is upon the whole as well kept as we have any right to expect that it should be. The book however was loudly cried out against for its unfairness, its positive falsehoods and inventions, as well as its omissions and suppressions, by the high church and Tory party on the appearance of the first volume. An elaborate exposition of the grounds of these charges (which however are very unsatisfactorily made out after all) may be found in the long introduction to Nalson's 'Impartial Collection of the Great Affairs of State from the beginning of the Scotch Rebellion in the year 1639;' which indeed was professedly published 'by his majesty's special command,' in opposition to Rushworth's work, but of which, although it was intended to come down to the death of Charles I., no more than two volumes ever appeared, the first in 1682, the second in 1683, carrying the history no farther than to January, 1642.

RUSSELL, LORD WILLIAM, was born in September, 1639: his ancestors were early possessed of landed property in Dorsetshire. We find John Russell in 1221 the constable of Corfe Castle, and his descendants subsequently filling honorable situations: one of them, Sir John Russell, was Speaker of the House of Commons in the second and tenth year of Henry VI. A fortunate occurrence raised this family to wealth and honour: in 1506 Philip, archduke of Austria, having been driven by a storm into the port of Weymouth, was hospitably entertained by Sir Thomas Trenchard, a neighbouring country gentleman· and Sir Thomas, knowing that the then head of the Russell family had travelled and was a good linguist, invited him to meet his unexpected guest. During this visit Mr. Russell so pleased the archduke that he recommended him to the king, by whom he was appointed one of the gentlemen of the Privy Chamber. 'He afterwards attended Henry VIII. in his expedition in France, and was present at the taking of Therouenne and Tournay. In 1522 he was knighted by the earl of Surrey for his services at the taking of Morlaix in Bretagne, and was created Lord Russell in 1539.' The lands of the abbey at Tavistock and of the dissolved monastery at Woburn were afterwards conferred upon him, and he was made earl of Bedford. (*Life of Lord Russell*, by his descendant Lord John Russell, from whose work the principal part of this article is derived.)

He died in 1555, and was succeeded by Francis, the second earl, who left no issue. The title now passed to the only son of Sir William Russell, by name Francis, who is known among other things for his drainage of the fens of Lincolnshire by the Bedford level. He died in 1641, and was succeeded by William Russell, who married Lady Anne Carr, daughter of the countess of Somerset, known for her participation in Sir Thomas Overbury's murder, and had issue, three daughters and seven sons, of whom Lord Russell, the subject of this memoir, was the third. The eldest died an infant, and the second in 1678.

Russell was educated at Cambridge, afterwards resided at Augsburg, spent a considerable time in different parts of the Continent, returned to England at the Restoration, and was elected member for Tavistock. He married, in 1669, Rachel Wriothesly, second daughter of the earl of Southampton, and widow of Lord Vaughan, the eldest son of Lord Carberry, a woman distinguished for ardent and tender affection, pious, reflecting, firm, and courageous: alike exemplary in prosperity and adversity, when observed by multitudes or hidden in retirement.

In the company of his excellent wife Russell would have continued to enjoy without interruption all the happiness of a private life, had the government been conducted with security and honour. But his indignation and fears being awakened by the hypocrisy and shameless venality of Charles II., and the avowed desire of the Duke of York to restore the Roman Catholic religion, he entered the lists of political contention, ranging himself with the defenders of Protestantism and the opponents of the king's devices. He gave great strength to the popular cause; 'I never knew,' says Burnet, 'any man have so entire credit with the nation as he had. He quickly got out of some of the disorders into which the court had drawn him, and ever after that his life was unblemished in all respects. He had from his first education an inclination to favour the nonconformists, and wished the laws could have been made easier to them, or they more pliant to the law. He was a slow man and of little discourse; but he had a true judgment when he considered things at his own leisure. His understanding was not defective, but his virtues were so eminent that they would have more than balanced real defects if any had been found in the other.' Lord Cavendish, Sir W. Coventry, Colonel Birch, Mr. Powle, and Mr. Littleton were the principal members of the party with which he acted, and which, by proceeding at first with moderation, gained so great an influence in the country, that the king suddenly prorogued the parliament, and when it re-assembled, found his opponents so strong that it was hopeless to attempt the continuance of the Dutch war. Thus the alliance with France was dissolved, and the troops by which Charles had wished to make himself absolute were dispersed; the Cabal ministry was broken up, and Buckingham and Shaftesbury were converted into popular leaders. The king's intrigues with France were speedily renewed, and engagements entered into, for the performance of which he was again to receive a stipulated sum of money. These intrigues were further opposed by Russell; the country party recommended war with France, promoted the impeachment of the king's minister and favourite Lord Danby, and voted the exclusion of the Duke of York from the succession to the throne. These were violent measures, but they were justified by the condition of the country, the king's baseness, and the fear of despotism and the re-establishment of the Roman Catholic religion. The struggle augured a second civil war, and had Charles, like his successor, attacked the church as directly as he did the constitution, an immediate civil war would have been the probable result; as it was, the foundation of a future revolution was laid.

Some of the principal Whigs were accused of having conspired to take the king's life, to raise a rebellion in the country, and to establish the Duke of Monmouth, the king's illegitimate son, upon the throne. This was called the 'Rye-house Plot,' from the name of a farm near Newmarket, at which it was said that the conspirators agreed to meet, in order to attack and dispose of the king as he returned from Newmarket races. There had doubtless been many meetings of disaffected persons. 'Of this plot,' writes Mr. Fox (Introductory chapter to *Hist. of James II.*), 'it may be said, much more truly than the Popish, that there was in it some truth mixed with much falsehood; and though many circumstances in Kealing's (one of the informers) account are nearly as absurd and ridiculous as those in Oates's, it seems probable that there was among some of those accused a notion of assassinating the king; but whether this notion was ever ripened into what may be called a design, and much more whether it was ever evinced by such an overt act as the law requires for conviction, is very doubtful. In regard to the conspirators of higher ranks, from whom all suspicion of participation has been long since done away, there is unquestionably reason to believe that they had often met and consulted, as well for the purpose of ascertaining the means they actually possessed, as for that of devising others for delivering their country from the dreadful servitude into which it had fallen; and thus far their conduct appears clearly to have been laudable.' The court ascribed the king's safety to his return from Newmarket somewhat earlier than was expected, and prepared to take advantage of the opening which now offered for the annihilation of their political adversaries. Russell, Essex, Sidney, and a number of less important persons were immediately committed to the Tower. Some were convicted and executed before Russell was brought to the bar. On the 13th of July, 1683, he took his trial at the Old Bailey for high treason. He was indicted 'for conspiring the death of the king, and consulting and agreeing to stir up insurrection; and to that end to seize the guards for the preservation of the king's person.' A full account of the proceedings is given by Lord John Russell (*Life*, p. 184), and in Phillips's *State Trials*. We believe that the extent of his error was having attended a meeting where a general rising was spoken of, and where there was some discourse of the feasibleness of seizing the king's guard. It was not shown that he consented to either of these schemes, which were never matured or determined on. An illegal construction was put on the 25th of Edward III., the statute under which he was indicted. The evidence against him was contradictory and insufficient; no one charge in the indictment was proved: but in the nomination of the panel, the sheriffs, who were creatures of the court, had secured his conviction. He was found guilty and sentenced to death.

From the time that the sentence was passed till the day of his execution, he manifested great piety, and maintained a dignified calmness. He was accompanied to the scaffold by Bishop Burnet and Dean Tillotson. Burnet, who likewise attended him during his imprisonment, has written an account of his latter days. He delivered to the sheriffs, at the time that he was beheaded in Lincoln's Inn Fields, on the 21st of July, 1683, a paper containing an explanation and statement of his conduct. Speaking of those who died for this plot, Mr. Fox says, 'that which is most certain in this affair, is, that they had committed no overt act indicating the imagining the king's death, even according to the most strained construction of the statute of Edward III., much less was any such act legally proved against them; and the conspiring to levy war was not treason, except by a recent statute of Charles II., the prosecutions upon which were expressly limited to a certain time, which in these cases had elapsed; so that it is impossible not to assent to the opinion of those who have ever stigmatised the condemnation and execution of Russell as a most flagrant violation of law and justice.' The firm and noble conduct of Lady Russell, who attended her husband during his trial to take notes and give him assistance, deserves the greatest admiration. The bitterness of their parting is described in the most pathetic terms, and a lasting grief is shown in her subsequent correspondence. She died at Southampton House, in Sept. 1723, at the advanced age of eighty-six.

We have not mentioned the charge made against Lord Russell, in common with Algernon Sidney, and many others of less repute, of having received bribes from the French government. We believe it to be groundless, as far as the two persons mentioned are concerned, but we must refer those who would inquire into the subject to the more lengthened biographies. Lord Russell's character is wholly at variance with such an act. As a politician, he appears uniformly disinterested; he was zealous and energetic, though not conspicuous for ability, the high public estimation in which he was held being founded upon his sense, his judgment, and his integrity. To a severity of public principle he united the mildness of domestic affection; he was beloved by his wife and children with sincerity and earnestness. Lord Russell's son was created duke of Bedford, one of his daughters was married to the duke of Devonshire, and another to the duke of Rutland. An act for annulling his attainder, which passed in the first year of William and Mary, recites that 'he was by undue and illegal return of jurors, having been refused his lawful challenge to the said jurors for want of freehold, and, by partial and unjust constructions of law, wrongfully convicted, attainted, and executed for high treason.' After the executions which followed the Rye-house Plot, the country party had little influence during the remainder of Charles's reign.

(Lord John Russell's *Life of Lord Russell*, from which this article is compiled; *Life and Letters of Rachel, Lady Russell*; Burnet's *Own Times*; Hallam's *Const. Hist.*; Fox's *Life of James II.*; Hume; *Biog. Univer.*, &c.)

RUSSELL, ALEXANDER, was a native of Edinburgh, where he received his medical education. Having finished his studies in the university of that city, he came to London, and in the year 1740 was appointed physician to the English factory at Aleppo. Having made himself master of the Arabic language, he soon obtained a pre-eminence over all the practitioners in the place, and was honoured by the particular friendship of the pasha. On his return to England, in 1754, he published his 'Natural History of Aleppo,' a valuable and interesting work. It contains a description of the city and principal natural productions in its neighbourhood; together with an account of the climate, inhabitants, and diseases, and a diary of the progress of the plague in 1742-3-4. Four years after the publication of this work a vacancy occurring in St. Thomas's Hospital, he was elected physician to that institution, which office he retained till his death in 1768.

He was a man of great abilities, industry, and humanity. He presented several contributions to the Royal and Medical Societies. A second edition of his 'Natural History of Aleppo,' revised, enlarged, and illustrated with notes, by Patrick Russell, has been translated into several European languages.

RUSSELL, PATRICK, brother of Dr. Alexander Russell, was born in Scotland, in the year 1726. His father was a lawyer of great eminence in the city of Edinburgh, and of seven sons whom he brought up, it is reported that not one ever gave him a moment's disquietude. We possess no record of the early history of the subject of the present memoir. It appears however that he completed his medical studies in the University of Edinburgh, and some time afterwards we find him at Aleppo, residing with his brother Dr. Alexander Russell. On the return of the last-named physician to England, Dr. Patrick Russell succeeded him as physician to the British factory at Aleppo. It was during his residence in this capital that the great plague of 1760 and the two following years broke out in Syria, and the opportunities which it afforded him of studying this disease in all its varieties, were not thrown away on a man of his abilities. His quarto work on the plague, which was published some years after his return to England, is justly esteemed one of the best and most complete that ever has been written on the subject. It contains an historical and medical account of the disease, and treats fully the subjects of quarantine, lazarettos, and the police to be adopted in times of pestilence. He also gave to the public a new and very enlarged edition of his brother's work on Aleppo; and in 1796 published an account of the Indian serpents collected on the coast of Coromandel, containing descriptions and drawings of each species, together with experiments and remarks on their several poisons. He died in the year 1805, and his name will be found among the contributors to the Royal Society and some others.

RUSSIAN EMPIRE, THE, extends over the north-eastern part of Europe, over the whole of Northern Asia, and the north-western coast of North America. It consists of Russia in Europe; GEORGIA, or Caucasia, SIBERIA, and KAMTCHATKA in Asia; and some settlements on the north-west coast of North America. [NORTH-WEST TERRITORY.] Excluding the last-mentioned country, the area of the whole empire, according to a very rough estimate, is 7,700,000 square miles, of which 2,110,000 belong to Europe, nearly 5,400,000 are included in Siberia, about 100,000 in Georgia, and 86,000 in the peninsula of Kamtchatka.

EUROPEAN RUSSIA comprehends the north-eastern portion of that continent, extending from 43° to 71° N. lat. and from 20° to 63° E. long. It is divided from Asia by the Ural Mountains, which begin on the peninsula which lies opposite the island of Nova Zembla, east of the Strait of Waigatz, and extend in a southern direction to 54° N. lat., where they divide into three ranges. [URAL MOUNTAINS.] From this point, the river Ural, which rises between the two most eastern ranges, is considered to form the boundary-line until it falls into the Caspian Sea. It is however to be observed that the political division of Russia does not in its whole extent coincide with this boundary which has been adopted by geographers, and that a portion of the two governments of Perm and Orenburg extend to the east of this line, and may therefore be considered as lying in Asia. From the mouth of the river Ural the boundary runs along the north-western shore of the Caspian Sea to the embouchure of the river Kcoma. At this point begins the southern boundary-line, which runs along the course of that river to 45° E. long., and then nearly north to the river Manytch, whose course it follows to 41° 30′ E. long., whence it continues nearly due west to the Sea of Azof, and chiefly along the course of the river Ieia. By this line Caucasia, or the two governments of Caucasus and Grusia or Georgia, are separated from Russia in Europe. The remainder of the southern boundary is formed by the Sea of Azof, the Straits of Yenikalé, and the Black Sea. Near its western boundary Russia extends to the banks of the Danube, which forms the boundary between it and Turkey as far as the mouth of the river Pruth (near 28° E. long.). The Pruth divides Russia and Turkey nearly to its source in the Carpathian Mountains. Russia then begins to border on the kingdom of Galicia, a portion of the Austrian empire, from which it is not separated by any natural boundary. Where it touches the kingdom of Poland, which at present is to be considered as an appendage of Russia, the rivers Bug and Niemen constitute the boundary-line, but between them there is a tract in which the boundary is indicated partly by the river Narew, an affluent of the Vistula, and partly by an imaginary line. North of the river Niemen, Russia borders on Prussia, from which it is separated by an imaginary line. Farther north it comes up to the Baltic, surrounding the Gulfs of Riga and Finland, and stretching along that of Bothnia to its northern extremity (66° N. lat.). Farther north it borders on Sweden and Norway. It is separated from Sweden by the lower course of the river Tornea, and farther north by its affluent the Muonio. The boundary between Russia and Norway is partly formed by the watershed between the Gulf of Bothnia, and partly by the course of the river Tana. A small part of Norway extends east of the river Tana. On the north, Russia is washed by the Arctic Ocean, which here forms the extensive gulf called the White Sea. The countries included within this boundary-line, according to a very rough estimate, occupy an area of 2,110,000 square miles.

Surface.—The whole surface of Russia may with propriety be considered one extensive plain. If the Ural Mountains, which extend along its eastern border, and a mountain tract in the peninsula of the Crimea [Crimea] are excepted, there is not in this immense extent of country an eminence which rises more than 500 feet above it base, or more than 1100 feet above the sea-level. The watershed which divides the rivers that flow to the Arctic Ocean, the Baltic, the Black Sea, and the Caspian Sea, is not formed, as in Western Europe, by mountains, but by tracts of elevated ground, the summits of which extend in wide and nearly level plains, and whose declivities form long and generally imperceptible slopes. The plains themselves are covered either with bogs and swamps or with forests, and in other parts they are dry and woodless tracts called *steppes*.

In tracing this watershed, we begin on the west. Almost on the banks of the river Bug, which separates Poland from Russia, between 51° 30′ and 53° N. lat. there is a plain which is flat, and the rivers and watercourses have so little fall as to render them unfit to carry off the accumulated water. The whole plain therefore is nearly a continuous swamp, covered with trees, especially firs. It contains the sources of several affluents of the Dnieper and Vistula. On both sides of 52° N. lat. it extends from 24° to 30° E. long., a distance of 240 miles, and renders the country on both sides of the river Pripec almost impassable. This portion of the watershed is called the Swamps of Pinsk and Ratnor. The swampy ground extends farther north, between the affluents of the Niemen and Dnieper, to 55° 30′ N. lat., and terminates on the banks of the Düna between Polotsk and Drooya. In these parts however the swamps are only from 100 to 50 miles in width, and are frequently interrupted by tracts of drier and more elevated land. On the east of the northern extremity of these swamps, between 54° 30′ and 55° 30′ N. lat., there is a more elevated country with a very broken surface, and containing numerous rocky hills, between which many lakes occur. The south-eastern edge of this tract seems to lie close to the course of the river Dnieper, from its source till it turns southward at the town of Orsha. From this elevated tract, which separates the upper courses of the rivers Dnieper and Düna, the watershed extends northward over the eastern portions of the governments of Vitepsk and Pskow, where it descends in low ridges to the lakes of Peïpus and Ilmen. The most elevated part of this tract probably attains 1000 feet above the sea, as the town of Mojaisk on the Moskwa is more than 700 feet above it. The watershed hitherto noticed divides the rivers that flow into the Baltic from those which run into the Black Sea. At this point however it divides, and forms two watersheds, of which one runs north-east between the watercourses that fall into the White Sea and those which run into the Caspian Sea, and the other runs south-east between the rivers which flow to the Caspian and those which fall into the Black Sea.

The north-eastern watershed begins in the hilly region of Valdai, which contains the source of the Volga, the largest river of Europe. It lies contiguous to the region just described, beginning on the west between the sources of the river Pola, which falls into the lake of Ilmen, and extending north-east to the river Msta. In this direction it occupies hardly more than 90 miles, but extends from north-west to south-east, between Novgorod and Vishnei Volotshok, more than 120 miles. The country rises from the north-west and south-east with a gradual slope, and at the town of Valdai attains an elevation of about 870 feet. On the most elevated portion of it there are steep and rocky hills, which however do not attain a great elevation above their base, as the highest of them, the Popowa Gora, according to Humboldt, does not exceed 934 feet above the sea-level. As this region was formerly covered with a continuous forest, it is also known by the name of the forest of Volkhonsk. From the banks of the river Msta the watershed extends northward towards the isthmus which divides the great lakes of Ladoga and Onega, but it does not reach it, as it turns again to the north-east, and remains about 20 or 25 miles from the southern extremity of lake Onega, running between its banks and the lake called Bielo Osero (White Lake). Having passed between these lakes, it suddenly turns to the south, and approaches the banks of the Volga (40° E. long.) within about 60 miles. Between the river Msta and 40° E. long. the watershed seems to be much lower than on the hilly region of Valdai, as is proved by the facility with which canals have been made across it to unite the rivers which fall into the lake of Onega or into the Dwina with the affluents of the Volga. The more elevated tract, with its very gradual slopes, does not seem to exceed 20 miles in width, and is entirely covered with forests. From 40° E. long., or from between the towns of Vologda on the north and Yaroslav on the south, the watershed extends eastward near 59° N. lat., between the affluents of the Dwina and those of the Volga, to 50° E. long., whence it declines to the north-east and reaches the Ural Mountains near 59° E. long. and 61° 30′ N. lat., between the sources of the rivers Petshora and Kolva; the latter is a branch of the Kama, an affluent of the Volga. East of 40° E. long. no hilly region seems to occur on the more elevated part of it; but the watershed rises from south and north with a very gentle slope formed by broad-backed ridges, which extend between the watercourses until they sink gradually to the level plains which extend along the large rivers. The whole region however is very imperfectly known, being covered with interminable forests of pines and firs, and nearly uninhabited. This large tract of country is now called by geographers *uwalli*.

The south-eastern watershed begins likewise in the elevated hilly region which separates the upper courses of the Düna and Dnieper, and runs for some distance close to the banks of the last-mentioned river, so that the river Moskwa, which originates in these parts, runs eastward to the Oka, an affluent of the Volga. It continues in a nearly southern course from 55° to 52° 30′, and up to 53° 30′ seems to consist of a broad-backed swell, which is covered with forests. Between 53° 30′ and 52° 30′ it expands in wide and nearly level plains, which occupy perhaps 100 miles in breadth, and extend over the central provinces of Russia eastward up to the banks of the river Volga, between 52° and 53° 30′ N. lat., in an eastern direction. These plains do not probably rise more than 800 feet above the sea-level, and are chiefly woodless, though in some of the numerous depressions trees of stunted growth are frequent. Where the watershed approaches the banks of the Volga, in the southern districts of the government of Simbirsk, it forms an elevated ridge, but small in width, which runs eastward, and compels the river to make a bend at Samara (near 53° N. lat.). On the eastern bank of the river a similar ridge rises, which encloses the river Sock, and continues in an eastern direction until it joins the Obstshei Sirt, or western branch of the Ural Mountains, near 56° E. long., not far from the place where the Bialaya, an affluent of the Kama, turns northward. That portion of the ridge which lies east of the Volga consists of sandy hills almost without vegetation, and partakes largely of the nature of the steppes which lie south of it. This watershed encloses the wide basin of the upper course of the Volga on the south, and divides it from the rivers which run southward and unite with the Dnieper and the Don.

Besides these two lines of watershed which cross Russia from west to east, there is in the southern provinces an elevated tract, the base of which is granite, and which traverses it in the same direction, but does not form a watershed, being broken through by several large rivers. At its western extremity it is connected with the eastern offsets of the Carpathian Mountains, which extend over the north-western portion of the government of Kishineff, or Bessarabia, and advance as far south as the town of Kishineff. From these ridges the elevated tract extends eastward, occupying on the banks of the river Dniester the whole space between Yampol and Dubossary, and rendering this part of the river unfit for navigation by forming rapids and falls. Farther east, on the banks of the Bug, it occurs near Olviopol, and on those of the Ingool, an affluent of the Bug, between Yelisavetgrad and Bobrinetz. It continues eastward to the Dnieper, which is compelled by it to make the great bend eastward between 47° and 49° N. lat., and in which it produces the Poroges, or twelve waterfalls of Ekaterinoslaw. From this place it declines more to the south, and extending along the banks of the Konskaya, an affluent of the Dnieper, it approaches the Sea of Azof, where it terminates, according to Pallas, on the banks of the river Berda. But it is supposed that it continues from Ekaterinoslaw in a more eastern direction, and fills up the great eastern bend of the river Don which occurs between 48° and 50° N. lat.

Soil.—Russia has a much greater variety of soil than any other country of Europe. Some very extensive tracts are hardly more adapted for agriculture than the great African desert; while others in fertility may be compared with those countries without the tropics which are most favoured by nature. In taking this survey of Russia, we begin from the north-east.

Between the northern portion of the Ural Mountains on the east and the river Mezen on the west, is the region of the *tundras*, which extend from the coast to 64° N. lat. Climate and soil render this region unfit for cultivation. It is mostly a plain covered with moss, which, for eight or nine months, is frozen, and, the remainder of the year, is so saturated with water as to be rendered impassable. In some places bushes occur, which bear berries. The few inhabitants live on fish, which is very plentiful in the rivers, and clothe themselves with the skins of the wild animals which haunt those regions. The skins also supply an article of traffic, for which they obtain small quantities of corn, which is brought from the countries south of the *uwalli* by the river Pechora.

To the south and west of the *tundras* extends the largest forest in Europe, if not on the whole globe. This region occupies the country on both sides of the upper course of the Pechora, and all those which lie within the basin of the Dwina and its great branches the Sukhona and Vychegda. According to official statements, the forests cover 150,000 square miles. They consist almost exclusively of different kinds of pines, especially *Pinus picea* and *Pinus sylvestris:* and of firs, larch, and birch. Only a few spots in this country are cultivated, and produce rye, barley, oats, and peas, as well as hemp and flax. But as the summer is very short, and, during this season, the weather very unsettled, fogs and rain being very frequent, the crops frequently fail, and they only yield from three to five times the seed. Hard frost continues from the end of October to the end of April. The scanty population is mostly occupied in bringing the produce of the forests to market, especially to Arkhangel. This region extends westward to the river Onega, and southward to the *uwalli*, the northern declivity of which, chiefly occupied by swamps, but well wooded, belongs to it. It comprehends the western portion of the government of Arkhangel and the whole of Vologda.

West of the river Onega begins the region of rocks and lakes. It extends over the immense tract which lies between the gulfs of Finland and of Bothnia on the west and south, and the White Sea on the north-east, and which is called by modern geographers the Isthmus of Finland. A line drawn from the mouth of the river Neva across the southern portion of the lake of Ladoga, and the southern shores of that of Onega to the lake of Latsha, indicates the southern boundary of this region; and another, drawn from the town of Uleaborg, on the shores of the Gulf of Bothnia, to the innermost recess of the Gulf of Kandalaskaya, separates it from Russian Lapland. This region extends from east to west about 500 miles, and from south to north more than 400 miles, and considerably exceeds the British Islands in extent. It has a much more broken surface than any other portion of Russia of equal extent. The northern portion, as far as 65° 30′, is level; at least it does not contain any continuous ridge of hills, and here the watershed is found to rise gradually, but not to a great elevation. Near 65° 30′ N. lat. and 30° E. long. a ridge of hills rises, which runs south to 64° N. lat., where it divides into two ridges, of which that which runs east divides the waters that fall into the White Sea from those that run to the lakes of Ladoga and Onega. After having passed the last-mentioned lake at a short distance, it approaches the banks of the Onega river, and then turns to the south-west, and terminates in that direction not far from the south-eastern shores of the lake. It is called the Mountains of Masielka (girdle), and, properly speaking, is only a huge swell of elevated ground with a broad-backed summit. It consists chiefly of sand-hills; but in some parts granite appears, and in such places the declivity is steep. The ridge which runs westward is mainly composed of granite, but it is of inconsiderable elevation, and grows lower as it approaches the Gulf of Bothnia, sinking down to the level ground at a considerable distance from the shores. The country surrounded by these two ridges, the gulfs of Bothnia and Finland, the river Neva, the lake of Ladoga, the river Swir, and the lake of Onega, has a rocky subsoil; and in many places the rocks rise above the surface, and constitute hills. They never form an extensive mass, but only low and narrow ridges, which alternate with wide and deep depressions, the greater part of which are filled up with lakes. It is supposed that one-fourth of the surface is covered with water. The general surface of the country appears to be lowest towards the east, north of the lake of Ladoga, where it probably does not attain 200 feet above the sea-level, and is less interspersed with rocks and lakes. But in approaching 30° E. long. it rises considerably. The lake of Saima, which lies towards the southern extremity of this rocky region, and is only divided by an isthmus, somewhat more than 20 miles wide, from the Gulf of Finland, is said to be 300 feet above the sea-level; and the numerous cataracts of the river Voxa, or Vuoxen, by which its waters are carried to the lake of Ladoga, support this assertion. If we consider that the lake of Saima receives the waters of numerous other lakes of various size, which extend in a line northward to 63° 30′ N. lat., a distance of 180 miles, and that the channels by which they send their waters downward have a very rapid course, and in some places form cataracts, it is not improbable that the general level of the country that surrounds the lake of Pielisyarvi, which is the most northern of them, may be 600 or 700 feet above the sea-level. The system of lakes which follows next to the westward is called, from the largest of them, that of Païana. The country along the shores of this lake is called Tavasteland, and is considered the most elevated portion of Finland; its general level is estimated to be 400 feet above the sea, even towards the south, where the river Kymmene, which issues from the lake of Païana, descends with numerous cataracts to the Gulf of Finland. The country seems not to be lower east of 24° E. long., until it approaches the Gulf of Bothnia within about 40 miles, to which it gradually descends in a rather gentle slope. The rocky elevations which divide the lakes from one another occupy only a small space, as level tracts, usually of considerable extent, lie between their declivities and the water-edge. The hills rise to different elevations, from 200 to 600 or 800 feet above their base, and frequently take the most fantastical shapes. Many of their declivities are covered with trees. All the northern shores of the Gulf of Finland, and the eastern shore of the Gulf of Bothnia, as far north as 64° N. lat., are high and rocky, especially the former. They are also lined with numerous rocks and small islands, which render the navigation difficult and dangerous; but good harbours and anchorage are found about these islands. Though the country rises as we proceed from east to west, the climate improves in the same degree, and vegetation and cultivation also. In the country surrounding the lake of Onega the winters are nearly as severe as on the Dwina in those districts where the Sukhona and Vychegda unite, and the soil principally consists of a mixture of clay and sand, in which the latter predominates. The cold and wet season is long, and renders the crops very uncertain; and owing to the poverty of the soil, agriculture is very limited. Rye, buckwheat, oats, and barley are cultivated in some places, and also hemp and flax, but by far the greatest part is still in a natural state. Pine-forests still cover more than nine-tenths of the country, perhaps not less than 30,000 square miles. There are few cattle in these districts, owing to the want of meadows, and the difficulty of maintaining them through a winter which lasts eight or nine months. But the more rocky country farther west contains extensive meadows along the banks of the lakes, and the rearing of cattle and the management of the dairy form the principal branches of rural economy. Agriculture is also much more attended to; and in addition to the grains which are cultivated farther east, some wheat is produced. Many tracts which are covered with bogs preserve the ice under their surface late in summer, and are the cause of night-frosts being felt to the end of May or the beginning of June. The climate is extremely wet, and much snow falls during the winter. A sudden thaw frequently fills the basins of the lakes to such a degree that the water rises several feet above the adjacent country, damages the winter crops, and renders the fields incapable of being cultivated for summer crops. With all these disadvantages, the western portion of this rocky country, Tavasteland, exports annually a considerable quantity of grain. Though the winter generally lasts from October to May, and the thermometer descends to 24° below zero, fruits, especially cherries, apples, and pears, succeed along the coast of the Gulf of Finland, and on that of Bothnia as far north as 64° N. lat. At Abo the mean annual temperature is 40°, that of the winter 24°, of the spring 40°, of the summer 50½°, and of the autumn 42°; but at the northern extremity of this region, at Uleaborg, the mean annual temperature is only 33°. The quantity of rain which annually falls is 24 inches. Spring does not appear before the end of May, when the birch comes into leaf, and the ice of the rivers breaks. In the middle of August, and sometimes at the end of July, night-frosts occur. Barley and some rye however are cultivated: they are sown and cut in the space of six or seven weeks. There are still extensive forests in this region, which chiefly cover the declivities of the rocky masses: they chiefly consist of pines and firs. The timber cannot be brought to market, on account of the cataracts which occur in all the rivers; but a great quantity of tar is annually made in these forests.

That portion of Russia which lies north of a line drawn from Uleaborg to the extremity of the Gulf of Kandalaskaya comprehends Lapland as far as it belongs to Russia. The surface is mostly a level, on which some sand-hills rise a few hundred feet above their base. There are numerous depressions on this plain, but most of them are of little depth, and form only extensive bogs; the deeper depressions are permanent lakes, of which some, as that of Enara, are of great extent. The sandy soil, being well saturated with moisture by the melting of the snow, affords pasture for a few months to a breed of small cattle, but especially to the numerous herds of reindeer. In the southern districts there are considerable forests of high growth; but towards the north they are less frequent, and the trees are of diminutive size. Some level and more fertile tracts occur along the banks of the lakes, on which rye and barley are cultivated, which commonly ripen in spite of the severity of the climate and the length of the winter. Even along the southern coast of the peninsula of Kola, the interior of which is rocky, but mostly level, though the shores are high and precipitous, rye and barley are cultivated. The early night-frosts indeed frequently destroy the crops; but when that is not the case, the labour of the husbandman is richly recompensed by a crop which produces twentyfold its seed. We have a set of meteorological observations made at Enontekis (68° 30′ N. lat.) in 1802-1805, according to which the mean annual temperature of that place did not exceed 27°, that of the winter was 0°, of the spring 25°, of the summer 55°, and of the autumn 26½°.

On the southern coast of the Gulf of Finland, the shores are composed of limestone, and rise abruptly from the sea like a wall to an elevation of 60 to 180 feet. From this elevated coast, the country extends in a level plain from 30 to 40 miles southward, and then descends to the plain of Livonia by a gradual slope. The surface of the plain is covered with a layer of mould of indifferent fertility, producing moderate crops of rye and barley. A part of the plain is covered with woods, consisting commonly of birch, but frequently intermixed with poplars and lime-trees; the last-mentioned trees constitute, in some places, extensive forests. The plain is furrowed by watercourses, which lie many yards below the surface, and the rivers which flow in them have a very rapid course, so as to be unfit for navigation, at least in several places. There are no swamps in this region.

Though both the northern and southern shores of the Gulf of Finland are elevated and rocky, the country that surrounds its innermost recess on both sides of the river Neva forms a depression which extends round the southern shores of the lake of Ladoga, and continues to the southern extremity of that of Onega. Towards the south it reaches, near 59° N. lat., the hilly tracts that branch off from the table-land of Valdai. A moderately thin layer of mould covers a subsoil of rock. The surface is level and very swampy, and though the soil is not devoid of fertility, it can only be successfully cultivated with great labour. Though situated in the immediate vicinity of one of the largest and most populous towns of Europe, only a very small proportion of the surface of this region is under cultivation, and about 20 miles from Petersburg the forests commence, which occupy nearly the whole of the country. The forests consist almost solely of fir and birch; pine does not occur except in a few spots which are somewhat more elevated and have a dry soil. Immense boulders of granite are dispersed through these forests. The mean annual temperature of Petersburg is lower than that of Abo, being only 37°: that of the winter is 16°, of the spring 32½°, of the summer 50°, and of the autumn 37½°. The mean annual quantity of rain which falls in that city is between 17 and 18 inches.

The table-land of Valdai and the elevated tract which extends from the river Msta to the lake Bielo Osero (both which countries surround the plain just noticed on the south and south-east) were formerly covered with extensive forests, but the greater part of them have been cleared away, and certainly they do not now occupy one-third and perhaps not one-fourth of the surface. They chiefly consist of elms, birch, and poplar. The surface is undulating, and the rocky eminences which rise on it only attain a height of 100 to 200 feet above their base. Though grain succeeds very well, and the crops are rather abundant, the greater part is used for the maintenance of horses, which are in great request, as several well-frequented roads and three lines of canals traverse this region. The elevated and broken region which is contiguous to the table-land of Valdai on the west, and occupies the greater part of the governments of Pskow and Vitepsk, appears to be similar in its natural features, but the surface exhibits greater variety, lakes being very numerous, and probably their effects on agriculture are as hurtful here as in Finland. But this tract is imperfectly known, as it is not traversed by any great line of road.

A ridge of elevated ground of considerable width commences on the banks of the river Düna near Dünaburg, not far from which town the last rapids in the river occur. It extends northward on both sides of 27° E. long., and terminates on the banks of lake Peipus south of Dorpat. It appears that its average elevation is about 600 feet above the sea-level, at least the small lake near the town of Marienburg, which lies nearly in the middle of this ridge, has this elevation. But in some places there are hills which are from 300 to 500 feet higher. This sandy and sterile ridge separates the elevated table-land of Vitepsk and Pskow from the low plains of Livonia, which extend westward from it to the shores of the Gulf of Riga. The eastern portion of this plain, east of 26° E. long., is in general undulating, but in many places contains hills 400 or 500 feet high. In this tract the soil is chiefly loamy, and has a considerable degree of fertility. In the forests the birch prevails. To the west of 26° E. long., the country is nearly a level, with the exception of the southern districts between the Düna and the river Aa, where there are some hills. The Wesenberg, near the town of Wenden, attains 1200 feet above the sea-level. The soil of the level portion of the plain is much less fertile, the greater part of it consisting of sand, which, by being saturated with moisture by the melting of the snow, becomes fit for maintaining vegetation, and for producing grain, hemp, and flax. The forests consist mostly of pine, and occupy a considerable portion of the level ground. It terminates on the sea with a low, flat, and sandy shore.

The immense tract of country which extends from the southern banks of the Düna southwards, having the swampy region on the east, and terminating in the great swamps of Pinsk and Ratnor, is traversed from north to south by a series of table-lands, which occupy extensive tracts between the Düna and Vilia (an affluent of the Niemen), the Vilia and the Niemen, and the last-mentioned rivers and the Bug, and extend eastward to the swamps. The tops spread out in large plains, the borders of which however are not well determined, as they lower imperceptibly towards the rivers with long and gradual slopes. The more elevated portions of these table-lands are from 400 to 800 feet above the sea-level, and as the soil is sandy and dry, but well penetrated by the water from the melting of the snow, they are covered with pine-forests, which supply the best pine-timber in Europe. This timber is floated down the affluents of the Niemen, and is sent from Memel to England. On the most southern table-land, between the Niemen and Bug, near the sources of the river Narew, and contiguous to the swamps of Pinsk and Ratnor (between 52° 29′ and 52° 51′ N. lat., and 23° 40′ and 24° 30′ E. long.), is the forest of Bialoviza, which occupies more than 700 square miles, or about the extent of Westmoreland, and contains oak, fir, and pines of immense size. It is said that no person has ever penetrated through this wilderness, as the interior is filled up with immense trunks of fallen trees. It is the only place where the *urus* is still found. [BISON.] The lower countries along the banks of the rivers have a tolerably fertile soil, consisting of loam and sand, intermixed with alluvial mould, the deposit of the inundations of the rivers. They produce wheat, rye, barley, oats, buckwheat, and millet. Cattle are not abundant, owing to the want of meadows. Horses are numerous, but of small size. The climate of this region is much colder than that of the countries along the Baltic under the same parallel. Even in the southern districts the mean annual temperature does not exceed 42°. The winter is long and severe; the spring short and late. The summer is extremely variable; the difference between two days frequently amounting to 20° and more. The heat is sometimes insupportable, but is soon followed by a cold wind. Fogs are very frequent in this season. Autumn is the most agreeable season, when the days are dry and warm; but the nights are chilly.

We pass to the survey of the basin of the river Volga, which occupies 650,000 square miles, and is equal in extent to three times the area of France, and five and a half times that of the British Islands. It constitutes the most important, and, generally speaking, the most fertile portion of the whole empire. The upper basin of the Volga comprehends the governments of Twer, Yaroslaw, and Kostroma. The source of the river is 910 feet, the town of Twer 390 feet, and the town of Nishnei Novgorod, at the lower extremity of this part of the basin, 230 feet above the level of the sea. To this region belongs a great part of the southern declivity of the uwalli, or northern watershed. Between Yaroslaw and Kostroma, the declivity of the uwalli terminates about ten or twelve miles from the Volga, but farther east at a greater distance. Between it and the river there is a level plain. This declivity is much less wooded than the northern towards the confluents of the Dwina. The forests, which consist mostly of pines, occupy less than half its surface. The remainder is partly covered with morasses and moors, and partly with heaths, here and there interspersed with tracts of sand. It is only along the watercourses that cultivable tracts of moderate extent and moderate fertility occur. The plains along the banks of the Volga above and below Twer are moderately fertile, and give tolerable crops of wheat, rye, barley, oats, hemp, and flax: the forests which lie within them and on their borders consist of oak, birch, ash, alder, poplar, fir, and pine. Farther down the land is less fertile, and as the climate seems to be more severe and less favourable to the growth of grain, hemp and flax, especially the latter, constitute the principal objects of agriculture. Extensive fields are entirely covered with flax. Rye and barley are cultivated with tolerable success, but wheat, oats, and peas do not succeed so well, and are little grown. A considerable portion of the flax and hemp grown in this country is consumed in the numerous manufactures which exist in the towns and even in the villages. Forests, chiefly of pine, are rather numerous. West of Kostroma however, where the plains increase in width, the soil is almost exclusively covered with sand, which produces few trees, and is only partially cultivated. In a few depressions there are meadows, but it is in general a very poor tract.

South of this portion of the basin of the Volga lies that of its affluent the Oka, which in some places extends to 52° N. lat., and is on an average 260 miles from north to south. Not far from the banks of the Volga, the country south of it rises to an elevation of from 50 to 100 feet, generally with a steep ascent, but in several places with a long gentle slope. The country which hence extends southward is an undulating plain interspersed with a few hills of moderate elevation and gradual declivities. The general level of the surface rises very slowly, as the town of Moscow is only 416 feet above the sea, or only 26 feet higher than Twer, and no part of the intervening country much exceeds 600 feet; but towards the west it rises higher, as the town of Mojaisk is 700 feet. It rises probably also much higher towards the sources of the Oka (north of 52° N. lat.), but we are not acquainted with the amount of this rise. The soil, which near the Volga is of indifferent quality, improves as we proceed both south and east. In the government of Moscow it is fertile, but still more so in those of Kaluga and Tula, and a part of Orel. But on approaching the watershed in Orel, the soil, though clayey, is very dry, and partakes of the nature of the steppes which lie towards the Black Sea. The country to the west of Moscow has also a less fertile soil, and though a part of it is under cultivation, the crops are less abundant, and the forests, which occupy extensive tracts, consist only of scrub oaks. In proceeding east of Moscow through the governments of Vladimir, Riasan, and the northern districts of Tambow, the soil improves still more than it does towards the south. The rivers which intersect this extensive region, and generally with a northern and eastern course, run in narrow valleys from 50 to 100 feet below the surface of the plain. The river bottoms are chiefly covered with sand, and are utterly sterile; in a few places only there are meadows. The heights which enclose these valleys are steep. Forests are rare in the countries south of Moscow, but in the eastern districts they occur at certain intervals between the well cultivated fields, and consist of birch and fir, among which there are many tall oaks. Though Moscow is not situated in the very centre of this region, but rather towards its northern boundary, the climate may be considered as representing that of the whole country, as the districts farther south are more elevated. The mean annual temperature is 39°, that of the winter 13°, that of the spring 39⅓°, that of the summer 62°, and that of the autumn 40°. The mean annual temperature of the summer is one degree higher than at London, whilst in that of the winter there is a difference of 26°. In spring the difference is 15°, but in autumn only 4°. The number of rainy days is 205 in the year, but still the quantity of rain is small.

The middle basin of the Volga extends from the mouth of the Oka downwards to the ridge of Samara, and comprehends the four governments of Nishnei Novgorod, Pensa, Casan, and Simbirsk. It contains the most fertile part of the basin of the Volga, and perhaps of all Russia. Pallas repeatedly asserts that this region is the granary of the empire. The most fertile portion of it lies on the west of the river. Along its banks there is an acclivity from 300 to 500 feet above its lowest level; and the country at the back of this acclivity does not descend, but stretches out on an undulating level, here and there rising into hills covered with excellent soil. It produces abundance of wheat, rye, spelt, barley, buckwheat, and millet. Horses and cattle are numerous, but of small size. Sheep are very abundant, especially the broad-tailed kind. Oak is the most common kind of wood; birch and lime trees are also numerous, but the few forests of fir which occur in this rich loamy soil consist only of stunted and crooked trees covered with branches from the bottom to the top, and they cannot be used as timber. The region east of the river is not quite so fertile, but still it supplies rich crops, and is remarkable for the extensive forests of oak which occupy the higher grounds. These higher grounds are divided from the banks of the river by a low tract from four to six or even eight miles in width, which is partly covered with swamps, but partly supplies good pasture. The mean annual temperature of Casan is nearly equal to that of Moscow, being 37¼°, but the autumn and winter are much colder. The mean temperature of the autumn is only 33°, and that of the winter 10°, while the mean temperature of the summer is 65°, or four degrees higher than that of London, and that of the spring is 42°.

To the north and east of this portion of the basin of the Volga extends that of its largest affluent, the Kama, which is stated to comprehend an area of more than 200,000 square miles, or to be equal to that of all France. It contains the government of Viatka, the greatest part of that of Perm, and the northern portion of Orenburg. As this extensive region lies contiguous to the central and southern portion of the Ural Mountains [URAL MOUNTAINS], the country adjacent to the range is mountainous, being traversed by a few offsets of that chain. But the country lowers rapidly as we proceed westward. The town of Perm, hardly seventy miles distant from the great range in a straight line, is only 576 feet above the sea-level. Along the rivers there are valleys, or rather depressions, from ten to twenty miles wide, and between these depressions there is a swell of elevated ground from 200 to 400 feet above the valleys, the highest part of which is a level or undulating plain, equal in width to the adjacent depressions. Near the Ural both the valleys and ridges run parallel to the principal range of the mountain-system, but farther west they extend south-east and north-west. The higher portions of the country are entirely covered with forests, which towards the north consist of pine-trees, but towards the south the forests are intermingled with oak and lime trees. A great part of the lower country is also wooded, but extensive tracts have been appropriated to the cultivation of rye, barley, and oats. In a few places wheat is cultivated. In the most northern districts drained by the Kama there are extensive swamps, which render cultivation precarious, but still it extends north of the parallel of 59°. The southern portion of this region, on both sides of the Bialaya and Ufa, is very imperfectly known. In many parts it appears to resemble the woodless steppes farther south, but in others cultivation alternates with forests of deciduous trees, especially oak. The basin of the Kama contains the richest mines of iron and copper in Russia, and immense quantities of salt are extracted from salt-springs. In this region platinum has been found.

The lower course of the Volga traverses an immense steppe or desert, which not only extends over the whole of the lower basin of the river, but stretches out eastward to the banks of the river Ural, along the course of which it extends from its mouth to the place where it issues from the valleys of the Ural Mountains. This river constitutes the boundary of Russia towards the Kirghis Cossacks, whose country does not differ much in natural features from the great steppe which extends over the south-east of Russia. On the shores of the Caspian Sea the steppe extends from the embouchure of the river Ural to that of the river Kooma, which, with the Manytch river, constitutes the boundary of Russia in Europe. But the greater part of the country between the river Kooma and the upper course of the Manytch on the north, and the base of the Caucasus on the south, is a steppe of the same kind. The western border of this immense desert lies close to the right bank of the Volga. About 52° 30′ N. lat., or where the ridge of the hills of Samara is broken through by the Volga, there begins on its right bank an elevated tract, rising in general 300 feet, but sometimes 500 feet above the lowest level. This elevated ground continues without interruption to the place where the Volga turns to the south-east (48° 30′), and prevents all the rivers that originate west of its course from joining it, and compels them to run to the Don. The elevated ground does not cease at the bend of the Volga, but continues to advance southward along the left bank of the river Sarpa, an affluent of the Volga, which runs from south to north. Near the place where the Sarpa originates, the elevated ground, which has the form of a low mountain-ridge, between 51° and 46°, is gradually lost in the plain which extends north of the river Manytch. The steppe thus confined, as far as it belongs to Russia, contains, according to a rough estimate, an area of 336,000 square miles, or more than once and a half the area of all France. Though the whole of this region is unfit for cultivation, and supplies only scanty pasture for the herds of the wandering tribes which inhabit it, some parts are less arid, and have better pasture-grounds. That part of the steppe which lies west of the course of the Volga is called the Koomanian steppe. This portion of the great steppe is not a level, but the surface consists of gentle swells of a roundish form, so that the view seldom extends over many miles. The soil consists almost entirely of a yellow clay, and rarely of sand; it is impregnated with salt, and pits, or small salt-lakes, are common. Vegetation is confined to a few plants. The most frequent are a low-growing wormwood, some species of salsola, and a coarse grass which grows in tufts several feet from one another; between these tufts the yellow soil is without any vegetation. In no place does the grass cover the whole surface so as to form a turf, except in some of the deeper depressions, and in these the vegetation chiefly consists of salt herbs fit only for camels. The shore of the Caspian Sea between the mouths of the Volga and those of the Kooma is very low to a distance varying between 20 and 40 miles from the sea. It is inundated by the waters of that great lake when a strong south-easterly wind happens to blow for some time, and vessels are sometimes driven on the sand-hills which rise on the west of this level tract. These low hills appear to have been produced by the accumulation of the sand thrown out by the lake. At the back of these hills there are extensive salt-lakes, which once evidently formed part of the Caspian before the sand-hills existed. Among these salt-lakes those called Solenoé Khaki are very remarkable. They occupy a depression from twelve to fifteen miles in width, which has a very swampy surface, over which the salt-lakes are dispersed. In this tract the river Manytch originates: it runs nearly due west for about sixty or seventy miles, when, having passed the elevated ground which separates the Sarpa from the Don, it enters an arid plain of moderate width which extends westward to the mouth of the Don and Sea of Azof, and is enclosed on the south and north by more elevated land. This level tract contained, at a remote period, according to Pallas, the strait by which the Black Sea was connected with the Caspian. The source of the Manytsh is divided from the low lands along the last-mentioned sea and those which lie along the lower banks of the river Kooma, by small hills, entirely consisting of sand, between which numerous salt-pits occur. In Strabo there occurs a passage which indicates that such a communication once existed. As the Caspian Sea, according to the latest measurement, is about 100 feet below the level of the Black Sea, it is supposed that, before this communication was stopped, the surface must have been higher by at least 100 feet, and that the waters then covered the whole steppe, not only that in Russia, on both sides of the Volga, but also that of the Kirghis Cossacks, far beyond the shores of the Sea of Aral. Pallas, who first adopted this opinion, supports it by stating that the innumerable shells which are scattered over these deserts exactly resemble those of the Caspian, and do not occur in the rivers; that the soil of this vast region is of great uniformity, consisting, except the quicksands, merely of yellow clay or sand combined with marine mud, with a bed of clay at a considerable depth; and that this soil is impregnated more or less with saline matter, which in many places forms salt-pits and salt-lakes. The western or Koomanian steppe however is the best part of the whole, at least of that which belongs to Russia. The number of Calmucks who find pasture for their numerous herds, consisting of camels, black cattle, horses, sheep, and goats, is estimated at 20,000 tents or families, besides a considerable number of Cossacks, who possess portions of it. In winter, when the grass of the plains is entirely destroyed, their herds find abundant pasture on the swampy tracts along the banks of the river Sarpa, on the low shores of the Caspian, and on the more level ground of the river Kooma above Kislar. The wild animals, which abound in the steppes, are horses, saiga-antelopes [ANTELOPE, vol. ii., p. 73], foxes, wolves, and the *dipus jerboa* [MURIDÆ, vol. xv., p. 509].

The bed of the river Volga is from 40 to 60 feet below the level of the steppe. The river flows from the bend at Sarepta (48° 30′ N. lat.) in a valley from 20 to 30 miles wide, the surface of which is not much above the common level of the river. It consists of alluvial soil, and the river has accordingly formed on it numerous channels, which frequently unite and separate again. Thus many islands are formed, most of which, as well as the low tracts along the river, are annually inundated for about two months, and though they are thus rendered unfit for cultivation, they are used as meadows and pasture-ground. Some of the larger islands however, being above the reach of the inundations, allow the cultivation of different kinds of grain; and these are the only tracts in this region where grain is grown.

The larger portion of the steppe is situated on the east of the Volga; and it is called by the Calmucks Gahsen, that is, the desert. This name however applies only to the southern and more sterile part, whose northern boundary is formed by the ridge of the Obstshei Sirt. This ridge of elevated ground is connected at its eastern extremity with the most western ranges of the Ural Mountains, near 52° N. lat., whence it extends westward, and at first parallel with the middle course of the river Ural, to the place where the river turns southward. The elevated ground continues westward until it reaches the Volga opposite Kamyshin, between 51° and 52° N. lat. The Obstshei Sirt rises with a gentle declivity about 500 feet above the steppe, which extends along its southern side, and is considered by Pallas to be the antient coast-line of the sea, when the waters of the Caspian Sea covered the whole plain south of it. It differs considerably from the steppe itself, the soil containing a considerable portion of black mould and being covered with grass. The northern part of the steppe is reached by a short descent on its northern side. This country is several feet above the level of the Black Sea, while the southern portion is considered to be between 50 and 100 feet below it. Its surface is also a level, in which the watercourses have made deep furrows. The upper level consists of a more fertile soil than that of the steppe, and is chiefly covered with a tolerably good turf, but is without trees or bushes. No part of it is cultivated, and it does not appear to be fit for cultivation. On the bottoms of the rivers however there are wild cherry and almond trees and other shrubs, and between them meadows. In some places these bottoms are partially cultivated.

Near the western extremity of the Obstshei Sirt, not far from the town of Kamyshin, begins the Naryn, an elevated tract of sand, which runs in a south-east direction through the great steppe, south of the Obstshei Sirt, and terminates not far from the shores of the Caspian Sea. Its length is above 300 miles, and it varies in width from 30 to 100 miles. The surface is covered with hills varying from 12 to 30 feet in height; they lie generally in groups close together, but sometimes the groups are separated from one another by large level tracts. The hills consist of fine white sand intermixed with broken shells and decomposed lime, and are quite destitute of vegetation; but it is remarkable that a few feet below the surface spring-water is always found among these hills, and in some of the depressions many rare plants grow. On the west of the Naryn extends the worst part of the steppe. It appears that a great depression occurs here, which contains numerous salt lakes, which begin on the north with the lake of Elton, about 70 miles south-west of Kamyshin, and extend parallel to the Naryn, south-eastward to the shores of the Caspian. The lakes are separated from one another by level tracts, consisting of yellow clay, without any vegetation, except in a few isolated spots of small extent. In some parts there are hills covered with gypsum, and consisting of great masses of rock-salt. The most southern of these hills of rock-salt, Solenoïa Gora, or Tshaptshatshu, is about 100 miles north of the town of Astrakhan. No use is made of the immense masses of rock-salt which occur in this tract, as that commodity can be obtained with less expense from the lakes. Formerly the fine and pure salt which crystallizes along the banks of the lake of Bogdoin Dabossu, was collected, but it has been discontinued since 1807, on account of the expense of transport. This lake, which is 10 miles long and 6 wide, is about 25 miles from the Volga, near 48° N. lat. Immense quantities of salt are obtained from the lake of Elton, or, as it is called by the Calmucks, Altun, which lies near 49° N. lat. and 46° 40′ E. long., and is 12 miles long, with a width of nearly 10 miles. The surface of the lake is covered with a thick layer of salt, like ice. It has a brownish-grey and reddish colour, and though not quite pure, is used in most parts of Russia. The government maintains on the sterile banks of the lake an establishment of about one thousand persons. The layer of salt is broken with poles and collected on the shores of the lake, whence it is transported to the great salt depôt at Saratow, which, according to Erdman, contained some years ago thirty million poods of salt, a quantity which was estimated sufficient for the consumption of the whole empire for more than a year. Between the series of salt lakes which have been already noticed, and the banks of the Volga, is a tract of sandy hills similar to the Naryn, but of less extent. Though the vegetation of this tract is very scanty, it is much superior to that of the depression in which the salt lakes occur, and there are some spots which supply pasture. There are no permanent watercourses in this region, nor even temporary ones of any considerable extent.

That part of the steppe which lies east of the Naryn appears to be less sterile than the country just described. Here the soil consists chiefly of yellow clay, but is more intermixed with sand, and more fit for supporting vegetation. But the soil is also impregnated with salt, though much less so than the western part of the steppe, and some saline plants, with the short wormwood, on which the saiga-antelopes feed, are the vegetation most frequently met with. Three rivers traverse it from north-west to south-east; two of them are called Usen (the Lesser and the Greater), and fall into the salt lake Kamysh Samara, which sometimes discharges its waters into the river Ural by a small channel, but generally, like all the lakes of this region, has no outlet. The third river is called Kushum, and falls into the lake of Zagan, or Zagan-Nor. The two rivers Usen run in a bed from 15 to 36 feet below the surface of the steppe, which is a dead level, and the bottoms along their banks are from half a mile to two miles wide. They are covered with poplars, willows, wild olive-trees, and tamarisk shrubs, and constitute the only wooded tracts in the whole extent of the steppe; for the bottoms along the Ural river, which are from half a mile to a mile and a half wide, are subject to long annual inundations.

Though the Ural river is considered as the boundary-line between Russia and the country inhabited by the independent tribes of the Kirghis Cossacks, from the place where it turns westward, or from the redoubt of Oreskaïa, the Russians consider two localities on the south and west of the river as belonging to them, the rock-salt mines of Ilek and the salt-lake of Inderskoe. The first are about 80 miles west of the town of Orenburg, near the place where the small river Ilek falls into the Ural. They are the only mines of rock-salt which are worked in Russia. Great quantities of salt were formerly obtained from them, but in modern times they have not been worked to any great extent. The salt-lake of Inderskoe, which is near 49° N. lat., about eight miles from the eastern banks of the Ural river, is about 55 miles in circumference. Its surface is covered with such a thick layer of salt, that, according to Pallas, it may be crossed by a man, like a sheet of ice. Only the Cossacks who are stationed on the Ural river take from it as much salt as is required to cure the fish which are caught in the river. [Ural, River.]

No country on the globe is subject to a greater diversity of heat and cold than this steppe, especially the eastern part. The Ural, notwithstanding its rapid current in its upper course, is covered with ice at the end of October or the beginning of November, and it does not break up before the middle of April. During this season the frost is continuous and intense. The thermometer generally sinks 15° below zero, and continues so for several weeks together, and sometimes it descends to 30° and 35°. During this time a considerable quantity of snow falls, but it does not cover the ground, being carried over the plain by violent whirlwinds, which cause it to accumulate in certain places. The spring is very short. In the middle of May the heat begins to be oppressive in the day-time. In June and July the thermometer rises to 100°, and at Orenburg it sometimes attains 110°. The heat is generally attended with a total want of rain and a southern wind which dries up the water of the lakes and converts them into swamps. The nights however are cool. In September the heat decreases rapidly, and soon afterwards night-frosts become frequent. In this season rain is rather common. Thus the inhabitants of this region experience in winter a degree of cold which is not inferior to that felt on the banks of the Mackenzie river near the polar circle; while in summer they are oppressed by a heat which may be compared with that of the hottest month on the Amazonas, under the equator.

As no mountains intervene between this steppe and the western countries of Europe, the effects of this extraordinary climate are felt as far west as Great Britain. When the wind blows from the east between October and May, it is extremely cold, and more disagreeable than that from the north. Though the wind has passed over extensive regions before it reaches our coast, it has not entirely changed its character. On the contrary, when we experience an easterly wind between May and October, it is attended with a greater degree of warmth than the southern winds. In summer the thermometer rises in Great Britain highest when easterly and south-easterly winds blow.

That portion of southern Russia which lies west of the lower basin of the river Volga extends along the coast of the Black Sea as far west as the Danube and Pruth. It terminates on the south with the peninsula of the Crimea, which contains a mountainous and very fertile and also a level region; the latter exactly resembles the great steppe lying west of the lower course of the Volga. [CRIMEA, vol. viii., p. 158.] The country which extends from the shores of the Putrid Sea northward between the Dnieper on the west and the river Moloshnya on the east, as far north as 47° N. lat., is likewise a salt steppe; the waters of the lakes as well as those of the small rivers being slightly impregnated with salt. It is not however level, but the surface consists of an alternate succession of elevations and depressions. The higher land has a soil consisting of a reddish clay, which is very barren. In the lower tracts the soil is an intermixture of black mould and sand, and mostly covered with grass, which supplies tolerable pasture. The most western portion, extending between the Gulf of Perecop and the Dnieper to the Liman or æstuary of the last-mentioned river, is a sandy waste, which is entirely barren and uninhabited.

North of this country there is a steppe of somewhat different character. It comprehends the whole country south of the granite tract which traverses Russia from east to west, from the banks of the Don and the Ilawla (its confluent, which joins it at its most eastern bend) to the river Pruth, with a width varying between 80 and 120 miles. This tract also may be included within the steppe, being similar in soil and climate, and only differing from it in the form of its surface, which is more hilly. Towards its eastern extremity, near 40° E. long., between the town of Voronez and the Manytch river, the width of this region is near 300 miles; but towards the west it grows narrower, and from 33° E. long. westward it does not exceed 150 miles. Its length from east to west is 900 miles, and the area is about 180,000 square miles, exceeding that of the British Islands by more than 60,000 square miles. Want of wood and of water are its characteristic features. It is considerably more elevated than the low steppes near the Caspian Sea, and not impregnated with salt, except between the mouths of the rivers Dniester and Danube, where a low marshy tract extends some distance from the sea, and where salt-marshes of some extent occur. Towards the south and east the surface is mostly a dead level, with the exception of narrow tracts along the watercourses, which are enclosed by steep acclivities that form the boundaries of these bottoms. The bottoms have a fertile soil consisting of a black mould, and yield good crops; but they are too narrow to admit cultivation to a great extent. The higher and level grounds have an extremely hard clayey soil, which, for want of sufficient moisture, is unfit for cultivation; but they are not a desert. In spring they are covered with a fine turf, and supply good pasture for cattle and horses. Much grass is also cut for fodder. The want of fuel is a great inconvenience, but a certain weed called *burin* is used for fuel. In other places dried dung is substituted for it. Within the granitic tract the surface of the country is more broken, especially west of the Dnieper, and in these parts the narrow valleys between the low hills are chiefly covered with bushes, and contain many tracts fit for agricultural purposes. The summer is dry and hot. Rain is rare, and of short duration, and the thermometer rises from 90° to 100°. In autumn and winter whirlwinds are frequent; and though a considerable quantity of snow falls, it is swept by the winds from the extensive plains, and accumulated in particular spots, so that the country derives very little advantage from it. From December to February, the thermometer frequently sinks to 25° and 30° below zero. The spring and autumn are of short duration.

The country north of this extensive steppe may be divided into two regions. The western lies on both sides of the middle course of the river Dnieper. On the west of the river, it extends from the northern border of the steppe (between 48° and 49° N. lat.) to the great swamps of Pinsk and Ratnor (near 52°), and comprehends the governments of Podolia, Volhynia, and Kiew. On the east of the Dnieper, it comprehends the government of Pultava, the greater part of that of Tchernigow, and the western parts of Charkow and Kursk. It is designated by the general name of the Ukraine. The surface of this region is chiefly undulating, but in many places it extends in level plains. The soil mostly consists of a black mould, here and there interspersed with sandy tracts. The fertility in general is considerable, and in some parts, where loam is mixed with the mould, it is very great. In fact it vies in fertility with the country on the middle course of the Volga. Here the forests principally consist of oak, but they are much less extensive than in the neighbourhood of Casan. The eastern portion of the region lies within the basin of the river Don, between its upper affluents, and comprehends the eastern portions of Charkow, Kursk, and Orel, the whole of Voronesh, and portions of Tambow and Saratov. It appears to be more elevated than the western region, and partakes more of the nature of the steppe, as wood and water in many parts are scarce. The surface is also more undulating, and in many parts it rises into hills of moderate elevation with rather steep declivities. The soil consists of a mixture of clay and sand, and is not without a certain degree of fertility, though on the higher parts there are considerable tracts of sterile land. On the lower ground however cultivation in general, and the wheat which is grown here is of excellent quality. The wheat is sent to the town of Taganrok, whence a great quantity is annually exported. Though the difference of the temperature in summer and winter is considerable, it is much less than in the steppe farther south. Here also the rains are much more abundant, especially in the western region. The scarcity of rain in summer in the eastern region is one of the causes to which its smaller degree of fertility is ascribed.

In conclusion, if we view Russia as an agricultural country, it appears that the most fertile region traverses nearly the central part of it, extending from between 48° 30′ and 52° on the west, north-eastward to between 53° and 56° N. lat. on the east. It lies between 25° and 50° E. long. The central part of this region, that about the antient capital and in the basin of the river Oka, is the least fertile, but the most eastern and western parts may be enumerated among the most productive countries in Europe. On both sides of this central region the fertility decreases, but less rapidly towards the north than towards the south. On the south it lies partly contiguous to the steppes of Southern Russia and those of the river Volga, but on the north the wide basin of the Upper Volga and the wooded region on both sides of the uwalli separate it from the swampy deserts which extend along the shores of the Arctic Sea.

Rivers and Lakes.—The principal rivers are noticed in the articles DWINA, VOLGA, DÜNA, NIEMEN, DNIEPER, DNIESTER, DANUBE, DON, and URAL. As Russia is a level country, the rivers present a greater line of inland navigation than those of most other countries. But all the rivers are not equally fit for navigation. Those which fall into the Gulf of Finland, or into the lakes of Ladoga and Onega, from the north, though they bring down a great volume of water, are unfit for navigation, owing to the numerous rapids and cataracts. The rivers which join the gulf and the lakes from the south generally present some impediments to navigation in their upper course, which is also the case with the Düna, which falls into the Baltic, while the Niemen is navigable in all its extent, nearly to its source. In the Dwina there is no impediment to navigation; and the principal river and all its branches may be ascended to a short distance from the places where they originate. The Volga has the longest line of navigation, as it flows more than 2000 miles, and in this course has no cataracts, rapids, nor whirlpools. It becomes navigable about twenty miles from its source in lake Seligher. Its northern affluents are navigable to an equal extent, but the southern much less so, on account of the small quantity of water which they bring down. The rivers which fall into the Black Sea are much less adapted for the transport of merchandise. Besides their comparatively small volume of water, owing to the scarcity of rain and snow, and the shallowness of their beds, their course is interrupted by rapids and cataracts, where they break through the granitic tract which traverses Southern Russia.

Lakes are very numerous in certain parts of the empire, especially in the north-west and south-east. Almost all the lakes which occur in the salt steppes that surround the Caspian on the north, as well as in those of the Crimea and the Nogay steppe, which lies north of the peninsula, are salt lakes, and salt might be obtained from all of them. The lakes from which salt is actually obtained have been noticed before, namely the lakes of Elton, Bogdoin-Dabossu, and Inderskoe. There are very few lakes in the interior of Russia, and they are all small; but those of the countries surrounding the Gulf of Finland are very numerous. To the south of that gulf a very great number of lakes is dispersed over the country, between 55° and 60° N. lat., and between 27° and 30° E. long., especially over the southern districts. The largest is the lake of Peipus or Pskow, which is nearly 90 miles long, and in its northern part nearly 30 miles wide. The area is about 1500 square miles, or more than the county of Sussex. It is 10 fathoms deep in the centre, and greatly facilitates the communication between the countries along its shore; but it is less favourable to the communication with the gulf, for its outlet, the river Narowa, though deep, has a very rapid course, and forms, a short distance above the town of Narva, a cataract 18 feet high, by which the navigation is entirely interrupted.

In the country north of the Gulf of Finland there are several systems of lakes, of which it is difficult to give any description. The deep depressions between the rocks are filled with water, which sometimes expands to four or five miles in width, and in other places contracts to a channel hardly 30 or even 20 fathoms across, which however soon widens again to the dimensions of a lake. The wider parts of these extraordinary pieces of water are dotted with rocks or rocky islets. The most extensive of these systems of lakes is that which terminates on the south with the lake of Saima. The most northern watersheds belonging to it lie between 63° 30′ N. lat., north of the town of Kuopio, and from thence the series of lakes connected with one another by short and rapid channels extends in a south-south-west direction to Nyslott (south of 62°), above which place it receives the waters of another series of lakes, which begin on the north also, near 63° 30′ N. lat. with the lake of Pielisyarvi, and extend southward. South of Nyslott the lakes lie from north-east to south-west, and continue to 61° N. lat., where they terminate at the town of Vilmanstrand. Thus the whole line of lakes, called the Saima lakes, is more than 180 miles in length. The great volume of water thus collected is carried off by the river Woxa or Wuoxen, which runs from the south-eastern extremity of the Saima Lake, east and north-east to the lake of Ladoga. In some places it enlarges to the width of a lake, but in others it is very narrow, and forms so many waterfalls that no part of its course is navigable. Near the village of Sitola is the cataract of Imatra, which consists of a series of falls of moderate elevation, which lie within a space of 200 yards. The lakes of Saima are also difficult to navigate on account of the numerous rocks, but an active communication exists between Nyslott and Vilmanstrand, by means of a few short cuts which have been made. Farther west, near 25° E. long., there is a similar but less extensive system of lakes, which, from the name of the largest of them, is called that of Païana, and which extends north and south. It discharges its waters into the Gulf of Finland by the river Kymnene, which is only from 40 to 50 fathoms wide, but generally from 8 to 10 fathoms deep. It is not however navigable, as several cataracts occur in it, among which that of Högfors, a few miles from the sea, is 20 feet high.

The country which extends between the innermost recess of the Gulf of Finland, and that bay of the White Sea which is called the Gulf of Onega, contains the largest lakes in Russia and in all Europe, the Ladoga and the Onega: the lake of Ladoga is the largest. In length from north-west to south-east it is nearly 120 miles, and its greatest width is 70 miles. It covers an area of more than 6500 square miles, or nearly 500 square miles more than Yorkshire, but not much more than half the surface of Lake Ontario (11,600 square miles). A few rocky islands occur along its north-western shores, but none in the main body of the lake. The depth varies greatly. In some places it is stated to amount to nearly 150 fathoms, which considerably exceeds the greatest depth of the Baltic, but in others it is shallow, and not deep enough for large vessels. The waters of a very extensive country unite in this lake. By the river Woxa it receives those of the Saima lakes from the eastern districts of Finland, by the river Swir the waters that are collected in the lake of Onega, and by the Volkhow those which originate nearly 300 miles south of it, and are collected in the lake of Ilmen. The lake of Onega, which is nearly at an equal distance from the lake of Ladoga and the Gulf of Onega, is more than 120 miles long, with an average width of nearly 40 miles. The area is about 4350 square miles, or more than double that of Norfolk. Its depth is considerable, generally 80 or even 100 fathoms. Along the shores there are numerous rocky islands, but the main body of the lake is free from them. The waters of this lake are discharged into that of Ladoga by the Swir river, which is about 120 miles long, and flows through a low and swampy country overgrown with thick forests. Though a few rocks occur in the bed, it has no cataracts or rapids, and is navigated by large river boats. The surplus of the waters collected in the lake of Ladoga is carried to the Gulf of Finland by the Neva, which flows more than forty miles measured along the windings of the river, and after dividing near and in Petersburg into four arms, reaches the wide inlet at the western extremity of the gulf called the Bay of Cronstadt. Its width varies between 100 and 200 fathoms, and its depth is commonly three fathoms or more, so that the largest river-vessels can navigate it. There exists a small impediment to navigation near Pella, about half-way between Schlüsselburg, where the river leaves the lake of Ladoga, and Petersburg: it consists of a shallow, which is strewed with large stones. This place is now avoided by a short artificial cut, called the canal of Pella. The river is covered with ice from the end of October to the end of March.

Three of the smaller lakes require mention on account of the facility that they have afforded for establishing a water-communication by canals in the interior of Russia. The lake called Bieloë Ozero, or White Lake, lies between 60° and 60° 20′ N. lat. and between 37° and 38° E. long. It has an oval shape, extending about 30 miles or little more from east to west, and 24 miles from south to north. In the centre it is 24 feet deep, and even near the flat shores it preserves a depth of from three to five feet. The waters are rarely agitated by storms. Its outlet, the Cheksna, flows to the Volga in a southern direction. At a distance of about 40 miles from the Bieloë Ozero is the lake of Koobenskoë, which belongs to the basin of the river Dwina. It is about 40 miles in length from north-west to south-east, varying in width from five to ten miles. Several small rivers fall into it, and the lake is considered the source of the river Sukhona, one of the principal branches of the Dwina, which is navigable for large river boats, its depth varying between three and four fathoms. The third lake is the Ilmen, or Ilmen Ozero. It lies between 58° and 58° 30′ N. lat., and near 31° E. long., and has nearly a triangular shape, extending about 25 miles from east to west, and nearly as much from south to north. It receives a great number of rivers, and sends its waters to the lake of Ladoga by the river Volkhow. This lake is 450 feet above the level of the Baltic.

Canals.—The navigability of nearly all the Russian rivers to a very short distance from their sources, and the very moderate height of the elevated tracts, which divide the river systems from one another, above the level of the rivers that originate in them, facilitates more than in any other country the making of canals and the establishment of a continuous water-communication in the interior of the empire. Peter the Great perceived the advantages of such a water-communication, and he planned nearly all the canals which have been executed since his time, and some of them were even finished in his reign.

It has been already observed that those rivers which originate south of 55° N. lat. are much less adapted for navigation in their upper courses than those which have their sources farther north. This is mainly to be attributed to the dryness of the climate and the consequent want of water. When the attempt was made to unite the southern rivers by canals, this circumstance does not appear to have been known, or at least not to have been considered as an obstacle to the enterprise. But experience has shown that it constituted an insurmountable obstacle. All the canals which were undertaken in these districts have failed. Between 48° 30′ and 49° 20′ the river Don approaches the course of the Volga within 25 miles, and the Ilawla, an affluent of the Don, runs parallel to the Volga at nearly the same distance for more than 100 miles. A canal was made between the Ilawla and Volga south of Kamyshin by the Turks in the sixteenth century, and another by Peter the

Great, but though both are of considerable dimensions, there is not a drop of water in them at present. No water can be procured in the vicinity to feed them. Pallas thought that the most advantageous place for uniting the Don and Volga was where these two rivers approach nearest to one another. But by a levelling subsequently made, it was found that the country between them was 310 feet above the level of the Volga, and 210 above that of the Don. There being no water in the neighbourhood to feed the number of locks requisite for such a canal, the undertaking was never commenced. The river Don rises in a small lake called Ivanowskoe Ozero, and not far from this lake are the sources of the Shat, which falls into the Oopa, an affluent of the Oka. Peter caused a canal to be made between the lake and the Shat; and it is stated that in 1707 about 300 barges passed through it, but it does not appear that it was used afterwards; and when Alexander intended to re-establish the navigation, it was found that there was no water. The Shisdra, an affluent of the Oka from the west, originates not far from the Bolva, which falls into the Desna, a tributary of the Dnieper. In the beginning of the present century a plan was formed for uniting the Shisdra and Bolva by a canal, but no step has been taken towards its execution. It is very probable that this design also would fail for want of water.

On the contrary, all the canals which have been made in the northern provinces have succeeded completely. The three most important constitute a water-communication between the river Volga and the lakes of Onega and Ladoga, and consequently with the Neva and Petersburg. The most famous and most frequented of them is the canal of Vishnei Volotshok, near 57° 40′ N. lat. and 34° 30′ E. long., by which a direct water-communication is opened between Petersburg and Astrakhan, a distance of 3200 miles. Yet the canal does not exceed three miles in length. It traverses the town of Vishnei Volotshok, and unites the river Twerza, which falls into the Volga near Twer, with the lake of Mstino, which is about eight miles long, but hardly a mile wide, and from which the river Msta flows into the lake of Ilmen. A simple cut was made by Peter the Great, but as in course of time the number of vessels passing through the canal rapidly increased, the want of water was felt, and in modern times a large reservoir, the basin of Sawod, has been formed by collecting the water of several streams and small lakes. Other hydraulic works have been constructed in order to render the rapids which occur both in the Twerza and Msta less dangerous to the vessels, especially the largest of the rapids of the Msta, the Borovitzkoi Porog, where the river in the course of 20 miles descends 180 feet, and where many vessels were formerly lost. After descending the Msta the vessels were obliged to traverse the northern extremity of the lake of Ilmen, and then to enter the Volchow. But as the lake is subject to sudden gales, many vessels were lost. To obviate this danger a canal was made from a point about a mile above the embouchure of the Msta to the Volchow, along the northern shore of the lake. This canal, which is nearly six miles long and from 12 to 14 fathoms wide at its upper level, is called the canal of Novgorod, as it terminates in the vicinity of that town in the Volchow. The Volchow also offered many difficulties to navigation by the rapidity of its course, as it descends 450 feet in a distance not much exceeding 160 miles. Though the actual extent of the canals on this line of water-communication amounts only to nine miles, the works are very extensive and have cost large sums. With the exception of the canals in the interior of China, there is probably no canal which is more navigated than that of Vishnei Volotshok. The produce of the mines of Perm and Ekatarinburg, of the rich country and the oak-forests between Nishnei Novgorod and Simbirsk, and of the whole basin of the Oka, reach Petersburg and the Baltic by the Volga and this line of navigation. In 1828 the number of laden river-vessels which arrived by this route at Petersburg was 12,936; that of empty vessels 702, and that of rafts 6388; and since that time a considerable increase has taken place. The value of the goods thus transported to Petersburg amounted to 130 millions of rubles banco. The canals and rivers on this line are generally free from ice from the middle of April to the end of October.

The second line of water-communication is formed by the Tikhwina Canal, which is farther to the north-north-east, near 59° 25′ N. lat. and 34° 20′ E. long. This line of inland navigation begins in the Volga at the mouth of the river Maloga, north of 58° N. lat. and near 38° 30′ E. long. It ascends the last-mentioned river to its most northern bend, where it is joined by its large affluent the Chagoda or Chagodocha: it then follows the last-mentioned river to its junction with the Somino, which rises in the lakes of Somino and Eglino. The lake of Eglino is united by the Tikhwina Canal with the small lake of Lebidini, which is the source of the river Tikhwinka. The Tikhwinka runs westward into the Sias, which falls into the lake of Ladoga a few miles east of the embouchure of the Volchow. The highest level in this line of navigation is 564 feet above the lake of Ladoga, and only 162 feet above the level of the Volga at the mouth of the river Maloga. The canal itself is only five miles long and 36 feet wide at its upper level. A few cuts have been made in the Somino and Tikhwinka, but their length does not exceed four miles. The number of locks amounts to eighty-six, which occur in a space of about 120 miles. It was terminated in 1814, and improved between 1822 and 1828. Loaded barges can return by means of this canal from Petersburg to the Volga, which is very difficult by the canal of Vishnei Volotshok. In 1828 the number of loaded barges which went to Petersburg was 1815, of empty ones 276, and of rafts 1448; while from Petersburg 887 loaded and 665 empty barges returned to the Volga.

The third line of water-communication traverses the two lakes of Onega and Bieloë Ozero. The Kowsha, a navigable river, falls into the last-mentioned lake from the north-west; it rises in a small lake, the Kowshoë Ozero, on the highest part of the elevated tract which is the watershed between the lakes of Onega and Bieloë Ozero. Some miles west of this lake are the sources of the river Vytegra, which by a north-westerly course reaches the lake of Onega. Between these two rivers is the lake of Matko, whose waters, with those of the Kowshoë, are used to feed the locks of three short canals, whose length, taken together, does not exceed eight miles. The fall of the Kowsha amounts only to 53 feet, and that of the Vytegra to 302 feet; consequently the Bieloë Ozero is nearly 250 feet higher than the lake of Onega. The number of locks is 31. But the river Cheksna, which issues from the Bieloë Ozero, and falls into the Volga at Rybinsk, contains some rapids, and in one place, above the town of Cherepovez, goods must be unshipped and transported by land a considerable distance. To avoid this inconvenience, it was proposed several years ago to make a canal on the left bank of the Cheksna, about twelve miles long. We do not know if this project has been executed. The canals by which the Kowsha is united to the Vytegra are called Mary Canals, in honour of the wife of the emperor Paul Petrowitch, who paid the expenses of the undertaking. It was finished in 1808. By this communication 2280 loaded and 150 empty barges, and 5500 rafts, came to Petersburg in 1828. The value of the goods brought to the capital in the years between 1825 and 1830 was, on an average, about ten millions of rubles banco; but that of the merchandise which went from the capital to the interior fell short of one million. The Tikhwina and Mary Canals can only be navigated from the end of April to the middle of October.

On comparing these three systems of water-communication between the Baltic and the Volga, as to length, it appears that the shortest is that through the Tikhwina canal, by which the whole distance between Rybinsk and Petersburg is reduced to 556 miles. Between the same places, through the Mary Canals, it amounts to 713 miles, and through the canal system of the Vishnei Volotshok to 782 miles. Though the last is the longest route, it is still generally preferred, and the value of the goods which about twelve years ago were brought to Petersburg by the Mary, Tikhwina, and Vishnei Volotshok canals was estimated in the respective proportions of one, three, and ten.

As these three systems of inland navigation traverse the lakes of Ladoga and Onega, and the barges were originally obliged to pass over them, heavy losses of property were frequently incurred by the barges being swamped during the gales to which the lakes are subject. To avoid this dangerous navigation, canals have been made along the southern shores of the lakes. The most western canal, called the Ladoga canal, unites the river Volchow with the Neva; it is nearly 70 miles long, from 10 to 14 fathoms wide, from 4 to 7 feet deep in summer, and from 7 to 10 in spring. Nine locks are built on the northern banks, to discharge the superfluous water into the lake of Ladoga, and sixteen on the southern bank, to bring into the canal such a supply of water as is required in summer. For the latter purpose some steam-engines are also used. This canal was finished in 1733, but has since been improved at several times: the last occasion was in 1831. When the Tikhwina canal was made, this line of navigation was extended farther east, by the Sias canal, which runs along the southern banks of lake Ladoga to the mouth of the river Sias, is nearly 7 miles long, 8 fathoms wide, and 5 feet deep. To obviate the danger which the barges passing through the Mary canals might encounter in navigating lake Onega, the Onega canal was undertaken. According to the original plan, it was to enclose the southern extremity of the lake, and to unite the river Vytegra with the river Swir, more than forty miles distant from one another on the projected line. But only one-third of this distance has been completed. The Onega canal begins in the river Vytegra, about ten miles from its mouth, and runs westward to the lake. It is about 14 miles long, 12 fathoms wide, and in general 7 feet deep. The barges are therefore still obliged to pass over the lake of Onega, a distance of about twenty-eight miles. The navigation on the river Swir is easy, and it has not appeared to require any improvement. But from the embouchure of the Swir to that of the Sias, where the Sias canal begins, the barges must traverse a portion of the wide expanse of the lake of Ladoga, which is full of danger. A canal was therefore made (between 1802 and 1810) from the mouth of the Swir river to that of the Sias, which is about 28 miles long and from 13 to 22 fathoms wide; its lowest level is seven feet below the surface of the Ladoga. It is called the Swir canal, and has no locks. Thus a line of canals surround the southern extremity of the lake of Ladoga, from the mouth of the Swir to the place where the Neva issues from the lake. The whole line is somewhat more than 100 miles long.

The lake of Bieloë and its outlet the river Cheksna have recently afforded the means of uniting by one system of canals the river Dwina and Archangel with the river Volga, and with the city of Petersburg. This line of canals begins in the Cheksna, about twenty miles below its efflux from the lake, near the town of Kirilow, whence it runs eastward through several small lakes, of which the lake of Vassirinskoë is the most elevated. From this lake it descends by a few other small lakes to the river Porosowiza, which falls into the lake of Kubinskoë. The last-mentioned lake is the source of the river Sukhona, the principal branch of the Dwina, which is navigable for large barges from the place where it leaves the lake. The descent from the lake of Vassirinskoë to the Cheksna is only 39 feet, and to the lake of Kubinskoë not more than 45 feet. The number of locks is only 13. The whole line between Kirilow and the lake of Kubinskoë does not much exceed 40 miles. This navigation was begun in 1825, and completed in 1828. In 1829 it was used by 76 barges and 275 rafts. It is of great importance for the transport of timber; the produce of the extensive pine-forests on both sides of the Sukhona, which formerly could not find a market, is now chiefly carried to Petersburg and to the Volga, where it finds a ready sale. This canal is called the Alexander canal, in honour of a prince of Wirtemberg of that name, who was active in its execution.

In the year 1825 was also commenced what must be considered the most important of the canals of Russia, that of the Moskwa and Volga. The abundant produce of the rich and fertile country which lies to the south and east of the antient capital of the empire was, before the execution of this canal, conveyed to the Baltic by a very circuitous route. After being embarked at Moscow, or some place in the neighbourhood, it was taken down the Oka to the town of Nishnei Novgorod, a distance of nearly 500 miles. From the last-mentioned place it ascended the river Volga to the town of Twer, a distance also of nearly 500 miles. At Twer it was less than 100 miles from the city of Moskow, the place of its embarkation, measured in a straight line. A canal, which would unite both places, would consequently make a saving of 900 miles. This saving was to be effected by the Moskwa and Volga canal, which begins on the Volga at the mouth of the river Dubna, about forty miles below Twer, ascends the Dubna to its confluence with the Sestria, and then the latter river to the vicinity of the town of Klin. At Klin the canal begins which leads to the lake of Gulzino, which constitutes the summit level, and where a reservoir is formed which covers about four square miles. This reservoir contains a volume of water exceeding a million of cubic fathoms, which is furnished by some small rivers, the course of which has been diverted to it. From this lake the vessels pass by another canal to the river Istra, which passes near Voskresensk, and falls into the river Moskwa, about twenty-six miles above the city of Moscow. The descent from the lake of Gulzino to the Moskwa is 232 feet, and that to the Volga is 286 feet. We cannot learn if this work has been completed, or if it has answered expectation.

There are a few other canals on the outskirts of the empire which require notice. Near 61° N. lat. a canal unites the Vychegda, one of the principal branches of the Dwina, with the Kama, which is the largest affluent of the Volga, by forming a water-communication between two rivers called the Northern and Southern Keltma. This canal, which is called the Catherine canal, is not much used. The river Düna is united to the Dnieper by the Beresinskoi canal, which joins the Oola, an affluent of the Düna, to the Berezina, a tributary of the Dnieper: it lies between 54° 30′ and 55° N. lat., and between 28° and 29° E. long. The river Niemen is united to the river Dnieper by the Oginsky canal, which forms a communication between the river Szczara, a tributary of the Niemen, and the Yasiolda, an affluent of the Pripec or Pripeat; the last-mentioned river traverses the swamps of Pinsk and Ratnor, and falls into the Dnieper. A communication between the Vistula and the Dnieper exists by means of the Pina canal, which unites the river Mookhavice (which joins the Vistula at Brzesc Litewski) and the Pripec.

Climate.—The fact that the intensity of cold in Europe increases from west to east, is illustrated by the climate of Russia. While the mean annual temperature of the western coast of Norway as far north as North Cape is always above 32°, or the freezing-point, in a considerable portion of the most northern part of Russia the mean annual temperature is below 32°. This is the case with the whole of Russian Lapland as far south as 66° N. lat., or the parallel of Tornea. But east of the White Sea, the line which separates the countries which have a mean annual temperature below 32°, and those in which it rises above it, turns more to the south-east, terminating on the Ural Mountains near the most northern branches of the river Kama, in 60° N. lat. Thus the whole country drained by the rivers Pechora and Mezen has a climate the mean annual temperature of which is below the freezing-point. But this severity of climate does not prevent the growth of trees; along the upper courses of both rivers, forests of considerable extent occur. But where the mean annual temperature does not exceed 25° or 26°, which is the case near the mouths of both rivers, a shrub a few inches high is hardly met with. Yet, on the peninsula of Kola, where the mean annual temperature is certainly below 32°, barley is cultivated, and generally comes to maturity. That part of Russia in which the mean annual temperature is below 32° may be called the *Arctic Region*.

South of the Arctic Region lies the *Cold Region*, in which the mean annual temperature varies between 32° and 40°. The southern limit of this region begins on the shores of the Baltic, on the Gulf of Riga, about 58° N. lat., and runs hence east-south-east to the confluence of the Moskwa and Oka, near 55° N. lat., whence it continues in the same direction towards the southern extremity of the Ural Mountains, terminating south of Uralsk on the river Ural, near 51° N. lat. It probably extends farther south in the middle of the line, over the elevated region in which the Desna, Oka, and Don rise. The winter in the northern districts lasts from seven to eight months, and in the southern from five to six months; in Petersburg, from the end of September to the beginning of May. The Neva is generally covered with ice for 160 days, from the 27th of November to the 19th of April. The thermometer usually descends to 22° below zero at the end of December or in January, even at Petersburg, but farther inland the cold is greater. The quicksilver froze at Plostow in 1809, which indicates that the cold was at least 40° below zero. Both spring and autumn are short, and the passage from cold to heat, and *vice versâ*, is rather rapid. But in summer the heat is for two or three weeks very great. The thermometer then rises to 86° and even 90°. In the interior both the heat and the cold are greater than on the coast. At Casan the thermometer in winter generally descends to 28° below zero, and in summer it rises to 95° and 96°. Near the sea western and north-eastern winds prevail, but in the interior southern, south-eastern, and south-western winds are most frequent. The aurora borealis is frequently seen, especially in March, June, July, and September.

The *Temperate Region* extends over the southern provinces, as far north as the line above mentioned. Its mean annual temperature varies between 40° and 50°, but in the Crimea and in the country between the Dniester and Danube it rises to 54° and 56°. This region is distinguished by severe though short winters, and by long and very hot summers. Night-frosts are frequent in October and November, but continual frost does not set in before the middle of December, and it lasts to the middle or end of February. But in the elevated steppes west of the river Don, the frost is often interrupted by a few days' thaw, while such a phenomenon is of rare occurrence east of the river. The frost however is severe, the thermometer generally sinking in the western districts to 12° below zero, and in the eastern to 20°. In this season northern and eastern winds are prevalent. From the end of February the cold becomes more moderate, but the weather continues to be raw, and there are night-frosts during the north-east winds, which at that season are the most frequent. In the middle of May however a sudden change takes place. In a few days the heat increases to such a degree as to become oppressive. In June and July it still continues increasing, until the thermometer attains between 90° and 100°. From the middle of August however the heat rapidly decreases, and in September the thermometer frequently descends to 42° and even 40°: sometimes night-frosts occur. In the hot season south-east and east winds are prevalent.

The countries which border on the Baltic and on the White Sea have a wet climate, and rain is frequent all the year round: in winter a considerable quantity of snow falls. According to several statements, it appears that the annual quantity of moisture which descends in rain and snow on these countries varies between 16 and 24 inches. This wet climate extends only to the elevated tract which borders the basin of the Volga on the north and west, and in this humid region the interminable forests which cover it consist almost exclusively of pine, fir, larch, and birch. In the basin of the Volga the rains are much less frequent, except towards its western extremity, where short showers are experienced all the year round. But in proceeding farther east, the rain becomes scarcer, and in these countries the forests consist mostly of oaks, limes, ashes, and elms; pines and firs are rarely met with. At Casan the number of rainy days in the year does not exceed 90. The southern provinces have a still drier climate. During the long summer a drop of rain seldom falls, and even in the early part of the autumn there are only a few showers. At the approach of the winter, in November, rain is common, but it is soon changed for snow. Snow is only frequent in the beginning of the winter, and very little falls in January and February. Though the air is moist in spring, there are few showers; and even these entirely cease at the approach of summer in the beginning of May.

Productions.—Russia produces much more grain than is required for the consumption, and considerable quantities are exported. In most parts of continental Europe rye is used for bread by the mass of the people, and the cultivation of this grain is best adapted to the soil and climate of Russia. Except in the steppes and the Arctic region, it may be grown in all parts of the empire, even in those districts which have rather a poor soil. The greatest quantity is produced between the cataracts of the Dnieper on the south and the river Volga on the north, but the cultivation extends to the mouth of the Dwina, 65° N. lat. It does not always ripen north of the Volga, owing to the shortness of the summer and the moisture of the atmosphere; and it is generally necessary to dry the grain in buildings constructed for that purpose. The cultivation of barley extends to 67° N. lat., but not so far as on the coast of Norway, where this grain is grown to 70° N. lat. It is not grown to such an extent as rye. Oats do not succeed north of 62° N. lat. They are still cultivated on the banks of the Sukhona near Vologda, but not on those of the Vychegda and Dwina. In some provinces which have a poor soil, and in the districts through which the great roads and lines of inland water-communication run, the cultivation of oats is very extensive. Wheat is the principal object of agriculture in the fertile tracts along the rivers in the southern districts, but especially in those governments which are comprehended under the name of the Ukraine (Volhynia, Podolia, Kiew, and Pultava); farther north it is less grown, even in the fertile country which surrounds the great bend of the Volga. In some favoured spots it succeeds to 58° and even 59° N. lat. Millet is extensively grown in the elevated country which surrounds the upper course of the Oka, Don, and Desna, and in some other parts of the country, but the cultivation does not extend north of 55° N. lat. At the southern extremity of Russia, Indian corn is cultivated, in a country the mean annual temperature of which is only equal to that of England, but which has a much drier climate and a hotter summer. Its cultivation extends northward to the cataracts of the Dnieper, to about 48° N. lat.

Flax and hemp are more extensively grown than perhaps in any other country in Europe: both the climate and the soil are very favourable to their cultivation. Pallas observes, that on the steppes along the river Don, and even on those of the Volga near Sarepta, it is found in a wild state. In no part of Russia are flax and hemp grown to a greater extent than in the countries on both sides of the upper course of the Volga, in the governments of Twer, Yaroslaw, and Kostroma. Great quantities of both flax and hemp are sent to other parts, though the consumption is very considerable in the numerous manufactures established in these parts. Hemp and flax succeed as far north as 65° N. lat., and both, together with hemp-seed and flax-seed, constitute important articles of export from Arkhangel, Petersburg, and Riga. Tobacco is much cultivated in the Ukraine, whence it is exported to the neighbouring countries.

The climate of Russia is not favourable to the cultivation of fruit-trees. With the exception of wild cherries and some bad apples, no fruits grow north of 56° N. lat. At Vladimir the first extensive plantations of cherry-trees occur, and their produce is sent to Petersburg and other parts farther north. Other fruits are imported from foreign countries, especially from the north of Germany. Pears and plums are only grown to any extent south of 53° N. lat. In the most southern districts there are peaches, apricots, quinces, mulberries, and walnuts, and in the numerous and extensive orchards of the Crimea there are also almonds and pomegranates. Grapes are chiefly cultivated in the districts along the lower course of the Don, and on the Volga between Kamyshin and Sarepta, and also in the Crimea. The wine made in these countries however was formerly of inferior quality, but the grapes constituted an important article of internal trade, and were sent to Moscow and even farther north. Since the beginning of this century however great improvements in the art of making wine have been introduced into the vineyards on the Don, by a Frenchman from Champagne, and it is stated that the wine which is made in these parts and extensively used all over Russia, and known there under the name of Donish wine, is hardly inferior to the French champagne.

Kitchen-gardens are not much attended to. Potatoes, several kinds of cabbages, turnips, and carrots however are extensively grown; and in some places cucumbers, pumpkins, and radishes. Melons, and especially watermelons, are very abundant in the hot and dry countries near the steppes, where they constitute in summer a considerable part of the food of the lower classes. Asparagus grows wild in the southern districts. Hops are frequently found wild, but they are also cultivated. Liquorice thrives luxuriantly on the banks of the Volga in the government of Astrakhan, where it sometimes attains the size of a man's arm: it is taken to Astrakhan, where the juice is expressed, and considerable quantities of it are exported. An excellent soda is obtained from different kinds of salsola that grow in the steppes on both sides of the Volga.

The forests constitute one of the principal sources of wealth to Russia, and their produce, consisting of timber, fire-wood, tar, pitch, ashes, pearl-ash and potash, is exported to a large amount. It is difficult to say what may be the proportion of the surface of the country which is still forest, to that which is cleared or not covered with trees. The official statements which have been published do not comprehend those forests which are private property, but they are limited to those that belong to the government. It can hardly however be an excessive estimate, if we assume that about three-fourths of the countries between 65° N. lat. and the course of the Volga as far east as its great bend near Casan, are covered with forests. In all these countries only pine, fir, larch, alder, and birch are found, with a few lime-trees; ashes are rare. From these countries is derived the greatest part of the produce of the forests which goes to foreign markets. The forests are much less extensive south of the upper course of the Volga. The central provinces, or those which are situated between the middle course of the Volga and the Dnieper, have hardly as much wood as is required for the consumption of a country subject to a severe winter, and for the manufactures which are established. In some parts even fire-wood is dear and scarce. The forests in the provinces west and east of the central countries are much more extensive. West of the Dnieper, in the governments which formerly constituted a part of Poland, several extensive forests occur on the banks of the Niemen and in the swamps of Pinsk and Ratnor. They chiefly consist of pine and fir trees, but birch and lime trees are also common, and in some parts they are the prevalent kinds. South of the swamps of Pinsk and Ratnor there are some forests of beech, and this is the only part of Russia where that tree is abundant. The great forests to the east of the central provinces occupy a large part of the governments of Perm, Viatka, Casan, Nishnei Novgorod, Pensa, and Saratov. Those of the first two governments consist mostly of the same trees as the more northern forests; but in the other governments the pine and fir trees are rare, and are replaced by oaks, lime-trees, elms, and ash. In these parts the proportion of the latter to the former is stated to be as 13 to 1. The oak-forests have engaged the attention of government, on account of their great importance for the navy. A more exact survey of them was made some years ago, when it was found that all the forests of Russia did not contain more than 375,000 full-grown oak-trees, that is, trees which were between 24 and 36 inches in diameter. The greatest number of them was found in the large forest which extends on both sides of the Volga, and begins at the town of Tcheborsar, somewhat above the place where the river turns southward. This forest contained more than 100,000 full-grown trees. In the neighbouring provinces the number amounted to 248,000. In the forests along the upper course of the Volga, and farther westward to the Baltic, only 15,600 trees were found, and in the central countries, the government of Smolensk included, not more than 11,400 trees. The southern provinces of Russia are quite without trees. The oak-tree is most common between 53° and 56° N. lat. Near the Ural Mountains it is not found north of 57° N. lat., but farther west it extends to 59°, and a few trees are even found in Finland north of 60° N. lat. In Sweden the oak grows north of 61° N. lat., and on the western coasts of Norway between 62° and 63° N. lat.

The domestic animals of England are found in Russia, with the exception of rabbits. Horses are very numerous, and of various breeds. Those in the northern provinces are rather small, but the central and southern districts have large breeds. Those of the Cossacks, Calmucks, and Kirghis, which pasture in the steppes, and become almost wild, are distinguished by their power of sustaining the greatest fatigue with very scanty food. There are also a few wild horses in the steppes. Black cattle is abundant, as is evident from the immense quantities of tallow and hides which are exported, though the domestic consumption of both articles is very great. Sheep are still more numerous. In some parts the great landed proprietors have begun to improve the breed by introducing the Merino and Saxon sheep, and by crossing them with the native sheep. In general however the wool is of an indifferent quality. During the winter sheep-skins are the common dress of the lower classes of peasantry. In the southern steppes there are some peculiar species of sheep, among which the Kirghisian breed with the large bushy tail is the most remarkable. Their wool, when full grown, is short and coarse, but the lambs have a fine and beautiful fleece. Goats are more numerous in Russia than in other countries of Europe: the skins are used for making marocco leather. Hogs are generally reared, except in the steppes: they are most numerous in the countries where there are oak-forests, and in the western provinces, from which a great number of hams and much bacon is sent to other parts of the empire. The nomadic tribes which wander about in the steppes keep a great number of camels: some rich proprietors have herds consisting of more than 1000 head. In the government of Astrakhan buffaloes are kept, but they do not appear to be numerous. Fowl, geese, and ducks are abundant; the two latter especially in those parts where there are numerous lakes and ponds. Reindeer are only kept north of 66° N. lat.

The bison [Bison, iv. 462], as already observed, still exists in the forest of Bialoviza, near the sources of the river Narew, a confluent of the Vistula. In the extensive northern forests there are elks, and several kinds of deer, hares, and wild hogs; the wild animals, which are killed for their skins, are also very numerous, as bears, gluttons, badgers, wolves, foxes, martens, polecats, weasels, ermines, otters, squirrels, and marmots. In the steppes there are wolves, foxes, and wild hogs; also wild asses, saiga-antelopes, konsaks, or foxes of the steppes, and the dipus jerboa.

Nearly all kinds of birds which are met with in England occur in Russia, and also the capercailzie and pelican: the last however only lives on the shores of the Black Sea and of the Caspian.

Fish is very plentiful in the rivers as well as in the White Sea and along the coasts of the Arctic Sea, but it is less abundant in the Baltic. The fish which are chiefly taken in the White Sea are haddock, cod, herrings, and the omul (salmo autumnalis, Pall.). In the Polar Sea, especially along the coasts of Nova Zembla, the whale, the walrus, narwhal (physeter macrocephalus), seal, dolphin, white fish (physeter catodon) and some other kinds are caught. A considerable number of families settled along the shores of the White Sea live by fishing. The most important fisheries in Russia are those of the Volga, the river Ural, and the sea of Azof. [Astrakhan; Azof.] The fish there taken are chiefly the beluga (accipenser huso, L.), sturgeon, sewruga (accipenser stellatus, Pall.), sterlet (accipenser ruthenus, L.), salmon, white salmon (salmo nelma), and the knife-fish (cyprinus cultratus, Pall.). The fish is sent to all parts of the empire, but is not exported to any large amount. Isinglass and caviare are sent to foreign markets.

Serpents and lizards are only common in the steppes. There are also swarms of locusts, which occasionally spread over the cultivated tracts within the steppes or those that border on them. They are not less destructive than those of Asia. Among the noxious insects are scorpions, millipedes (scolopendra millipes), tarantulas (aranea tarantula), and the scorpion-spider. Bees are found wild in most of those provinces which have large forests, but they are also reared by some of the natives who inhabit the countries at the base of the Ural Mountains and along the middle Volga, especially by the Mordwi. Though the consumption of wax is very great all over the country, especially in the churches, Russia still exports some wax. The honey collected in the districts where forests of lime-trees exist is highly valued, and fetches a good price. Several attempts have been made to introduce silk-worms, as Russia imports great quantities of silk from Persia for the manufactures in Moscow. The mulberry-tree thrives well in the southern provinces, and the silk-worm also succeeds.

Russia is rich in minerals. A gold-mine was formerly worked not far from the Gulf of Onega, near 63° N. lat.; but as the produce was small, and did not pay the expenses, it was abandoned in 1783. Gold occurs also on the western declivity of the Ural Mountains; but it has not yet been found in such quantity as to induce any person to collect it. Gold is found on the eastern or Siberian side of the mountains in considerable quantity. Platinum was discovered on the western declivity of the Ural in 1823, and has been worked since that time. The mines are near 57° 40′ N. lat., and the produce has always been on the increase. Between 1831 and 1834 it amounted annually to about 5000 marcs, and in 1836 to 8270 marcs. The number of mines is six, and they lie at a short distance from one another. No silver is found in European Russia, though it occurs in Siberia. But the greatest mineral wealth of Russia consists in its mines of copper and iron. Both these metals frequently occur on the western declivity of the Ural Mountains, from Slatoust near 55° S. lat., on the south, to 60° N. lat., and they are worked in many places. In 1782 the copper which was produced there amounted to 190,000 poods, and the iron to about 4,000,000 poods. It is stated that in 1830 the government of Perm, where the mines are most extensively worked, had 200 mines in operation, and that more than 7200 furnaces were employed. The number of copper-mines amounted to 27, with 200 furnaces. More than 160,000 men were directly or indirectly employed in this branch of business. The mines belong to the crown or to private persons. Those of the crown produced, in 1830, 41,000 poods of copper, 100,325 poods of bar-iron, and

1,050,000 poods of cast-iron. In those belonging to private individuals there were produced 90,000 poods of copper, and between 3½ and 4 million poods of cast-iron. The produce of the mines in the governments of Viatka and Orenburg is not stated. It is however supposed that in both taken together it fell short of that of Perm alone. Iron-ore however is not confined to the Ural Mountains; it occurs also on the southern declivity of the Uwalli, and on the table-land which extends about the sources of the rivers Oka, Don, and Desna. It is there found in the clay in layers, and sometimes only in lumps. Frequently it occurs in bogs and morasses. The quantity of iron obtained in these parts is considerable, and the extensive manufactures of Tula hardly use any other iron. Other metals are not worked, though it is said that quicksilver, arsenic, nickel, cobalt, antimony, and bismuth exist in several places.

Salt is an important article. We have already mentioned the numerous salt lakes in the great steppe to the east of the Volga and the rock-salt of Ilez. But the salt-formation seems to extend along the western declivity of the Ural Mountains, to the source of the Kama, and thence westward on both sides of the Uwalli. In all these districts salt is made from the salt-springs, which are numerous. The greater number of these salt-manufactures are contained in the governments of Perm and Viatka; but several of them occur in the basin of the Sukhona, a branch of the Dwina, and those near Totma are of great extent. The most western salt-work is at Staraïa Russia, a few miles south of the lake of Ilmen, by which some of the countries along the Baltic are provided with this article. But a considerable quantity of salt is imported into the last-mentioned countries, as the places in Russia where salt is made are very remote, and the expenses of transport are so great that salt can be got from France or England at a more moderate price.

Coal exists in a few places, as on the banks of the river Maloga, where it is found with iron-ore. Pallas says that it also frequently occurs in the vicinity of the river Donetz, and to the north of Taganrok, beyond the sources of the rivers which fall into the Black Sea: it is not worked. Other minerals are not much used, with the exception of marble and granite, of which there exist extensive quarries near the village of Tivdia, at the northern extremity of the lake of Onega; and at Serdobol, on the northern shores of Lake Ladoga. The marble is of a good grain; some is white, and some has a reddish colour with white stripes or spots. The granite is worked with great activity, as all the public edifices and many of the private palaces in Petersburg are built of it.

Inhabitants.—Russia is inhabited by a greater number of nations, differing in language, character, and civilisation, than any other country of Europe. The inhabitants belong either to the Caucasian or to the Mongol race. The Caucasian however is by far the most numerous, as the nations of Mongol origin do not comprehend one-hundredth part of the whole population.

The Caucasian race in Russia consists of individuals belonging to Slavonians, Tshudes or Fins, Turks or Tartars, Germans, Jews, and Greeks. Nine-tenths of the population belong to the Slavonians. They are divided into Russians, Poles, Lithuanians and Lettes, and Wallachians and Servians. The Russians constitute more than two-thirds of the whole population, and their number is estimated at about 40 millions, and consequently they are equal to the Germans, who are considered the most numerous nation of Europe. They inhabit, to the exclusion of all other nations, the central provinces of the empire between the Dnieper and the Volga. On the banks of the Volga, and farther east to the Ural Mountains, a great number of Russian families have settled among the tribes belonging to the Tshudes and the Turks. On the banks of the Dnieper they are mixed with Lithuanians and Poles; but south of the swamps of Pinsk and Grodno the Russians are more numerous than the Poles. They likewise constitute the mass of the inhabitants in the northern provinces between the Ural Mountains and the White Sea, and in the southern between the Don and the Dniester. They are divided into Great and Little Russians. The latter inhabit the country called the Ukraine, or the governments of Tchernigow, Pultava, Kiew, Volhynia, and Podolia. The Cossacks are properly descendants of the Little Russians, and are intermixed with Poles, Tartars, and Calmucks. [COSSACKS.] The Great Russians, with the exception of a comparatively small number who have obtained their freedom, are bondsmen to the numerous body of rich nobles which exists among them. Among the Little Russians a considerable number of families are not subject to any master; and the Cossacks are all free. The Russians have attained a greater degree of civilization than is generally supposed, as is evident from the care with which the soil is cultivated in the more fertile provinces of the empire, from the activity with which the internal navigation is conducted, and from the numerous manufactures in the governments of Yaroslav, Kostroma, Moscow, Tula, and Kaluga. In some of these branches of manufacture they have distinguished themselves, especially in tanning. Very few foreigners from more civilised nations have settled in those parts which are exclusively inhabited by the Russians; and the civilization which they have attained, is as it were of native growth.

The Poles, together with the Russians, inhabit the governments of Volhynia and Podolia, and almost exclusively that of Grodno. Their numbers within the boundary of Russia amount to about four millions, to which the population of Poland to the same amount may be added. The Poles, as a nation, consist of between nine and ten millions, but about two millions of them are in Prussia and Austria. As the country which they inhabit borders on a part of Europe which is more advanced in civilization, the Poles have adopted more refined manners; but in the arts of civilised life, especially in manufactures, and all branches of industry, they are behind the Russians. Within the territories of Russia the Poles are bondsmen to the nobility, but in Poland they are free.

The Lithuanians inhabit the countries adjacent to the northern part of Poland and to Eastern Prussia, or the governments of Vilna and Minsk. Their number does not exceed one million and a half. Though certainly belonging to the Slavonian family, their language is very different in its material and forms, but is intermixed with many Russian terms. They are agriculturists, but otherwise they have not made much progress in civilization. North of the Lithuanians, in Courland and Livonia, are the Lettes, whose number probably does not much exceed half a million. They speak a language different from that of the Russians and the Lithuanians. They are exclusively occupied with the cultivation of the ground. Those who live in Courland are frequently distinguished by the name of Koors. Both nations, the Lithuanians and Lettes, were bondsmen to the German nobility established in their country, till the reign of the emperor Alexander, who effected their emancipation.

The Vlaches, or Wallachians, only live in the most south-western angle of the empire, in the government of Bessarabia, between the rivers Dniester and Pruth. Their number does not exceed half a million. They speak a language which is mainly composed of Latin, Greek, Italian, and Turkish words, which however have undergone some change and corruption. They are industrious cultivators of the land, but do not appear to have otherwise made much progress in civilization. They were formerly slaves to the boyars or nobility, but they ceased to be so nearly 100 years ago. Among the Vlaches there are a few families of Servians or Raizes, and a few more are settled in the government of Ekatarinoslaf.

The Tshudes, or Fins, were formerly considered to belong to the Mongol race; but their light hair and their blue eyes have of late procured them a place among the Caucasian race, in spite of their flat noses and flattened countenances. They inhabit two separate portions of Russia. The majority of them are settled on both sides of the Gulf of Finland. Two of these nations, the Fins and the Laplanders, occupy the country north of the gulf. The Fins, who inhabit Finland to the number of more than one million and a half, are agriculturists and breeders of cattle: they manage their dairies with great skill. The Laplanders live north of 65° N. lat., and are mostly occupied with their reindeer. Their number does not exceed a few thousands. On the south of the Gulf of Finland are the Esthes or Esthonians, whose number is above half a million. Their language is similar to that of the Fins. They are almost exclusively occupied with the cultivation of the ground, and were serfs to the nobles until 1818, when the emperor Alexander effected their emancipation. South of the Esthonians, in the country lying on both sides of the small river Salis (near 58° N. lat.), is the small tribe of the Livis or Livonians, who have given their name to Livonia. It is supposed that they formerly extended to the northern banks of the

Düna, but were expelled from the southern districts by the Lettes. Their number does not exceed two thousand. They speak a dialect of the Finnish language, and are exclusively agriculturists.

The eastern members of the Tshudic family are separated from the western by an immense tract of country upwards of 500 miles in width, which is now inhabited by Russians. When and how the separation took place is not on record. The eastern Tshudic tribes live on the western declivity of the Ural Mountains, and on the banks of the middle Volga, and are eight in number,—Syrianes, Permians, Vogules, Votiakes, Chuvashes, Cheremisses, Mordvines or Mordwi, and Teptiares.

The Syrianes, the most northern of these tribes, inhabit the woody country between the upper course of the Kama and the Vychegda, an affluent of the Dwina, and particularly both banks of the Vychegda, as far west as the mouth of the Syssola. Their number is stated not to exceed 30,000. Their principal occupation is the chase of the wild animals with which their country abounds. Their language differs very little from that of the Permians, which has preserved a great affinity to that spoken by the Finlanders, but still so far differs from it as to be properly considered a distinct dialect. The Permians occupy the country south of the Syrianes, between the rivers Kama and Viatka. Their number is stated not to exceed 35,000 individuals. Though agriculture has made more progress among them than among the Syrianes, they derive their principal subsistence from the chase, and more especially from the fisheries in the Kama and Viatka. Both tribes, the Syrianes and Permians, though they have preserved their own dialects, generally speak also the Russian language.

The Vogules occupy both declivities of the Ural Mountains between 58° and 60° N. lat. According to the description of them by Pallas, it would seem that they rather belong to the Mongol than to the Caucasian race. They are short in stature, have round faces with projecting cheek-bones, and very little beard. They may be compared with the Calmucks. But on the other hand their language shows that they belong to the Tshudes, though it exhibits so many peculiarities as to have been sometimes considered a peculiar language. The affinity of their language to that of the Magyars in Hungary is stated to be very great. The Vogules live entirely on the produce of the chase. They live in small societies, consisting only of five or six huts, and lead a wandering life. Their number is stated to amount to 100,000 individuals, of whom however the greater part live east of the Ural Mountains in Siberia. A small number have been converted to the Greek church; the remainder are heathens.

The Votiakes are settled west of the Permians, on both sides of the upper course of the river Viatka, and in the country about the source of the Kama. In the conformation of their body they rather resemble the proper Fins than any of these eastern Tshudic tribes; and their language has also a greater affinity to that of the tribes on the shores of the Gulf of Finland. They are diligent agriculturists, according to Pallas, and rear also cattle and bees. Some of the peasants have more than fifty bee-hives. The wax and honey are sent to Archangel. Their number is stated to exceed 100,000 individuals; and government has granted them permission to live under magistrates of their own tribe and chosen by themselves. They pay only a capitation-tax. Most of them have embraced Christianity.

The Chuvashes and Cheremisses live in the neighbourhood of Casan, on both sides of the Volga. The first-named tribe is chiefly settled on the western side of the river, and the Cheremisses on the eastern. Single families are found as far south as the town of Saratov. The number of the Chuvashes is stated to be 370,000, all of whom, with the exception of about 3000, have become members of the Greek church. In their personal appearance they resemble the Turkish or Tartar tribes, a circumstance which is attributed to their having lived for many centuries near the Tartars of Casan. As to their language, a difference of opinion prevails. The French philologist Levesque, from the examination of a printed grammar of their language, is of opinion that it contains a large number of roots which are common to the Finnish language. But Lumley Davids says that the grammar of their language approaches very nearly to the pure Turkish, that about three-fourths of the words are of Turkish origin, and the rest belong to the Ouralian and Samoyede languages, and that some few are entirely unknown. The Chuvashes cultivate the ground, and rear cattle and bees: the care of bees is a regular branch of rural economy. The Cheremisses are stated to amount to about 200,000 individuals. Their language seems to contain a much larger number of Finnish roots than that of the Chuvashes, but they are intermixed with a large number of Turkish origin. The conformation of their body likewise shows some mixture with the Turkish race. They are very diligent and intelligent agriculturists, and have large herds of cattle. The majority have adopted the religion of the Greek church, but many still adhere to their heathen ceremonies and tenets. All of them observe the religious festivals both of the Greek church and of the Mohammedans.

The Mordwi or Mordvines are settled west of the Chuvashes, in the country on both sides of the river Sura, which falls into the Volga from the south, between Nishneï Novgorod and Casan. On the west they extend to the very banks of the river Oka. They are divided into two tribes: the Ersad or Ersanes, who inhabit the tracts along the eastern banks of the Oka; and the Mokshad or Moskhan, on the banks of the Sura and Moksha. They are dispersed in the forests of the governments of Casan, Nishnei Novgorod, Simbirsk, Saratov, Pensa, and Tambow, and live intermixed with the Russians, with whom they communicate more freely than the Chuvashes and Cheremisses. Their number is stated not to exceed 92,000 souls. They are all Christians. They rather resemble the Russians than the Cheremisses and other Finish tribes. Their language is of Finnish origin. They cultivate their lands with great care, and their fields are not inferior to the best-cultivated grounds in Russia. They pay great attention to bees, especially the Mokshad, who have their lands in the middle of the extensive forests of lime-trees which are contiguous to the oak-forests. Some individuals have from one hundred to two hundred bee-hives. Their honey is preferred to that of any other part of Russia.

The Teptiares, the most eastern of the Finnish tribes, are settled on the banks of the Bialaya, an affluent of the Kama from the east. The origin of this tribe is of comparatively modern date. When the Russians, in the middle of the sixteenth century, took possession of the territories belonging to the khan of Casan, a number of Cheremisses, Chuvashes, Votiakes, and Tartars left their country and settled along the upper course of the river Bialaya, where they soon formed a separate nation, which however was subject to a tax which they were obliged to pay to the Bashkirs, in whose country they had settled. Though the Finnish element prevails in their language, it always contained a large number of Turkish words, which were further increased by their close connection with their neighbours the Bashkirs. They do not attend much to the cultivation of the land, but rear cattle and bees, and pass a great part of their time in hunting the wild animals with which their country abounds. Their number, which in the middle of the last century did not exceed 34,000 individuals, is stated to have increased to 110,000. They are partly heathens and partly Mohammedans. The exertions of the Greek clergy to introduce their creed among them have almost entirely failed.

The third great branch of the Caucasian family which inhabits Russia is the Turkish. They are generally called Tartars, but they call their language Turkish. They did not originally inhabit any portion of Russia, but came into it between the ninth and thirteenth century with the Mongols and other conquerors. The Turkish tribes at present existing in Russia are four, the Tartars of Casan, the Bashkirs, the Metsheriakes, and the Nogai Tartars. The Tartars of Casan are the most civilised nation in Russia. Their language, according to Lumley Davids, is the most cultivated and polished of the Turkish idioms. The attempts of the Greek clergy to convert them to Christianity have not been successful, and they are still Mohammedans; they take great care of the education of their children. They have schools both for the lower and higher classes of the people. In the elementary schools instruction is given in reading and writing, and the Korán and some other religious books are explained. The objects of instruction in the higher schools are the Turkish, Persian, and Arabian languages, and arithmetic. The priests are educated in an institution established for that purpose in a village called Gargali, which is about nine miles from the town of Orenburg. Those who are established at Casan, and in other towns, are either merchants or manufacturers. They traffic chiefly in tea, goods imported from Bokhara, and stuffs of European manufacture. They are very expert in tanning leather. The inhabitants of the villages are very careful cultivators of the soil, and also occupy themselves with rearing cattle and bees. Their villages are well provided with the most common mechanics, as tanners, shoemakers, tailors, dyers, blacksmiths, and carpenters. Like other Mohammedans, they are distinguished by their cleanliness. According to Erdmann, their number amounts to about 230,000, of whom about one-eighth have embraced Christianity.

The Bashkirs inhabit both declivities of the Ural Mountains, from 56° N. lat. southward to the sources of the river Ural near 54° N. lat. There is some reason for believing that this tribe has always inhabited the country which they now occupy, but it is quite certain that the present Bashkirs resemble in language and manners the Tartars of Casan, though in the form of their body they approach the type of the Mongols. The Bashkirs still adhere to a wandering life. In winter they inhabit villages, but in summer they ramble about in the country, sometimes to a distance of 60 or 80 miles from their villages. They cultivate some patches of land near the houses before they begin their wanderings, but the produce of these fields is not adequate to their consumption. Their riches consist in horses, of which the poorest peasant has from 30 to 50, and many have 500, and the richest from 1000 to 2000. Their horses are of a good breed. They keep only a small number of black cattle, sheep, and goats. They have also a great number of bee-hives, and they collect an immense quantity of wax and honey from the wild bees, which are nowhere more common than in the countries adjacent to the base of the Ural Mountains. They are good huntsmen, and know completely how to train the falcon for the chase. The smaller species are used by them to take hares, but the larger (Falco chrysaëtus) is used in hunting foxes, and even wolves. They sell a considerable number of these trained birds to the Kirghis Cossacks. The number of Bashkirs amounts to 150,000 individuals. The small tribes of the Metsheriakes, which do not exceed 20,000 individuals, live dispersed among the Bashkirs, and subsist on the produce of their herds of cattle and of their bee-hives. They also cultivate the ground, but not to a great extent. They are considered to be more civilised than their neighbours. Both tribes are Mohammedans.

The Nogai Tartars inhabit the Crimea and the steppe which extends north of the peninsula; they are also dispersed over the country east of the Sea of Azof, and along the northern base of the Caucasus. They are stated to compose a population of 600,000 individuals. A considerable number of them are settled in the valleys and towns of the mountainous part of the Crimea, where they are agriculturists, and have extensive orchards. They also manufacture leather, and make cutlery, saddles, and shoes. This portion of the Nogai has attained a considerable degree of civilization, and they are hardly inferior in that respect to the Tartars of Casan. Their number does not much exceed 250,000. The remainder of this branch of Tartars lead a wandering life in the extensive steppes which they inhabit. In summer they travel northward with their flocks, and sow a little wheat and millet in some convenient place. In winter they return to the shores of the Sea of Azof or some warmer tracts. Their herds consist of cattle and horses, but of a rather small breed: their horses are much prized, being strong, hardy, and tractable. The have numerous flocks of the large-tailed sheep. Notwithstanding their wandering habits, they have adopted a degree of civilization in their dresses and manners, which are derived from their kinsmen of the Crimea.

The number of individuals belonging to the Teutonic family is probably larger than that of the Turks. They are Germans and Swedes, with whom a few Danes are mixed. Numerous families of Germans are dispersed through the provinces along the Baltic, south of the Gulf of Finland, among the Lettes and Esthonians, and in those parts they constitute the nobility of the country. Most of these families settled there when the Order of the Knights Swordbearers was the acknowledged sovereign of these countries (from 1300 to 1530). Great numbers of German families are settled in the two capitals of the empire. When Peter founded Petersburg, he peopled it at first almost exclusively with Germans, and they constituted for several years the principal population of the town. Even at present their number is stated to exceed 24,000. The Germans are also numerous in all the sea-ports, in the southern provinces and in the Crimea; and along the middle course of the Volga a great number of German colonists have been settled at the expense of government in the last seventy years. The number of such colonists in the government of Saratow alone amounts to more than 30,000, and they constitute nearly the whole population of some towns and of villages.

The Swedes are numerous along the northern coast of the Gulf of Finland, and the eastern coast of the Gulf of Bothnia. In some places they constitute the whole population, to the exclusion of the Fins, but generally both nations live together. The number of Swedes in these parts probably exceeds 100,000, and there are also a few Swedish families in Esthonia.

There are no Jews in the central and northern provinces; but they are numerous in those parts which formerly belonged to Poland, especially in the government of Vilna, Grodno, Volhynia, and Podolia, where they are almost the sole inhabitants of the towns. They exercise several kinds of handicraft; they are smiths, tailors, shoemakers, &c. They have also small breweries and distilleries. Their number is stated to exceed a million.

The number of Greeks probably does not exceed half a million. They are dispersed all over the southern provinces of the empire as merchants; and in the Crimea there are a few villages entirely inhabited by them. They occupy themselves with agriculture, especially gardening.

The Calmucks show their Mongol origin by the form of their body, as well as by their language. [CALMUCKS.] The tribes of this nation which still exist in the south-eastern steppes of Russia are the remnant of those which left Russia in 1770 and 1772, at the invitation of the Chinese government, and settled in the plains of Soongaria. They are divided into five tribes. The Derbet and Torgot are the most western, and occupy the country between the Sarpa and the Don, on both sides of the river Sal, nearly as far west as the mouth of the river Manytch. On the east of the Sarpa are two other tribes, the Erked and Baganzokhan, who extend their rambles to the shores of the Caspian. The fifth tribe, the Khoshud, live on the banks of the Lower Volga, on both sides of the river. The first tribe is the most numerous, consisting of 12,000 kybitkas, or families; the four latter, taken together, probably fall short of that number. In summer a part of them live chiefly on the produce of the chase, of which the saiga antelopes are the principal object, but in winter they depend only on their herds. They wander about with their flocks and herds in the immense steppes. In a country which has hardly a few patches of cultivable land, the Calmucks by able management have succeeded in maintaining horses, cattle, camels, sheep, and goats to the number of three millions of heads. The value of the goods exported from their country to other parts of Russia is estimated at one million and a half of rubles. They consist of wool, hair, tallow, lamb and sheep skins, hides, and fur. The Calmucks are Buddhists, and the only nation in Europe which professes that religion. They have the different classes of priests found among the Buddhists, as lamas, gellonghi, gezuli, and mandshicami, and up to the end of the last century they were subject to the ecclesiastical authority of the Dalai Lama, who resides at L'hassa in Tibet, but in 1800 the emperor Paul induced them to choose their own Great Lama, to whom all the other lamas and priests are subject. The Calmucks are not immediately subject to the governor of Astrakhan, but have their own political administration, of which the khan of the Derbet tribe is the head. He is assisted by eight counsellors and judges, and a person sent from Petersburg.

By the emigration of the larger number of Calmucks in 1771 and 1772, the whole steppe between the rivers Volga and Ural south of the Obstshei Sirt was at once deprived of its inhabitants, and remained in that state till about 1785 or 1786, when a numerous tribe of Kirghis Cossacks, belonging to the Little Horde of that nation, on account of the civil wars then existing between the different tribes of that horde, was induced to submit to the Russian government, and was settled in the tract which the Calmucks had abandoned. They are known under the name of the Buke horde, from the name of their chief, called Bukei, who introduced them into Russia. At that time the horde consisted of about 10,000 kybitkas, or families, but it is supposed that the number may at present not fall short of 120,000 individuals. In personal appearance, they greatly resemble the Calmucks and other Mongol tribes, but their language is Turkish, and it is supposed that they owe their origin to several tribes of Mongols, which have united with Turkish tribes, and in progress of time formed one nation. Like the Calmucks, they are nomadic herdsmen, but they have only a small number of camels, the climate of their country being much more severe than the steppes farther west. They also keep some cattle and goats. Their wealth mainly consists in horses and sheep. Some rich proprietors are said to have 4000 or 5000 horses and 20,000 sheep. The sheep supply the principal articles of traffic, and numerous flocks are annually sold to the Russians at Orenburg, Troizk, and Astrakhan. Their agriculture is limited to the raising of some barley, and a small quantity of wheat and millet. They are also expert hunters, and in winter kill the fur-bearing animals, with which their country abounds, and in summer the saiga-antelope. The Kirghis Cossacks are Mohammedans, but far from being very exact in the performance of the duties prescribed by that religion.

(Pallas, *Reisen durch Verschiedene Provinzen des Russischen Reichs*; Pallas, *Travels through the Southern Provinces of the Russian Empire*; Erman, *Reise um die Erde*; Zwick, *Calmuc Tartary, or a Journey from Sarepta to several Calmuc Hordes*; Erdmann, *Beiträge zur Kenntniss des Innern von Russland*; Georgi, *Beschreibung des Russischen Reiches*; Klaproth, *Asia Polyglotta*; Rose, *Reise nach dem Ural, dem Altai, und dem Kaspischen Meere*; Miller, *Der Ugrische Volks-stamm*; and Schubert, *Reise durch Schweden, Norwegen, Lappland, Finnland, und Ingermanlund*.)

Agriculture.—Notwithstanding the variety and great abundance of the natural productions of the Russian empire, agriculture may be said to be even now in its first stage, since there is certainly no province which yields ever half of what it is capable of producing. Hence in the greater part of the empire it is not so much the ground itself that has any value, as the labouring population, and accordingly it is not the number of acres in an estate that is considered, but that of the male serfs attached to it. The Southern Baltic provinces, the governments nearest to Moscow, and the kingdom of Poland, have the greatest proportion of cultivated land, and the best system of cultivation, but it is only on a few estates that it approximates to that of Northern Germany; yet even in these provinces there are extensive tracts in which not one-fifteenth part of the surface is cultivated. The thinness of the population, and the want of a market in the interior of the empire, contribute to prolong this state of things; for where there is little demand for corn, agriculture languishes, however bountiful nature may be, especially when, as is here the case, the inhabitants are satisfied with having a sufficiency of the necessaries of life, and are too little advanced in the scale of civilization to have any desire for the comforts or luxuries of a more refined state of society. The whole area of European Russia is (according to Schubert) 1,742,435,725 Prussian acres, of which about 676,000,000 acres are covered with forests and shrubs: about 771,000,000 acres are to be reckoned as wholly unproductive, 246,500,000 acres at the most as arable land, and 24,500,000 acres as meadow land. Of the remaining land, not even a rough estimate can be given, for want of all data respecting it in most of the governments. On account of the comparatively small value of land, and the want of manure, the fields in Great and Little Russia are often suffered to be fallow for two or three years. The times of sowing and harvest are regulated according to the climate. The usual kinds of corn are grown in most of the governments, viz. rye, wheat of many different species, barley, and oats; maize, chiefly in the countries about the Black Sea, but is not a general article of food. The kind of pulse most cultivated is peas, which succeed up to 62° N. lat. Millet is grown about Tula, hemp chiefly in Little Russia. Flax and hemp are cultivated in the Baltic provinces, and in West Russia. Hops flourish in Poland and in Little Russia. The cultivation of the grasses is neglected. Schubert judges from the official averages for several years, and from the tables of the quantity produced, that after deducting the reserve of seed-corn, and that used in the breweries, the distilleries, and for feeding cattle, besides the quantity exported, there remain (in European Russia) about fifteen Winchester bushels per head. Between 1830 and 1841 there have been several years in which the harvests have failed, and instead of exporting, it has been necessary to allow the importation of corn free of duty. This is at present the case, the crops in 1839 and 1840 having proved deficient. The government makes great efforts to favour agriculture. It endeavours to extend useful knowledge on the subject to all parts of the empire; many agricultural societies have been formed, and schools established, in which everything bearing on the subject is taught in the most simple manner. A school of agriculture has been lately formed at Gorygoretzk (a domain of the crown) near Mohilew; it is designed for educating 120 young men in such a manner as to qualify them for the management of great estates.

The breeding of silkworms promises to prosper in the southern provinces of the empire, that is, the Transcaucasian provinces, and in Taurida, the countries on the Volga between Saratow and Astrakhan, and the governments of Kiew and Podolia.

Manufactures.—The manufactures of Russia commenced, as in other countries, with the beginning of its political importance, but have been chiefly indebted for their encouragement and progress to the efforts of the government. The czars Ivan I. and II., who in the fifteenth and sixteenth centuries had restored Russia to independence, invited artisans and workmen from Germany, the Netherlands, and Italy, and established at Moscow, Yaroslaw, Smolensk, and Kiew manufactures of woollen cloth, linen, arms, &c. But the civil wars before the accession of the house of Romanoff, and the interference of Sweden and Poland, which led to the desolation of the country, checked the infant manufactures, so that in fact nothing was done till the reign of Peter the Great, who in this, as in many other respects, was the founder of the prosperity of Russia. He gave great encouragement to foreign manufacturers, and founded in the first instance great manufactories of arms at Tula, Petrosawodsk, and at Sestrabeck near Petersburg; and the great imperial manufactories of woollen and linen at Moscow. At Petersburg he established manufactories of articles of luxury, such as mirrors, expensive glass-wares, rich carpets, silks, cotton, &c. In all the larger cities he established at least one manufactory of woollen, linen, and metal, so that at his death there were twenty-one great imperial manufactories, and many smaller ones, partly supported at the public expense. Peter's system was not followed up by his immediate successors, but it was renewed by the empress Elizabeth, and has been steadily adhered to with constantly increasing energy, and the most brilliant success, up to the present time. It may perhaps be questioned whether many branches of manufacture may not have been forced into premature existence, for the protection of which it has been necessary to establish a most rigorous system, entirely prohibitory of many foreign articles, and imposing enormous import duties upon others. This system, it is true, chiefly affects the rich, for whose use foreign goods are imported. The chief seat of manufactures is Moscow and its government; and next the governments of Wladimir, Nischnei Nvogorod, Saratow, and Petersburg. In Poland, the woollen, linen, and leather manufactures attained great prosperity under Alexander. In 1828 there were in the empire 6000 manufactories, with 250,000 workmen, and in 1831 there were 100 with steam-engines. The exhibitions of the productions of Russian manufactures which have taken place within these few years at Petersburg and Moscow have greatly contributed to excite emulation. But the prices of most of the articles of Russian manufacture are still higher than in most other European countries. In general too the Russian workman finds it difficult to give to his work a high degree of perfection. He is indeed very clever, and imitates with wonderful facility, but as he attends mainly to external appearance, his works are deficient in quality and durability. There are exceptions undoubtedly, but it must not be forgotten that most of the manufactories have foreigners at their head. The Report of the department of manufactures for 1839 published in 1840 (that for 1840 has not appeared) contains the following statements:—

'The progress of manufactures in Russia has been so extremely rapid for some time past, as to excite general attention. The partial failure of the crops in some seasons, though it certainly had some effect on the inland trade, did not prevent an increase in the number of manufactories and of the workmen employed in them. The years 1835, 1836, and 1837 were more favourable to the development of the national manufactures; we have seen an increase of activity in all the provinces of our vast empire, and the progress made has far exceeded the most sanguine expectations. To give our readers an idea of it, it will suffice to say that in the year 1838 the number of new manufactories was 405. As we have not yet received all the accounts for 1839, we cannot state the number of new manufactories established in that year, but there is no doubt that it was as considerable as in the year preceding.

The number of manufactories existing in Russia at the beginning of 1839 was 6855, and that of the workmen employed in them 412,931, not including those that work in the mines, and in the furnaces, smelting-houses, &c. dependent on them. In 1835 there were only 6015 manufactories in the whole empire, employing 279,673 workmen. Thus we have 840 new establishments in three years, and an increase of nearly 50 per cent. in the number of workmen employed.

'Among the most important branches of national industry, and the development of which has been the most remarkable, are the following:—

Manufactories of Woollen Cloths and other Woollen Goods	616
,, ,, Silk	227
,, ,, Cotton	467
,, ,, Linen of all kinds	267
Tanneries	1918
Tallow Melting-houses	554
Candle Manufactories	444
Soap Manufactories	270
Metal-Wares	486

'The central part of the empire is the chief theatre of manufacturing industry. Moscow has become the focus of it; in the little towns of the government of which it is the capital, the number of manufactories continues to increase, so that at the beginning of last year there were in that government alone 1058 manufactories, with 83,054 workmen. In the adjoining government of Wladimir, there were 315 manufactories, with 83,655 workmen; and in that of Kaluga, 164 manufactories, and 20,401 workmen.

'The changes which have been effected in several other parts of the empire are not less remarkable. But lately Tula alone used to be mentioned for its manufactories of all kinds of metal articles; yet the 124 manufactories in that government (of which 39 are of metal articles) employ only 6538 workmen, though there has certainly been no relaxation of their activity; they therefore no longer hold the first place, since in the government of Perm alone, which at a pretty recent date was still almost a desert, there are now 352 manufactories (of which 81 are of metal goods, and 199 tanneries), with 36,600 workmen.

'Lastly we must mention, among the branches of industry, the increase of which has been the most remarkable, the manufacture of tobacco and snuff. In the year 1839 they furnished (including what remained of the preceding year's stock) tobacco, 3,800,000 lbs.; snuff, 2,200,000 lbs.; roll tobacco and carrot tobacco, 800 lbs.; cigars, 62,500,000 lbs. There were imported from foreign countries 84,141 poods in leaf and prepared; but 50,646 poods were exported. The excise duty on the tobacco consumed in the interior produced 2,670,374 rubles, from which must be deducted 300,000 rubles for the expense of collecting the duty.

'The above are the great manufactures properly so called. We have not the means of ascertaining the total amount and value of their products up to a recent date. The latest account that Schübert was able to procure in 1838, was that of 1828, in which year there were manufactured 20 million yards of linen, nine million yards of woollens (besides seven millions in Poland); 60 millions of calico; 2 million pounds of cotton-yarn: silks to the value of 4 millions of dollars; 16 millions of glass bottles; 80,000 chests of window-glass; three and a half millions of hides; 500,000 poods (at 36 lb.) of potashes; two million poods of soap; and 975,000 poods of sugar. Besides the workmen employed in these great establishments, there were 800,000 employed in handicraft trades, and a much larger number in the villages, in coarse woollen and linen manufactures, iron, and other metal-wares, or in preparing bast-mats, caviar, hogs' bristles, in dressing furs, &c.'

Commerce.—I. Inland Trade.—The inland trade is carried on in a very great measure by means of annual fairs, the most remarkable of which is that of Nischnei-Novgorod, of which we have given a very detailed account. [NISCHNEI NOVGOROD.] The following is an official list of the principal fairs, and of the value in rubles of the goods exposed for sale in 1839:—'Nischnei-Novgorod, 161,643,674; Irbit, 41,829,674; Romna, first, 8,972,585; Romna, second, 24,661,026; Charkow, first, 20,360,360; Charkow, second, 17,386,235; Charkow, third, 6,281,605; Kursk, 21,401,630; Korsun, 2,969,023; Rostoff, 13,860,476; Sumy, first, 6,506,900; Sumy, second, 5,204,000; Saratow, 2,722,800; Simbirsk, 5,101,300; Tambow, first, 1,821,500; Tambow, second, 1,465,800; Taganrog, 2,030,781; Jakutzk, 1,593,671; Lebedjan, first, 2,143,416; Lebedjan, second, 2,334,955; Penza, 1,774,970; Nischnei-Lomoff, 1,928,970. The total amount is 353,894,722 rubles in bank assignats, which, reckoning the ruble at 10½*d.* English, is nearly 15 millions and a half sterling.'

In order to facilitate still more the commercial intercourse in the interior of the empire, the minister has organised, in different cities and towns, twenty-five new fairs and ten weekly markets. The inland trade is greatly promoted by the extensive system of inland navigation, of which the following is the summary for the year 1839:—'The goods designed for exportation are of course conveyed in a great measure by water from the most distant parts of the empire to the seaports. In entering into some detail of the navigation on the rivers and canals last year, we shall examine in the first instance their result as a means of aiding our foreign commerce. The following is the number of the barks and rafts which, coming from the provinces more or less distant from the sea, arrived in our principal seaports, with the value of the cargoes. 1. Archangel: barks, 1362; rafts, 1233; value of the cargoes, 15,281,505. 2. St. Petersburg: barks, 22,042; rafts, 784; value of the cargoes, 196,974,904. 3. Riga: barks, 1965; rafts, 1373; value of the cargoes, 32,437,878. Odessa, the most important of the seaports in the south of Russia, has not yet had any direct communication by water with the central provinces of the empire, but it is well known that the goods conveyed on the Dniester and Dnieper from the interior to the mouth of those rivers, are sent by coasting vessels to Odessa. 4. Cherson: barks, 398; rafts, 340; value of the cargoes, 4,065,835. 5. Taganrog, Nakhitschevan, and Rostow. These three towns, which are very near each other, all communicating with the interior by the Don, and with the Black Sea by the Strait of Kertsch, ought to be considered as one commercial entrepot: barks, 328; rafts, 114; value of the cargoes, 8,353,820. The number of barks and rafts and the value of the goods despatched on the Volga to the port of Astrakhan on the Caspian, were: barks, 346; rafts, 12; value of the cargoes, 6,238,877.

'The following is a summary of the navigation in all the rivers of Russia, in 1839. 1. Despatched from the several ports, 60,277 barks, 24,421 rafts; arrived, 46,850 barks, 17,469 rafts; value of the goods despatched from these ports 737,814,276 rubles; value of goods arrived, 538,921,730. The difference which may be observed between the arrivals and departures, arises from the circumstance that a great number of the barks have been loaded or have arrived at intermediate places, the names of which are not stated.'

II. Foreign Commerce.

Value of exports:—

	Value.
To foreign countries	332,002,258
To Finland	2,901,767
To Poland	6,994,654
Total	341,898,679

Imports:—

From foreign countries	244,977,560
From Finland	1,543,680
From Poland	2,631,236
Total	249,152,476
Balance in favour of Russia	92,746,203

Principal articles of export:—

Wheat	4,754,473 chetwerts	88,259,396
Flour	3,633,468 rubles	
Cattle, furs, feathers, mats		12,727,187
Flax, hemp, linseed, hempseed, oil, tallow, hides, wool, bristles, timber, metals, &c.		203,642,732
Linen, cordage, woollens and cotton, candles, soap, coarse woollen cloth, exported to China, &c.		22,753,661
Brandy, dried and salt fish, fruits, honey, &c.		3,877,066

Principal articles of import:—

1. Rice, refined sugar, coffee, tea, wine, and fruits		62,448,655
2. Raw sugar		24,768,298
3. Various articles which cannot be placed among raw materials or manufactures, such as pearls and precious stones, books, engravings, furs, &c., cattle and horses from Asia, &c.		15,868,667
4. Foreign manufactures of silk, wool, cotton, &c.		47,074,108
5. Raw materials for our manufactories: Raw cotton,	354,832 poods	8,824,035
Spun cotton,	535,837 „	30,304,689
Indigo,	35,500 „	11,151,152
Cochineal,	4,409 „	1,104,436
Madder,	154,811 „	3,797,196
Dye-woods,	486,373 „	2,775,072

The number of ships that *arrived* in all the ports of Russia in 1839 was, with cargoes, 2426, of 429,214 tons; in ballast, 4192, of 792,166 tons; *sailed*, 6275, with cargoes of 1,025,642 tons; in ballast 307, of 57,994 tons.

The custom-house duties produced, in 1839, 91,889,696 rubles.

The following are the chief particulars of the foreign commerce of Cronstadt and St. Petersburg in 1840:—Ships arrived, 1213 with cargoes, of which 176 with corn, and 256 with coals, and 163 in ballast; 34 had wintered. The steamer performed 42 voyages, and nine new ships were registered: making a total of 1461, of which 675 were English, and there were probably many from England under other colours. The number of ships that sailed was 1445, of which 736 were bound to England, 15 remained for the winter, and one was sold. Thus it appears that nearly half the import trade, and more than half the export trade, according to the number of the ships, were on English account. The tonnage of the English vessels, is, we believe, greater on an average than that of any others employed in this trade.

The value of the goods imported into St. Petersburg in 1840, on which the duty of customs was paid, amounted to 61,026,194 silver rubles (the silver ruble is nearly three shillings and three-pence sterling), including gold and silver to the amount of 3,350,050 silver rubles. The value of the exports on which duty was paid in 1840 was 36,536,814 silver rubles. The duties of custom raised in 1840 amounted to 15,344,586 silver rubles.

Fisheries, see ASTRAKHAN; AZOFF; BALTIC; BLACK SEA; CASPIAN; WHITE SEA; VOLGA.

Revenue.—The revenues of Russia have increased in an extraordinary degree; Schnitzler estimates them at 312,000,000 rubles, exclusive of the revenues of Livonia, Esthonia, Courland and Finland, and Poland. If we add the contributions in kind, the whole may amount to 400,000,000. The debts, which are of different descriptions at different rates of interest, were, in 1833, 863,249,849 rubles; and new loans have since been contracted. The debt may perhaps amount to a thousand millions of rubles, or about 40 millions sterling.

The Army.—The Russian army is much more numerous than that of France, Austria, or Prussia, and is composed of the following corps:—1, Imperial guard: 12 regiments of infantry, each of 3 battalions of 800 men, or 28,800; eleven regiments of cavalry of 800 men, 8800; artillery and pioneers, 2800; Cossacks, 800: in all, 41,200. 2, Infantry of the line, *a*, 138 regiments, each of 2400: in all, 331,200; *b*, garrison troops, 104,032. 3, Regular cavalry: *a*, cuirassiers, 20 regiments, 20,000 men; *b*, light cavalry; 64 regiments of hussars and dragoons, 64,000 men: in all 84,000. 4, Artillery, 40,000; engineers, 10,500: making a grand total of 612,000. To these are to be added 38 regiments of regular Cossacks, 19,000; 18 regiments of Don Cossacks, 18,000 men; 10 regiments of Tschernomorsk Cossacks, 10,000; 10 regiments of Ural Cossacks, 10,000; 3 regiments of Cossacks of the Volga, 3000; Siberian Cossacks, Calmucks, Tartars, Bashkirs, Caucasians, 40,000: in all, 100,000. These irregular troops are not to be reckoned as belonging to the standing army. We must observe that the numbers, though officially given, cannot be implicitly relied on; being often rather the proper full complement, than the number of really effective men.

The Navy is divided into five squadrons, 2 in the Black Sea, and 3 in the Baltic, called the Blue, White, and Red squadrons; each squadron consists of 1 ship of the line of 110 guns, 2 of 84, 6 of 74, 6 frigates, and some lighter vessels. The 3 Baltic squadrons are supposed to be always complete and ready for service. There is also the galley fleet of the Baltic, consisting of 20 galleys with 320 guns, 25 floating batteries with 160 guns, 81 gun-boats with 162 guns, and 88 smaller vessels; the squadron of 40 gun-boats of the Black Sea; the flotilla of the Caspian, consisting of 6 vessels of 6 to 18 guns, and 11 galliots; and the flotilla of Kamtchatka and Ochotzk, consisting of 3 vessels of 10 to 15 guns, and 8 galliots. These vessels are manned with 33,000 sailors, 9000 marines, and 3000 artillerymen. The navy has probably been increased since the publication of this official statement.

Education.—It is a fact which must not be lost sight of, that in Russia civilization and the instruction of the people have originated with the government, which has given the impulse to the nation, and consequently impressed the system of public education with one uniform stamp. The following extract from a manifesto of the emperor Nicholas, of the 13th of July, 1826, shows the spirit of the system now pursued:—

'Let the fathers of families direct all their attention to the moral education of their children. It is certainly not to the progress of civilization, but to vanity, which produces only idleness and vacuity of mind, to the want of real instruction, that we must attribute the licentiousness of thought, those unbridled passions, that confused and fatal half-knowledge, that tendency to extreme theories and political visions, which begin with demoralizing and end by ruining their victims. Let the fear of God, and solid and patriotic instruction, be the basis of all hope of improvement, the first duty of all classes.'

The institutions for public education are—I. The public schools of all classes under the minister of public instruction. These are—1, the parish schools; 2, district schools; 3, gymnasia; 4, the universities. II. The military schools. III. Ecclesiastical schools. IV. Special schools depending on different branches of the administration. Each university has three faculties—philosophy, jurisprudence, and medicine; and has several governments attached to it. The following is the state of the universities for 1839:—

Name.	Professors and Masters.	Students.
St. Petersburg	58	400
Moscow	106	798
Dorpat	65	525
Charkow	77	391
Casan	70	225
Kiew	54	126
	439	2465

At Odessa there are three public institutions, viz.:—The Richelieu Lyceum, 18 professors and 57 students; ditto, Demidoff, 20 professors and 54 students; ditto, Besborodko, 18 professors and 45 students. White Russia, consisting of 6 governments, has 13 gymnasia, 2 noble boarding-schools, 16 district and 143 parish schools—in all 239 schools, with 11,530 scholars. Including the universities and the lyceums, the whole of the establishments under the minister of public instruction was, in 1839, 1905, with 97,912 pupils. Many schools have been founded in the Transcaucasian provinces, but the number of pupils is inconsiderable, probably not exceeding 1400.

2. The military schools, under the direction of the grand-duke Michael, contain about 9000 scholars; the naval schools about 2500 scholars. The military schools of all classes have 18,000 scholars.

3. The ecclesiastical schools of the Greek church were, in 1836, 384 in number, containing 58,586 scholars. The schools of the Roman Catholics, Protestants, &c. were 317, with 8803 scholars.

4. Special schools are under the several ministers; such as the establishments of the empress Maria, those under the reigning empress, and those under the grand-duchess Helen, besides the German, Tartar, and Jewish schools. The special schools are 1622 in number, and contain 127,864 pupils. The government contributes about 10,000,000 rubles to their support.

Population.—Various causes contribute to render the statement of the population very inaccurate and imperfect. The census in general gives the number of males only, from which the number of females is estimated according to the ascertained proportion in other countries.

RUSSIA IN EUROPE

The Baltic Provinces.

Governments.	Area in English Sq. Miles.	Population.	The principal Towns.	Population.
1. Petersburg . Divided into 9 Circles.	18,600	950,000	St. Petersburg . .	476,386
			Cronstadt . . .	63,244
			Schlüsselburg . . .	4,000
			Narva	4,000
			Novaja-Ladoga . .	3,000
2. The Grand-Duchy of Finland Divided into 8 Provinces.	134,000	1,397,450	Helsingförs . . .	14,000
			Wiborg	5,000
			Abo	14,000
			Uleaborg . . .	4,000
			Biörneborg . . .	3,000
			Lovisa	3,000
			Sweaborg . . .	3,500
			Nystadt . . .	2,500
			Friedricksham . .	2,000
			Carleby	2,000
3. Esthonia . 4 Circles.	7,224	282,000	Revel	15,000
4. Livonia 5 Circles.	17,340	754,000	Riga	71,228
			Pernau	10,000
			Dorpat	12,000
			Windau	2,500
5. Courland . 5 Bailiwicks.	10,000	503,000	Mitau	16,500
			Libau	6,500
Great Russia.				
6. Moscow . 13 Circles.	11,500	1,500,000	Moscow	348,562
			Serpuchow . . .	6,000
			Kolomna . . .	10,175
			Borodino-Wireja . .	6,000
			Mosaisk . . .	4,000
			Dmitrow . . .	3,000
7. Smolensk . 12 Circles.	20,000	1,190,000	Smolensk . . .	12,000
			Wiaesma . . .	12,000
			Porestschje . . .	6,000
			Roslawl . . .	4,000
			Dorogobusch . . .	4,000
			Gschalsk . . .	3,000
8. Pskow . . 8 Circles.	21,960	900,000	Pleskow . . .	12,000
			Toropez . . .	12,000
			Wellikaja-Luki . .	3,800
9. Twer . . 12 Circles.	23,560	129,700	Twer	24,000
			Nschew-Wladimir . .	10,000
			Torschok . . .	15,000
			Wischnei-Wolotschok .	6,500
			Ostaschkow . . .	6,500
			Kaschin . . .	4,000
10. Novgorod . 10 Circles.	54,100	950,000	Novgorod . . .	10,000
			Staraja-Russa . .	5.600
			Waldai	3,200
			Tichwin	4,100
			Kirilow	2,400
			Beloserak . . .	3,000
			Borowitschi . . .	3,000
			Ustjuschna . . .	3,000
11. Olonetz . 8 Circles.	50,000	359,000	Petrozavodsk . . .	4,000
			Olonetz . . .	3,000
			Kargepol . . .	3,000
12. Archangel . 7 Circles.	320,000	263,000	Archangel . . .	17,000
			Mesen	2,000
			Onega	2,000
13. Wologda . 10 Circles.	161,000	830,000	Wologda . . .	14,000
			Ustjug-Welliki . .	14,000
			Torma	3,000

Great Russia—continued.

Governments.	Area in English Sq. Miles.	Population.	The principal Towns.	Population.
14. Yaroslaw 10 Circles.	17,000	1,040,000	Yaroslaw	28,000
			Uglitsch	7,800
			Rostow	6,500
			Romanow	4,500
			Welikoje-Selo	3,500
			Rybinsk	3,600
15. Costroma 10 Circles.	30,000	1,450,000	Costroma	10,000
			Galitsch	6,500
			Sol Galitzkaja	3,500
			Makariew	3,000
			Kimschna	2,500
16. Wladimir 13 Circles.	17,500	1,400,000	Wladimir	7,400
			Murom	6,500
			Pereslawl-Saleski	4,000
			Gorochowez	2,800
			Susdal	2,500
			Schuja	2,000
17. Nischnei-Novgorod 11 Circles.	20,180	1,430,000	Nischnei-Novgorod	24,995
			Muraschkina	7,000
			Arsamas	8,500
			Pawlona Selo	6,000
			Podschinski	5,500
			Balachna	4,500
			Pogrow	3,500
			Gorodistsche	3,500
18. Tambow 12 Circles.	24,200	1,600,000	Tambow	20,000
			Koslow	8,200
			Kadom	7,000
			Kirsanow	5,000
			Schatzk	7,000
			Jelatma	6,000
			Morschansk	6,000
			Temnikow	4.500
			Lipetzk	6,500
19. Riäsan 12 Circles.	16,000	1,241,700	Riasan	9,000
			Saraisk	5,000
			Donkow	2,500
			Kasimow	10,000
20. Tula 12 Circles.	11,200	1,115,000	Tula	51,231
			Bjelew	7,000
			Wenew	3,500
			Odojew	3,300
			Jefremow	3,000
21. Kaluga 11 Circles.	10,560	1,220,000	Kaluga	32,345
			Borowsk	6,000
			Koselsk	3,500
22. Orel 12 Circles.	17,830	1,500,000	Orel	40,000
			Siäwsk	5,000
			Br[illegible]ansk	5,000
			Jelez	8,000
			Bolchow	14,000
			Karatscheff	6,000
			Liwny	6,000
			[illegible]	[illegible]
			Trubtschewsk	3,500
			Dmitrowsk	3,000
23. Kursk 13 Circles.	16,580	1,527,000	Kursk	25,000
			Korotscha	11,000
			Putiwl	10,000
			Bielgorod	9,000
			Sudscha	7,000
			Rylsk	6,500
			Oskol-Staroi	6,900
			Mikhailowka	6,000
			Obojan	6,000
24. Woronesh 12 Circles.	29,400	1,508,000	Woronesch	43,800
			Ostrogohsk	4,000
			Pawlowsk	2,500
			Korotojak	2,500

Little Russia.

Government.	Area in English Sq. Miles.	Population.	The principal Towns.	Population.
25. Kiew 12 Circles.	16,800	1,530,000	Kiew	44,633
			Uman	3,000
			Bialocerkiew	3,000
			Chodorkow	3,000
			Lisanska	2,800
26. Czernigow, or Tschernigow 12 Circles.	20,000	150,000	Czernigow (or Tschernigow)	10,000
			Neschin	16,000
			Novgorod-Seversk	8,000
			Gluchow	9,000
			Baturin	5,000
			Mglin	5,000
			Starodub	4,500
			Oster	4,000
27. Poltava 12 Circles.	22,300	1,950,000	Poltava	10,000
			Krementschuk	9,500
			Mirgorod	7,500
			Pereaslawl	8,000
			Kobiljaki	7,000
			Lubny	6,000
			Lokhwiza	6,000
28. Slobodsk-Ukraine 11 Circles.	29,000	1,331,000	Charkow	18,000
			Achtyrka	13,500
			Sumy	12,000
			Walki	10,000
			Tschugujew	10,000
			Bielopalje	10,000
			Lebedjan	9,000
			Bogoduchow	6,800
			Miropolje	6,800
			Krasnokutzk	5,000
			Smijew	5,000

South Russia.

29. Ekatarinoslaf 8 Circles.	25,000	701,000	Ekatarinoslaf	8,000
			Bachmut	4,000
			Taganrog	14,000
			Azof	3,000
			Nakitschevan	12,500
			Alexandrowsk	4,000
			Mariopol	3,500
30. Cherson	23,300	765,000	Cherson	14,000
			Odessa	73,000
			Elisabethgrod	12,000
			Nikolajeff	14,000
31. Taurida 6 Circles, with the country of the Tschernomorsk Cossacks.	22,500	520,000	Sympheropol	5,800
			Baktschisarai	10,000
			Feodosia	5,000
			Eupatoria	4,500
			Karasubasar	4,000
			Kertsch	4.000
			Sebastopol	4,000
32. Don Cossacks	53,650	640,000	Staro Tscherkask	15,000
			Novo Tscherkask	10,000
33. Bessarabia	16,800	720,000	Kischeneff	42,636
			Akjerman	13,800
			Ismail	12,500
			Bender	5,000
			Khotim	8,000
			Kilia Nova	3,500
			Beltzy	3,500

West Russia.

34. Wilna 11 Circles.	24,400	1,315,800	Wilna	58,000
			Kreydani	6,000
			Troki	4,000
			Kowno	6,000

West Russia.—Continued.

Government.	Area in English Sq. Acres.	Population.	The principal Towns.	Population.
35. Grodno . 8 Circles.	14,000	800,000	Grodno	10,500
			Brzesc-Litewski . .	8,000
			Slonim	4,000
			Novogrodek . . .	2,000
36. Witepsk . 12 Circles.	16,800	935,000	Witepsk . . .	15,500
			Polotsk	10,000
			Welisch . . .	6,800
			Dünaburg . . .	4,000
			Newel	3,009
37. Mohilew . 12 Circles.	19,300	980,000	Mohilew	21,000
			Mstislawl . . .	5,000
			Orscha	4,000
			Dubrowna . . .	4,000
38. Minsk . 10 Circles.	37,000	1,205,000	Minsk	20,000
			Sluzk	5,000
			Pinsk	4,500
			Bobruisk . . .	4,700
			Dawidow . . .	3,500
			Borissow	3,000
39. Volhynia . 2 Circles.	28,300	1,500,000	Schitomir . . .	8,500
			Berdykziew . . .	9,000
			Krzemieniec . . .	8,000
			Dubno	6 000
			Ostrog	5,000
			Staro-Constantinow . .	4,500
			Jaslau	5,000
			Olyka	4,000
40. Podolia . 12 Circles.	14,500	1,550,000	Kaminiec . . .	16,000
			Mohilew . . .	7,000
			Staragrod . . .	7,000
41. Provinces of Bialystock .	3,400	251,000	Bialystock . . .	6,000
			Ciechanowiek . .	2,700
			Siemiatyce . . .	4,000
			Bielsk	2,000
Kingdom of Poland.				
42. Cracow . 4 Circles.	4,000	440,000	Kielce	5,000
			Pinczow . . .	5,000
			Slawkow . . .	2,000
			Zarki	2,800
43. Sandomir . 4 Circles.	5,500	415,886	Sandomir . . .	3,000
			Radom	3,700
			Kozienice . . .	2,200
			Opoczno . . .	3,500
			Konskie . . .	3,250
			Opatow . . .	2,500
44. Kalisch . 5 Circles.	6,540	649,328	Kalisch . . .	15,000
			Petrikau . . .	4,276
			Konin	3,600
			Wielun	3,000
			Sieradz	2,650
45. Lublin . 4 Circles.	6,650	518,000	Lublin	12,000
			Zamosc	4,750
			Lubartow . . .	3,200
			Krubieszow . . .	4,000
46. Plock . . 6 Circles.	6,500	497,000	Plock	8,000
			Pultusk	3,760
			Wyzogrod . . .	3,500
			Sierps	2,600
47. Masovia . 7 Circles.	7,350	850,000	Warsaw . . .	136,100
			Ozockow	8,000
			Lovicz	6,700
			Alexandrow . . .	3,000
			Kutno	4,000

Kingdom of Poland.—Continued.

Government.	Area in English Sq. Miles.	Population.	The principal Towns.	Population.
48. Podlachia .	7,250	381,700	Siedlee . . .	4,420
5 Circles.			Sokolow . . .	3,000
			Wengrow . . .	3,200
			Miedzyrzyce . . .	5,000
			Wlodowka . . .	3,200
			Biala	3,600
49. Augustowo .	7,820	566,685	Augustowo . . .	3,300
5 Circles.			Suwalky . . .	3,000
			Kalwary . . .	5,500
			Szczuczyn . . .	3,100
			Novomiasto . . .	3,230
			Wilkowyszki . . .	3,000
			Lomza	2,300

RUSSIA IN ASIA.

Kingdom of Casan.

50. Casan . .	23,500	1,220,000	Casan	59,000
12 Circles.			Tschebokoary . .	5,000
			Swiähsk . . .	3,500
51. Wiätka .	52,500	1,511,600	Wiätka . . .	12,000
10 Circles.			Sarapul . . .	6,000
			Ischewsk . . .	8,400
			Slobodsk . . .	6,000
52. Perm . .	127,000	1,488,800	Perm	10,000
12 Circles.			Ekaterinenburg . .	12,000
			Nischnei Newiansk .	12,000
			Kungar	6,000
			Solimansk . . .	5,000
53. Simbirsk .	24,000	1,200,000	Simbirsk . . .	13,500
8 Circles.			Syzran	7,100
			Samara . . .	4,580
			Kuria Woloschka . .	3,000
			Alatyr	2,800
			Singilejew . . .	2,500
			Karsun . . .	3,400
			Staropol . . .	2,200
54. Pensa .	13,167	968,400	Pensa	11,000
10 Circles.			Saransk	9,000
			Nischnei-Lomoff . .	7,000

Kingdom of Astrakhan.

55. Astrakhan .	43,000	260,000	Astrakhan . . .	45,703
4 Circles.			Uralskoi . . .	15,000
			Tschernojarsk . .	6,000
56. Saratow .	73,000	1,564,400	Saratow . . .	42,371
10 Circles.			Wolsk	8,500
			Petrowsk . . .	7,000
			Kusnezk . . .	4,500
			Zarizyn . . .	4,000
			Sarepta . . .	3,000
57. Orenburg .	127,235	1,771,000	Orenburg . . .	20,000
12 Circles.			Ufa (the capital) . .	6,000
			Bugalma . . .	4,700
			Wosresensk . . .	3,500
			Menzelinsk . . .	3,900
			Serginsk . . .	3,000
			Troitzkaja-Kreport . .	3,000

Caucasian Provinces.

58. Georgia, including Ossetia	17,500	450,000	Tiflis	40,000
			Signakh	3,500
			Duschet	2 000

Caucanan Provinces.—Continued.

Government.	Area in English Sq. Miles.	Population.	The principal Towns.	Population.
			Gori Elizabethpol Akhalzyk	3,600 12.000 15,000
59. Caucasia	40,000	150,000	Kisliar Mosdok Georgiewsk Stawropol	12,000 6,000 3,000 2,500
60. Daghestan	9,300	190,000	Tarki Derbend Kubetschi Karabudach	10,000 7,000 6,000 3,000
61. Imiretia	4,830	170,000	Kutais	14,000
62. Four Musselman Provinces, viz. Schirwan, Karabagh, Talischin, and Schenkin	9,145	135,000	Baku Alt Schamachi. Schuschi. Lenkoran. Nucha.	15 000
63. Armenia	7,850	160,000	Erivan Nakhitschevan Urdabad Megri	15,000 6,000 6,000 3,000
64. Auriel	1,422	64,000	Tilizighe. Poti. Bathumi.	
65. Mingrelia, Abchasia, &c.	7,200	430,000	Redoute-Kaleh. Anaklia. Sucham-Kaleh. Gelendschik. Sudschuk-Kaleh. Anapa.	
66. Circassia	32,250	550,000	No towns, but villages and Russian forts	[CIRCASSIA.]

Kingdom of Siberia.

(N.B.—The population of the governments according to Koppen, the area according to Cannabich.)

67. Tobolsk 7 Circles.	519,000	685,000	Tobolsk Tjumen Turinsk	20,000 8,300 6,000
68. Omsk 2 Circles.	325,500	600,000	Omsk Tara	2,000 3,000
69. Tomsk 6 Circles.	29,800	478,400	Tomsk Barnaul Schlangenberg Kaensk Kuznezt	9,700 6,000 4,000 3,500 3,500
70. Jenisseisk 4 Circles.	945,000	205,000	Jenisseisk Krasnojarsk	5,850 4,000
71. Irkutzk 5 Circles	150,000	507,000	Irkutsk Nischnei-Udinsk Werchnei-Udinsk Nertschinsk Kiachta Selingensk	15,800 3,000 2,600 3,600 4,000 2,600
72. Jakutzk	1,386,000	162,000	Jakutzk	3,000
73. Ochotzk	170,000	7,700	Ochotzk	1,600
74. Kamtchatka	84,000	4,500	St. Peter and St. Paul	650

The Islands in the Frozen Ocean.

Government.	Area in English Sq. Miles.	Population.	The principal Towns.	Population.
The Lena Archipelago . . New Sibera and some others.	2,000	500		
The Islands in the Pacific.				
The Nelken Islands				
St. Lawrence and St. Mathew .	1,000	500		
The Kurile Islands	3,000	1,000		
The Aleutian Islands	10,000	15,000		
Russian America.				
North-West Territory . .	500,000	61,000		
Total of the Empire	6,442,593	61,803,049		

If any differences should be remarked between the statements of the population in the above table and those in the several articles, they are occasioned by the receipt of more recent information.

(Stein's *Handbuch*, by Hörschelmann; Hassel's *Handbuch*; Cannabich's *Geographie*; Schubert, *Das Russische Reich*; Krusenstern, *L'Instruction Publique en Russie*; Schnitzler, *La Russie, la Pologne, et la Finlande*; Rose, *Reise nach dem Ural, &c.*; Eichwald, *Reise in dem Caucasus*; Erman, *Reise durch Nord Asien*; Von Wrangel, *Reise längs der Nord Küste von Sibirien, &c.*; *The Russian Official Journals of the Ministers of Commerce, Public Instruction, and the Interior, for the years* 1837-41.)

History.—The history of Russia cannot properly be said to commence before the middle of the ninth century of the Christian æra: though we obtain occasional glimpses of the various Scythian and Sclavonian tribes which roamed over its vast territory, little more can be ascertained than that it was divided into numerous small independent states, the two principal of which were Kiew and Novgorod. About A.D. 850 however a Varagian (probably Danish) freebooter of the Baltic, named Rurik, who had been called in by the people of Novgorod to defend them against their neighbours, made himself master of great part of the country, and founded a dynasty which continued to rule uninterruptedly till A.D. 1598. Oleg, the guardian of the sons of Rurik, seized Kiew by treachery (883), put the ruler to death, and made it the seat of government: and in 904? (various dates are assigned) conducted a fleet of 2000 canoes, carrying 80,000 men, from the mouth of the Dnieper to the attack of Constantinople, called by the Russians Czargorod, or 'city of Cæsar.' This first attempt was frustrated by a tempest: and a second expedition in 941, under Igor the son of Rurik (879-945) was defeated by the operation of the Greek fire, which destroyed the Russian flotilla. A communication was however opened between Russia and Greece, and Olga, the widow of Igor, was baptized at Constantinople (955) by the name of Helena; but her son Swatoslas obstinately adhered to the idolatry of his fathers, and fell (973) in an invasion of the Greek empire. But the reign of St. Vladimir the Great (980-1015) was the æra of the conversion of Russia. Vladimir himself, who had married Anna, sister of the emperor Basil II., became a Christian according to the Greek church in 988, and his example was speedily followed by his boyars, or nobles, and all his subjects. He subdued Halicz, or Galicia, and reduced to subjection the Patzinaces and Khozars, a barbarous race in South Russia; and is said to have been the first who assumed the title of grand-prince, or grand-duke (Veliki-Knez). At the death of Vladimir, his dominions were divided and disputed by his numerous sons; and though Yaroslaf, whose reign was signalized by an unsuccessful attack on Constantinople in 1043, reunited them for a short time, a second partition took place at his death (1055); and Russia was overrun for half a century with constant civil wars and Polish invasions. Vladimir II. (1113-1125) re-established in some degree his power as paramount sovereign; but disorder soon recommenced, and the authority of the grand-prince of Kiew was continually curtailed by the erection of petty sovereignties under the different branches of the house of Rurik, till Andrew I., prince of Vladimir, or White Russia (1057-75), arrogated to himself the title of grand-prince of Russia, while the elder line reigning at Kiew sunk into a subordinate rank; and Novgorod, though still retaining the forms of princely government, had become in effect a free republic, and was the centre of an extensive traffic with both Europe and Asia The annals of this period present only an unceasing succession of devastating struggles between the different principalities (in one of which Kiew was sacked and almost ruined (1168) by the troops of Vladimir), and wars with Poland for the possession of Galicia. The death of almost every prince was followed by a contest among his sons; but these scenes of discord and bloodshed are diversified by no event of historical importance, till the invasion of the Tartars (1223) produced a momentary unanimity from the sense of common danger. These barbarians had already under Genghis-Khan overrun and subdued the greatest part of Asia; and a host of 500,000 men under Toushi, the son of Genghis, encountered and overthrew the combined forces of the Russian princes on the river Kalka, near the Sea of Azof: but though the death of Toushi diverted the victors from the immediate completion of their conquest, they returned in 1236 under his son Batu, and laid waste the whole country with fire and sword. Youri, or George, grand-prince of Vladimir, after seeing his capital destroyed and his family massacred, was slain in battle; Kiew shared the fate of Vladimir (1240): all the cities and principalities of Russia (with the exception of Novgorod) were involved in indiscriminate ruin and slaughter, and the whole country fell under the yoke of the enemy.

For more than two centuries and a half after this conquest Russia continued to be held in abject vassalage by the Tartars of Kapchak, whose hordes overspread the eastern and southern provinces, and the plains between the Caspian and the Volga, on the banks of which river the Golden Horde, or imperial residence of the khans of the race of Batu, was fixed; but the interior of the country was still left under the government of the native princes, who were compelled to present themselves at the Golden Horde to receive investiture and to perform homage; and to such an extent was their humiliation carried, that on the annual visit of the Tartar deputies to receive the tribute, the Russian rulers were required to lead the horse of the khan's representative by the bridle, and feed him with oats from their own cap of state. The grand-prince of Vladimir continued to be considered as the head of the Russian nation, and this dignity was disputed both by arms and by intrigues at the court of the khans, who fomented these dissensions as favourable to the stability of their own supremacy. In 1320 the reigning prince Mikhail was even put to death at the Golden Horde, on a charge of treason brought against him by his cousin Youri, who was nominated his successor, and removed the seat of government from Vladimir to Moscow; while the principality of Kiew was finally extinguished (1321) by the Duke of Lithuania, who conquered and annexed it to his own dominions. In the mean time Novgorod (which in 1276 had joined the Hanseatic league) had risen in commercial importance till its inhabitants had numbered 400,000; and its vast wealth and importance were attested by the well-known proverb, 'Who can resist God and Novgorod the Great!' But the remainder of Russia continued to be held in hopeless bondage, till the termination of the direct line of Batu (1361) by the death of Berdi-Bek Khan, gave rise to disputes for the throne of Kapchak among the collateral branches, and the discord of their oppressors encouraged the Russians to resistance. In 1380 Temnik-Mami, one of the competitors, was overthrown in a great battle on the Don by Demetrius IV., thence surnamed Donski; but this victory, though celebrated by all Russian writers as the commencement of freedom, produced no permanent effect. Moscow was burnt by Tokatmish-Khan in 1382, and Demetrius was forced to sue for pardon and peace. But the unsuccessful wars of Tokatmish against the mighty Timur, who twice (1389, 1395) invaded Russia, gave a fatal blow to the power of Kapchak; and the reigns of Vassili or Basil II. (1389-1425), and Basil III. (1425-62) were a period of incessant warfare between the Russians and Tartars, who strove to maintain their domination. In 1441 Moscow was a second time destroyed by the khan of Casan, but the Tartars were now still further weakened by their divisions into several separate and conflicting khanates, and Ivan or John III. (1462-1505) at last succeeded in shaking off the last vestiges of dependence on the Golden Horde, which was finally dissolved in 1480.

With the reign of this prince, who married Sophia, the niece of the last Greek emperor, a new epoch commences in the history of Russia. He defeated the Poles and Lithuanians, reduced the Tartars of Casan to tribute, and reunited under his authority most of the minor Russian principalities; but his capture of Novgorod (1475), and the exactions which he levied on the merchants and citizens, gave a death-blow to the commerce of that famous emporium. The embassies of the European powers, Germany, Poland, Venice, the Holy See, &c., were now first seen at Moscow; and though the character of Ivan is sullied by the cruel despotism of his internal administration, he is justly entitled to rank as the founder of the Russian empire, the power and splendour of which date from him. He was succeeded by his son by Sophia, Basil IV. (1505-33), who prosecuted the scheme of aggrandisement commenced by his father, and completed the reunion of all the Russian states by the conquest of the principality of Severia; but great part of his reign was occupied by bloody and indecisive wars with Poland, terminated by a peace (1523), with little advantage on either side. The Tartars of the Crimea, incited by the Poles, committed fearful ravages throughout Russia in 1510; and in 1520 their khan advanced to Moscow, which he spared only on promise of tribute; and all the efforts of Basil failed to complete the subjugation of the Tartars of Casan, who defeated (1524) an army of 150,000 Russians on the Volga, and compelled another force, commanded by thirty Vaivodes (1530), to raise the siege of their capital with loss and disgrace. His successor Ivan IV., Vasilovitch, surnamed the Terrible (1533-84), was not four years old at the death of his father. The tyranny and maladministration of the regent Schuiski occasioned disturbances during his minority, and the Crimean khan made in 1541 an unsuccessful attempt to reassert the supremacy of his nation in Russia; but in 1543 Ivan assumed the reins of government, punished the obnoxious minister with death, and was crowned (1545) by the title of czar,* which he substituted for that of Veliki-Knez. The first acts of his reign were the institution of the corps of Strelitzes (archers), the first regular army of Russia; and the reform of jurisprudence by the publication of a regular code of laws named Youdebnik; but he was unsuccessful in his efforts to procure (by an embassy to Charles V. in 1547) artisans and engineers from Germany for the instruction of his subjects. In 1552 he took Casan by storm, with a dreadful slaughter of the inhabitants. Astrakhan shared the same fate two years later; and the voluntary adhesion of the Don Cossacks (1549) secured to Russia the services of those active and warlike auxiliaries. In 1553 the English trade through Archangel was first opened; but the long wars which Ivan waged with Sweden and Poland for the possession of Livonia produced no successful result; and after the death (1563) of his consort Anastasia he became cruel and capricious, and alienated the nobles and people by the savage barbarity of his actions. In 1565 he consummated the ruin of Novgorod by the massacre of 25,000 of its inhabitants, on suspicion of correspondence with Poland; but the Poles formed an alliance with the Tartars, who took Moscow for the last time in 1571, and pillaged and burnt it, 100,000 persons perishing in the conflagration. The continued ill success of the war in Livonia forced Ivan to obtain peace (1578) through the mediation of Pope Gregory XIII., by the cession of the disputed provinces on the Baltic. The acquisition in 1581 of Siberia, which had been invaded seven years earlier by the Cossack Yermak, compensated in some measure for this loss; and the advance of civilization is marked by the introduction, about this period, of the art of printing, and of several branches of manufacture. But the ferocity of Ivan increased with his years: his eldest son perished in 1584 by a blow from the hand of his father, and Ivan himself died the same year. Though execrated by his subjects as a remorseless and sanguinary tyrant, he had raised the country by his energetic policy to a hitherto unexampled pitch of prosperity; but his eldest and surviving son and successor, Feodor or Theodore (1584-91), was a prince of such natural imbecility that the reins of government were left entirely in the hands of his brother-in-law and minister Boris Godoonoff; and the only events of his reign were the erection of a patriarchate for Russia (1589) independent of the see of Constantinople, and a short war with Sweden (1590-95), which terminated in the acquisition of Ingria and Carelia by the peace of Teusina. Feodor died childless in 1598; and his only brother Demetrius having (as was supposed) been previously murdered by the contrivance of Boris, the male line of the house of Rurik, which had ruled under fifty-six sovereigns for 736 years, became finally extinct. [GODOONOFF.]

Boris was now placed on the throne by the clergy and nobles, and commenced his reign (1598-1605) by the emancipation of the serfs and other salutary measures; but he soon degenerated into an arbitrary and cruel tyrant, and at length lost his throne and life in a contest with an adventurer who declared himself to be the lost Demetrius, and whose pretensions were supported by Poland. The real history of this person has never been satisfactorily ascertained, and many writers consider his claims to have been well founded; but after ruling scarcely a year, he perished (1606) in a popular revolt headed by a boyar named Basil Schuiski, who thereupon became czar. But a second false Demetrius speedily started up. The Poles and Swedes, who each aspired to seat a prince of their own nation on the throne, invaded the country, and were supported by various factions among the nobles, and for seven years (1606-13) Russia became the prey of desolating anarchy and civil war. The Swedes occupied Kexholm and Novgorod, and the Polish prince Ladislas, after taking Smolensk, advanced to Moscow, and sent Schuiski prisoner to Warsaw (1610). But the prospect of the dismemberment of their country roused the national spirit of the Russians; the Poles were driven from Moscow (1613) after a sanguinary battle; and in the following year Michael Romanof, a descendant by females from the house of Rurik, was called to the throne with a unanimity among all orders in the state, which the sense of imminent danger alone could produce.

The accession of the line of Romanof gives a new character to the history of Russia, which henceforward, from being regarded as a barbarous and semi-Asiatic power, begins to assume its proper rank among European States. The long reign of Michael (1613-45) afforded him time both for the consolidation of his own power and the restoration of his dominions from the depression caused by the late calamities; but he was obliged to purchase the peace of Stolbova from Sweden (1617) by the cession of Ingria and Carelia, including the whole Baltic coast of Russia, which thus retained only the single port of Archangel in Europe, and to resign Smolensk to Poland as the price of a fourteen years' truce (1618-32), a sacrifice which was confirmed, after a vain attempt to recover it by arms by the peace of Viasma in 1634. But the internal administration of Michael was more fortunate than his wars. Though compelled by the boyars to re-establish the slavery of the peasants, he succeeded in a great measure in redressing the abuses which the preceding anarchy had occasioned; and he gave a fresh impulse to trade by the conclusion of commercial treaties with England (1623) and with France (1629). The minority of his son Alexis (1645-76) was disturbed by a dangerous revolt arising from the arrogance and tyranny of the regent Morouzof; but the removal of the obnoxious minister restored order, and Alexis, on assuming the reins of power in 1648, became an unsuccessful candidate for the Polish crown against John Casimir. This rejection deeply chagrined him, and he eagerly embraced the opportunity of revenge which was afforded by the offer of the revolted Ukraine Cossacks (1654) to put themselves under his protection. The Poles, distracted by civil war, were unable to make head against the Russians, who recovered, by the truce of Vilna (1656), Smolensk and all the other cessions of the last reign. A short war with Sweden was concluded by the peace of Cardis (1661) without any change of territory. But the contest with Poland, which had re-commenced in 1658, was continued with increasing success till 1667, when the truce of Andrussow (converted into a permanent peace in 1686) gave to Russia Tchernigow, Kiew, and the Ukraine, with the protectorate of the Dnieper Cossacks. But in the mean time the internal peace was disturbed by seditions arising from the debasement of the coinage, and from the deposition (1666) of the patriarch Nikon, whom the lower orders regarded as a saint; and in 1667 the dismemberment of the empire was threatened by a revolt of the Don Cossacks under a chief named Stenko Razin, who, by proclaiming liberty to the serfs, attracted to his standard an army of 200,000 men, by the aid of which he captured Astrakhan, and assumed the style of an independent sovereign; but he was at length overpowered and put to death, with great numbers of his followers. The last years of the reign of Alexis were devoted to internal improvements and the advancement of civilization. Numerous foreigners, particularly Scotch and Germans, were attracted to Russia, where they introduced the arts and manufactures of their own countries; and the publication of a revised code of laws gave a settled character to the national jurisprudence. Alexis died in 1676, at the age of 47, leaving several children by his two wives. The short reign of his eldest son Feodor (1676-82) was remarkable only for the first war between Russia and the Porte (1678-82), which ended in the final cession of Ukraine to the former; and for the destruction at Moscow of all the charters and muniments of the nobility, who thenceforward took precedence according to military rank. Feodor left no issue, and at his death, Ivan and Peter, both sons of Alexis, but by different wives, were placed jointly on the throne, under the guardianship of Sophia, the sister of the former. But the intrigues of this ambitious princess, who aspired to the sole exercise of authority in her own person, gave rise to sanguinary tumults among the strelitzes. The discontent of the nation was excited by the total failure of two expeditions (1687 and 1689) against the Crim Tartars; and the attempts of Sophia to exclude Peter from all share in the government at length brought on a revolution (1689) in favour of the latter. Sophia was sent to a monastery, and Ivan, whose weakness of mind and body unfitted him for rule, abdicated in favour of Peter, who ascended the throne as sole sovereign.

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* This change is often erroneously attributed to his grandfather, the former Ivan Vasilovitch.

The genius of this future regenerator of Russia had been cultivated by the instruction of a Genevese named Le Fort, who had been his tutor since 1684, and the energy of his mind speedily developed itself in action. His first care was the reform of the army, and having succeeded in raising and disciplining some regiments in the European manner, he attacked and took Azof from the Turks in 1694, being further aided by a flotilla which he built on the Don, and which was the first Russian navy. In 1697 he however quitted his dominions, and travelled for nearly two years in England, Holland, &c., in order to acquaint himself with mechanics and ship-building, and to engage artisans and engineers for his service; and a sanguinary revolt of the strelitzes, in favour of Sophia, having occurred during his absence, the corps were summarily abolished at his return, and replaced by regular troops. The same year (1698) he founded the first Russian order of knighthood, that of St. Andrew; and the cession of Azof by the Porte at the peace of Carlowitz (1699) at length gave him a port on the Black Sea. His next aim was to acquire a territory on the Baltic, and with this view he joined the Northern League with Denmark and Poland against Sweden; and though his raw levies were signally defeated at Narva (1700) by Charles XII., he succeeded during the next two years in occupying Ingria and Carelia, while the Swedes were engaged in the Polish war; and his new capital city of Petersburg was founded on this territory (1703) at the mouth of the Neva. Narva and Dorpat in Livonia (1704), and Mittau in Courland (1705), were successively taken; and the victory of Kalish over the Swedes (1706) gave confidence to the Russian soldiery. The internal reforms were not suspended during these warlike operations. Schools, printing-presses, manufactories, and hospitals were everywhere established, and the university of Moscow was founded in 1705; while the overgrown power of the clergy was curtailed by the abolition of the patriarchate, the czar declaring himself head of the church. Charles XII., who had dethroned Frederic Augustus in Poland, and was now at the summit of his power, determined to crush the rising strength of Russia, which he invaded (1708) through the Ukraine, and was joined by the Cossack ataman Mazeppa; but he sustained an irreparable defeat from Peter (July 8, 1709) at Poltava; all his army was either destroyed or taken, and the king himself fled into Turkey. The Russian arms were now in the ascendant; Wiborg, Reval, Riga, with all Esthonia and Livonia, fell into their hands; and Frederic Augustus remounted the throne of Poland, in which kingdom Russian influence continued from that time paramount. But a war (1710) with Turkey, arising from the shelter afforded by that power to Charles, had a disastrous result; the Russians were surrounded on the Pruth, and Peter was compelled to purchase the peace of Falczy (1711) by the restoration of Azof and other humiliating concessions. The domestic administration in church and state was provided for by the erection (1711) of the Directing Senate, the supreme civil tribunal, and some years after (1724) of the Synod for ecclesiastical affairs; but both were under the direct control of the czar, who exercised despotic sway by means of his army, and deprived the nobility of all their power. In 1716-17 he again travelled through Holland and Denmark, and visited France, where he concluded an alliance with Louis XV. But his return was marked by a domestic tragedy; his son Alexis, who had previously offended him by his weak and vicious course of life, was tried on pretence of conspiracy, and condemned, but died, perhaps from natural causes, in prison. The Swedish war, which had languished after the death of Charles XII. in 1718, was at length concluded (1721) by the peace of Nystadt. Russia acquired Wiborg, Ingria, Carelia, Esthonia, and Livonia, and became thenceforward the great Northern power in place of Sweden; and Peter exchanged the title of czar for that of *emperor and autocrutor of all the Russias*, which his successors have ever since borne. In 1723 he availed himself of the distracted state of Persia to seize the provinces on the Caspian, which necessity compelled Shah Tahmasp to cede to him; but this was his last exploit. He died Jan. 28, 1725, aged 53. In 36 years he had raised Russia from a semi-barbarous state to a pitch of military strength and political importance which placed her on a level with the first powers of Europe. Her army, her navy, her commerce, and her legislature were all created by his genius; and though his great qualities were too often stained by acts of cruelty and tyranny, he must be pronounced to have justly merited the epithets of *the Great*, and the *Father of his Country*, conferred on his memory by the unanimous voice of the nation.

In obedience to the last commands of Peter, his widow Catherine, formerly a Livonian peasant-girl, was proclaimed empress: but her short reign (1725-7), and that of her successor Peter II., grandson of Peter the Great, and son of the unfortunate Alexis (1727-30), were (except the conclusion of a commercial treaty with China in 1727) almost barren of events, and remarkable only for the ascendency, under Catherine, of Prince Menzikoff, and under Peter, of the Dolgoruki family. On the death of Peter II., Anne, daughter of Ivan, the elder brother of Peter the Great, was called to the throne (1730-40) by the influence of the Dolgoruki faction, on signing an agreement which limited the imperial power in favour of the nobility: but this compulsory act was almost immediately cancelled under the advice of the Chancellor Ostermann, and the Dolgorukis were disgraced and exiled to Siberia. The election to the Polish crown in 1733 was decided in favour of Frederic Augustus II., by the presence and peremptory interference of a Russian army: and though the Persian provinces seized by Peter the Great were restored (1735) by a convention with Nadir-Kouli, the defeat of the Pruth was amply avenged by a war (1736-9) (in alliance with Austria) against the Porte. Crim-Tartary was overrun by Marshal Munnich; Azof, Oczakow, and Choczim taken, and Moldavia occupied; but the peace of Belgrade (1739), which was necessitated by the losses of Austria, restored all these conquests except Azof. Anne bequeathed the succession, under the regency of her favourite Biron, to her grand-nephew Ivan (1740-1), a child two months old, son of her niece Anne of Mecklenburg, by Duke Antony of Brunswick-Bevern. Biron was speedily overthrown by a cabal headed by the parents of the infant emperor, who themselves assumed the guardianship; but the discontent of the Russians at the influence of the foreign ministers introduced by Anne at length broke out in revolt; and Elizabeth, daughter of Peter the Great by Catherine, was called to the throne (1740-62). Ostermann and Munnich were sent to Siberia, and the ministry vested in Bestuchef-Riumin, who continued at the head of affairs till 1757; while a war with Sweden, which had commenced 1741, ended (1743) in the acquisition of part of Finland by Russia. The alliance concluded with Maria Theresa (1747) in the war of the Austrian Succession, and the consequent appearance on the Rhine of 36,000 Russian auxiliaries under Repnin, gave Russia, for the first time, a direct participation in the politics of Western Europe; and in the Seven Years' war, a large Russian force, acting as allies of Austria, invaded Prussia, of which they held possession from 1757 to 1762: the victories of Gross-Jagersdorff (1757) and of Kunnersdorff (1759) over Frederic the Great, established the renown of Russian arms, and Berlin fell into their hands in 1760; while an army of observation was maintained from 1758 in Poland, then a prey to anarchy and confusion. Elizabeth died Jan. 1762, regretted by her subjects, to whom she had endeared herself by the mildness of her domestic administration; and was succeeded by her nephew, Peter III., duke of Holstein-Gottorp. The first act of this prince was to abandon the Austrian alliance, and conclude peace with Prussia: he abolished the torture in criminal processes, and issued judicious regulations for the protection of commerce; but he speedily disgusted his subjects by the rash innovations which he attempted to introduce into the army and the church, and the public discontent was secretly fomented by his consort, Catharina of Anhalt-Zerbst, a princess of a masculine understanding, who had long been at variance with him. After a reign of six months, he was dethroned (July, 1762) by a conspiracy, and died in prison a week afterwards, as is generally supposed by violence; while Catharina II. was called to the throne by the unanimous voice of the army and the people.

The accession of this ambitious and unscrupulous princess (1762-96) gave a fresh impulse to Russian policy, which from this time assumed the steadily aggressive character which it has ever since maintained. On the vacancy of the Polish throne, in 1764, a Russian army dictated the election of Stanislaus Poniatowski, a former paramour of Catherine: but Poland continued distracted by civil war, and the complaints of the Porte at the continued occupation of the country by Russian troops led to a Turkish war (1768-74), in which the Russian arms were signally triumphant. A Russian fleet appeared for the first time (1770) in the Mediterranean, and destroyed the Turkish navy at Tchesmé; the land forces subdued Crim-Tartary, Moldavia, and Wallachia; the Danube was crossed for the first time in 1773, and the losses of the Porte compelled her, by the treaty of Kutchuk-Kainardji (1774), to acknowledge the Crim-Tartars independent, and to cede to Russia an extensive tract of territory. In the mean time the first partition of Poland (1772) had taken place, which gave Polotsk and Moghilew to Russia; and the dangerous revolt of the Cossack Pugatchef, who personated Peter III., was quelled by his capture and death in 1775. The internal administration was placed on a new footing by the division of the empire (1776) into forty-three governments with separate jurisdictions, and by the gradual promulgation (1775-83) of a new code of laws; the deserts were colonized, and 200 new towns built by Potemkin, who was absolute minister from 1778 to 1791. In the mean time the chains of Poland were daily riveted tighter; and the opposition of England to the avowed project of erecting a new Greek empire at Constantinople, on the ruins of the Turkish power, is generally supposed to have given rise to the famous Armed Neutrality (1780), in which all the northern powers combined with Russia to resist the right of maritime search claimed by Great Britain. Crim-Tartary was seized (1783) and incorporated with Russia; but this encroachment, though the Porte was compelled at the time to acquiesce, led eventually to the second Turkish war (1787-92), memorable for the sanguinary triumphs of Potemkin and Suwarrow: Choczim, Oczakow, Bender, and Ismail were successively taken with fearful slaughter, and the peace of Jassy (1792) established the Dniester as the boundary of Turkey and Russia. A short war with Sweden (1788-90), in which the Swedes threatened Petersburg, and gained a great naval victory at Svenkasund, had in the mean time been concluded by the peace of Werela, without territorial change. The outbreak of the French revolution produced a change in the disposition of Russia towards England, with whom an alliance and a commercial treaty were concluded in 1793; but no active part was taken against France, as the attention of the empress was directed towards Poland, by the second partition of which (1793) Russia gained Podolia and the Ukraine, with half Lithuania and Volhynia. Warsaw was garrisoned by the Russians, but a fierce struggle ensued (1794) on the general revolt of the Poles under Kosciusko and Madalinski; till the storm of Praga by Suwarrow, in which 20,000 Poles were slaughtered, finally crushed all resistance, and the third and last partition of the kingdom took place the next year, by which the nationality of Poland was extinguished, while Russia gained Courland with the rest of Lithuania and Volhynia, in addition to her former acquisitions.

Catharine II. died the year after the accomplishment of this favourite object of her policy, and was succeeded by her son Paul (1796-1801), a weak and fickle prince. He joined (1798) the second grand coalition against France; and the Russian auxiliaries, under Suwarrow and Korsakow, covered themselves with glory in Italy and Switzerland in the campaign of 1799: but Paul soon capriciously abandoned his allies, concluded peace with Bonaparte (then first consul), and, in 1800, put himself at the head of the Convention of the North, a union of the northern states, on the principle of the armed neutrality, against the British maritime supremacy. A war with England was impending, when Paul, whose frantic tyranny (verging on madness) had made him odious to his subjects, was murdered in his palace (1801) by a band of conspirators.

His son and successor Alexander (1801-25) immediately effected a pacification with England, and disbanded a force of 45,000 Cossacks which his father had assembled at Orenberg, with the wild design of marching overland to India: the relations with France continued however peaceful till 1805; but Alexander refused to acknowledge Napoleon as emperor, and joining the Austrian alliance against him, was personally present at the defeat of Austerlitz. In 1806 the renewed alliance of the Porte with France was made the pretext of a new Turkish war (1806-12), and Moldavia and Wallachia were occupied; but the successive victories of Eylau and Friedland gained by the French (1807), led to the famous conferences between Alexander and Napoleon, the result of which was the peace of Tilsit. Russia joined the 'Continental System' of Napoleon, and became an ally of France; declaring war (1808) against England and Sweden, the latter of whom was forced to cede, by the peace of Frederiksham (1809), all Finland, East Bothnia, and Aland. The war with the Porte, which had been suffered to languish, was resumed with fresh vigour in the bloody but indecisive campaigns of 1810-11-12; but the injury which the 'Continental System' inflicted on Russian commerce was becoming insupportable, and the refusal of Alexander to enforce it at length led to a rupture with France (1812). Alliances were now formed with England and Sweden, and the peace of Bucharest with the Porte, concluded through the mediation of the British minister, extended the Russian frontier to the Pruth. In the autumn of 1812, Napoleon invaded Russia with 500,000 men, defeated Kutusoff at Borodino, and advanced to Moscow; but the country was everywhere laid waste, and the conflagration of the capital itself by the governor Rostopchin compelled the French to retreat in the midst of a winter of unexampled rigour, pursued by the Russians: nine-tenths of their vast host either perished or were taken prisoners, and Napoleon himself escaped only by deserting his army.

A powerful Russian force continued to take part in the campaigns of 1813-14 against France, and Alexander entered Paris in triumph. By the congress of Vienna (1815), Warsaw and a large territory, under the name of the kingdom of Poland, were annexed to the crown of Russia, but with a separate administration and free press. A desultory war with Persia (1804-13) had been concluded by the peace of Goolistan, Persia ceding most of her Caucasian provinces, and giving up her claims on Georgia.

The military power and political influence of Russia were now almost paramount on the Continent; and after the final downfal of Napoleon, in 1815, she became the head of the 'Holy Alliance,' entered into by herself, Austria, Prussia, and France, for the suppression of revolutionary principles. The remainder of the reign of Alexander was peaceful, and occupied chiefly in reforms of the internal government; while the long line of frontier was strengthened by the formation of military colonies, and the welfare of the subjects was promoted by the frequent progresses of the sovereign through the interior provinces. In one of these tours of inspection Alexander died at Taganrog, on the Don, aged forty-eight (Dec. 1825); and, leaving no issue, was succeeded by his brother Nicholas, the third son of Paul, the second brother, Constantine, having previously renounced the succession. This change in the succession occasioned some military tumults, which were not quelled without bloodshed. In 1826 a dispute respecting boundaries led to a fresh war with Persia, which continued till 1828, when the progress of the Russians compelled Persia to give up Erivan and the country as far as the Araxes, as the price of the peace of Turkmanchai. The Greek revolutionary war was now raging, and the treaty of London was signed (July, 1827) by Russia, France, and England, for the settlement of the question; but the refusal of the Porte to accede to the terms dictated to her produced the destruction of the Turkish fleet by the allied squadrons at Navarino; and in 1828 a Russian army invaded Turkey, and though repulsed from before Shumla in the first campaign, succeeded in crossing the Balkan (1829), and occupied Adrianople, where a treaty was concluded, by which Russia acquired numerous frontier fortresses on the Black Sea, and the protectorate of Moldavia and Wallachia. A general insurrection of the Poles (Nov., 1830), who were goaded by the tyranny of their viceroy the grand-duke Constantine, and by repeated infractions of their constitution, was crushed, after a campaign of frightful devastation and bloodshed, by the capture of Warsaw, Sept., 1831: many thousand Poles of all ranks were sent to Siberia; the kingdom was incorporated with Russia, and has ever since been governed as a conquered province. The relations with the Porte assumed a new form in 1833, from the application of the sultan for aid to check the advance of the rebel pasha of Egypt: an auxiliary force was sent to Constantinople, and terms imposed on the pasha; but this service was repaid by the treaty of Unkiar-Skelessi, binding the Porte to have recourse to no other power for assistance, and to close the Dardanelles against all foreign ships of war. The absolute ascendency thus acquired in the divan was viewed with great jealousy by France and England; but their complaints were disregarded by the Russian cabinet, which, shortly after the accession of Mohammed Shah to the Persian throne, in 1834, succeeded in obtaining a similar paramount influence, to the exclusion of British interests, in the councils of that nation. These proceedings excited in England a strong popular feeling of hostility towards Russia, which was further augmented by the seizure, in 1836, of a British merchantman on the coast of Circassia, where a fierce guerilla warfare with the natives had been for some years carried on, the Russians claiming the country as ceded to them by the peace of Adrianople. The march against Herat (1838) of a Persian army, directed by Russian officers, which was viewed as preliminary to the invasion of the Anglo-Indian empire, brought the conflicting relations apparently to the verge of a rupture: but the apprehensions of the English cabinet were tranquillised by the repulse of the Persians, and the subsequent conquest of Afghanistan by an army from India; and the Russian schemes of aggrandisement in this quarter have since received a further check from the failure of a formidable expedition directed (1840) against the predatory Uzbek state of Khiva. Such is the present political aspect of Russia: with two formidable fleets in the Baltic and Black seas, and a standing army amounting (at least nominally) to upwards of 800,000, she presents a formidable armed front to Western Europe. The events of the last ten years have rendered her almost absolute arbitress of the destinies of her antient opponents, the two great Moslem powers of Turkey and Persia; and her interests are everywhere watched and promoted by the exertions of her diplomatic service, the numbers and organisation of which far exceed that of any other nation. But on the other hand, the absolute despotism which pervades every branch of the government, renders the efficiency of this vast power almost entirely dependent on the personal character and energy of the reigning sovereign: the Polish nation and many of the subject tribes are retained in unwilling obedience only by military coercion; and the extensive disaffection understood to prevail among the nobility (whose former privileges and power have been wholly annihilated), with the desire for free institutions, which must necessarily result from the gradual diffusion of knowledge among the lower orders, will probably lead, at no distant period, to important changes in the constitution and government.

Government and Administration.—The actual political organization of Russia is as follows:—

The emperor is as absolute as in the times of Ivan Vasilovitch the Terrible. However this despotism may be modified by the progress of civilization, the actions of the emperor Paul I. prove, that should the monarch of Russia wish to indulge himself in any freaks of tyranny even bordering on insanity, there is no power to prevent him from doing so. Several classes of the inhabitants enjoy certain privileges and immunities, although it is quite superfluous to add that these liberties have no other guarantee than the pleasure of the monarch, who may abolish them just as he granted them. A remarkable feature in the political organization of Russia is, that no one has of right any rank unless such as he obtains by filling a civil or military office. The offices, military, naval, and civil, are divided into the following fourteen grades:—

	Military.	Naval.	Civil.
1	Field-Marshal	General Admiral	Chancellor
2	Full General	Full Admiral	Actual Privy-Councillor
3	Lt.-General	Vice-Admiral	Privy-Councillor
4	Major-General	Rear-Admiral	Actual Councillor of State
5	Brigadier (now abolished)	Commodore	Councillor of State
6	Colonel	First Captain	Councillor of College
7	Lt.-Colonel	Second Captain	Councillor of the Court or Aulic Councillor
8	Major	Capt.-Lieutenant	Assessor of College
9	Captain	Lieutenant	Honorary Councillor
10	Second Capt.		Secretary of College
11			
12	Lieutenant	Midshipman	Secretary
13	Under-Lieut.		
14	Ensign		Registrar of College.

Many of these grades belong to certain offices, and are lost with the loss of office, which is particularly the case with those that are elective. The inhabitants of Russia are divided into the following classes; the clergy—the nobility, the merchants and burghers—the peasants.

The clergy is composed of the monastic or regular clergy, and the secular clergy. All the higher preferments of the church are held exclusively by the first; the secular or parish clergy (the members of which, according to the discipline of the Greek church, must be married) have no higher preferment than that of a *protoyerey* or *protopapa*, who has the superintendence over a certain number of parishes. The children of the clergy generally follow the voctaion of their parents, so that it is a very rare case in Russia to see a clergyman who is not descended from the clerical class. Many of these children however enter different branches of the public service, particularly the civil department.

The nobility is the privileged class, and in some degree the ruling class, in Russia. Till the time of Peter III. it was subject to the duty of personal service, but that monarch granted, by a ukase of 18th February, 1762, to that order the following privileges:—

The nobles may enter the service of foreign powers not at war with Russia.[*] A noble marrying a non-noble woman raises her to his rank; but a noblewoman marrying a person of an inferior condition does not lose the privileges of her order, although she does not communicate them either to her husband or children. A noble cannot be judged except by a judge belonging to his condition, and a sentence passed against him cannot be carried into execution without having been previously examined by the senate and confirmed by the emperor himself. A noble is exempt from corporal punishment, and he cannot be prosecuted for a crime committed by him if ten years have elapsed without legal notice being taken of it. The nobility may establish any kind of manufacture and engage in commerce, but in the latter case they must inscribe themselves in one of the merchants' guilds, and pay the taxes attached to it. By a ukase of 1782, all the mineral productions found on their estates are their property, and they are the almost exclusive landholders of the country.

The nobles have meetings for the election of local magistrates, and they may send deputations to the emperor after having previously obtained a special permission for so doing. They may also deliberate at those meetings on several local affairs. Those nobles only who enjoy a grade in the military or civil service are capable of voting. The votes are either personal or by a representative. The right to a personal vote belongs to those who possess 100 male serfs or 3000 dessiatines of ground.[†] Those who have not the required amount of property vote by a representative, provided they possess at least five male serfs or 150 dessiatines of ground. This class of nobles elect in respect of their collective estates one representative for every 100 serfs or 3000 dessiatines of ground.

The nobles elect the following magistrates:—

For the government—1st. The chief or marshal of the nobles. 2. The presidents and assessors of the criminal and civil tribunals which are courts of appeal from the district tribunals. 3. Judges of the conscientious tribunal. 4. The honorary curators of the schools. 5. The members of the commission of public victualling. 6. Deputies from each district, forming a commission for examining the pedigrees of the nobles. 7. A secretary of the above-mentioned commission. The elective officers of the districts are:—1. A chief or marshal of the nobles. 2. The district tribunal, consisting of a chairman, two assessors, and a secretary. 3. The police magistrates, consisting of the captain *Ispravnick* (*i.e.* executive), and four assessors. There are also offices existing only in some particular governments, as the magistrates for settling the boundary questions between estates, &c.

The nobles are divided into two classes:—

1. Hereditary and personal. To the first class belong all nobles who have inherited their rank or risen in service to the eighth grade. The personal nobles are those who have acquired by their services a grade inferior to the eighth. These latter enjoy the privileges of the order without transmitting them to their children, and they cannot be elected to certain offices.

The titled nobility, or princes, counts, and barons, have no privileges beyond those of the other nobles. These titles are derived from Russian and foreign grants. The princes are chiefly descendants of the antient petty princes of Russia, and some of the Lithuanian dynasty; many are of Tartar descent, as the Tartar Murzas, or nobles who were baptised, and received the title of princes. In later times, many of the Georgian and Imeritian nobles of the first class, called *Tavadi*, or heads, have been received into the class of Russian princes.

2. The second order of the inhabitants of Russia is composed of the citizens or townsmen, *Grajdane* or *Gorodoveeye*. They are subdivided into many classes, viz.: 1. The honorary citizens, *Pochetneeye Grajdane*, who are exempt from the capitation-tax, military conscription, and corporal punishment, and have the right of being elected to municipal offices, consist of free non-nobles, who have obtained academical honours,[‡] distinguished artists, and heads of manufacturing establishments. The privilege of honorary citizenship is possessed by some of hereditary right, and is with others only personal. The children of the personal nobles are hereditary honorary citizens. The privileges of that order are forfeited either in consequence of a criminal sentence, or by engaging in some mean trade, and entering into domestic service.

The merchants are divided into three classes or guilds. The first guild, which is obliged to pay under various denominations an annual tax of 100*l.*, has a right to engage in any commercial or manufacturing enterprise without any limitation as to the amount of capital employed in it. The second guild, which pays an annual tax of 40*l.*, is subject to the following limitations:—A merchant of that guild cannot declare at the customhouse, merchandise brought in one ship-load or by land conveyance of higher value than 2000*l.*, and his foreign trade must not exceed in the course of a year the value of 12,000*l.* Should the value of his merchandise exceed that maximum, he is obliged to pay the tax of the merchant of the first guild. The merchant of the second guild cannot enter into any contract for more than 2000*l.*, nor can he keep a banking or insurance office. Both the first and second classes enjoy an exemption from the capitation-tax, military conscription, and corporal punishments. They may possess estates with serfs, provided the serfs are employed in manufactories. Their children enter the service on the same footing as those of the personal nobles, *i.e.* they can advance as officers after having served three years in an inferior grade. The merchants of the third guild, who pay an annual tax of 10*l.*, may carry on every kind of retail trade, and have manufactories, provided they employ in them no more than 32 workmen. Nobles who engage in commerce may enter one of these three guilds, according to the extent of their transactions.

Foreign merchants trading in Russia must pay the same taxes as the Russian merchants, and their commerce is subject to several limitations. They may acquire real property in places where they are settled.

The burghers, *Mieshchane*, by purchasing an annual licence, the price of which, according to the class of the town which they inhabit, varies from 1*l.* to 3*l.*, may engage in several kinds of retail trade, and have workshops, in which they may employ, besides their family, eight workmen, and by doubling the price of their licence sixteen workmen. Should they wish to increase that number, they must pass into the third guild of merchants. Those who pay no licence can engage in certain ordinary trades and have a single shop for retailing certain common goods specified under fourteen heads. The burghers are not exempted from the capitation-tax, military conscription, or corporal punishment.

The peasants constitute the lowest class of the inhabitants of Russia, and as they do not enjoy any personal privileges, they cannot (according to the expression of the ukase of the 10th March, 1813) be deprived either of honour or good name. They pay the capitation-tax and are subject to military conscription. Beside their agricultural pursuits, they are allowed to engage in handicrafts and some minor trades, as keeping inns in villages, &c. By purchasing licences they may engage in any kind of commerce, even that which is carried on by merchants of the first guild, but they do not enjoy the personal privileges of the merchants.

There are instances of serfs belonging to some noblemen possessing immense wealth, and even a great number of serfs, which they hold in the name of their master.

The peasants of Russia are divided into crown peasants, those of appanage estates, serfs of landowners, and free cultivators of land; the number of these last is however very small.

The crown peasants are those who live on the estates belonging to the crown. They pay, besides the capitation-tax, a rent for their grounds. Many villages are obliged to maintain post-horses for the government couriers and private travellers.

The crown peasants elect some of their authorities. Each commune, *Volost* (500 male individuals constitute a commune), elects every two years its chief, called head. Each commune also sends a deputy for the election of assessors who judge in causes arising among themselves, or between them and other classes. These assessors may be chosen from among the peasants themselves or other classes. Causes between crown peasants themselves are decided by the judge of the district with the above-mentioned assessors; but when other parties are concerned, the causes are decided by the same judge with an assessor of the peasants and another of the nobles. The crown peasants may pass into the class of burghers and merchants.

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[*] A ukase of 1831 prohibits all Russian subjects, except those who are employed on diplomatic service, from educating their children from ten to eighteen years of age abroad. All children educated in contravention to the ukase are declared incapable of holding office in Russia.

[†] A dessiatine is about three English acres.

[‡] Academical honours entitle the individual who has obtained them to receive a corresponding grade on entering the civil service. Thus a student who has completed a course of studies at a university is received into the civil service with the 12th grade, a candidate with the 10th, a master with the 9th, and a doctor with the 8th.

The *Odnodvortzi*, or single householders, are descendants of military men who received grants of land for their services. They formerly constituted a kind of minor nobility, and could possess serfs, a privilege which those who are in the actual enjoyment of it retain even now, but they are prohibited from making new acquisitions, except from persons belonging to their own class. They have also some few other privileges over the common crown peasants.

Many estates peopled with crown peasants have been, according to a ukase of Peter the Great, ceded to particular individuals on condition of establishing manufactories. These peasants, called adscripti (*pripisnuye*), work in manufactories on certain fixed terms. The owners of the manufactories pay all taxes due from these peasants, who are likewise exempted from military conscription. The condition of the peasants of the appanage estates (those reserved for the maintenance of the imperial family) differs little from that of the crown peasants.

The landowner's peasants, or serfs, are complete slaves. Their master can inflict on them such punishment as he chooses, but he is not permitted to kill, to starve to death, or to maim his serf. A serf cannot contract marriage without the permission of the master. The prodial serf cannot be sold without the ground to which he is attached, but the domestic serf may be sold like any other chattel. A ukase of 1808 however prohibits the sale of serfs at fairs or by auction, or as substitutes for recruits. An accusation of a serf against his master, except in cases of high treason, is not admitted, and he who proffers such a charge is liable to punishment.

The free peasants, a class whose existence began under the emperor Alexander, are subject to the capitation-tax and military conscription, but they are free in all other respects.

A great number of German colonists have settled in Russia at different times. They are exempt from all taxes for ten years after their settling, and from military conscription entirely.

Having described the various classes of the inhabitants of Russia, we must say a few words on its administration.

The principal authority is the council of the empire, presided over either by the monarch or by a member specially appointed. It is divided into four departments: 1, the legislative; 2, the military (which comprises also the navy); 3, that of civil and ecclesiastical affairs; and 4, the financial. Each of these departments has a secretary of state, and they deliberate either separately, or together, which is called the general assembly of the council. The affairs which are decided by a majority of votes, are submitted to the approbation of the emperor. To the council of the empire are attached—the commission of petitions for examining and deciding on all petitions addressed to the emperor, and an imperial chancery.

The senate, or, as it is officially called, the Directing Senate (*Pravitelstvooyooshehey Senat*), was established by a ukase of Peter the Great, dated February 22, 1711, and its organization was determined by the ukases of 1772 and 1802. Its powers and duties are comprehended under the following heads:—

1. It is the supreme tribunal for all judicial cases.
2. Its authority is limited only by that of the monarch.
3. It is presided over by the emperor in person.
4. The ukases of the senate are binding like those of the emperor, who alone can prevent their execution.
5. Every imperial ukase obtained by private persons, except such as may require secrecy, must be presented to the senate by those by whom they have been obtained.
6. It is the duty of every senator to represent to his colleagues every matter relating to the state and breach of law which may come under his cognizance.

The senate is divided into eight departments, of which the 1st superintends the general affairs of the country; the 2nd, 3rd, and 4th try civil cases; and the 5th, criminal cases: these are all at Petersburg. The 6th, which also tries criminal cases, and the 7th and 8th, which try civil cases, are at Moscow. Each of these departments has a number of governments or provinces, from the courts of which it hears appeals. Judgment is given by a majority of votes, which must consist of two-thirds of the whole number, or of the number present. In case the required majority cannot be obtained, the cause is decided in the general assembly of the senate, where all the departments vote together. Causes are not publicly argued before the senate or before any other Russian tribunal. A statement of the case of each party is made by the secretary, and communicated to the party, who signs it as correct. These statements are then read by the secretary, in the presence of the parties, to the court, which pronounces judgment. In the antient Polish provinces, where the Polish laws were retained, causes were publicly argued by advocates, but these laws have been recently abolished and those of Russia introduced. A separate department called Heroldia is attached to the senate: its office is to examine and confirm the claims to nobility, and to superintend the advancement and rewards of civil officers throughout the empire.

The synod, or, as it is officially called, the most holy directing synod, is the supreme administrative and judicial court for all ecclesiastical affairs of the Greek religion. Its decisions are subject to the control of the emperor as head of the church.

The administration of the country is conducted by the following ministries:—

1. Ministry of the Imperial household.
2. Ministry of foreign affairs.
3. Ministry of interior affairs, or home department.
4. Ministry of war.
5. Ministry of marine.
6. Ministry of national education, to which is attached the administration of the ecclesiastical affairs of those sects which do not belong to the Russian church.
7. Ministry of finance.
8. Ministry of justice.
9. The board of control of the empire, which audits the accounts of all moneys expended for the public service.
10. Ministry of the post department.
11. Ministry of the general direction of land and water communication.

The governments or provinces are organised in the following manner:—The head of the administration of a province is the civil governor, to whose department belong all the affairs of the province except judicial cases; but although he cannot decide judicial cases, he may compel the judges to hasten the decision of an affair. No criminal sentence can be executed without his confirmation. There is also one military governor for two, three, or four provinces, to whom all civil and administrative affairs are referred.

The vice-governor is the head of the financial department of the province, and he supplies the place of the governor in case of his absence.

The government procurator is appointed to observe that the laws are strictly fulfilled, and he may in case of irregularity suspend the execution of a judicial sentence, and report the case to the minister of justice. On account of his extensive powers, he is called the eye of the monarch.

The tribunals or courts of appeal try civil and criminal cases, and the members of them are, as we have said, elected by the nobles.

The conscientious tribunal (*soviestneey sud*) is composed of a chairman and two assessors elected from the nobles, two assessors from the merchants, and two from the peasants. This court hears those criminal cases where the crime was committed more from a concurrence of unfortunate circumstances than from malice; consequently all crimes committed by minors and lunatics, as well as cases of witchcraft, because they are supposed to originate from folly, ignorance, and delusion, are within its jurisdiction. Parents may also apply to this court for relief against the misconduct of their children. In civil cases it endeavours to reconcile the parties who apply to it. But the most important duty of the conscientious tribunal is to prevent illegal imprisonment. If any individual addresses a petition to it, stating that he has been kept in jail three days without being informed of the charge on which he was arrested, and without having been examined, the tribunal is obliged immediately to issue an order that the person detained shall be brought before it, with a declaration of the reasons for which he was imprisoned and not examined, and this order must be obeyed within 24 hours under a heavy penalty. The jurisdiction of the court does not however apply to cases of offence against the Imperial person, high treason, murder, theft, and robbery.

The Board of Public Charities is composed of the governor of the province and some principal magistrates; its name sufficiently denotes its duties. There is a medical board in each government.

The authorities of the district have been enumerated in describing the privileges of the class of nobles from whence these authorities are elected; we must only add that there is in every district a council called the tutelage of the nobles, which is the trustee of all minors of that class. It is composed of the marshal of the nobles and of the members of the judicial tribunal of the district.

The towns have their separate jurisdiction, composed of the burgomaster and ratmans (from the German rathmänner, councilmen), who are elected from the merchants and burghers of the town. There is also a council of tutelage for minors of the burgher class.

This is a general outline of the political organization of Russia, and if this organisation had been effective, the country would have been tolerably governed. It is needless to observe that a despotic power will not interfere with established order, except in political cases, as it is interested in maintaining that order for its own preservation; but other causes prevent the good working of the Russian administration, which, particularly with respect to justice and police, is really wretched. One of the most mischievous defects is the insufficient pay of magistrates, of whom the highest, *i.e.* a senator, receives 160*l.* a-year. It is true that many senators are men of property; but there are many who have nothing more than their pay, which is also the case with the majority of the civil officers. Bribery is the universal plague of the Russian administration.

Laws.—Yaroslav I. promulgated at Novgorod a code of laws evidently of Teutonic origin. But the dominion of the Tartars entirely changed the character of the laws of Russia, introducing death, mutilation, and torture, instead of the ordeal and fines.

In 1497, Ivan III. made an order for collecting into one body the existing customs and ordinances, and rendering the collection complete by the necessary additions. By order of Ivan the Terrible, this code was (1550) revised and completed under the name of *Sudebnik*, or judgment-book. The Czar Alexey Michaelovich gave orders (1640) for composing a general code of laws under the name of *Ulogenie* (Regulation). It consists of 25 chapters, and still forms the basis of the Russian law. Since that time the Russian legislation has been continued by *ukases*, *i.e.* ordinances issued either in the name of the monarch himself, or of the senate; and their number from the 25th Jan., 1649, to the demise of the emperor Alexander, is 30,920, including all kinds of statutes,* regulations, and treaties. Peter the Great had a project for collecting the separate ordinances into one body, and remodelling the Ulogenie of 1649; and for that purpose he established a commission in 1700, which however produced no effect. The empress Elizabeth appointed (1754) one general and several special commissions for the purpose of making laws 'clear, intelligible, and adapted to the progress of the times.'

These commissions prepared three codes, relating respectively to procedure, criminal law, and the different conditions of the inhabitants. These codes were not however sanctioned by the supreme authority, and the commissions dissolved of themselves. Catharine II. published her celebrated instructions for the composition of a code of laws, and appointed new commissions for that purpose. These commissions, which framed some projects of laws, were dissolved in 1774. A commission for the same object appointed by the emperor Paul (1797) had no better success. Under the reign of Alexander, the legislative labours were again resumed (1804). New instructions were published, and several foreign lawyers were nominated correspondents of the legislative commission, which received a new organization; but all these labours produced no result. These commissions cost the treasury, from 1754 to 1826, 5,678,935 francs, and did not even effect a complete collection of the existing ordinances. Each of the commissions began its labours anew, instead of continuing what was done by preceding commissions. Many superior officers of state were members of these commissions, but being occupied with other affairs, they could not give the necessary attention to their legislative labours, and as the members were frequently changed, it was some time before new members became well acquainted with their subject. Opinions also frequently varied as to the real object of the undertaking: sometimes their labours were directed to the accomplishment of a simple collection and arrangement of the existing laws and ordinances (code de concordance), and sometimes it was contemplated to effect a reform in legislation. Immediately after his accession, the emperor Nicholas declared that a systematically arranged collection of the existing laws and ordinances should become the basis of legislation, and he transformed the legislative commission into the second section of the imperial chancery, under the presidency of the celebrated Speranski. [SPERANSKI.] The result of this measure was a collection of all the laws and ordinances from 1649 till the death of the emperor Alexander, 1st December, 1825, which were published in 48 vols. 4to., 1827-30. It was followed in 1832-33 by a collection of the ordinances of the emperor Nicholas, from his accession to 1832, in 8 vols. 4to., and is still continued. These two collections contain 32,993 laws, from which was extracted the *Svod Zakonow* (corpus juris), published 1826-1833, 15 vols., which was declared by an imperial ukase, 31 January, 1831, to be the law of Russia wherever the provincial laws are not opposed to it, and that it should become valid from the 1st January, 1835.* This svod is a systematic arrangement of single laws, in eight parts or codes. The 1st comprehends the fundamental law of the state, the law of the imperial family, and the organization of the authorities of the state; the 2nd, the public services, *i.e.* military service and statute labour (corvée); the 3rd, the administration of the finances; the 4th, the different classes of the inhabitants; the 5th, civil law; 6th, internal administration, industry, municipalities, &c.; 7th, police; and 8th, public law. These eight codes contain 1499 chapters, and about 38,000 articles. Together with each article is indicated the ordinance from which it is taken, and its connection with other ordinances is given in notes. An historical sketch of the Russian legislation is prefixed to the work. For further information consult *Précis des Notions Historiques sur la Formation du Corps des Lois Russes*, St. Petersburg, 1833.

RUSSIAN CHURCH. The Russian church is a branch of the Eastern or Greek church, whose missionaries seem to have penetrated among the Slavonian population that inhabited the countries to the north of the Black Sea at an early period. The commercial intercourse which Cherson and other Greek colonies on the northern shores of the Black Sea maintained with the Slavonians, facilitated the diffusion of Christianity among them. The number of Slavonian converts must have been considerable towards the end of the 9th century, as the Byzantine writers, about the year 900, mention the diocese of Russia. The expeditions of the Varego Russian princes of Kiew against the Greek empire greatly contributed to the progress of Christianity. Among their subjects, the princess Olga went, in 955, to Constantinople, in order to be baptised. Her example was not followed by her son Sviutoslaf, who continued in the idolatry of his ancestors, although he did not persecute the doctrines nor prevent his mother from building churches. A popular commotion against the Christians, in 980, at Kiew, proves that their number was already sufficiently great to excite the jealousy of the pagans; and in 988, Vladimir the Great, grand-duke of Russia, was himself baptised by Greek missionaries. He also married the sister of the Greek emperor, and introduced Christianity into his dominions. The pagan idols were destroyed by his command, but idolatry was not completely eradicated in Russia till the 12th century. The first metropolitan of Kiew was instituted about 900, by the patriarch of Constantinople. From that time the metropolitans of Kiew, who presided over all the churches of Russia, were consecrated at Constantinople, and generally chosen from among Greeks. After the capture of Constantinople by the Latins, when the seat of empire, as well as that of the patriarch, was transferred to Nicæa, the metropolitans of Russia were consecrated in that city until the expulsion of the Latins, when things returned to their antient order

The popes made several attempts to extend their supremacy over the Russian church, and there seems to have been some intercourse between Rome and Vladimir the Great, as the patriarch of Constantinople urged that prince to break off every correspondence with the pope. The grand-duke Jsiaslaf being expelled from his throne, in 1073, by his brother, sought refuge at the court of the emperor

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* Several acquired provinces have retained their former laws for civil cases, but criminal cases are judged according to the Russian laws

* It has not yet been put into execution.

Henry IV., and sent his son to Rome, in order to interest Gregory VII. to restore him to his country, on which he promised to submit to the papal dominion, spiritual as well as temporal. Gregory wrote a letter in 1078 to the brother of Jsiaslaf, and admonished him to relinquish the sovereignty which he had usurped. The papal admonitions produced no better result than the imperial remonstrances to the same effect, and Jsiaslaf having recovered his throne after the death of his brother, thought no more about the pope. The chronicles mention different attempts of the Roman see to establish its dominion over Russia, but we are left in doubt whether these negociations were attended with any result. One circumstance seems to imply that the popes possessed some influence at Kiew, about the end of the 11th century, as Ephraim, a learned Greek who occupied the metropolitan see of that town from 1070 to 1096, introduced into the Russian calendar, under the 9th May, the commemoration of the translation of the reliques of St. Nicholas from Lycia to Bari in Italy; a feast which is unknown in the Greek church, but is observed by that of Rome. It is very possible that before the separation between the Western and the Eastern churches was completed by Michael Cerularius, the metropolitans of Russia were sometimes wavering in their obedience between Constantinople and Rome. The papal power however never gained a permanent footing in the Russian territory, although that of Halich, situated between the Roman Catholic countries Poland and Hungary, was the object of its unceasing efforts. The Hungarians having, in 1214, occupied the principality of Halich, endeavoured to subject its church to the supremacy of Rome, but their expulsion from the country destroyed all hopes of that connection. Daniel, prince of Halich, who was equally distinguished as a warrior and as a politician, thought that he might derive some assistance from the pope against the Mongols, to whom he was obliged to pay tribute and do homage in the camp of their khan. He therefore opened a negociation in 1247 with pope Innocent IV., who sent a legate to receive the submission of Daniel and that of the church of Halich, to which he promised permission to retain all such customs and observances as would not be in direct opposition to the doctrines of the church of Rome. Daniel hesitated a long time, but at last, in 1254, he accepted a crown and the other insignia of royalty from the pope. He was crowned by the legate as king of Halich, and formally acknowledged the supremacy of Rome. But as the promised assistance did not come, he broke off his connection with the pope in 1257.

The invasion of the Mongols, and the consequent subjugation of Russia, had great influence on the ecclesiastical condition of that country. Many churches and monasteries were destroyed, and the clergy massacred during the invasion of the Mongols, but as soon as they had permanently established their dominion in Russia, they sought to strengthen their power by gaining over to their interest the clergy of the subjugated country. In consequence of this policy the khan of the Mongols declared that all individuals connected with the church establishment should be excepted from the rolls on which the population of the conquered country was registered for the capitation-tax, in the years 1254 and 1255; and in 1257 the same khan, by his yerlik, or letters-patent, granted to all the Russian clergy, and to all persons connected with the churches, as well as their families, complete exemption for their persons and property from all taxes or services paid or rendered to him by the inhabitants of Russia. A Russian bishop was always resident at Saray, the capital of the khans, by whom those prelates were sometimes employed in offices of high trust; thus the Bishop Theognost was sent, in 1279, by the Khan Mengutemir as ambassador to the Greek emperor, Michael Palæologus.

The favourable position which the Russian church enjoyed under the dominion of the Mongols, and subsequently under that of the Tartars, increased its wealth and influence. Many persons sought refuge from the universal oppression of their barbarous masters by entering the church, while many others, in order to secure the possession of their estates, made grants of them to the church, from which they received them back as tenants.

Kiew was destroyed by the Mongols in 1240, but the authority of the khans being never so firmly established in the western as it was in the eastern principalities of Russia, the former were constantly distracted by disturbances. This circumstance induced Maxim, the metropolitan of Kieff, to transfer his see, in 1299, to Vladimir on the Klasma, the capital of the grand-dukes of Russia, chief vassals to the khan, under whose protection the head of the Russian church enjoyed perfect security.

Kiew and many other principalities of Western Russia were united with Lithuania in the fourteenth century. [LITHUANIA.] The metropolitans of Vladimir, who afterwards transferred their residence to Moscow, endeavoured to maintain their supremacy over the churches of Lithuania, and for that purpose sometimes went to reside in that country. Yet notwithstanding all their efforts, the separation between the churches of Moscow and Lithuania was continually increasing, and it was completed in 1415, when the bishops of Lithuania, assembled at Novogrodek, elected Gregory Zamblak metropolitan of Kiew, whose successors continued independent of Moscow, and acknowledged only the supremacy of the patriarch of Constantinople, as long as they remained under the dominion of Poland, with which Lithuania was finally united. Since that epoch there have been two independent Russian churches, the Russian church of Muscovy and that of Poland.

The church of Muscovy was governed by its metropolitans, who either received their consecration from the patriarchs of Constantinople, or were only approved by them. The metropolitan Isidore, a learned Greek, went from Moscow to assist at the council of Florence, in 1438, where he subscribed to the union with Rome. He returned to Moscow in 1439, with the dignity of cardinal, and invested with the authority of a legate; but he was deposed and imprisoned in a convent, whence however he succeeded in escaping, and died, at an advanced age, at Rome. After the capture of Constantinople by the Turks, the metropolitans of Moscow were elected and consecrated without any reference to the patriarch of Constantinople. In 1551 a general synod held at Moscow enacted a code of ecclesiastical laws, called *Stoglav*, that is, the hundred chapters.

In 1588, Jeremiah, the patriarch of Constantinople, came to Moscow, in order to get pecuniary assistance for his churches. The assistance was liberally granted by the devout Czar Fedor Ivanovich, and Jeremiah consecrated the metropolitan of Moscow as patriarch of Russia. These patriarchs enjoyed extraordinary influence, not only in ecclesiastical but also in temporal affairs; their consideration was increased by the public marks of respect which were shown to them by the czars, who on every Palm Sunday led the ass on which the patriarch rode through the streets of Moscow, in commemoration of the entrance of our Saviour into Jerusalem. Under the Czar Alexey the church was disturbed by the rise of many sects.

In 1682 the Slavono-Greco-Latin academy, the first ecclesiastical high school that was founded in Russia, was established, by the Czar Fedor Alexeyevich. After the death of the patriarch Adrian, in 1702, Peter the Great abolished that dignity, proclaimed himself the head of the Russian church, and established a supreme council for ecclesiastical affairs, under the name of the 'most holy synod.' Peter also ordered schools to be established in every episcopal see, and declared that the convents should not acquire any more estates, either by gift or purchase; he subjected the estates of the church to the general taxation, and introduced many reforms into the organization of the church. In 1764 the Empress Catharine confiscated all the estates of the church, which contained above 900,000 male serfs, and assigned pensions to bishops, convents, &c. Several ecclesiastical seminaries and schools were established during the reigns of Catharine, Paul, and Alexander, and their organization was fixed by an ukase of 1814.

Such is a brief sketch of the history of the Russian church of Muscovy, which must be completed by a similar sketch of that of Poland.

It has already been said that the Russian or Greek church of Poland was completely separated from that of Moscow in 1415, by the election of a metropolitan of Kiew, who became the head of the church of Poland. His authority extended over the Russian population of Lithuania and the principality of Halich, which was united with Poland in the fourteenth century, and accordingly comprehended the dioceses of Kiew, Chernigow, Turow, Smolensk, Polotsk, Lutsk, Chelm, Vladimir, and Leopol. Although the dominant religion of Poland was the Roman Catholic, the privileges of the Russian church were secured by several enactments, and its followers enjoyed equal rights with those of the Roman Catholic church. The faith of the Russian church was professed not only by millions of the common people, but also by a great number of nobles, among whom there were many of the first families of the land, and even several branches of the royal house of the Jagellons, such as the Czartoryski and Sanguszko.

The Russian clergy of Poland sent a delegation to the council of Basle, but they did not come to any understanding about a union with Rome. The efforts of Isidore, metropolitan of Moscow, who passed through Poland on his return from Florence, to promote the same union, seem not to have been attended with any success. Yet although the Russian church of Poland opposed a union with Rome, it was, notwithstanding the community of dogma, equally adverse to a connection with the church of Moscow, and all the efforts of the latter to establish its influence over that of Poland proved abortive. As an instance of the hostility which existed between these two churches, we may mention that Kiew was pillaged in 1484, by the khan of the Crimea, at the instigation of the grand-duke of Muscovy, to whom the khan sent as a present a part of the church-plate.

In 1509 the Russian church of Poland held a general synod at Vilna, in which it enacted many important regulations. Several bishops of the same church, who assembled at a synod in 1594, at Brest in Lithuania, proposed a union with Rome. This project was zealously supported by Sigismund III., king of Poland, as well as by the Roman Catholic clergy of that country. A delegation of these bishops went to Rome, where they subscribed the union of Florence of 1438, which after their return was confirmed by a new synod convened in Brest in 1596. Many clergymen however and a great part of the nobles belonging to that church, with Prince Ostrogski, the most powerful grandee of Poland, at their head, rejected the union, and the opposite parties mutually excommunicated each other. The anti-Roman party sought to effect a union with the Protestants at a meeting held at Vilna in 1599, but the project failed, chiefly through the clergy, who wished the Protestants to submit to the patriarch of Constantinople.

Poland enjoyed a high degree of civilization at a time when Muscovy was still in a barbarous state of ignorance. It was therefore natural that the Russian or Greek church of Poland should be very superior in learning to that of Muscovy. Its first book of prayer was printed at Cracow in 1488; but the first book (the *Acts*) was not printed at Moscow till 1564. The printers were however obliged to leave Moscow, where their art brought upon them the suspicion of heresy, and they retired to Poland, where they printed several books for the use of the Russian church. In 1581 prince Ostrogski, palatine of Kiew, caused the whole Bible, in Slavonian, to be printed on his estate of Ostrog. This book, which is well known to bibliographers, was reprinted several times. An ecclesiastical academy was established at Kiew in 1633, by the metropolitan Peter Mohila [GREEK CHURCH], and its privileges were confirmed by Vladislav, the fourth king of Poland, and the diet. This academy, founded on the model of the Roman Catholic establishments of that kind, diffused a considerable degree of learning among the clergy of the Russian church of Poland; and Peter the Great, as well as his predecessor Fedor, was obliged to invite from that country learned divines and teachers, in order to improve the intellectual condition of his own church.

The party which had subscribed to the union with Rome was supported by the king and the influence of the Roman Catholic clergy. This party grew every day stronger, and oppressed its opponents, who convened a synod at Kiew in 1623, in which they elected bishops in opposition to those who had subscribed to the union. From that time a double hierarchy has existed in the Russian church of Poland,* and this division has led to the most melancholy political consequences. [POLAND.] The anti-unionist party however gradually submitted to the supremacy of the pope, and only one diocese, that of Mohilew, remained under the obedience of the patriarch of Constantinople, and it was seized by Russia at the first dismemberment of Poland in 1772.

Catharine II. and Paul endeavoured to force the united churches of the incorporated Polish provinces to renounce their union with Rome, and to acknowledge the spiritual supremacy of the monarchs of Russia. Their attempts had partial success among the churches which had only recently formed this union, while those which had effected it at an earlier period persisted in their connection with Rome, notwithstanding the persecution to which they were exposed. Under the emperor Alexander the persecution was discontinued; but under Nicholas, in 1839, the bishops of the united church being prevailed upon to sign a renunciation of their obedience to Rome, all the churches of their dioceses were by an imperial ukase ordered to do the same, and a great number of clergymen who opposed this measure were transported to Siberia.

Present State of the Russian Church.—The emperor is the head of the church, the affairs of which are administered by a supreme council, called 'the most holy governing synod,' composed of ecclesiastical and lay members, whose number is not limited. The body usually consists of two metropolitans, two bishops, the chief secular priest of the imperial staff, and of the following lay members:—the procurator or attorney, two chief secretaries, five secretaries, and a number of clerks. The procurator has the right of suspending the execution of the decisions of the synod, and of reporting any case to the emperor. The synod decides all matters relating to the faith and the discipline of the church, and generally performs the functions of the ecclesiastical courts of this country. It has also the superintendance of the administration of the dioceses, from which it receives a report twice a year of the state of churches, schools, &c., as well as the register of births, marriages, and deaths.

The Russian church contains forty dioceses, divided into three classes: the first (containing four dioceses) is governed by metropolitans, the second (sixteen dioceses) by archbishops, and the third (containing the remaining dioceses) by bishops. All those prelates who are comprehended under the general appellation of archiyerey, differ only in rank, and do not depend on each other, but immediately on the synod. Each diocese has a consistorial court, whence an appeal may be made to the *archiverey*, and from him to the synod.

Episcopacy is confined, as it is in the Greek church, to the monastic clergy. The highest preferment to which the secular clergy can attain, is the rank of chief priest of the Imperial staff, and the individual who occupies that place is generally also the confessor of the sovereign; and, as already observed, he has a voice in the synod. The ecclesiastical law of Russia is the Greek Nomocanon, with the addition of some ordinances issued on several occasions.

There are four ecclesiastical academies in Russia, at Moscow, St. Petersburg, Kiew, and Casan, besides numerous seminaries. All the sons of the clergy must be educated in these seminaries, many of which contain colleges, called burses, in which the poorer students are maintained gratis. This compulsory system of education has had the effect of making many of the sons of clergymen the most learned men in Russia. The clergy form a kind of separate body in Russia, and it is a very rare occurrence that a person belonging to another class enters the church. The sons of clergyman are, as a general rule, obliged to follow the profession of their parents, and they must obtain a licence before they can adopt any other profession. This licence however has been easily granted, and is become a mere formality, and we believe the practice of obtaining it is now abolished or disused.

Dissenters.—There are numerous dissenters from the Russian church, generally called *Raskolniks*, from the Russian verb *raskolot*, to 'split,' which signifies dissenters or schismatics. The beginning of this dissent dates from the introduction of Christianity into Russia. In 1003, fifteen years after the establishment of Christianity in Russia, a monk called Andrew attacked the hierarchy, the worship of images, and some other doctrines of the Eastern church; but he recanted his opinions, and returned into obedience to the established church. Nicephorus, metropolitan of Kiew (1122-26), imprisoned an individual called Demetrius for spreading heretical opinions. An Armenian monk named Martin (about 1150), in a work called *Prawda*, i.e. the truth, attacked the established church, but rather in its liturgy than its dogmas. He taught that the religious processions should begin their march from the north to the south, and not contrarywise, as is usual with the Greek church; that hallelujah should be repeated at the end of psalms twice instead of thrice; but he insisted particularly that the sign of the cross should be made with two fingers (which is the Armenian manner), and not with three, as is prescribed by the established church, being, as some pretend, typical of the trinity. However unmeaning these differences may appear, they are very remarkable, because they constitute, even now, among the great majority of Raskolniks, their chief grounds of opposition to the established church. The doctrines of Martin were condemned by a synod in 1157, and he was himself sent to the patriarch of Constantinople, before whom he recanted, and became reconciled to the church. His doctrines were however preserved by a small number of followers, and re-appeared with great force at a later period.

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* The expression, 'Russian church of Poland,' may appear strange to those who are not sufficiently conversant with the history of that country. It must therefore be remembered that the Polish empire was composed of three nations, Poles, Lithuanians, and Russians, and that the last are not to be confounded with the inhabitants of Muscovy, the sovereigns of which assumed the title of the monarchs of Russia only at a recent epoch.

An individual called Seit preached some heretical tenets in 1312. All we know of them is, that an assembly of bishops at Pereyaslaff, in 1313, condemned those tenets and severely punished their author.

In 1375 a citizen of Novgorod called Karp Strigolnik accused the clergy of simony, on account of the custom then established in Russia, of the bishops receiving payment for conferring holy orders. At the same time he rejected confession to a priest. He had many partisans, and a contest between them and the supporters of the established church ensued in the streets of Novgorod. Strigolnik's party was defeated, and himself, with some of his principal adherents, thrown into the river and drowned. The rest however survived, and must have attained considerable importance, as the patriarchs of Constantinople several times addressed the bishops of Russia on that subject. The republican institutions of Novgorod and Pskov seem to have prevented any severe persecution against those sectarians; and it was only when these states fell under the dominion of Moscow that the Strigolniks were obliged to seek refuge in the border provinces of Sweden and Poland, where they still continue to exist, though under different names.

Towards the end of the fifteenth century, the so-called Jewish sect produced a great stir in the Russian church. Its origin is ascribed to a Jew named Zacharias, who is described as an astrologer and necromancer, and who came from Poland to Novgorod about the year 1470. He began to teach secretly that the only divine law is that of Moses; that the Messiah was still to come, and that the worship of images was a sin. He made his first converts among clergymen and their families, who became so zealous in their new persuasion, that they desired to receive circumcision. But Zacharias persuaded them not to discover by such an act their real sentiments, and to conform outwardly to the Christian religion. The clergymen followed this prudent advice, and strictly performed the duties of their calling. The number of proselytes considerably increased, chiefly among the clergy and some principal families of the town.

These sectarians covered their real opinions with such a display of zeal in the rigid observance of the precepts of the church, that they acquired a great reputation for sanctity. Two of them, Alexis and Dionysius, were accordingly transferred to Moscow, in 1480, by the grand-duke Ivan Vasilovich, as priests to two of the principal churches of the capital. Alexis advanced high in the favour of that monarch, to whom he had free access, which was a rare distinction. This circumstance gave him great facilities for propagating his opinions, and he made many proselytes, the principal of whom were the secretary of the grand-duke, Theodor Kuritzin, who was employed on several diplomatic missions; and Zosimus, the archimandrite of the convent of St. Simon, whom the grand-duke, on the recommendation of the same Alexis, raised to the dignity of metropolitan of Moscow. Thus the head of the Russian church was secretly its bitterest enemy.

Alexis died in 1489, and it was only after his death that his opinions became known. The grand-duke then declared that he remembered some very strange mysterious words of Alexis. It is also said that he confessed that his daughter-in-law Helena, daughter of Stephen the Great, prince of Wallachia, was seduced to the Jewish sect by a disciple of Alexis. The existence of this sect was discovered by Gennadius, archbishop of Novgorod, who sent to Moscow several priests accused of having insulted the cross and the images of the saints, of having blasphemed against Christ and the Virgin, and denied the resurrection of the dead. A synod was assembled at Moscow in 1490, in order to try these heretics. The metropolitan Zosimus presided, whose participation in their tenets, as well as that of the secretary Kuritzin, was not then discovered. The accused denied the charge, but sufficient evidence was brought forward to prove the fact. The bishops wished to punish the heretics severely, but the grand-duke opposed them, and declared they should only be anathematised and imprisoned. This leniency is indeed astonishing, if we consider the barbarity of the age, as well as the cruel temper of the monarch; and it must be ascribed either to the importance which was attached in those times to the anathema of the church, which the grand-duke considered a sufficiently severe punishment, or, which is more probable, to the influence of the secret abettors of that sect. The archbishop of Novgorod punished many of them with more severity.

Theodor Kuritzin and other adherents of the sect continued to propagate its doctrines, and to increase the number of its followers, particularly by teaching astrology. This began to spread a spirit of doubt and inquiry among many people; and clergymen and laymen were constantly disputing about the dogmas of religion. The sectarians were protected by the metropolitan Zosimus, who is accused of having persecuted the orthodox clergy.

The details about this sect are contained in a work by Joseph, hegumenos or abbot of the convent of Volokolamsk, who died in 1516, and who was the most zealous adversary of this sect. He boldly accused the metropolitan of being a supporter of these heretics. Zosimus resigned his dignity in 1494, and retired into a convent. Many reasons were assigned for this, but the fact is that he was not compelled to do it on account of his heresy. It may be that the grand-duke wished to avoid the scandal which would have been caused, if the heterodoxy of the head of the church was proved, or perhaps he disbelieved the accusations of his enemies. There are some grounds for the latter supposition, as the same Joseph laments the lukewarmness of the grand-duke in one of his letters. The persecution ceased for some time at Moscow, but the archbishop of Novgorod continued it in his diocese, whence many sectarians fled to Germany and Poland. In 1503 the representations of the clergy, which were supported by this Joseph, induced the grand-duke to issue an order for the trial of the heretics. They were tried before an ecclesiastical court, of which Joseph was a member and their chief accuser. The heretics acknowledged their opinions, and maintained them to be true. They were condemned, and some of them publicly burnt; others had their tongues cut off, and many were shut up in prisons or in convents.

Nothing more has been heard of the sect since the date of 1503, but there now exists among the Raskolniks of Russia a sect which observes the Mosaic rites, and it is very probable that it is derived from the sect which we have described.

The principal dissent in the Russian church was caused by the emendation of the corrupted text of the Slavonian version of the Scriptures, and other sacred books in the same tongue, which are used by the Russian church. The text of these books, transcribed by ignorant copyists during the dark ages of the Tartar domination, was disfigured by omissions, and still more by the additions with which some ignorant transcribers attempted to supply the omissions. The necessity of correcting such defects was represented by the metropolitan to the czar Vasil-Ivanovich, who, in 1520, requested the Greek convent of Mount Athos to send him a person competent to compare the Slavonian sacred books with the Greek texts from which they were translated. A Greek monk named Maxim, thoroughly conversant with the Greek and Slavonian languages, was sent to Moscow. He began his labours with great zeal, and continued them for ten years; but he was accused by the ignorant clergy of Moscow of heresy, and was shut up in a convent, where, notwithstanding all his protestations of orthodoxy, he remained till his death in 1555. The necessity of amending the corrupt text was acknowledged on several occasions; but it was only under the czar Alexey Michaelovich that this measure was carried into execution. In 1654 a council was assembled at Moscow, in which Nicon, the patriarch of Moscow, presided. It was composed of thirty-six bishops, and the patriarch of Antioch. It decided unanimously on the necessity of revising the corrupt text of the Russian sacred books. This decision was approved by the patriarch of Constantinople; and the czar made an order that there should be collected from all the libraries of his empire manuscript copies of the sacred books, and he received above five hundred copies of the Greek texts from Mount Athos. The patriarchs of Alexandria and Antioch, and several bishops of the East, sent many manuscripts to Moscow on this occasion. This important affair was suspended for some time by a quarrel between the czar and the patriarch Nicon, who was deposed by the synod assembled at Moscow in 1660. This synod, in which the czar presided, was composed of the patriarchs of Alexandria and Antioch (who were also mandatories of those of Constantinople and Jerusalem), the new patriarch of Moscow, fourteen metropolitans of Russia and the East, eight archbishops, five bishops, twenty-five archimandrites, six hegumeni (abbots), and fifteen protopapas. It continued and completed the revision of the texts of the sacred books according to the antient copies.

The solemnity with which this reform was carried into effect did not ensure the general approbation of the Muscovite clergy and nation; many of the more ignorant declared it to be an heretical innovation, and loudly declaimed against the heresy of the Niconians, as they called—after the name of the patriarch, whom they justly considered as the first mover of this measure—those who received the revised books. The leaders of this party generally belonged to the lower clergy, with the exception of the bishop of Kolomna, who also strenuously opposed the introduction of the revised text, and was in consequence deposed from his dignity, and exiled to a distant convent, where he died in confinement; the Raskolniks consider him as their first martyr.

But this fanaticism soon spread wider, particularly in the northern provinces. Both clergymen and laymen opposed the Niconian heresy, as they designated the use of the revised books. A terrible persecution now arose, and blood was shed in many places. The fortified convent of Solovetzk, situated on an island in the White Sea, declared for the unrevised text, and became thenceforward the stronghold of the anti-reformers, who bravely defended themselves against the forces of the czar; and, after a seven years' resistance, were reduced in 1675, when the monastery was taken by storm. Many of the besieged threw themselves into the flames, and voluntarily perished. In some places, many of the adherents of the old books shut themselves up in their churches, and others in their houses or barns, and then setting fire to them, perished; firmly believing that they should obtain salvation by what they called the baptism of fire, and that their souls would immediately rise to heaven in the shape of doves. Others to escape persecution fled to Poland, where they formed large settlements. Some even sought refuge in the Turkish dominions, where they settled in considerable numbers on the right bank of the Danube.

The revolt of the Cossacks under Stenko Razin (Alexey Michaelovich), who filled the south-east of the Muscovite dominions with carnage, gave the anti-reformers an opportunity of retaliating on the ruling party. Accordingly they joined the standard of the rebel, and committed the greatest excesses. It was a natural consequence that when the insurrection was quelled, the severity of their persecution should be increased. This persecution, which was continued under Feodor, the son and successor of Alexis (1676-82), and also during a part of the reign of Peter the Great, produced dangerous riots even in the capital itself. At last, in 1702, Peter the Great issued a ukase granting toleration to the sectarians, but subjecting them to a peculiar tax, and directing that they should wear a medal of copper stamped with a beard.

These adherents of the old text, who are designated by the general appellation of Raskolniks, or dissenters, call themselves *Starovertzee*, which signifies 'those of the old faith.' The name which is now usually applied to them, even officially, is that of *Staroobradtzee*, that is, 'those of the old rite.' But although these appellations are in general indiscriminately applied to all those who dissent from the established church of Russia, yet there are essential differences of opinion among them, both in respect of tenets, ceremonies, and discipline. One great division consists of the *Popovshcheena*, or those who have priests; and another of the *Bespopovshcheena*, or those who have no priests. This latter class comprehends a great variety of sects, most of which have no common characteristic except the absence of ordained priests.

The *Popovshcheena*, or those who have priests, approach nearest in doctrine and ceremony to the established church, from which they differ on the following points:—They reject the revised text of the Bible and of the Liturgy, and use only such as are literally transcribed or reprinted from the unrevised text. In making the sign of the cross they use two fingers instead of three; they repeat the *Hallelujah* only twice, after which they say 'Praise be to the Lord.' They begin their processions, not as prescribed by the established church, from the right to the left, but from the left to the right. They reject the usual form of the cross. They never shave their beards, considering it as a deadly sin, and they support their opinions by reference to the council or general synod of Moscow, held in 1551, which declared that—'Of all the heresies which are punishable by excommunication, none is more damnable and criminal than to shave the beard. Even the blood of the martyrs is unable to purify such guilt; consequently whoever shaves his beard for human considerations violates the law, and is an enemy to God, who has created us after his own image.' They also observe other prohibitions of this synod, which condemned as sins driving with one pole, eating hares, sausages, &c. They also consider the use of tobacco and snuff as unlawful. Indeed before the time of Peter the Great the use of tobacco and snuff was visited in Muscovy with several legal penalties.

Although the *Popovshcheena* consider the established church as involved in heretical errors, still they hold that the ordination of its priests is valid, although conferred by heretical bishops, because it descends in an uninterrupted succession from the times of the true church, that is, before the revision of the books. This opinion agrees with that of the church of England respecting the ordination of the Roman Catholic clergy, which it considers to be valid on account of the apostolical succession, notwithstanding the errors of the Romish church. In consequence of this doctrine the Russian dissenters admit priests who have been ejected by the established church, which is generally done for their bad conduct.

It has been already mentioned that at the time of the persecution great numbers of the Raskolniks fled from the country. Many of them settled in the Ukraine, which was then a kind of independent country, having recently acknowledged the czar of Muscovy rather as a protector than as a sovereign. They also formed extensive settlements along the frontiers of Poland, and many settled in the interior of that country. They built churches, and founded monasteries and nunneries, which were soon filled with inmates from the most distant parts of Russia. The most celebrated of these was Vietka, situated within the Polish dominions, not far from the Russian frontiers. It stands on a small island formed by the river Sosha, which falls into the Dnieper about forty miles below. This settlement was founded about 1690, by emigrants from the north of Russia, and being favoured by the landowner on whose property it was established, became so flourishing that it contained no less than 30,000 inhabitants. This community soon acquired a great celebrity among all the Raskolniks scattered through Russia, Poland, and the Turkish dominions; and the followers of the creed flocked from all parts to that place, which they considered as the fountain-head of the true doctrine. The monasteries and nunneries received inmates from the most distant parts, from the shores of the White Sea and the banks of the Don, and the society was constantly enriched by large donations. This prosperity excited the jealousy of the Russian government. It first offered them (in the years 1733 and 1734) an amnesty, toleration, and lands for a settlement. But the Raskolniks preferred the Polish government, and declined the offer. The Russian government, finding that all its efforts to induce them to quit the Polish dominions were ineffectual, resolved to obtain by force what it could not obtain by policy. Notwithstanding the peace then existing with Poland, an expedition consisting of five regiments of infantry, one of dragoons, and two of Cossacks, secretly passed the Polish frontier, and surrounded the settlements of Vietka. The churches and monasteries were destroyed, the inhabitants carried by force into Russia, many of them sent to Siberia, and their priests were confined in monasteries, and even the bodies of their saints disenterred and burnt. This event happened in the year 1735, under the reign of the empress Anne, and the community of Vietka was thus dispersed.

But scarcely had two years elapsed when the Raskolniks again began to assemble at Vietka, and five years after the place was entirely rebuilt, and became more flourishing than ever. The persecution which it had suffered gave it the reputation of sanctity; and the numbers who flocked thither to settle, or sent donations to support the settlement, were greater than before. The community of Vietka must have been indeed prosperous, when, in 1758, its convents contained 1200 regular monks, not including lay-brothers.

The Russian government again held forth promises of protection, in the hope of inducing them to return to Russia. But these promises producing no better effect than the former, it had again recourse to violence. In 1764 another inroad was made, and the scenes of 1735 were re-enacted. Twenty thousand persons were carried away, and, almost without exception, sent to Siberia as colonists. Notwithstanding these repeated outrages many of the sect remained at Vietka and in its vicinity, but Russia made no more attempts to compel them to return, inasmuch as by the partition of 1772 it became master of that part of the Polish dominions.

A great number of sects are comprehended under the general appellation of *Bezpopovshcheena*, or those who have no priests. The most important of these sects is that of the *Pomoranes*, which signifies 'the inhabitants of the sea-coast,' because it originated on the shores of the White Sea. They are also called *Anabaptists*, because they baptise afresh all those who become their converts. They maintain that all priests of the established church ordained since the time of the patriarch Nicon, are falsely so called, and that baptism administered by them is a profanation; that marriages solemnised according to the rites of the same church are invalid, because there are no longer any true priests to give the nuptial benediction; and they conclude and dissolve marriages at will: that churches are the houses of the Antichrist, whose reign has already commenced, although, being himself invisible, he reigns only in spirit. They confess one to another; they administer the sacrament to themselves; and the bread which they use on that occasion is said to be derived from some consecrated loaves saved from the convent of Solovetzk, which, as we have already mentioned, was for a considerable time the stronghold of these sectarians, but was taken in 1675 by the troops of the czar. This consecrated bread is multiplied by working the fragments of it with a new paste, and the loaves thus prepared are considered as holy as the originals. The sacred bread has thus descended in uninterrupted succession from loaves consecrated before the Niconian heresy, that is, before the revision of the Liturgy. Each of these sectarians is always provided with a crumb of this bread, in order that he may be able to receive the sacrament in case of emergency, and the rich are obliged to pay a high price for their portion. They have places of worship, where they assemble for prayer, and where one of the members officiates as priest; but he has no ordination, and frequently changes his ecclesiastical vocation for some other employment. There are many subdivisions of this sect, the principal of which are the Theodosians and the Philipons, who derive their appellations from the names of their respective founders, both of whom were runaway priests of the established church. The points on which they differ from one another are trifling, and relate merely to some forms of worship; and they vie in acts of the wildest fanaticism, which is particularly manifested by their inclination to commit suicide by burning themselves. They support the doctrine of suicide by the text of St. Mark (viii. 35):—'For whosoever will save his life shall lose it; but whosoever shall lose his life for my sake and the gospels shall save it.' A remarkable instance of the fanaticism of these sects occurred in the province of Archangel in 1742. A commission of inquiry sent by the government came to a newly constructed monastery which contained about fifty individuals. This convent was a large wooden building, with narrow windows, and was enclosed by a wall of timber. The commissioners were not only refused admittance, but received every kind of abuse and imprecation. They ordered the gate of the enclosure to be broken open; but as soon as the order was carried into effect, they saw the convent in flames; and the entrance was so strongly barricaded with large pieces of timber, that all their efforts to save the inmates were unavailing. But this mode of self-destruction, by which life is speedily extinguished, is much less horrible than starving to death, of which some revolting cases were reported in the official inquiries made upon the subject. It is said that persons sometimes make a vow to fast forty days, in imitation of the fasting of our Saviour in the desert; and that they are generally induced to commit such acts of fanaticism by those who succeed to their property. These unfortunate victims are locked up in a house, barn, or any other building situated in some remote and unfrequented place, and strictly watched. After a few days the poor victims repent; but all their entreaties for food or drink produce no effect on their fanatical guardians. There are many other anecdotes of a less tragical nature related of these sectarians. Some of them, after having calculated the time of the last judgment, imagined that they had found out the very day and hour. In order to meet it becomingly, they dug their graves and laid themselves therein dressed in their shrouds. Time however passed on, until the urgent cravings of nature reminded them that they were still of this world, and compelled them to resume their ordinary occupations.

Other sects differ in certain dogmas and ceremonies from the true Pomoranes, but all are united in their hatred to the established church. The members of these sects are numerous all over Russia, and many of them have settled in Livonia, Prussia, Austria, Turkey, and Poland. In 1751 they held a synod in Poland, the decisions of which, comprised in forty-six articles, display the wildest fanaticism and the grossest superstition.

The *Capitonians*, a sect founded by a monk called *Capiton*, have no places of worship, but they assemble for prayer and other religious purposes in their dwelling-houses. Like the Pomoranes, they dissolve marriages at will, and are said to live in a state of great licentiousness. One division of the sect administers the sacrament after a strange fashion. A girl fastens on her head a sieve filled with raisins; and after prayers, accompanied with frequent prostrations, she presents the raisins to the assembly. This sect is known, on account of that strange ceremony, by the nickname of *Podreshetnikee*, that is, 'those from under a sieve.'

The *Samokreshchennikee*, or 'self-baptisers,' are a sect founded by a common peasant called Roman Danilovich. They baptise themselves by repeatedly diving into a river.

The *Samostrigolniks*, that is, 'self-tonsurers' (the tonsure is considered as the ordination of a monk), are a sect founded in 1700 by Fedor Rostow and a nun called Anthusa. According to their doctrine, every one may become a monk or nun by tonsuring his or her own hair, putting on the cowl before the image of a saint, taking another name, and performing other rites usual in taking the monastic vows.

A sect founded in 1715 by a strelitz called Procopius Lupkin, and another individual of low condition named Ivan Nagoy, chooses a man to personate Christ, and a woman to personate the Virgin, and they worship them. They also employ twelve individuals to represent the apostles, &c. Great abominations are imputed to this sect, but it is impossible to know with what degree of truth.

There is a numerous sect amongst the Cossacks of the Don, called *Shchelniki*, i.e. 'Chinkmen,' because in saying their prayers they look on a chink through which a ray of light is passing. They have no images, which they reject as forbidden by the second Commandment. They never go to church, saying that God dwells not in a house built by men, but is omnipresent. They make use of the revised sacred books, in which respect they differ from all other Raskolniks.

In several parts of Poland, Turkey, and in the Russian government of Tula, there are the followers of the *Jeleenewshcheena*. The origin of this appellation is unknown, and it is probably derived from the name of their founder or some leading member. Although Russians by origin and language, they strictly observe the Mosaic law, perform circumcision, keep the Sabbath on Saturdays, and abuse the Christian religion. It may be that they are the descendants of that Jewish sect which appeared at Novgorod and Moscow at the close of the fifteenth century.

The *Molokane*, or 'milk-drinkers,' eat milk and eggs on Wednesdays and Fridays, which the established church does not permit on these fast-days, but they observe a rigid fast on Sundays. Their dogmas and ceremonies are almost unknown. They have some strangely shaped images of saints, which they carefully conceal from persons who do not belong to their sect. They are also called Soobotniki, or 'Saturday-men,' but we are unable to say whether they have any Judaic rites. On the whole the nature of this sect is very little known.

The *Ikonoborshchina*, that is, 'Iconoclasts,' reject images, and always pray in the open air. We know nothing about their dogmas.

The *Akulinovshcheena* are a sect founded by a woman of the name of Akulina. They form a kind of spiritual community. They release, by a certain formality, the monks and priests who join them from their vows, and are accused of living a life of great profligacy.

The *Choovstvenniki*, or Sentimentalists, are a sect founded by a monk called Benedict, who ran away from his convent. They require nothing more than unity among those of the antient faith (that is, who follow the unrevised books), and they teach that whoever keeps to that antient faith is in the right way to salvation, and that it matters little whether he is or is not baptised afresh, or whether he belongs to the sect which has priests or to that which has none. Their number is not considerable, and many of them incline to Deism.

The *Doochoboritzee*, or 'combatants in spirit,' are a sect which has much resemblance to the Quakers and the Mennonists. They never take an oath, and they shed no blood. They entertain Unitarian opinions, and admit only the New Testament. They have neither churches nor priests, and in their devotions make use only of the Lord's Prayer. This sect became known under the reign of the empress Anne (1730-40), at Moscow and other towns, and a commission was appointed to inquire into their tenets. Its origin is involved in darkness, and it is not improbable that it may be of very antient date. Under the reigns of Catharine II. and Paul they were persecuted, but they bore their oppression with a really Christian meekness and resignation. The emperor Alexander granted them toleration, and offered to assign them lands for cultivation in the deserts of Southern Russia. They willingly accepted that offer, and they formed, by their industry, flourishing settlements in the uncultivated but fertile steppes.

The sect of the *Bogomiles*, which was well known in the Greek empire, and of which a description is given by Mosheim and other ecclesiastical historians, is said to exist among the Raskolniks of Russia, and this circumstance leads to the supposition that some other sects comprehended under the above-mentioned appellation may have a similar origin. There are also many fanatics who inflict on themselves the same mutilation that Origen did; and frequent instances of such acts of fanaticism have recently occurred in several parts of Russia.

There are still many less important sects of the Raskolniks, which are distinguished by some absurd rites or observances. All the sects are confined to the lower classes, and, notwithstanding the progress of civilization, they are rather increasing than decreasing. This must be ascribed to their great zeal for making proselytes, and to the circumstances that any person who will join them and adopt their persuasion, submitting to all their superstitious observances, is sure of the kindest reception and support, whatever may have been his former conduct. Although they are no longer persecuted on account of their religion, they are only tolerated, and have no legal existence. Their clergy are not acknowledged by the government as such, and do not enjoy the privileges which are enjoyed in Russia not only by the clergy of all Christian persuasions, but even by Mohammedan mollahs.

The account of these sects is chiefly extracted from a Russian work, entitled 'Description of Antient and Modern Raskolniks,' &c., published under the authority of the government, by a priest of the established church, who was for a long time a member of one of those sects, and had much intercourse with different sectarians. It is however impossible to vouch for the correctness of all his statements.

RUSSIAN LANGUAGE AND LITERATURE. [SLAVONIAN LANGUAGES.]

RUST, in the common acceptation of the term, is the red pulverulent substance which is formed on the surface of iron when exposed to air and moisture. It is an oxide of iron, and in point of fact other metallic oxides may be considered as rusts of the peculiar metals which they contain; the term is however limited in application to the red oxide or per- or sesqui-oxide of iron.

RUST. [MILDEW.]

RUSTIC or RUSTICATED WORK, in Architecture, a species of decoration for walls, wherein the joints between the courses, and between the separate stones in each course, are strongly defined by sunk channels or grooves. Although an imitation of what would in itself be offensive, and therefore at first apparently quite at variance with good taste, this mode is only a legitimate, artistical, or æsthetical imitation, suggested by accident or defects. The expression, originally derived from rudeness and coarseness of execution, from large stones irregularly put together, without their edges being smoothed and fitted to each other, is here only partially retained so as to indicate boldness and strength, and also a certain attention to finish and to regularity in the symmetrical arrangement of the courses and stones. There is a studied intention manifested, which prevents our confounding the imitation with what furnished the hint for it.

Although the preceding remarks partake more of criticism than of explanation, they may have their use here, if only as serving to correct a prejudice or misconception likely to be occasioned by the term itself as expressive of rude strength to the utter exclusion of anything like refinement or grandeur, of richness or studied symmetry and regularity. In reality however rustication contributes in an eminent degree to richness of surface, and it was accordingly frequently employed by the antients—by the Romans at least, not only in those works which were characterised by massiveness and by a certain degree of rudeness, such as amphitheatres, bridges, &c., but on the exterior of temples and other edifices, on which the most finished decoration was bestowed. For not only does rusticating the face of the walls occasion contrast, and thereby tend to set off columns or pilasters to greater advantage, but the lines and shadows so produced remove that blankness which might otherwise attend too much uniform plain surface. Undoubtedly it is a very great excellence in masonry, and a great beauty in itself, when the facing of a wall is uniformly smooth and even in colour, and the stones are put together with such extreme nicety that the joints can hardly be detected. Still the beauty so produced depends in some degree on that of the material itself—on its texture and colour, for were smoothness alone a particular merit, it may be obtained either by stucco or painting; in which case the uniformity of surface and the absence of joints rather detract from than add to beauty.

Besides being different from plain masonry, rustication admits of exceedingly great variety, both in regard to design and execution, and of great diversity of character, from severity and heaviness to studied elegance. The most obvious distinction is that arising from the surfaces of the rustics, according as they are either *plain* or *rough*; and if the former, they may be either *smooth*, or *hammer-dressed*, *i.e.* left slightly chipped; else *tooled*, or with the marks of the chisel. Or if intended to be rough, the rustics may be *vermiculated*, *hatched*, or *frosted*. The first of these modes is produced by cutting deep hollows into the surface, the second by making it jagged and rugged, while the third consists in giving a delicate crispness like frost-work to the stone.

As regards *jointing*, there are two modes: one in which the channels between the stones are *grooved*, or form rectangular sinkings; the other in which they are *chamfered*, that is, the edges of the stones are bevelled off in such manner that the section of the joints forms a rectangular triangle. Neither are the above by any means all the varieties, as will be seen by some examples at the end of this article, which cannot be very well explained without cuts. Great variety of character and design may further be produced by an intermixture of the different modes,—for instance, by smooth and rough rustics together, or by different kinds of rusticating for different stories, the bolder and coarser being placed below and the more delicate above, as is in a certain degree exemplified in the basement of the Excise-Office, London, which consists of two stories, the lowermost having rough, the upper one smooth rustics.

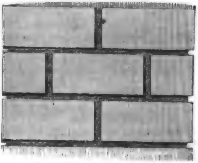
Italian architecture presents many fine studies and examples of rusticated work; and indeed its productions of that class possess infinitely more artistic merit than many of its columnar façades, where the orders are generally insipid, and sometimes so insignificant that the columns themselves are nearly the most trifling features in the design. The Florentine style—which, it may be observed, is the direct antithesis of the Palladian—shows what may be accomplished by little more than rustication alone. If it be severe, it is also simple, yet rich and grand and dignified; on which account, we should hardly hesitate to say that, unlike as it is in its forms, it possesses more of antique feeling, more of the sentiment of Grecian architecture than is to be found in many buildings professedly Grecian and adorned with Greek orders. Nevertheless the Florentine style has found little favour with those who have gone to Italy for their models. In this country we have very few examples indeed of rusticated work upon a grand scale: for here it is almost entirely confined to basements. It is scarcely ever employed as the general decoration of an entire front, except it be occasionally for prisons, for which it is certainly very appropriate, yet it does not therefore follow that it is unsuitable where richness and magnificence are more required than severity. Even if not for general purposes, the rusticated style recommends itself strongly for a class of buildings that have sprung up of late years, namely, railway termini.

Rustication however is now almost entirely banished from architectural design, or else an exceedingly poor and spurious kind of it is substituted, in which only shallow horizontal joints, or rather stripes, are shown, which, besides producing a most meagre and monotonous effect, give a wall the appearance of being faced with planks instead of built of blocks of stone bonded together. The exterior of Goldsmiths' Hall, London, is materially injured by the extreme poverty of the lower floor, which has merely a few horizontal streakings, without either moulded dressings or any kind of border or finishing to the windows. The lower windows, on the contrary, of the garden-front of the Travellers' Clubhouse are bordered with rough rusticated quoins, while the faces of the other rustics are smooth; which produces a most pleasing variety and contrast. Both in that and the adjoining Reform Clubhouse, Mr. Barry has given some tasteful specimens of rustic quoining, which differs from rustication merely in the rustics being applied only at the angles of a building, where they serve not only to give an expression of greater strength, but also to show that the design is completed and there terminates. It is a very great error to suppose that rusticated work is incompatible with elegance and elaborate finish. It is true that it admits of great rudeness and severity of character, but it also admits of the most studied and elaborate finish. So far too from requiring less care and accuracy than usual, the arrangement of the courses and rustics so as to combine them in perfect symmetry with arches, windows, &c., is a work of more thought and labour than would suffice for designing half a dozen Grecian porticos. Much of the beauty of rusticated fronts depends upon the form and proportions of the arches or openings, and on the arrangement, &c. of the rustics which form the voussoirs either to arched or straight-headed windows. Occasionally, moulded archivolts are substituted for radiating voussoirs, but the effect is not good, because they cut the horizontal joints of the courses very disagreeably; which, it may be observed, is likewise the case where the voussoirs form an *extrados* either concentric with the arch, or making a more elevated curve, as in most of the Florentine examples. It is far better to make the voussoirs *elbowed*, so as to unite with the horizontal courses, whereby the whole looks firmly bonded together. Sometimes imposts to arches are omitted altogether, or if there be such member, it is usually a mere plat-band, although occasionally it is moulded. In arches the keystone may either be similar or distinguished from the other voussoirs; which last may be done in a variety of ways, although the most usual one is to cut it into the form of a console, or else enrich it with a mask sculptured upon it, of which kind are the keystones to the arches of the Strand front of Somerset House, representing the nine principal rivers of England, personified as old men. *Bossages* is a term more particularly applied to rusticated cinctures on the shafts of columns, which may be either square or cylindrical, but should not greatly exceed the diameter of the shaft itself, more especially in the former case. Columns of this kind ought invariably to be engaged, and the wall behind them of course rusticated also. In such case the cinctures serve as ligatures to bind and incorporate them with the rest, whereas insulated columns with blocks upon their shafts are equally unmeaning and uncouth. The same remark applies to rustic blocks stuck at intervals upon the architraves of doors and windows, as for instance those of St. Martin's church, London, although there is no rusticating in that building. Of columns with bossages or rusticated cinctures, the two arches within the court of Somerset House are a tastefully-designed and well-executed example.

The following are some of the varieties of rusticating above referred to, drawn sufficiently large to show the precise form and section of the joints or grooves:—

No. 1. **Rustics with rectangular joints or channels.**

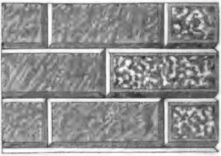
No. 1.



Rustics of this kind have always plain faces. French or horizontal rusticating, without vertical joints, has generally rectangular channels; this sort of rusticating, or pseudo-rusticating with horizontal joints only, has of late years almost superseded the other modes in this country, where it has been still further impoverished by making the channels broad and shallow, and the courses so deep that there are only a few horizontal streaks along the face of a wall.

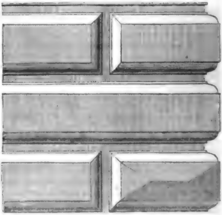
No. 2 **is an instance of chamfered joints and vermiculated rustics, bordered, that is, having a plain surface around their faces.**

No. 2.



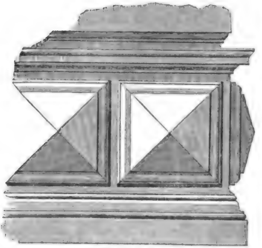
No. 3 **shows an example of Florentine rusticating with moulded channels, the effect of which is particularly rich. Of this kind is the rustic work of the Königsbau at Munich. [MUNICH.] One of the rustics is *facetted* in the cut, in order to give an example of that mode in rusticated quoins.**

No. 3.



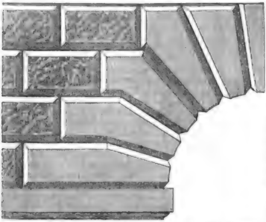
No. 4 is another mode peculiar to the Florentine style, in which the rustics are *facetted*, or cut so as to form four triangular surfaces. It is not used throughout, but only in the lower course, forming a sort of dado to the building This example is from the same building as the preceding.

No. 4



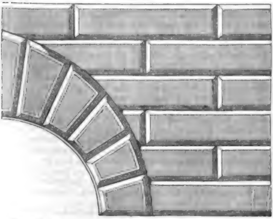
No. 5 shows one-half of a rusticated arch having *elbowed* voussoirs running into the horizontal courses

No. 5.



No. 6 represents half of another arch with voussoirs whose *extrados* form an eccentric curve from that of the arch itself, or else a pointed arch, while the *intrados* form a semicircular one

No. 6.



RUTA, the name of a genus of plants belonging to the natural order Rutaceæ. The following is a description of this genus:—calyx four-partite, deciduous, shorter than the petals, which are four and unguiculate, with the limb vaulted. Stamens eight, longer than the petals; filaments subulate, glabrous; anthers ovate, obtuse. Receptacle broader than the ovary, marked round with eight nectariferous pores, bearing the petals and stamens at the base. Carpels four, partly combined by means of the central axis (gynobase) into one four-lobed ovary, ovules 6-12 in each cell. Styles four, distinct at the base, united upwards into a single pistil which is attenuated towards the apex. Stigmas four. Capsules four, partly united, dehiscing internally at the apex. Seeds dotted. The species of this genus are suffrutescent herbaceous or perennial plants, with alternate exstipulate pinnated or decompound leaves covered with pellucid dots. The flowers are yellow, rarely white, and disposed in terminal corymbs or racemes. De Candolle enumerates twenty-four species of Ruta, of which comparatively few are generally known or cultivated. The species which has been longest known and most used, and perhaps the handsomest for culture is the *R. graveolens*, common Rue. It is a glaucous hairless erect herb or half-shrubby plant, with a strong heavy unpleasant smell, growing to the height of about two feet. The leaves are supradecompound, alternate, their lateral lobes linear or nearly so; the terminal ones obovate; they and all other parts of the plant are covered with transparent dots. Carpels terminal, leafless, trichotomous, cymose; petals four, wavy concave, a little irregularly toothed. Fruit roundish, warted, four-lobed, each lobe opening into two valves.

Rue is sometimes called herb-grace, or the herb of grace, and in some parts of England ave-grace. This name is said to have been given to it on account of its use in exorcisms. In company with rosemary it has been used from time immemorial as an emblem of remembrance and grace on account of its evergreen foliage. The stamens are remarkable for their presenting an instance of vegetable irritability. When the time is come for the pollen to be introduced into the stigma, and thus presented to the ovules, the stamens, which are hard and rigid, and almost at right angles with the style, approach the stigma one by one, and after remaining in contact with it long enough to discharge their pollen, they return back to their original position parallel with the petals.

Rue is frequently cultivated as an ornamental plant, for which its curiously cut leaves, their glaucous hue, and the profusion of fine dark yellow flowers appearing for several months in succession, adapt it exceedingly well. It may be increased by seeds, slips, or cuttings. The seed should be sown in March; and when the young plants are two or three inches high, they should be put out in nursery rows; but propagating by slips or cuttings is best, especially for continuing varieties, of which there are three or four.

RUTA GRA'VEOLENS, a plant, native of the south of Europe, intermediate between an herb and a shrub, of a peculiar yellowish green colour. Every part of it is marked by transparent dots, filled with volatile oil. The leaves and immature fruits are officinal, and owe their virtue to the volatile oil and a bitter extractive. The odour is peculiar, strong, and penetrating; the taste intensely bitter, aromatic, and stimulating. One hundred parts of the fresh herb dry into twenty-two parts. The quantity of oil obtained by distillation with water varies much according to the period of growth when it is collected. Thirty pounds of the fresh herb before flowering scarcely yield one drachm, while twelve pounds with the fruits almost ripe yield nearly one ounce. Rue possesses powerful stimulant, antispasmodic, and tonic properties. The careless handling of the fresh plant sometimes causes rubefaction and vesication, and its improper employment internally has produced serious results. When judiciously used, it is very serviceable in hysteria and other convulsive disorders.

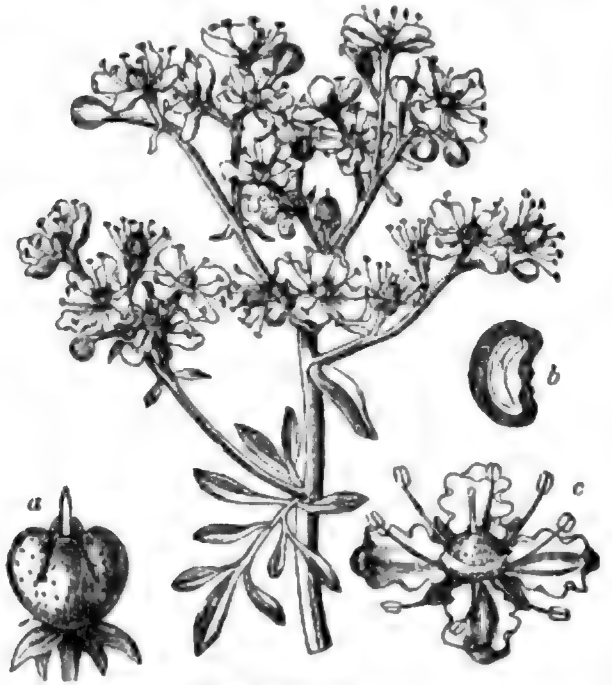
Oil of rue obtained from the fresh herb is green, from the dried herb yellow. It has the peculiar odour of rue, and a bitterish acrid cardamum-like taste. Its specific gravity is 0·911 It does not redden litmus-paper. The oil met with in commerce is rarely genuine, being an artificial compound of oil of turpentine with petroleum and oil of rue.

The pollen of the flowers produces inflammation of the skin; and any of it received into the eyes causes violent lachrymation, and other painful effects.

RUTA'CEÆ, a natural order of Polypetalous Exogens, characterised by the possession of hypogynous stamens, two or three times as many as the petals, cohering carpels with from three to five valves, an entire ovarium with several cells, imbricate calyx with four or five divisions, symmetrical hermaphrodite flowers with petals either wanting or as many as the lobes of the calyx, mostly twisted in æstivation; fruit capsular, the sarcocarp mostly separating from the endocarp; leaves without stipules, opposite, or alternate, simple, deeply lobed or pinnate, and covered commonly with pellucid resinous dots. They are trees, small shrubs, or herbaceous plants.

This order embraces the Ruteæ and Diosmeæ of A. de Jussieu, which are now made the principal sections of Rutaceæ. Ruteæ are known by their seeds containing albumen, and by the sarcocarp of the fruit not being separable from the endocarp. In Diosmeæ the seeds have no albumen, and the sarcocarp and endocarp are separable into distinct bodies when the fruit is ripe. A. St. Hilaire says that the observation of the adhesion of the sarcocarp and endocarp in Ruteæ has been made on unripe specimens of the plants, and that when ripe they are as separable as in Diosmeæ; whatever may be the real state of the case, the two sections are too obviously related in structure and general properties to permit of so slight differences elevating them into the importance of distinct natural orders. Rutaceæ agree with Aurantiaceæ in their dotted leaves, definite stamens, and fleshy disk. With Xanthoxylaceæ, Simarubaceæ, and Humiriaceæ, they have also many points of analogy. They are closely allied to Zygophyllaceæ through Peganum, which Jussieu and other writers place amongst Rutaceæ. They are found in the South of Europe, and in our hemisphere extend as far as the limits of the Old World. Diosma and allied genera are found at the Cape of Good Hope. Australia possesses Boronias, Phebaliums, Correas, &c.; and great numbers are found in the equinoctial regions of America.

Many of the plants of this order emit a powerful and usually offensive odour from the glands that cover their whole surface. These glands are sometimes so full of a volatile oil, that in hot weather the atmosphere surrounding the plant becomes charged with it, so that a lighted taper brought near the plant will cause the air to inflame. This is especially the case with Dictamnus. The Diosmas, or Bucku plants, are used in medicine as antispasmodics. The celebrated Angostura bark is produced by a plant (*Galipea officinalis*) [GALIPEA] belonging to this order.



Ruta graveolens.

a, Lobed fruit surrounding the central axis; *b*, section of a seed showing the embryo lying in the centre of the albumen; *c*, flower showing a double row of stamens, concrete carpels, and rim of the disk.

RUTH (רות), **BOOK OF**, a canonical book of the Old Testament, consisting of a narrative, of which the following is an outline:—During a famine, which happened in the time of the Judges, a man of Bethlehem-Judah, named Elimelech, removed into the country of Moab, with his wife Naomi and two sons. The sons took wives of the daughters of Moab, and they and their father died. The famine in Judah having now ceased, Naomi set out to return thither with her daughters-in-law, Orpah and Ruth. On the journey she gave them the choice of returning to their homes. Orpah returned, but Ruth clave to Naomi. It was harvest-time when they arrived at Bethlehem, and Naomi sent Ruth to glean in the fields of her husband Elimelech's wealthy kinsman, Boaz, who was struck with the maiden, and showed her kindness (chap. i., ii.) At the end of the harvest, Ruth, under Naomi's direction, claimed of Boaz the rights which he owed her as her nearest kinsman, or Goël, namely, marriage, and the redemption of her father-in-law's estate. Boaz, after first ascertaining that a person who was nearer of kin to Ruth than himself declined to act as the Goël, married her (chaps. iii., iv.), and thus became the ancestor of David (iv., 18-22).

The history of Ruth seems to have been inserted in the sacred canon as a necessary link in establishing the pure genealogy of David, and consequently of the Messiah; and perhaps also to furnish a record of the fact that one of the Messiah's ancestors was a Gentile, thus intimating the great truth that the Gentiles were to have a part in the highest privileges of the Jews. In the antient Jewish canon this book forms a part of the Book of Judges, because the events recorded in it happened during the rule of the Judges. Its exact date is however uncertain, but most probably the famine mentioned in verse 1 is that which happened in the time of Gideon, about B.C. 1241. It is generally supposed to have been written by the prophet Samuel. The style is marked by a touching simplicity, and some parts of it are very pathetic. (The *Introductions* of Jahn, Eichhorn, De Wette, and Horne.)

RUTHERFORD, DANIEL, was born at Edinburgh, in November, 1749, and was educated at the university of his native city. In 1772 he took his degree of M.D., and it was in the thesis which he printed upon this occasion, entitled 'De Aere Mephitico,' that he announced the discovery for which he is chiefly remembered, of the gas which has since been called azote or nitrogen; for Rutherford merely indicated its existence as a peculiar air, and neither gave it any name nor explained its properties. The same discovery was also made about the same time by Dr. Priestley, and was announced by him in his paper 'On the Different Kinds of Air,' which obtained the Copley medal, and was published in the 'Philosophical Transactions' for 1772. Dr. Rutherford was admitted a fellow of the Edinburgh College of Physicians in 1777, and in 1786 he was appointed professor of botany in the university. He died 15th November, 1819.

RUTHERFORTH, THOMAS, D.D., was born in the parish of Papworth-Everard, Cambridgeshire, in the year 1712. Having taken his degree and obtained a fellowship in St. John's College, Cambridge, he was appointed Regius Professor of Divinity in the University, and created D.D. He was afterwards elected a fellow of the Royal Society, and obtained the preferments of the rectory of Barley in Hertfordshire, Shenfield in Essex, and the archdeaconry of Essex. He died in Oct. 1771.

Besides single sermons and charges to the clergy, Dr. Rutherforth is the author of the following works:—'Ordo Institutionum Physicarum, in privatis suis Lectionibus,' Camb., 1743, sm. 4to.; 'Essay on the Nature and Obligations of Virtue,' Lond., 1744, 8vo.; 'A System of Natural Philosophy, being a Course of Lectures on Mechanics, Optics, Hydrostatics, and Astronomy,' Camb., 1748, 2 vols. 4to.; 'A Letter to Dr. Middleton, in Defence of Bishop Sherlock on Prophecy,' 1750, 8vo.; 'A Discourse on Miracles,' 1751, 8vo.; 'Institutes of Natural Law, being the substance of a Course of Lectures on Grotius De Jure Belli et Pacis, read in St. John's College, Cambridge,' Lond., 1754-56, 2 vols. 8vo. A list of his sermons, tracts, and charges is given in Watt's *Bibliotheca Britannica*.

RUTI'LIUS LUPUS, a Roman rhetorician, who was a contemporary of Quinctilian (Quinct., *Inst. Orat.*, iii., 1, p. 150, Bipont), but of whose life we have no particulars. We possess a small treatise of his on rhetoric, entitled 'De Figuris Sententiarum et Elocutionis;' which we learn from Quinctilian (ix. 2, p. 152) was taken from a work of a contemporary of the name of Gorgias, in four books. The treatise of Rutilius does not appear to have come down to us in the same state in which he wrote it. It is now divided into two books, whereas Quinctilian says that it was only in one. It is several times quoted by Quinctilian, and is still valuable for the quotations which it contains from writers now lost.

The work of Rutilius was originally published by Roscius Ferrariensis, Venet., 1519, 8vo., and afterwards by Ruhnken, Lug. Bat., 1768, 8vo., the latter of which was republished by Frotscher, Lips., 1831, 8vo. There is also an edition by F. Jacob, Lub., 1837, 8vo.

RUTI'LIUS NUMATIA'NUS, CLAUDIUS, a Roman poet at the beginning of the fifth century of the Christian æra, was a native of Gaul, and held at Rome the high offices of magister officiorum or palatii, and præfectus urbi. Having occasion to return to his native country, he gave an account of his voyage, in a poem entitled 'Itinerarium,' written in elegiac verse, and consisting of two books, of which the greater part of the latter is lost. Rutilius made the voyage in a small vessel, which put into shore during the night and sailed again in the morning. He describes with much beauty, and in the genuine spirit of poetry, the towns, ruins, and various objects of nature and art which he saw, and deeply laments the ravages which had been committed by the barbarians of the north. Rutilius was a pagan, and in his voyage gives an account of the monks who lived at Capraria, and in other parts of his poem makes allusion to the state of Christianity at that time.

The poem of Rutilius was first printed in 1520, Bonon., 4to. The best edition is by Zumpt, published last year (1840). Other useful editions are by Damm, Brandenb., 1760, 8vo.; by Kappius, Erlang., 1786, 8vo.; and by Gruber, Norimb., 1804, 8vo.

RUTLANDSHIRE, an inland county of England, bounded on the north and north-east by Lincolnshire, on the south-east and south by Northamptonshire, and on the west by Leicestershire. It is of compact form; the greatest length is from north-east near Essendine, on the road between Stamford and Bourne, to south-west near Belton, near the road from Uppingham to Leicester, nearly 19 miles; the greatest breadth at right angles to the length is from the bank of the little river Eye near Whissendine, to the bank of the Welland at Tixover, 14 miles. The area is estimated at 149 square miles; the population, in 1821, was 18,487; in 1831, 19,385; showing an increase in ten years of 898 persons, or about 5 per cent., and giving 130 inhabitants to a square mile. In size and amount of population, it is far below the rest of the English counties: its area is little more than half that of Middlesex (282 square miles), the next county to it in size; and its inhabitants are not much more than one-third of those of Huntingdonshire (pop. 53,192), the next county to it in population. In density of population, it is the thirty-fifth of English counties; being next below Huntingdonshire, but exceeding the five counties of Hereford, Lincoln, Northumberland, Cumberland, and Westmoreland. Oakham, the county town, is in the vale of Catmoss, on the western side of the county; 85 miles in a direct line north by west of the General Post-office, London, or 96 miles by the road through Barnet, Bedford, Higham Ferrers, and Uppingham.

Surface, Geology, Hydrography, and Communications.—The north-eastern part of the county consists of a somewhat elevated plain or table-land, skirted on the southern side by the valley of the Wash, which opens on the west into the more expanded vale of Catmoss, a name derived by Camden from CoetMaes, Celtic words signifying 'a wooded plain.' The rest of the county consists of valleys whose general direction is east and west, divided from each other by narrow ranges of low hills. There are no very elevated points in the county; Manton, between Oakham and Uppingham, is said to be the highest.

The county is included in the district occupied by the lower formations of the oolitic series. The great oolite forms the north-eastern table-land above mentioned, and occupies also the higher ground on the eastern side of the county from Stamford to within two miles east of Uppingham: the prevailing rock is a close-grained buff limestone clouded with blue. The remainder of the county is occupied by the red or reddish-brown ferruginous sands which separate the great oolite from the subjacent lias. These are covered in many places, especially near their junction with the lias, which takes place just on the north-western border of the county, by vast accumulations of transported blocks of gravel. There are quarries of good building-stone at Ketton, between Stamford and Uppingham, just on the border of the district occupied by the great oolite.

Rutlandshire belongs chiefly to the basin of the Wash. The Welland, one of the rivers flowing into that æstuary, skirts the county on the south-east side, between Rockingham and Stamford, separating it throughout from Northamptonshire. This river is not navigable above Stamford, where it quits the county altogether. The river Guash, or Wash, rises just within the border of Leicestershire, and flows eastward through this county into Lincolnshire, where it joins the Welland just below Stamford. The river Chater also rises in Leicestershire, and flows parallel to the Wash: it joins the Welland just above Stamford. The Eye brook bounds the county on the south-west, and joins the Welland just below Rockingham.

The Wreak, which joins the Soar, a feeder of the Trent, rises in Rutlandshire near Oakham, and flows northward through the vale of Catmoss into Leicestershire; it drains a small district in the north-west part of the county, which is thus included in the basin of the Humber.

The Oakham canal is a prolongation of the Melton Mowbray navigation, from Melton Mowbray in Leicestershire to Oakham. It follows a circuitous course, passing through the vale of Catmoss, and has a total length of fifteen miles, of which about six miles and a half are in Rutlandshire, all on the same level.

The principal roads are, the mail road from London to Melton Mowbray, and the Great North road. The former enters the county on the south side just beyond Rockingham in Northamptonshire, and runs northward through Uppingham and Oakham into Leicestershire. The Great North road crosses the eastern side of the county between Stamford and Grantham. A road from Leicester to Stamford crosses the county from west to east, passing through Uppingham, and following the valley of the Welland; and two roads run from Oakham into the Great North road, one at Stamford, the other at Stretton between Stamford and Grantham.

Agriculture.—The county of Rutland, although the smallest in extent in England, is of some importance in an agricultural point of view. The climate is that of the midland counties of England, and differs in no perceptible degree from that of the surrounding counties of Leicester, Northampton, and Lincoln. Compared with the larger counties, it is altogether a small district, containing only about 90,000 acres of land; but as a proof of the state of the cultivation, it is observed in the 'Agricultural Report to the Board of Agriculture' in 1808, that there is little or no waste land in the county. Of the whole surface, one-half was then in pastures, only about one-thirtieth in woods, and in the whole county only 30 acres of waste, which probably are long since cultivated in some way or other. Rutlandshire is one of the grazing-counties, in which much attention has been paid to rearing choice animals, both oxen and sheep. There are many wealthy proprietors in the county, who more or less encourage agriculture in all its branches. The soil is mostly of a good quality; and the face of the country agreeably diversified, affording good sites for country-seats, parks, and pleasure-grounds: and the richness of some of the natural pastures have no doubt made it, from an early date, the residence of the richer clergy and gentry. The best pastures are on the lias clay, which, with a portion of oolite, red sand, and magnesian limestone, form the principal soils of the county. The pastures are very similar to those of Northamptonshire, and there is no great peculiarity in the cattle and sheep bred or fed in them. The pure short-horns are the general favourites with those who pay particular attention to their stock; and the crosses with these are so frequent and repeated, that no other breed can be considered as so well established, they having almost entirely superseded the long-horns. There are however other breeds to be frequently met with, bred in other parts of the country, and purchased for the sake of grazing, such as a few North Devon, Hereford, and Scotch oxen. The milch-cows are chiefly short-horns.

There are some low meadows subject to be flooded along the rivers Welland, Guash, and Chater. The first of these having but little fall, the water goes off very slowly from the flat meadows by the side of it; hence the herbage is not of the best quality, and sheep fed there are apt to rot, which they seldom or never are subject to in the upland pastures. Few attempts have been made to produce regularly irrigated water-meadows. It is the opinion of graziers that the good pastures in this county will produce from 40 to 50 stone of meat per acre every year, which gives a return of 6*l.* or 8*l.* per acre gross. The rent consequently may fairly be reckoned worth from 50*s.* to 4*l.* per acre, including poor-rates and tithes. But no such rent is paid for any considerable portion. The farms were formerly of small extent, but they have been increased by joining two or more into one occupation.

The sheep are chiefly of the improved Leicester breed. There are a few flocks of South-downs; but on the richest pastures the Leicester are the most profitable, although the South-down wethers, when moderately fat, produce by far the best mutton. This is the reason why many opulent proprietors prefer them; while the farmers, for profit, keep the Leicester, which fatten rapidly and at an early age. The improved mode of feeding sheep with turnips cut into long strips by a machine, assisted with corn or oil-cake, is gradually gaining ground on the best farms, and is one of the greatest improvements introduced of late years. The housing, or at least sheltering, the sheep, especially the breeding ewes, in wet and inclement weather, is not yet sufficiently attended to; nor is the saving in food by this means sufficiently appreciated by the farmers. There is however a spirit of improvement abroad which cannot fail to produce rapid advances in all branches of husbandry.

The farm horses are not of the most active kind, although they are large, and some very strong dray-horses have been bred in the county, and sold to dealers for the London market after having been moderately worked for a year or two. But for general farm-work they are far inferior to the Suffolk or to the active Clydesdale horses. Farmers do not always consider that time is money, and that he who can perform his work in the least time, at the same expense, has more time left for additional work. In harvest, especially, a team which will go with a loaded cart or waggon at the rate of three miles or more in an hour, and trot back empty six miles in the hour, will clear a field twice as soon as those which move little more than two miles in the hour either way.

There being no very considerable dairies in the county, no particular breed of pigs is peculiar to it. The hogs which are fatted are mostly of the Berkshire or Suffolk breed. Some gentlemen and farmers have taken pains to improve their breeds by crosses with the Chinese and Neapolitan; and these two superior breeds have been so frequently used of late years to render the native breeds more prolific and finer in the skin, that very few fine pigs are to be met with without some portion of Chinese or Neapolitan blood in them; and the infusion of a little foreign blood has considerably increased their aptitude to get fat, while some attention to the shape and smallness of the bone has produced a very manifest improvement in general.

The arable land was formerly but indifferently cultivated, as was the case in most parts of the country where grazing was the principal object of the farmer: but by the enclosure of common fields, and the extended cultivation of turnips, of which the value for the cattle in winter is now fully appreciated, a much greater quantity of corn is produced than would, at one time, have been thought possible; and by means of under-draining and an improved husbandry, the land which will produce good crops of turnips, especially the Swedish, is daily increasing.

The plough in general use is one with two unequal wheels attached to the beam, which has of late received the name of the Rutland plough, although it is common to all the adjoining counties. It is often drawn by three horses; but the best farmers begin to use only two, and find, that, if the ground be occasionally stirred to a considerable depth by the subsoil plough, and heavy scarifiers, with four, or even six horses, all the common ploughings, even in the heaviest soils, can be accomplished with a light plough and two horses abreast; and that the work is done better, more rapidly, and at less expense. The course of crops varies according to the nature of the soil; on the lighter soils, turnips, barley, and clover are succeeded by wheat, with an occasional crop of peas. On the heavier, oats and beans are introduced instead of barley or peas, with a naked fallow. The best farmers avoid two white crops in succession; but those who are tempted, by the apparent profit, to have barley after the wheat, and some of the old school cannot resist it, on fine rich soils, find, that what they have apparently gained by a catch crop, as it is called, is dearly paid for in the end, by the deficiency in those which come after, especially the clover and turnips, two crops which never are so sure and so profitable as on land which is in very good heart.

There are several extensive woods in Rutlandshire, containing fine oak, ash, and other timber. The amount of the whole is stated, in the survey in 1808, at nearly 3000 acres. But they have not improved since that time: the high price of timber during the war has caused many of the finest trees to be cut, and there is now little timber fit for navy purposes in the county; and there being no wastes, the planting has been confined to ornamental plantations. There is a considerable quantity of coppice-wood, which is cut every twelve or sixteen years; and it is the opinion of some very experienced surveyors, that a well managed coppice, with a few trees interspersed, is much more profitable than a close plantation of oaks, however well managed, when the rapid growth of the coppice-wood is taken into consideration. Ash, chesnut, whitethorn, and hornbeam are the sorts to be preferred for a coppice.

In some places allotments of land have been let to cottagers, which, where it has been judiciously done, has added much to their comfort, and stimulated industry by giving employment to women and children.

The following fairs are held in Rutlandshire:—Oakham, first Monday after Plough-Monday; Monday after February 14; Monday after April 6; May 6; Saturday in Whitsun-week; last Saturday but one in July; Monday after August 13; September 9; Monday after October 11; Monday after November 11; second Monday in December. Uppingham, March 7; July 7.

Divisions, Towns, &c.—The divisions of the county are as follows:—

Name.	Situation.	Area in Acres.	Pop. 1831.
Alstoe Hundred .	North .	27,900	4,275
East do. .	East .	20,300	3,466
Martinsley do. .	Central .	14,580	3,779
Oakham Soke .	West .	18,140	4,320
Wrandyke Hundred	S. and S.E. .	16,580	3,545
		97,500	19,385

There are only two market-towns, Oakham and Uppingham.

Oakham, or Okeham, is in Oakham Soke, in the vale of Catmoss. It had an antient castle, erected probably by Walcheline De Ferreris, a younger branch of the family of de Ferrars, to whom Henry II. had granted the manor. The manor and castle repeatedly reverted to the crown, and were again repeatedly granted. Among the possessors of them were: Richard, king of the Romans, brother of Henry III.; Edmund, earl of Kent, brother of Edward II.; De Vere, earl of Oxford and duke of Ireland, favourite of Richard II.; Thomas of Woodstock, uncle to the same king; Humphrey, duke of Buckingham, the supporter and victim of Richard III.; Thomas Cromwell, earl of Essex: and George Villiers, duke of Buckingham, the witty and profligate favourite of Charles II. Of this castle, the county-hall, in which the assizes are held, and the other business of the county and the town transacted, is a remain; the other parts are in ruins. The architecture is of late Norman or very early English. The gate of the castle-yard and the interior of the county-hall are covered with horse-shoes; the lord of the manor being authorized by antient grant or custom to demand of every peer, on first passing through the lordship, a shoe from one of his horses, or a sum of money to purchase one in lieu of it. Some of these shoes are gilt, and stamped with the donor's name. Among them are shoes given by queen Elizabeth, by the late duke of York, and by George IV., when prince regent.

The number of houses in the parish, in 1831, was 520, inhabited by 524 families, beside 29 uninhabited houses, and 10 building. The population was 2390, about one-fourth agricultural. The area of the parish is 3130 acres. The town consists of neatly-built houses. The church is a large edifice, mostly of perpendicular character. It has a fine tower and spire; the latter is said to have been erected by Roger Flore, who died A.D. 1483. There is a library connected with this church, of about 200 vols. folio, consisting chiefly of the decrees of councils, the fathers, schoolmen, and other divines. There is a school-house in the churchyard for the richly endowed grammar-school, and connected with it is a building originally used as an hospital for aged men, but now occupied by the master of the grammar-school and his boarders. There are meeting-houses for Wesleyans, Independents, and Baptists. There is a gaol and house of correction for the county in an open spot near the castle.

The Oakham canal affords facilities for supplying the town with coal, and for sending corn to the manufacturing districts. The market, which is on Saturday, is a good corn-market: and there are three yearly fairs of antient institution, and eight of modern date, for cattle. The assizes and quarter-sessions are held here; and the court of election for the county members. It is the only polling-station.

The living is a vicarage united with the chapelries of Langham, Brooke, and Silverstone, of the clear yearly value of 918*l.*, with a glebe-house, in the gift of the dean and chapter of Westminster.

There were, in 1833, twelve day-schools, with 365 children; including the grammar-school with 40 boys, and a national-school with 54 boys and 30 girls. There were three Sunday-schools, with 255 children, besides the national school, the children of which attended also on Sunday.

Jeffrey Hudson, the well-known dwarf (introduced by Sir W. Scott, in his 'Peveril of the Peak'), was born at Oakham, A.D. 1619.

Uppingham is in Martinsley hundred, six miles south of Oakham, at the intersection of the Melton mail-road with the cross-road from Leicester to Stamford. The area of the parish is 1210 acres. It had, in 1831, 342 houses, inhabited by 358 families, and 7 houses uninhabited. The town consists chiefly of one street, tolerably well paved, with an open area in the centre. The houses are in general good, and the appearance of the place is superior to that of Oakham. The church is large, with a lofty spire, and contains several interesting portions. The free grammar-school house is a neat and plain building, at one end of the churchyard; and there is an hospital for poor men. These institutions, which are well endowed, were, as well as the grammar-school and hospital at Oakham, founded by Robert Johnson, archdeacon of Leicester, A.D. 1584. There are two dissenting meeting-houses.

The population of Uppingham, in 1831, was 1757, about one-fifth agricultural. There is a market on Wednesday; and there are two yearly fairs for horses, cattle, and sheep, and coarse linens. Races are held on a course called the Brand, just south of the town.

The living is a rectory, of the clear yearly value of 661*l.*, with a glebe-house, in the gift of the bishop of London.

There were in 1833 six dame-schools, with 90 children; six other day-schools, with 266 scholars, including the free grammar-school with 32 boys, and a national school with 100 boys and 66 girls; and two Sunday-schools, with 161 children.

Divisions for Ecclesiastical and Legal Purposes.—The county is included in the archdeaconry of Northampton, and diocese of Peterborough. It comprehends the rural deaneries of Alstow, Oakham-Soca, Rutland or Martinsley, East Hundred, and Wrandike. These divisions are coincident or nearly so with the hundreds of the same name. The number of parishes is given in the Population Returns at 52; the number of benefices is given by Mr. Brewer (*Beauties of England and Wales*) at 49, viz., 31 rectories, 12 vicarages, and 6 chapelries.

The county is included in the Midland Circuit; the assizes and quarter-sessions are held at Oakham, where is the county gaol.

Rutlandshire returns two members to parliament; they are elected and the poll taken at Oakham. There is no other polling-station.

History and Antiquities.—This county appears to have been included in the country of the Coritani; and upon the Roman conquest of Britain was included in the province of Flavia Caesariensis. A Roman road, generally considered, though Blore disputes it, to be Ermine-street, crossed the eastern side of the county in the line of the present North road, and a Roman station appears to have existed at Great Casterton, which is just within the boundary of the county, in the neighbourhood of Stamford; but antiquaries are not agreed as to which of the Antonine stations it is to be identified with. There are some remains of the encampment on the south-east side of the present village; it was square, and had an area of about 27 acres, and was defended on the south and west sides by the river Wash. Ermine-street may be traced in the form of a raised bank four or five feet high.

Under the Saxons this county was included in the kingdom of Mercia. From them it appears to have derived its name of Rutland, in Domesday 'Roteland,' which was perhaps given first to a part only of the present county. This district of Roteland, which was crown land, had been bequeathed by Edward the Confessor to his queen Eadgith or Edith for her life, and, after her decease, to the abbey at Westminster. William the Conqueror however resumed the grant, leaving the tithes to the abbot and monks, and dividing the greater part of the land among his followers. In the reign of John, Rutland, then first mentioned as a county, was assigned to his queen Isabel as part of her dower. In the reign of Edward II. the crown appears to have possessed East Hundred, Martinsley, and Alstoe Wrandyke belonged to the Beauchamps, earls of Warwick Oakham Soke is not mentioned, and is supposed to have been included in Martinsley hundred. An earl of Rutland is mentioned in a charter of Henry I., but nothing is known of him. The first known earl was Edward, eldest son of Edmund of Langley, who was the fifth son of Edward III. The title was inherited by Richard, duke of York, and by his son, a boy of twelve years of age, who was stabbed by Lord Clifford, after the battle of Wakefield, in which Richard himself fell, A.D. 1460. The earldom was revived by Henry VIII., and conferred on the family of Roos: it afterwards came to the Manners family, in whose favour it was raised to a dukedom, which still exists. Few incidents of historical interest are connected with this county. Wright, in his 'History of Rutland,' mentions that in 1016 a battle of doubtful issue was fought between the Danes and the Saxons, but the account is at least very doubtful. In A.D. 1381, Henry Le Spencer, bishop of Norwich, assembled a force at Burley in this county to suppress the insurrection of the commons in Norfolk, under John the Litester or Dyer. [NORFOLK, vol. xvi., p. 270.] And in 1468 (according to Grafton's Chronicle), the Lincolnshire insurgents under Sir Robert Welles or Wells were defeated with great loss by Edward IV., at Hornfield in Empingham parish, in this county, beyond Stamford. It may be well to notice here that Grafton ascribes the rebellion to the instigation of the earl of Warwick; and makes the execution of Lord Wells, the father of Sir Robert, the consequence, and not the cause of the rising. [Compare LINCOLNSHIRE, vol. xiv., p. 15.] The battle is commonly known as the battle of Lose-coat-field, from the fugitives throwing off their coats in order to escape more swiftly.

The antiquities of the county are chiefly ecclesiastical. Tickencote, Little Casterton, Empingham, Essendine, and Ketton churches, all on the east side of the county, go back to the Norman period. Tickencote has been a very curious specimen of enriched Norman, but it was rebuilt in 1792, and only the elaborately ornamented arch between the nave and chancel, and part of the groining of the chancel; with the font, remain. Before it was rebuilt, it had attracted much attention, and some antiquaries regarded it as of early Saxon date. The church at Little Casterton has a nave, aisles, and chancel, with a gable for two bells at the west end: the piers and arches are late Norman, and the form of the capitals resembles the Roman. The other parts of the church are of various later dates. Empingham church has a nave with aisles, and a transept, with a tower and spire of good composition. The piers and arches of the church are late Norman or early English; the chancel, transepts, and lower part of the tower are early English. Essendine is a small church, with nave and chancel, and a gable for two bells at the western end: the architecture is partly Norman, partly early English: the south door is Norman, enriched with zig-zag moulding and other ornaments. Under the arch are three figures in relief, representing the Saviour supported by two angels: there are sculptures on each side of the door. Ketton is a large cross church, with a tower and lofty spire at the intersection: though some Norman features are intermingled, its general character is early English. The spire, which is ribbed at the angles and perforated by twelve windows, is nearly 180 feet high, and of beautiful proportions. Of Pickworth church there remains a beautiful arch or doorway, with clustered pillars, the capitals of which are adorned with elegantly carved foliage. Ryhall church has a tower and spire of early English, with some singular features.

(Blore's *History of Rutlandshire*; *Beauties of England and Wales*; Rickman's *Gothic Architecture*; *Parliamentary Papers*.)

STATISTICS.

Population.—Of 4940 males aged twenty and upwards, only twelve were, in 1831, employed in manufactures, or in making manufacturing machinery. Rutlandshire ranks third in the list of agricultural counties, and of the above-mentioned 4940 males, there were 2763 engaged in agricultural pursuits in 1831, namely 1910 as labourers, 429 as occupiers employing labourers, and 424 as occupiers who were not employers of hired agricultural labour.

The population of the county in each of the following decennary periods, was,—

	Males	Females.	Total.	Increase per cent.
1801	7978	8378	16,356	
1811	7931	8449	16,380	0·14
1821	9223	9264	18,487	12·86
1831	9721	9664	19,385	4·85

showing an increase of 3029 between the first and last periods, or 17¾ per cent., the increase for England and Wales in the same period being 57 per cent.

The following table presents a summary of the population of each hundred, as taken in 1831:—

HUNDREDS.	HOUSES.				OCCUPATIONS.			PERSONS.			
	Inhabited	Families.	Building.	Uninhabited.	Families chiefly employed in agriculture.	Families chiefly employed in trade, manufactures, and handicraft.	All other Families not comprised in the two preceding classes.	Males.	Females.	Total of Persons.	Males twenty years of age.
Alstoe Hundred .	821	892	4	4	597	183	112	2120	2155	4275	1099
East " .	667	725	2	15	474	130	121	1774	1692	3466	868
Martinsley " .	775	821	1	13	377	299	145	1880	1899	3779	966
Oakham Soke .	917	968	12	38	418	296	254	2143	2177	4320	1097
Wrandyke " .	755	785	3	29	433	194	158	1804	1741	3545	910
Total .	3935	4191	22	99	2299	1102	790	9721	9664	19385	4940

County Expenses, Crime, &c.—In the three years 1748-49-50, the average sum expended annually for the relief of the poor was 862*l.*; in 1776 it was 2664*l.*; for the three years 1783-4-5 the annual average was 2664*l.*; and for the under-mentioned periods as follows:—

	£		s.	d.	
1801	8,276,	being	10	1	for each inhabitant.
1811	11,168,	"	13	7	"
1821	10,575,	"	11	5	"
1831	8,809,	"	9	1	"

The sum raised by the county for local purposes in the year ending 25th of March, 1833, was 12,190*l.*, of which sum 10,985*l.* was assessed on land; 938*l.* on houses; 127*l.* on mills, factories, &c.; and 139*l.* on manorial profits, navigation, &c. The expenditure for the years ending 25th March, 1834-37-40 was as follows:—

	1834.	18..	1840.
	£.	£.	£.
Relief and maintenance of poor . .	9,006	6,[illegible]9	7,946
Suits of law, removal of paupers, &c. .	237	203	6
Other local purposes	1,504	463	212
	11,204	6,285	7,464

The total saving effected in 1840, compared with 1834, was 3740*l.*, or 33 per cent. The expenditure per head with reference to the population in 1831, was 9*s.* 4*d.* in 1834; 6*s.* 5*d.* in 1837; and in 1840, in consequence of the high price of provisions, it rose to 7*s.* 6*d.* per head. The number of paupers relieved in 1839 was 1535; and in 1840 there were 1454 relieved, or 7 per cent. of the total population, being one and one-half under the average for England, and one-half the average for Wiltshire. In 1835-6 the number of bastards chargeable to parishes in the county was 1 in 242 of the total population; the proportion for England being 1 in 215, and for some of the Welsh counties less than 1 in 60. In 1830 the number of illegitimate births to the total number of births in the county was 1 in 22; the proportion for England being 1 in 20.

The county-rate expenditure amounted to 273*l.* in 1792; 477*l.* in 1801; 2020*l.* in 1811; 1296*l.* in 1821; 1192*l.* in 1831; and 966*l.* in 1838.

In 1839 the sum of 921*l.* was collected on account of church expenses, of which sum 581*l.* was derived from church-rates, and 340*l.* from various other sources, including 203*l.* from estates and rent-charges. The expenditure amounted to 874*l.*, and included 306*l.* for repairs of churches.

The statistics of the highways for the years 1812-13-14, the annual average being taken, were as follows:—Length of paved streets and turnpike roads, 63 miles; all other highways used for wheel-carriages, 254 miles; rates levied for repair of the above, 3327*l.*; composition in lieu of statute duty, 403*l.*; estimated value of statute labour performed in kind, 2032*l.* In 1839 the expenditure on the highways, estimated at 267 miles in length, was 4694*l.*, the cost of repair per mile being 17*l.* 11*s.*

The number of turnpike trusts in the county in 1834 was four. The total income was 6406*l.*, the chief items being 3757*l.* from tolls; 405*l.* parish composition in lieu of statute duty; and 1076*l.* estimated value of statute labour performed. The expenditure amounted to 6081*l.*; and there were bonded debts to the amount of 9900*l.* In 1836 the income, including money borrowed, was 5804*l.*; and the expenditure, including debts paid off, 5610*l.* The debts amounted to about two years' clear annual income (the proportion of debts for England being equal to 4½ years' income), and the proportion of unpaid interest was 3 per cent. of the total debt, that for England being 12 per cent.

The number of persons charged with criminal offences and committed in the three septennial periods ending 1819-26-33, was 56, 83, and 102, making an annual average in each period of 8, 11·8 and 14·5 respectively. The average of the six years from 1834 to 1839 inclusive was 19·5, the total committals for the above years being 117. The numbers for each year were as follows:—

	1834.	1835.	1836.	1837.	1838.	1839.
Committed	25	15	24	27	13	13
Convicted	21	13	16	19	7	11
Acquitted	4	2	8	8	6	2

The average comparative results presented by the criminal tables for so small a population as Rutlandshire are calculated rather to mislead than afford information. For example, in 1835 the proportion of persons committed to the total population was 1 in 1292, and for England and Wales 631, but in 1837 the proportion in Rutlandshire rose to 1 in 718, the number of committals being 15 in the former year and 25 in the latter. For the last six years the average has been as nearly as possible 1 in 1000, which is a more favourable proportion than prevails in any of the eastern or southern agricultural counties. The number of females committed does not average more than 2, and in 1839 there was not one. In 1837-8-9 the proportion of instructed criminals in Rutlandshire averaged 39 per cent., which was higher than in any other county, the county of Bedford standing as low as 2·2 per cent.

The number of registered electors in the county in 1835 was 1328, and 1373 in 1840. In the latter year there were 858 voters possessing freehold qualifications; 68 copyholders; 9 leaseholders for lives or periods of years; 327 occupying tenants at a rent of 50*l.* per annum; 24 deriving the right of voting from offices which they enjoyed; and 87 were were either joint qualifications or double qualifications.

There is no savings'-bank in the county.

Education.—The summary from the Returns to Parliament in 1833, in obedience to circulars issued to churchwardens and other local authorities throughout England and Wales, might be omitted in the case of this county, a much more complete statistical inquiry having taken place in 1838, under the direction of the Manchester Statistical Society; but for the purpose of comparing the result of the official inquiry with the one last mentioned, the former is given in an abridged form.

	Schools	Scholars
Infant-schools . . .	10	
Scholars, aged from 2 to 7 years .		173
Daily schools . . .	102	
Scholars, aged from 4 to 14 years .		2707
Total daily schools . . .	112	
Total scholars under daily instruction		2880
Sunday-schools . . .	56	
Scholars at such schools, aged from 4 to 15 . . .		2732

The most apparent defect in the official returns arises from the impossibility of ascertaining the number of duplicate entries of scholars who attend both day and Sunday schools, and consequently the numbers who are not receiving any education at all cannot be determined. The above official return for Rutlandshire is believed to be more accurate than for any other county. The corrections are therefore less than they would be in other cases. The following statements are taken from the Report of the Manchester Statistical Society:—The population of the county, in 1838, was estimated at 20,000, and the number of children between 5 and 15 years of age at 5000. Of these 3561 were found to be attending either at day or Sunday schools, leaving 1439, or about 29 per cent., not receiving school instruction. Taking the scholars of all ages, it was found that 1117, or about 5·6 per cent. of the population, attended day and evening schools; 1922, or about 9·6 per cent. of the population attended both day and Sunday schools; and 1274, or about 6·4 per cent. of the population, attended Sunday-schools only. The dame and common day schools were attended by 6·25 per cent., and the endowed or charity schools by 8·26 per cent., of the total population. Out of 46 parishes and 2 hamlets in the county there were only 7 parishes and the 2 hamlets without a Sunday-school. Out of 140 schools, all but 14 had been established since 1801; 63 schools had been commenced from 1830 to 1838; and 58 from 1801 to 1830. The following 'General Summary of Schools and Scholars in the county of Rutland in 1838' is appended to the Manchester 'Report' (p. 315, vol. ii. of the *Journal of the Statistical Society of London*).

In another 'Report' of the Manchester Statistical Society, 'On the Condition of the Population in Three Parishes in Rutlandshire, in 1839,' it is stated that 75 persons per cent. were able to read, and 44 per cent. could write, in one parish, and in the two other parishes it was found that the proportion of the former was 81 per cent., and of the latter 50 per cent. On the whole, Rutlandshire may be regarded as considerably in advance of other counties. In the 'Second Annual Report of the Registrar-General,' the number who signed with marks in attestation of marriages is given as 33 per cent., while in Bedfordshire the proportion was 60 per cent. Little however has been done throughout the county to extend education beyond reading and writing or to develop the intelligence of the people. The Manchester 'Report' states that 'want of books is a very serious impediment to the usefulness of the schools.' The books most commonly found in the cottages in the three parishes which the Society made the subject of a separate inquiry were Fox's 'Martyrs;' Fleetwood's 'Life of Christ;' and Venn's 'Whole Duty of Man.' Few cottages were entirely destitute of books, but they were almost exclusively religious works.

General Summary of Schools and Scholars in the County of Rutland, 1838.

Estimated Population, 20,000.	AGE.			SEX.		TOTAL.		PER CENTAGE.		
	Under 5 years.	Between 5 and 15 years.	Above 15 years.	Male.	Female.	Schools.	Scholars.	Of the Total estimated Population.	Of the Total Number of Scholars.	Of the Total Number of Sunday Scholars.
Sunday-schools—Church of England	229	2,077	13	1,221	1,098	55	2,319	11·60	53·74	72·56
" Protestant Dissenters	91	780	6	429	448	14	877	4·38	20·32	27·44
Total	320	2,857	19	1,650	1,546	69	3,196	15·98	74·06	100·00
	10·01 per ct.	89·39 per ct.	0·60 per cent.	51·63 per ct.	48·37 per ct.					Of the Total Number of Day Scholars.
Returned also as Day or Evening Scholars	134	1,775	13				1,922	9·60	44·49	
Receiving Sunday-school Tuition only	186	1,082	6				1,274	6·38	29·57	
Day-schools—Dame schools	249	429	..	277	401	50	678	3·39	15·71	22·87
" Common Boys' and Girls' schools	77	463	..	272	268	25	540	2·70	12·52	18·22
" Superior Private and Boarding Schools	4	125	7	85	51	9	136	0·68	3·15	4·59
" Supported solely by the Scholars	330	1,017	7	634	720	84	1,354	6·77	31·39	45·68
" Endowed and Charity Schools wholly or in part supported by the Public	154	1,419	37	941	669	49	1,610	8·05	37·31	54·32
Total	484	2,436	44	1,575	1,389	133	2,964	14·82	68·69	100·00
	16·33 per ct.	82·18 per ct.	1·49 per cent.	53·14 per ct.	46·86 per ct.					Of the Total Number of Evening Scholars.
Evening-schools—Supported solely by the scholars	..	13	20	24	9	4	33	0·16	0·77	44·00
Connected with Charity-bools	..	21	21	42	..	3	42	0·21	0·97	56·00
Total	..	34	41	66	9	7	75	0·37	1·74	100·00
	..	45·3 per cent.	54·7 per cent.	88 per cent.	12 per cent.					
Total Number of Schools and Scholars	670	3,552	91			209	4,313	21·57	100·00	
	15·53 per ct.	82·36 per ct.	2·11 per cent.							

RUTULI. [LATINI.]

RUYSCH, FREDERIC, a celebrated anatomist, was born at the Hague, in 1638. His father was secretary of the States-General of Holland. He studied medicine at Leyden, took his doctor's degree in 1664, and then returned to practise at the Hague. In 1665 he published his first work on the valves of the lymphatic vessels, and in the following year he was appointed to the professorship of anatomy at Amsterdam. From this time he devoted himself entirely to the study of anatomy, or rather to the formation of an anatomical museum, for he seems to have regarded the science of anatomy as a pursuit far inferior to the art of preparation-making. In this art he was certainly unequalled by any of his contemporaries, and the accounts given by those who saw his museum, of the perfect state in which the bodies of children and animals were preserved, with all the apparent freshness and bloom of life, if they could be entirely credited, would be sufficient evidence that he has not yet had a rival in the preservation of bodies. In the art of dissecting and of injecting the blood-vessels however, in which Ruysch was supposed to be equally eminent, he has long been far surpassed; and it is probable that his best preparations of this kind were not superior to those which are ordinarily made at the present day.

By unceasing labour Ruysch collected a most extensive museum of anatomical preparations of all kinds, for which, in 1698, Peter of Russia gave him 30,000 florins. It was then conveyed to Petersburg, where, it is said, the greater part has since decayed, and become useless. After selling his first museum, Ruysch commenced with unabated ardour to collect a second, a part of which, at his death in 1731, was sold to the king of Poland for 20,000 florins.

Ruysch's merits as an anatomist have been greatly overrated. In all his works, which make up five large quarto volumes, there is no evidence that he was more than a plodding anatomical artist. Though he claimed many discoveries, those that really belong to him are few and not important; and in proportion to the labour expended in the pursuit of anatomy, few have contributed less to its progress as a science, for he did not even publish the modes of making his preparations.

RUYSDAEL, or RUYSDAAL, JACOB. This great landscape-painter was born at Haarlem, in 1635. He was originally brought up to surgery, which he practised for a short time, but he appears to have painted at an early age, and eventually he adopted painting as his profession. If we may judge from a certain similarity of handling, he probably received the first instruction in his art from his elder brother Solomon, who was also a good landscape-painter, but his reputation has been lost, or rather obscured, by the superior name of his brother. Solomon was born also in Haarlem, in 1616, and died there in 1670; he was the scholar of Schoeft and Van Goyen. He distinguished himself by the invention of an admirable composition in imitation of variegated marbles.

Jacob Ruysdael became the friend of Nicolas Berghem, and, as has been reported, his scholar; but this, if we may judge from the extreme dissimilarity of their styles, is highly improbable. Ruysdael was a simple but accurate imitator of nature, and his taste inclined him towards the wild and the secluded; but he displayed an exquisite judgment in the selection of his subjects, and for the power and at the same time the truth of his imitations he has never been equalled. Woods and waterfalls are the prevailing subjects of his landscapes, and he rarely if ever painted a scene without introducing either a cascade or a rivulet. He occasionally also painted marine pieces.

Ruysdael's works, independent of their powerful effect and masterly imitation, are distinguished from those of other masters by the peculiarity that the foregrounds generally constitute the pictures, the distances being introduced simply as accessories to complete the view, and he may be said perhaps never to have produced a mere scenic effect. His colouring, though warm, as also his foliage, is that of a northern climate, and it is very improbable that he ever visited Italy; he was fond of rather cold and cloudy skies with sudden and powerful masses of light and shade. Ruysdael never painted figures; those which are introduced into his compositions were painted by Ostade, Wouvermanns, a Vandevelde, or Berghem.

His works are held in the highest estimation by good judges. There are fine specimens of them in most of the principal collections of Europe. The Stag-Hunt, in the Royal Gallery of Dresden, the figures of which are by Vandevelde, is generally reputed to be his masterpiece; but there is a large woody landscape in the Doria gallery at Rome, of surprising power and beauty, and which is certainly unsurpassed by any production of its class. Ruysdael also etched a few plates in a very bold and effective style, but impressions from them are very scarce. He died at Haarlem in 1681, in the forty-sixth year of his age. The celebrated Hobbema studied the works of Ruysdael. (Descamps; Fiorillo.)

RUYTER, MICHAEL, born at Fleissingen in 1607, went to sea at eleven years of age as a cabin-boy, and rose successively until he became a warrant-officer, and, in 1635, was made captain. He served for several years in the East Indies, and in 1645 was appointed rear-admiral. In 1647 he attacked and sunk off Sallee an Algerine squadron. In 1652 he was employed in the war against England, and while accompanying a large convoy of merchantmen he met the English fleet off Plymouth. The combat was not decisive, but Ruyter succeeded in saving his convoy. In 1653 he commanded a division, under Van Tromp, and was beaten by Blake, but he had afterwards an advantage over the English near the Goodwin Sands. In 1655 he was sent to the Mediterranean to chastise the pirates of Algiers and Tunis. In 1659, being sent by the States-General to the assistance of Denmark against Sweden, he defeated the Swedish fleet, as a reward for which the king of Denmark gave him a title of nobility with a pension. In 1665 he fought against Prince Rupert of England with no decisive result, and in July of the following year he was beaten by the English. In June, 1667, he entered the Thames as far as the Medway, and destroyed the shipping at Sheerness. In 1671, war having broken out between France and Holland, Ruyter had the command of the Dutch fleet which was to oppose the French and the English: he fought several battles in the Channel and the German Ocean, without any important result. In 1675 he was sent to the Mediterranean, and fought a desperate battle with the French admiral Duquesne, off the eastern coast of Sicily, in which his fleet was worsted and Ruyter had both his legs shattered. He effected a retreat into the port of Syracuse, where he died of his wounds, in April, 1676. A splendid monument was raised to him at Amsterdam, and G. Brandt wrote his Life, which was translated into French, Amsterdam, fol., 1690. Even Louis XIV. expressed sorrow on hearing of his death, saying that 'he could not help regretting the loss of a great man, although an enemy.'

RYAN, LOCH. [WIGTONSHIRE.]

RYBINSK, in the government of Yaroslaw, at the confluence of the Rybinka and the Volga, though a small town with only 3200 inhabitants, is a place of considerable importance. It is as it were the central point of the inland trade and inland navigation of Russia, because it is here that the goods are generally transferred from the large Volga vessels to the smaller craft which are to convey them by the rivers and canals connected with the Volga. In one year 1760 large vessels have brought goods to the value of 30 millions of rubles, and above 6000 small vessels have conveyed these and other goods (to the amount, in all, of 56 millions of rubles) to St. Petersburg. The number of strangers who visit Rybinsk in the summer is very great.

RYCAUT, or RICAUT, SIR PAUL, was the tenth son of Sir Peter Rycaut, a merchant of London. The date of his birth is unknown, but he took his bachelor's degree in 1650, at Cambridge. In 1661 he attended the earl of Winchelsea as secretary, when that nobleman went out as ambassador extraordinary to Constantinople. During that embassy, which lasted eight years, he made himself acquainted with the manners, customs, and religion of the Turks, and published the 'Capitulations, Articles of Peace, &c., concluded between England and the Porte in 1663,' and also 'The Present State of the Ottoman Empire, in Three Books, containing the Maxims of the Turkish Politie, their Religion, and Military Discipline, illustrated with Figures,' London, 1668, 1670, fol. He was afterwards appointed consul at Smyrna, which situation he held during eleven years, and exerted himself diligently in extending the commerce of England with the Levant.

On his return to England, Rycaut employed himself chiefly in literary occupations. He published 'The present State of the Greek and Armenian Churches, Anno Christi 1678,' London, 1680, fol., and a 'History of the Turkish Empire from 1623 to 1677,' London, 1660, fol., which is a continuation of Knollys's 'History of the Turks,' and contains much information concerning the political resources of the Turkish empire and the manners of the Turks. It has been translated into almost all the languages of modern Europe, and has been several times reprinted.

In 1685 the earl of Clarendon, then lord lieutenant of Ireland, appointed Rycaut secretary of the provinces of Leinster and Connaught, and James II. created him a privy councillor of Ireland, a judge of the Court of Admiralty, and a knight. The Revolution of 1688 deprived him of all his employments, but in 1690 he was appointed resident to the Hanse Towns; he then went to reside on the Continent, and remained there till 1700, when he returned to England for the benefit of his health, and died on the 16th December in the same year.

Rycaut was a member of the Royal Society of London, and, in addition to his high character as a diplomatist, was celebrated for his knowledge of the learned languages and of the modern Greek, the Turkish, Italian, Spanish, and French.

Besides the works already mentioned, Rycaut published a 'History of the Turks from the year 1675 to 1679,' London, 1700, folio; an English translation of Garcilasso de la Vega's 'Royal Commentaries of Peru,' London, 1688, fol.; an English translation of Platina's 'History of the Popes,' London, 1685, fol.; and an English translation of 'El Criticon,' of Baltasar Gracian, London, 1681, folio.

RYE, a parliamentary borough, a seaport town, and a member of the Cinque-Ports, is situated upon an eminence at the south-eastern corner of the county of Sussex, and 63 miles south-east from London. It is bounded on the east by the river Rother, the channel of which was suddenly diverted from Romney by the tempest that overwhelmed Old Winchelsea in the year 1287, and on the south and west by the river Tillingham, which, having received the waters of the Brede immediately above the town, joins the Rother at Rye: the united stream enters the sea about a mile and a half below the town, and there forms Old Rye harbour. Rye is supposed to be the Novus Portus of Ptolemy. The derivation of its name is variously stated: Camden derives it from *Rive*, Norman (*Ripa*, Lat., a bank); Jeakes, from the British *Rhy* or Saxon *Rhee*, a ford; and the position of the town in former years seems to favour the latter opinion. The earliest authentic record of Rye is of the year 893, when the Danes, under the pirate Hastinges, effected a landing near this town, and afterwards took Appuldore. Edward the Confessor gave the town to the abbot and monks of Fescamp in Normandy; but Henry III., in the fifty-first year of his reign (1267), resumed possession of it for the better defence of the kingdom by maritime operations, and granted to the monastery in exchange the manors of Chilcenham (Cheltenham) and Selover in Gloucestershire, with lands in Lincolnshire. The town is not mentioned in 'Domesday,' but it was doubtless included in the hundred of Gheslinges, in which it is locally situated, and probably formed part of the manor of Rameslie. In the reign of Stephen, William d'Ipres, earl of Kent, erected a tower or small castle on an eminence which commands the rivers at their junction, which is still standing. It was purchased by the corporation, 10 Henry VII., and is now used as a gaol; immediately below it is a modern battery for eighteen guns. This single castle being thought insufficient for the defence of the town, Edward III. caused it to be walled on the north and west sides, the natural abruptness of the native rock, at that time washed by the sea, being considered a sufficient protection on the east and west. There were originally three gates, besides a small postern-gate. The eastern or land-gate, the only one still preserved, has a handsome Gothic arch, flanked on each side by a round tower. The town was burnt by the French in the 1st Richard II. (1377), when the greater portion of the town and the beautiful church were reduced to ashes; and again in 25 Henry VI. (1447), when the old records perished. After these attacks of the enemy, the town in the next century suffered severely from pestilence. In 1544 there were 462 persons buried; in 1563 no less than 765 died, of whom there were buried in August 105, in September 290, and in October 168, or 563 persons in three months; and again, in 1580, 592 persons died, the majority of whom were carried off in the summer months by the plague. In 1572 Rye became an asylum for the Huguenots, who were driven from their homes by Catherine de' Medici. On the 22nd November, 1572, there were 641 strangers in the town, and the arrivals continued to increase till 1582, when the French Protestant inhabitants in Rye were 1534: they remained at Rye till the latter part of the reign of James I., when they or their descendants re-embarked for France.

The condition of Rye has mainly depended upon its harbour. In the sixteenth century the harbour was nearly choked up: an act was passed (2 Edw. VI.) (1548) for amending the haven, yet it was not till the storm of 1570 reopened it that the harbour was navigable for trading vessels. The sea however continued to recede, so that in 1607 the inefficiency of the port was the cause of great complaint. During the whole of that century the sea receded, and the bar of beach accumulated at the entrance, till, in 1750, all hopes of improving the old harbour being abandoned, it was determined to form a new mouth by a canal running directly south into the sea; this work was prosecuted at a great expense till 1778, when the new harbour was found to be a complete failure, and was abandoned. The old harbour was once more resorted to, and it has been much improved. A wooden pier of piles has been constructed on the eastern side, and embankments have been thrown up on the western side, leaving an intermediate entrance 160 feet in width. The average rise of spring-tides is about 17 feet, and of neap-tides from 9 to 12 feet at the pier-head, whilst the lift in the bay is 22 feet. At low-water the harbour is dry. The depth of the channel up the river decreases gradually to the town, where there is 14 feet of water at spring-tides, but during neaps seldom more than 9 feet. The approach from the bay to the entrance of the harbour is very intricate and difficult, especially for sailing vessels, owing to the sand-banks and the tortuous course of the channel. The shingle or stone beach, which extends on both sides of the harbour's mouth, has accumulated at the entrance, owing to the winds either from the westward or eastward of south, and forms banks on each side (according to the prevalence of the wind), which, in combination with sand, shut out the sea and render the channel crooked and uncertain. The chief trade consists in the export of hops, bark, and wool, and in the import of coals, corn, timber, and Dutch produce. Lime is also burnt near the town from chalk brought from Beachy Head, and ship-building is successfully carried on.

Rye has never received a charter. It is a corporation by prescription. The town is not divided into wards. The council consists of four aldermen, and twelve councillors; the style is 'the mayor, jurats, and commonalty of the antient town of Rye.' (5 and 6 Wm. IV., c. 76.) The jurisdiction extends over nearly one-half of the parish of Rye, comprehending 1078 acres out of 2475. The mayor and aldermen, assisted by a recorder, hold courts of sessions and general gaol delivery for all offences, and a court of record for all actions real, personal, and mixed; they have also a summary jurisdiction for debts below 40*s*.

Rye returned two members to parliament from 42 Edw. III., till 2 Wm. IV., c. 45, when it was placed in schedule B, since which, in conjunction with Winchelsea and six rural parishes, it has returned one member. Rye is one of the two antient towns added to the Cinque Ports before the reign of John, and described as 'nobiliora membra quinque portuum.' [CINQUE PORTS.]

The town is pleasantly situated on the northern and eastern slopes of a hill, and consists of three principal streets running parallel to the sea, intersected by cross streets, but the houses are irregularly built. The town-hall is a neat brick building supported on arches, with a market-place beneath. The market-days are Wednesdays for corn, vegetables, fish, &c.; and Saturdays for vegetables, fish, and meat. Every alternate Wednesday there is a market for fat stock well supplied. Rye is within the diocese of Chichester; the church, dedicated to St. Mary, described by Jeakes as 'the goodliest edifice of the kind in the counties of Sussex or Kent, the cathedrals excepted,' has been patched and altered so as to spoil the general effect. The southern chancel, once a chapel dedicated to St. Clare, is used as a school-room, and the northern, formerly the chauntry of St. Nicholas, is blocked out from the body of the church. The living is a vicarage, with an average net commuted income of 410*l*. The population of the entire parish, in 1831, was 3715, and the number of inhabited houses 680. There are two schools, recently united: one a free grammar-school, erected in 1636, by Thomas Peacock, gent., one of the jurats, and endowed with the sum of 32*l*. annually; and the other, for poor children, founded and endowed by James Saunders, Esq., in 1708, with a rent-charge, now producing 116*l*. 10*s*. per annum.

(Horsfield's *History of Sussex*, 4to, 1835; Stockdale's *Sketch of Hastings*, &c.; Burrell MSS.; Lansdowne MSS.; *Parliamentary Papers*, &c.)

RYE is a plant of the family of the Gramineæ, and bears naked seeds on a flat ear furnished with awns like barley. The straw is solid, the internal part being filled with a pith, which, if it causes it to be inferior as fodder, makes it more valuable for litter, and particularly for thatching. The value of the straw is often nearly equal to that of the grain. Rye grows on poor light soils which are altogether unfit for wheat, and hence tracts of light sands are often denominated rye-lands. On these soils this grain is far more profitable than wheat, which can only be raised there at a great expense of marling and manuring. The value of rye in those countries where it forms a considerable portion of the food of the labouring classes, is from two-thirds to three-fourths of that of wheat. From experiments made to ascertain the quantities of nutritious matter in rye and wheat, Thaer states their real comparative value to be as 64 to 71. It was formerly raised in considerable quantities in England, either alone or mixed with wheat, and was then called *meslin*, from the old French word *meslé*, which means *mixed*. The meslin when ground produced a very wholesome and palatable household bread, and it was thought advantageous to sow the two sorts together, from the notion that if either failed there would still be a crop of the other. This however was an error. No doubt the wheat would often fail on inferior soils when the rye would thrive; but the reverse was seldom or never the case; and besides the rye comes to maturity at least a fortnight before the wheat. If the soil is capable of bearing a moderate crop of wheat, it would be much more advantageous to sow one portion of a field with rye and another with wheat; and if meslin bread is desired, the two grains may be mixed in any required proportion. Excellent bread is made of two parts of wheat and one of rye ground together, with only the coarse bran sifted out. Rye is at present raised in very small quantities in England. By examining the averages taken for the purpose of regulating the duty on the importation of corn, the quantity of rye sold is insignificant compared with that of other grain. Except at the time when it is sown for the purpose of affording green food for sheep and horses in spring, there is no demand for rye in the markets. In the Return now before us, made January 8, 1841, for the preceding week, the quantity of wheat sold is stated to be 68,990 quarters, and of rye only 258; and while the average price of wheat was 3*l.* 1*s.* 9*d.*, and barley 1*l.* 13*s.* 6*d.*, that of rye was only 1*l.* 12*s.* 6*d.*, which is much below its comparative value, according to Thaer's experiments, either to make bread of its flour or to distil a spirit from it.

Rye is extensively cultivated on the Continent, especially in the Netherlands, where it is the chief grain from which the spirit commonly called Hollands is distilled, which is flavoured with juniper, in Dutch called *Genever*, whence the name of *geneva* and its contraction *gin*. When malted it makes excellent beer, one bushel of rye malt being equal to at least one and a quarter of barley malt. The cultivation of rye is very simple; it is usually sown after wheat, where the soil is light and rich, or after turnips and potatoes, in those soils which are not strong enough for wheat. As it is ripe in June or July, turnips are often sown immediately after; and by the manure produced by these, as well as their effect on the soil, a second crop of rye can be obtained the ensuing year. This is no doubt contrary to all sound theory; but such is the practice in Flanders, and they do not find that their crops diminish in consequence.

In England rye is mostly sown as a green crop, and when fed off early in spring with sheep, the land is invigorated, and will bear excellent potatoes or turnips the same year. This practice cannot be sufficiently recommended; and if the rye is sown very early in autumn, it may be fed off in October and November, when sheep-feed is beginning to fail and the turnips have not yet attained their full size, without any detriment to the succeeding spring produce.

Winter barley and winter oats have been substituted for rye as spring fodder by some farmers; but on land of moderate quality rye is generally preferred. It bears the severest winters, which is not the case with barley or oats. The rye which has been fed off very early may be allowed to remain for seed, which it will produce more or less abundantly, according as it has been fed off earlier or later.

The preparation of the land for rye is the same as for wheat, except that in very light soils no more ploughings are required than will clear the ground of weeds. If rye is sown after harvest, one ploughing only is usually given. It will thrive upon rich wheat soils, as well as upon lighter, and, as it throws out numerous stems in rich land, it is the more profitable as fodder, although the crop of grain might not be so abundant when the plants are too much crowded. To have as much green food as possible, the rye is always sown broadcast, three bushels at least to an acre; some sow a sack, and with advantage. It is also usually sown amongst winter tares, which the stems of the rye help to keep up from the ground: half a bushel of rye to three bushels of tares is a fair proportion; some farmers sow wheat instead of rye, as being stronger in the stem, but besides its being more expensive, it does not shoot so early as rye, nor is it so much stronger in the green stem, as is supposed. Oats are invariably sown amongst spring tares, and answer the purpose well.

There is a variety of rye mentioned by continental authors by the name of *Seigle de la St. Jean*, or St. John's-day rye, because it grows so rapidly that, if sown about St. John's Day (24th June), it will be fit to mow green by the middle of September, and in favourable seasons may be fed off again in November, without preventing its giving ample feed in spring, and a good crop of grain at the next harvest. It might be advantageous to introduce this variety into England, if it be not already known. There is no doubt that there are varieties of the same kind of plants which have a much more vigorous vegetation than those commonly cultivated; and the introduction of them where they are not known is an important benefit to agriculture. The celebrated agriculturist Du Hamel du Monceau mentions an individual who had obtained, from one sowing, five abundant cuts of green rye for cattle in two years. If any green plant is cut down before the fructification is completed, it will in general throw out fresh stems; and in very rich soils its blossoming may thus be continually retarded, until the roots become too weak to force successive stems.

When the land is in good heart and clean after wheat-harvest, it may be expeditiously cultivated by means of a strong scarifier, such as that lately invented by Mr. Biddel, or some similar instrument, which opens the soil several inches deep, without turning it over; and rye may be sown immediately, without using the plough. This is an immense saving of time and labour, as four or at most six horses will completely stir ten acres of land in a day, which may thus be immediately sown before the wheat is out of the field, or fit to be carried. A week gained in the time of sowing may make all the difference between a crop which can be eaten off before winter and one which will only be fit for the sheep in the succeeding spring. The weeds which may spring up with the rye will either be choked by its luxuriance, or at all events will never shed their seeds, being mown or fed off with the rye, and the roots ploughed in the next year. The large perennial roots will thus be more easily taken out by the harrows, and all the annual weeds will be destroyed.

Although the value of rye as a green crop is fully admitted in England, very little is grown for food or distillation, yet on some poor soils, where wheat and barley are now often sown with a very poor return, and at a great expense of manure, rye and buckwheat would give a much greater clear profit, and would require much less manuring: and where there are not ready means of improving the soil by claying or marling, the cultivation of rye would be found most advantageous; and, by means of sheep, very poor sandy soils might thus be made profitable.

Rye is subject to most of the diseases which attack the plants of the family of the Gramineæ, such as rust, mildew, burnt ear, and smut-ball. These diseases are described in the article WHEAT. But there is one remarkable disease, which, although sometimes found in wheat, is much more commonly observed in rye. It is called the *ergot*, the French name of a cock's spur, which the diseased grain resembles in shape. [ERGOT.] By some perversion of the vital functions of the plant, the embryo or germen, instead of growing into a regular seed filled with farina, shoots out a long black fungus-like substance, several times the length of a common seed, which rises above the chaff, and has the appearance of a slender pyramid, slightly bent on one side. This substance is soft, and easily broken or cut, and is uniform in its internal texture, without any husk or skin over it. If it were merely the loss of the grain of which the ergot takes the place, the mischief occasioned by this disease would be comparatively trifling, but this fungus, when taken internally, mixed with the rye flour converted into bread, has a most powerful and deleterious effect on the animal frame. When taken in any considerable quantity, it produces the most dreadful diseases. This was first observed in France, where a great scarcity from the failure of the crops, accompanied with a more than usual production of the ergot in rye, obliged the poorer inhabitants of certain districts to make bread from diseased rye. The consequences were horrid to behold; their limbs rotted and separated from the trunk before death relieved them from their misery. The ignorant ascribed it to witchcraft, but experiments made on animals by feeding them on ergotted rye, soon showed the real cause. A similar effect is recorded, and supposed to have been produced by the ergot of wheat on a family in the parish of Wattisham, Suffolk, in 1762, of which an account appeared in the 'Philosophical Transactions' for 1762, and which is mentioned by Professor Henslow, of Cambridge, in a paper on the diseases of wheat, in the 'Journal of the Royal Agricultural Society of England' (vol. ii., No. 1, page 17

The extraordinary effects of the ergot of rye have made it the subject of experiments in medicine, and it has been found extremely useful in certain cases of protracted labour. It is consequently become an article of commerce as a drug, and imported from the Continent. By an attentive observation of the circumstances which favour this disease in the rye, it might be profitable to cultivate the plant expressly for the ergot it produces. The seed which grows on the same ear with the ergot might be selected for seed, and a cold wet soil, with an ungenial aspect, might be chosen as most likely to perpetuate the disease. The ergot is sold by druggists at from ten to twenty shillings per ounce, so that, if only a pound of ergot could be collected, it would be worth more than the produce in sound grain of an acre of the best land. At all events, it will well repay the trouble of picking out the ergot from the rye, where it is infected, and it is easily discovered, before reaping, from its prominence and black colour.

RYE-GRASS, sometimes called *Ray-Grass*, is one of the most common of the artificial grasses; it is of the family of the *Gramineæ* of the genus *Lolium*. There are several varieties, some annual and others perennial, some producing a strong juicy grass, and others a small diminutive plant. These varieties arise chiefly from difference of soil, climate, and cultivation. In the convertible system of husbandry, rye-grass performs a very essential part, especially the perennial sort, which, mixed with different varieties of clover and other grass-seeds, produces a rich and close herbage, which may be either mown for hay or depastured. In the course of two or three years the land is so much recruited by the extention of the roots, and by the dung and urine of the animals, that, without dung from the yard, it will produce one or two very good crops. When clover is sown to remain only one year, the annual variety of rye-grass is frequently sown with it. It adds to the weight of the hay, and the stems of the rye-grass are a good corrective to the richness of the clover, when they are given to horses in a green state; but when the hay is intended for the London market, or that of any of the great mercantile towns, the tradesmen and carmen prefer the pure clover hay, thinking it more nutritious. Some farmers also who cultivate their land on the Norfolk system, have a prejudice against rye-grass, as being unfavourable to the succeeding crop of wheat. Accordingly, when they have a layer of rye-grass, instead of clover (because the clover, having been too often repeated, fails in the end), they often take peas or beans between the rye-grass and the wheat. This accords with theory; for when the rye-grass completes its fructification, even if the seed is not ripe, it has a deteriorating effect on the soil similar to that of a white crop, and therefore a leguminous crop should succeed it. Many farmers, without being able to give any reason, assert, from experience alone, that wheat taken after rye-grass is more subject to accident or failure than after red clover. This is not the case when the rye-grass has been depastured, but in the convertible system generally adopted in Scotland oats are usually sown when the grass is broken up, because an abundant crop is obtained on a single ploughing; and the land requires stirring to produce a good crop of wheat, which is taken in preference after beans or early turnips.

Different varieties of rye-grass have been recommended at various times; one which goes by the name of *Pacey's* rye-grass has kept its reputation as a perennial grass for a long time. The *Italian rye-grass*, well known in the South of France, in Switzerland, and in Germany, is a native of Lombardy, where it grows most luxuriantly and rapidly by means of irrigation. There is no grass which so soon forms a water-meadow. It has been brought into notice in England within a few years, in consequence of small parcels of the seed having been brought over by individuals who admired its qualities; and it has borne the cold and wet winters of Britain better than might have been expected. On rich moist land it grows most rapidly and luxuriantly. It will bear several cuttings in a season. The writer of this article has had two perfect crops of seed from the same plants in one year, the first in June and the second in October, both perfectly ripe and heavy. Those who have paid attention to the cultivation of rye-grass think highly of it. This grass grows much more rapidly in spring than any other grass, and is so much relished by cattle, that they scarcely allow a single stem to spring up. A small space in a layer being sown with Italian rye-grass, may be distinguished in the pasture by its superior green colour and its very close pile; and the cattle will always be found there, as long as there is the least bite for them. It may be advantageously sown in autumn with the Trifolium incarnatum, and together they will give much early green food in spring. It may be a question, whether this is preferable to sowing rye; but it affords a variety, and on some soils may produce earlier and more abundant feed for lambs. When Italian rye-grass is sown by itself, and allowed to go to seed, it becomes thin after the first year, from many of the plants dying off: it may therefore be prudent to mix some other kinds of grasses with it, which will supply its place where it is worn out. It is a most excellent practice to sow Italian rye-grass on old meadows and pastures, at the time when they are recruited with compost or earth. If they are well harrowed or scarified, and the rye-grass be sown before the roller goes over them, the succeeding crop of hay will be much increased in quantity and improved in quality. On water-meadows, which require renovation, this grass is invaluable, being early, rapid in growth, and very abundant when irrigated. We have seen hay made in July from a newly made water-meadow sown with Italian rye-grass in March. This was at Mr. De Fellenberg, at Hofwyl, near Berne, in Switzerland. Mr. J. Rodwell, at Alderton Hall, near Woodbridge, in Suffolk, cultivates the Italian rye-grass for seed to a large extent, and with great success.

RYE-HOUSE PLOT. [Russell, Lord Wm.]

RYE, SPURRED. [Ergot.]

RYMER, THOMAS, the learned editor of the great collection of documents relating to the transactions of England with foreign powers, popularly known as 'Rymer's Fœdera,' was one of many sons of Ralph Rymer, of the neighbourhood of Northallerton, who had rendered himself obnoxious to the Royalists in the Commonwealth times in his office of Sequestrator, and becoming implicated in the northern insurrection of 1663, was thereupon executed. Thomas was born in 1638 or 1639, and educated under an excellent schoolmaster at the grammar-school of Northallerton, where he was class-fellow with the learned Dr. George Hickes. He was removed to Sidney College, Cambridge, and was entered of Gray's Inn in 1666.

He does not appear to have attained any eminence in the law. He rather devoted himself to polite literature, till he was named the historiographer royal, and appointed editor of the 'Fœdera.' His first publication is a play, published in 1677, entitled 'Edgar, or the English Monarch.' This was followed in the next year by his letter to Fleetwood Shepherd, 'The Tragedies of the Last Age considered and examined by the Practice of the Antients and by the Common Sense of all Ages.' In 1683 appeared his translation of the Life of Nicias, by Plutarch, which is found in the collection of the 'Lives translated into English by several Hands.' In 1684 he published a tract on the antiquity, power, and decay of Parliament, which was reprinted in 1714, on occasion of the expulsion of Richard Steele, Esq., the member for Stockbridge. In 1693 he published 'A short View of Tragedy; its Original Excellency and Corruption: with some Reflections on Shakespear and other practitioners for the Stage.' This is the work in which he attacks some of Shakspere's tragedies in a manner ludicrously absurd. In 1694 appeared his translation of Mons. Rapin's 'Reflections on Aristotle's Treatise of Poesie.' There are other minor tracts by him, among which is probably to be reckoned the 'Life of Thomas Hobbes,' printed 'apud Eleutherium Anglicum sub signo Veritatis, 1681.'

On December 23, 1692, he was made historiographer royal, a post which had been held by Shadwell and Dryden. The salary was 200*l.* per annum. There was at that time a scheme for publishing a corpus of the documents which remain connected with the transactions between England and other states. It was intended that it should be a large and comprehensive work, honourable to the English nation, and useful to the historical inquirers, not only of England but of all other countries. The patrons of this magnificent design were Montagu, who was afterwards earl of Halifax, and Lord Somers. The execution of it was committed to Rymer. His duties were twofold: first, to collect the instruments themselves, which were to be found chiefly in the chronicles and in the depositaries of public records, particularly the Tower of London and the Chapter-House at Westminster; secondly, to print accurate copies of them. The first volume appeared in 1703, and it was followed by others in quick succession, the later volumes being carried through the press by Sanderson, who had assisted Rymer almost from the beginning.

The work did not disappoint the expectations of the public. It entirely changed the face of the histories of our own country, as may be seen by Rapin's History, and it was hailed with great satisfaction by all the historical writers of Europe.

Large as the work was, there have been three editions of it. A fourth was undertaken by the Commissioners on the Public Records, in which it was proposed to incorporate other documents, which had been discovered since the time of Rymer. This edition extends only to the close of the reign of Edward III.

There are in the British Museum a great number of transcripts of documents made under Rymer's direction not used in his work.

Notwithstanding his appointment of historiographer, and whatever remuneration he might receive for his labours on the 'Fœdera,' Rymer became exceedingly poor in the latter part of his life, and died December 14, 1714, in Arundel Street, in the Strand, and was buried in the church of St. Clement Danes.

RYNCHÆA. [Scolopacidæ.]

RYNCHOPS, the name assigned by Linnæus to a genus of aquatic palmipede birds. The word would be more correctly written *Rhynchops* (ῥύγχος), and indeed is so spelled by most ornithologists; but the word stands in the last edition of the *Systema Naturæ*, published by Linnæus, as it appears at the head of this article, and the genus is arranged at the end of the *Anseres*, coming immediately after *Sterna*, which last is preceded by *Larus*.

Latham placed the form among the *Palmipedes* with short feet; and Lacépède, in the first subdivision of the first division of his second subclass, which last consists of those birds which have the lower parts of the leg denuded of feathers, or many toes united by a wide membrane. *Rynchops* appears in his twenty-fourth order, containing the web-footed birds which have the bill straight and compressed, immediately before the *Divers* (*Urinator, Colymbus*, &c.).

M. Duméril arranged it among his family *Longipennes*, or *Macroptères*, in the order *Palmipedes*. Illiger also places it among his *Longipennes* (in company with *Sterna* and *Larus*), in his order *Natatores*.

Cuvier places it also among the *Longipennes* (order *Palmipedes*), immediately after the Terns and Noddies.

M. Vieillot gives it a position among the fourth family (*Pelagians*) of his first tribe (*Teleopodes*) of his order *Natatores*.

In M. Temminck's method it appears in the order *Palmipedes*, near the Terns and Gulls.

Mr. Vigors observes that *Phaëton* [Tropic Bird], which belongs to the *Pelecanidæ*, bears a considerable resemblance in general appearance and habits to the *Sterna* of Linnæus; and he enters the family of *Laridæ* by means of the last-mentioned genus, with which, he remarks, *Rynchops* most intimately accords in habits and external characters, notwithstanding the dissimilitude of the bill.

M. Latreille places the genus next to the Terns and Noddies, at the end of the *Longipennes*, the third family of his *Palmipedes*.

The Prince of Canino arranges the form at the head of his family *Longipennes*, in the order *Anseres*, immediately before *Sterna* (*Specchio Comparativo*). In the *Birds of Europe and North America* he makes *Rhyncopsinæ* the first subfamily of the *Laridæ*, and places it immediately preceding the *Sterninæ*. One genus only (*Rhyncops*) belongs to the *Rhyncopsinæ*.

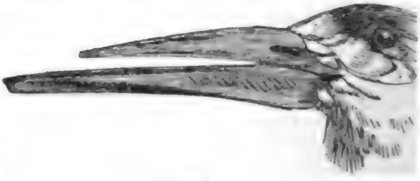
Mr. Swainson (*Classification of Birds*) makes *Rynchops* a subgenus of *Sterna*, which last he places at the head of the family *Laridæ*, and he arranges *Rynchops* between the subgenera *Phaëton* and *Gavia*.

Mr. G. R. Gray (*List of the Genera of Birds*) arranges *Rhyncopsinæ*, with its single genus *Rhyncops*, as the third subfamily of the *Laridæ*, placing it between the subfamilies *Larinæ* and *Sterninæ*.

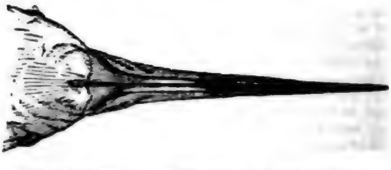
Generic Character.—Bill longer than the head, straight or nearly so, compressed, and in form resembling the blade of a knife, truncated, and with the appearance of having been broken at the point; upper mandible much shorter than the lower, and with a groove into which the lower mandible is received; nostrils marginal, median. *Feet* moderately long, slender. *Wings* very long; the first quills longest.

The extraordinary structure of the bill in this bird immediately fixes the attention. In appearance it looks, at first sight, like a worn or imperfect organ: in reality it is an instrument of the nicest adjustment as applicable to the purposes which it has to execute. Buffon, as was too frequently his wont, condemns an organization which he did not understand and indeed could never have accurately examined. 'The bird named *Bec-en-ciseaux* (Scissor-bill),' says this eloquent but hasty writer, 'can neither bite on the side of the bill nor pick up anything before it, nor peck forwards, its bill being composed of two excessively unequal pieces; the lower mandible, which is elongated and projecting (avancée) beyond all proportion, much exceeds the upper mandible, which only falls upon it like a razor on its haft. In order to reach anything and seize it with so defective an organ, the bird is reduced to skim the surface of the sea as it flies, and to plough it with the lower part of the bill plunged in the water so as to catch the fish below and lift it as the bird passes. It is from this *manège*, or rather from this necessary and painful (pénible) exercise, the only one which could enable it to live, that the bird has received the name of *Coupeur d'eau* (cut-water) from some observers, whilst the name of *Scissor-bill* has been intended to point out the manner in which the two unequal mandibles of its bill fall one upon the other; of these, the lower, hollowed into a gutter with two elevated trenchant edges, receives the upper, which is fashioned like a blade (lame).' Buffon then quotes Ray in proof of this supposed structure: 'Maxilla superior inferiore multò brevior, et in illam, ut novacula in manubrium suum, incidit.'

Now the structure is the very reverse. The upper mandible at its base overlaps the lower with its edges; but the upper edge of the under mandible, which consists of a thin flattened plate or blade, is received in a groove with elevated sharp edges, on the lower surface of the upper mandible: this groove diverges at the base, and thus comes to overlap the lower at the gape as above noticed. We shall presently see how effectually this apparently uncouth instrument is adapted to the necessities of the animal. Catesby indeed justly speaks of it as 'a wonderful work of nature, and accurately describes it. 'The under mandible,' says he, 'is more compressed than the upper, and very thin, both edges being as sharp as a knife, and is almost an inch longer than the upper mandible, which has a narrow groove or channel into which the upper edge of the lower mandible shuts.' Yet Buffon, who quotes Catesby, gives the erroneous description above noticed.



Bill of Rynchops.



Bill of Rynchops; the mandibles closed, and seen from below.

Example, *Rynchops nigra*.

Description.—Male.— About 19 inches in length; the closed wings extend beyond the tail four inches; alar stretch 44 inches. Length of the lower mandible 4½ inches; of the upper 3½; both red, tinged with orange, and tipped with black. Upper part of the head, neck, back, and scapulars black; wings the same, except the secondaries, which are white on their inner vanes, and also tipped with white. Tail forked, the two middle feathers about an inch and a half shorter than the exterior ones, all black, broadly edged on either side with white: tail-coverts white on the outer sides, black in the middle. Front, cheeks and neck below the eye, throat, breast, and all the lower parts white. Legs and webbed feet red-lead colour.

Female only 16 inches long, and 39 in alar stretch; similar with the male in plumage, except in the tail, which is white-shafted and broadly centred with black.*

There are oblique striæ on the lower mandible, which become most apparent in the dead and dry specimen.

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* The description is almost entirely Nuttall's.

This is the *Bec-en-ciseaux* and *Coupeur d'eau* of the French; *Sheerwater*, *Cut-water*, *Skimmer*, and *Black Skimmer* of the Anglo-Americans; and *Piscutor* of the Chilians.

Locality.—Tropical and temperate America.

Habits, Food, Nidification, &c.—Linnæus thus succinctly and truly describes its habits: 'Volando aquæ superficiem radit, ex illa insecta[*] pisciculosque, mandibulo inferiore introducta, extrahit; victitat etiam conchiliis.' Catesby says, 'These birds frequent near the sea-coasts of Carolina. They fly close to the surface of the water, from which they seem to receive somewhat of food. They also frequent oyster-banks, on which I believe they feed; the structure of their bills seems adapted for that purpose.'

Wilson thus describes their mode of taking food on the wing: 'The *Sheerwater* is formed for skimming, while on the wing, the surface of the sea for its food, which consists of small fish, shrimps, young fry, &c., whose natural haunts are near the shore and towards the surface. That the lower mandible, when dipped into and cleaving the water, might not retard the bird's way, it is thinned and sharpened like the blade of a knife; the upper mandible, being at such times elevated above the water, is curtailed in its length, as being less necessary, but tapering gradually to a point, that on shutting it may suffer no opposition. To prevent inconvenience from the rushing of the water, the mouth is confined to the mere opening of the gullet, which indeed prevents mastication taking place there; but the stomach or gizzard, to which this business is solely allotted, is of uncommon hardness, strength, and muscularity, far surpassing in these respects any other water-bird with which I am acquainted. To all these is added a vast expansion of wing, to enable the bird to sail with sufficient celerity while dipping in the water. The general proportion of the wing of our swiftest hawks and swallows to their breadth is as one to two; but in the present case, as there is not only the resistance of the air, but also that of the water to overcome, a still greater volume of wing is given, the sheerwater measuring nineteen inches in length, and upwards of forty-four in extent. In short, whoever has attentively examined this curious apparatus, and observed the possessor, with his ample wings, long bending neck, and lower mandible occasionally dipped into and ploughing the surface, and the facility with which he procures his food, cannot but consider it a mere playful amusement, when compared with the dashing immersions of the tern, the gull, or the fish-hawk, who to the superficial observer appear so superiorly accommodated. The sheerwater is most frequently seen skimming close along shore, about the first of the flood. I have observed eight or ten in company passing and repassing at high water, dipping with extended neck their open bills into the water with as much apparent ease as swallows glean up flies.'

And this is the 'exercise pénible' of M. Buffon, to which he tells us the bird is condemned on account of its 'organe defectueux.'

Mr. Darwin says, 'I saw this bird both on the east and west coast of South America, between latitudes 30° and 45°. It frequents either fresh or salt water. Near Maldonado, in May, on the borders of a lake which had been nearly drained, and which in consequence swarmed with small fry, I watched many of these birds flying backwards and forwards for hours together close to its surface. They kept their bills wide open, and with the lower mandible half buried in the water. Thus skimming the surface, generally in small flocks, they ploughed it in their course; the water was quite smooth, and it afforded a curious spectacle to behold a flock, each bird leaving its narrow wake on the mirror-like surface. In their flight they often twisted about with extreme rapidity, and so dexterously managed, that they ploughed up small fish with their projecting lower mandibles, and secured them with the upper half of their scissor-like bills. This fact I repeatedly witnessed, as like swallows they continued to fly backwards and forwards close before me. Occasionally when leaving the surface of the water, their flight was wild, irregular, and rapid; they then also uttered loud harsh cries. When these birds were seen fishing, it was obvious that the length of their primary feathers was quite necessary in order to keep their wings dry. When thus employed their forms resembled the symbol by which many artists represent marine birds. The tail is much used in steering their irregular course.

These birds are common far inland, along the course of the Rio Parana; and it is said they remain there during the whole year, and that they breed in the marshes. During the day they rest in flocks on the grassy plains, at some distance from the water. Being at anchor in a small vessel in one of the deep creeks between the islands in the Parana, as the evening drew to a close one of these scissor-beaks suddenly appeared. The water was quite still, and many little fish were rising. The bird continued for a long time to skim the surface; flying in its wild and irregular manner up and down the narrow canal, now dark with the growing night and the shadows of the overhanging trees. At Monte Video, I observed that large flocks remained during the day on the mud-banks at the head of the harbour, in the same manner as those which I observed on the grassy plains near the Parana. Every evening they took flight in a straight line seaward. From these facts I suspect that the Rhynchops frequently fishes by night, at which time many of the lower animals come more abundantly to the surface than during the day. I was led by these facts to speculate on the possibility of the bill of the Rhynchops, which is so pliable, being a delicate organ of touch. But Mr. Owen, who was kind enough to examine the head of one which I brought home in spirits, writes to me (August 7, 1837) that 'the result of the dissection of the *Rhynchops*, comparatively with that of the head of the duck, is not what you anticipated. The facial or sensitive branches of the fifth pair of nerves are very small; the third division in particular is filamentary, and I have not been able to trace it beyond the soft integuments at the angles of the mouth. After removing with care the thin horny covering of the beak, I cannot perceive any trace of those nervous expansions which are so remarkable in the lamellirostral aquatic birds, and which in them supply the tooth-like process and soft marginal covering of the mandibles. Nevertheless, when we remember how sensitive a hair is through the nerve situated at its base, though without any in its substance, it would not be safe to deny altogether a sensitive faculty in the beak of the Rhynchops.' (*Zoology of the Voyage of H. M. S. Beagle.*)

But it appears that this organ is not merely useful as a skimmer, but that it is equally available as an oyster-knife. M. Lesson says:—'Though the *Bec-en-ciseaux* seems not favoured in the form of the beak, we had proof that it knew how to use it with advantage and with the greatest address. The sandy beaches of Penco are in fact filled with *Mactræ*, bivalve shells, which the ebbing tide leaves nearly dry in small pools; the *Bec-en-ciseaux*, well aware of this phenomenon, places itself near these mollusks, waits till their valves are opened a little, and profits immediately by the occasion to plunge the lower and trenchant blade of its bill between the valves, which immediately close. The bird then lifts the shell, beats it on the beach, and cuts the ligament of the mollusk, which it then swallows without obstacle. Many times have we been witnesses of this highly perfected instinct.' (*Manuel d'Ornithologie.*)

Mr. Darwin seems to think this use of the bill very improbable; but he gives no reason that ought to weigh against the direct testimony of so good an observer as M. Lesson, for whose accuracy in many cases we can vouch. Indeed, though Mr. Darwin quotes Wilson as declaring that he does not believe the report of its frequenting oyster-beds and feeding on those fish, he acknowledges the existence of this report in the United States, and seems neither to be aware of the passage in Catesby above quoted, nor of the 'victitat conchiliis' of Linnæus.

But, if we are to reason upon this use of the bill, Mr. Owen's account of the absence of nerves from its anterior portion comes in aid of M. Lesson's evidence. The insensibility of the blade of the lower mandible would be a necessary condition for its undergoing the pressure of a bivalve shell griping it with the whole force of the adductor muscles. No lamellirostral bird could support the pain of such a situation; and if one of the ducks should by any chance get the end of its highly sensitive bill into such a vice, it would not be very ready to repeat the experiment.

M. Lesson further states that the bird flies slowly, and at great distances from the coasts of Concepçion (Chili); and that, with the gulls and other sea-birds, it formed bands so thick ('et quod vidimus testamur'), that they resembled long moveable black scarfs, which obscured the heavens from the banks of the Penco to the isle of Quiriquine, a space of twelve miles. (*Manuel d'Ornithologie.*)

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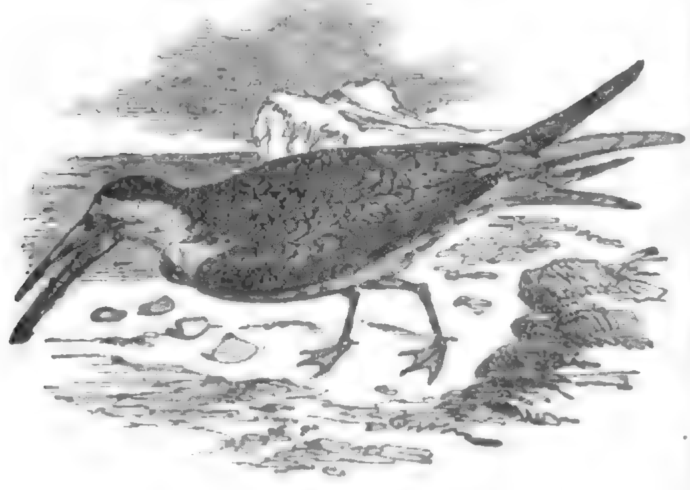
[*] Crustaceans were classed by Linnæus among the *Insecta*.

Mr. Nuttall states that the Cut-water, or Black Skimmer, is a bird of passage in the United States, appearing in New Jersey (to the north of the sea-coast of which he believes it is unknown) from its tropical quarters early in May; and he thinks that it probably passes the breeding season along the whole of the southern coast of the United States. In New Jersey it 'resides and breeds in its favourite haunts, along the low sand-bars and dry flats of the strand in the immediate vicinity of the ocean. Their nests have been found along the shores of Cape May about the beginning of June, and consist of a mere hollow scratched out in the sand, without the addition of any extraneous materials. The eggs are usually three in number, oval, about one inch and three quarters to two inches by one inch and a quarter, and nearly pure white, marked almost all over with large umber-brown blotches and dashes of two shades, and other faint ones appearing beneath the surface. In some eggs these particular blotches are from half an inch to an inch in length. As the birds, like the terns and gulls, to which they are allied, remain gregarious through the breeding season, it is possible to collect half a bushel or more of the eggs from a single sand-bar, within the compass of half an acre; and though not very palatable, they are still eaten by the inhabitants of the coast. The female only sits on her nest during the night, or in wet and stormy weather; but the young remain for several weeks before they acquire the full use of their wings, and are during that period assiduously fed by both parents: at first they are scarcely distinguishable from the sand by the similarity of their colour, and during this period may often be seen basking in the sun, and spreading out their wings upon the warm beach. The pair, retiring to the south in September, or as soon as their young are prepared for their voyage, raise but a single brood in the season.' (*Manual of the Ornithology of the United States and of Canada*, vol. ii.)

The same author states that this species is met with in the equatorial regions of America, where it is resident as far as Surinam, but never penetrates into the interior, being, properly speaking, an oceanic genus.



Rynchops nigra.

M. Lesson remarks that, though this bird closely approaches the species belonging to the Antilles, it is still possible that it may be distinct from it.

RYOTS, the name by which the cultivators of the soil in Hindustan are designated. The social and economical condition of the ryots presents several peculiar features, which form an interesting subject of inquiry for the political economist.

The ryots pay rent out of the produce of their land to a sovereign proprietor, and, so long as they pay the rent demanded of them, have a claim to the continued occupation of the land. This indeed is the condition of the cultivators of land, not only in Hindustan, but in all Asiatic countries. In speaking then of ryots, we speak of the cultivators of land throughout Asia.

The economical condition of the Asiatic cultivator may be described as being made up of the three following circumstances:—1. He is an hereditary occupier, or, in other words, has an hereditary claim to the occupation of the land which he cultivates. 2. The amount of rent which he pays is, in practice, determined by the sovereign power. 3. There exists a number of classes intermediate between the hereditary occupier and the sovereign, all entitled to various portions of the revenue which is yielded by the land, but none having any proprietary right. The number of these intermediate classes, arising out of the tendency of all offices connected with the land to become hereditary, has contributed greatly to the ignorance prevalent among Europeans of the position of Asiatic cultivators.

Such being the general features of the economical condition of the ryot, his actual position necessarily depends most on the amount of rent paid by him to the sovereign, and the manner in which the rent is paid.

The amount of rent was fixed by the laws of Menu at a sixth, an eighth, or a twelfth of the crops, according to differences in the soil, in the degree of labour necessary to cultivate it, and in the general prosperity of districts; but in times of urgent necessity, of war or invasion, the same laws allowed the king to take even so much as a fourth. (*Institutes of Menu*, c. iii., 130; x. 118, 120.) A sixth part of the produce had come to be the uniform tax in Hindustan, when the Mohammedans become its masters. (*Sacontala*.) But we find in Strabo, that when Alexander invaded India, a fourth of the produce was generally taken as rent. The despotic sovereigns of the East did not long continue to observe their antient laws, sometimes openly violating them, at other times evading them by a resort to indirect taxation. Indeed before the Mohammedan period there are instances of oppression by Hindu governments, under which the ryots were allowed to retain no more than a fifth or sixth of their crops.

The form in which the rent is paid has even a greater influence on the condition of the ryot than its amount. In antient times the rent was always paid in produce. Whenever, in later times, it has been demanded in money, the effects have been ruinous to the ryot, chiefly owing to the want of markets. When the ryot is compelled to pay in money, which, owing to the want of a ready market, he has a difficulty in doing, his obvious resort is to a money-lender. The money which he borrows for the purpose of relieving himself of immediate difficulty is borrowed at a high rate of interest. The immediate difficulty is thus got rid of at a great sacrifice, and the ryot becomes dependent on the money-lender. In villages where money-payment is adopted, the money-lender is generally the party contracting with the government for the rents (the *Maharjum*); and were he suddenly to leave the village, taking with him his capital, the village would be ruined.

The agency by means of which the rents are collected, though less important than the form of payment, has also a considerable influence on the condition of the ryot. An account of the system of agency through which the antient Indian governments collected their rents from the ryots, and of the modifications which this system has undergone under the British sway, will here be interesting.

Under the antient Indian governments, the agents of the prince to whom districts were assigned transacted immediately with the ryots, either singly or in villages. The latter mode was the more general, by which the government levied a certain sum on each village, and left it to the villages to settle the individual quotas among themselves. The villages were so many little republics or corporations, governed in the following manner:—There was a head of the village (*Potail*), originally elective, but afterwards hereditary, who united in his own person the magistracy, the superintendence of the police, and the duties of collecting the revenue; a registrar (*Curnum*), who kept the accounts of cultivation, sales, transfers, rents, contracts, receipts, and disbursements; and a number of other officers, comprehending Brahmins for the service of the gods as well as for education, handicraftsmen, inferior ministers of police, &c. The full complement of these officers was twenty-four; but all villages did not contain this number. Assignments of land were made to all these officers, which they held tax-free. Fees paid by the ryots furnished additional profits.

As regards the payment of rents, there were two kinds of arrangement prevailing in the villages. In some villages the land was cultivated in common, and each cultivator had a share of the produce assigned, according to certain fixed rules; these were called *byacharry* (brotherhood) villages. In others each ryot cultivated separately his own spot of land, and paid rent for it separately: these went by the name of *putterday* (partnership) villages.

The heads of villages paid the rents collected to the heads of districts (*des adikars*); these again to the heads of larger tracts of country. The system of government detailed in the *Institutes of Menu* enumerates lords of one town or district, of ten towns, of twenty towns, of a hundred towns, and a thousand towns. All these lords received assignments of land, and a per centage on their collections besides.

The heads of districts (des adikars) came afterwards to be represented by one class of Zemindars, namely those whose duties were confined to the superintendence of police. The class of Zemindars however which is the best known is that class in which the duty of collecting the revenue was added to the superintendence of police. This is not the place to speak of these functionaries, or to trace the changes in their duties and position until the commencement of the British dominion. [ZEMINDAR.] Under the same head must be placed an account of the first proceedings of the English with the Zemindars, and the influence of those proceedings on the Ryots. [CORNWALLIS, LORD; HINDUSTAN.]

A full and interesting account of Ryot rents will be found in Mr. Jones's *Essay on the Distribution of Wealth, and on the Sources of Taxation*, pp. 109-142. The reader is referred also to Mr. Mill's *History of India*, vol. i., p. 271-3.

RYSBRAECK or **RYSBRECHTS, PETER**, an artist, who was born at Antwerp, in 1657, and studied under Francis Milé, whom he accompanied to Paris. He followed the style of Poussin, in imitating whom he was pre-eminently successful. Notwithstanding large offers and flattering encouragement to remain in France, he returned to his native city, and in 1713 was made director of the Academy there. The landscapes of Rysbraeck are distinguished by grandeur of style, which, though founded on an imitation of the admirable productions of Nicholas Poussin, possess sufficient originality to secure him from the imputation of plagiarism. Indeed he painted in the spirit rather than copied the works of that great artist. Rysbraeck's colouring is harmonious, his touch is bold and free, and he possessed great facility of execution. Still there is a want of variety, a certain monotony in his pictures, which places them, in the estimation of connoisseurs, far below those of Poussin. (Pilkington's and Bryan's *Dictionaries*.)

RYSWICK, PEACE OF, was concluded in 1697, and erminated the war which had been begun in 1688 by France against Holland, England, Germany, and Spain, he parties to the league of Augsburg (1686) and the Grand Alliance (1689). Four treaties were upon this occasion signed in the royal palace of Ryswick: the first, between France and Holland, on the 20th of September; the second, between France and Spain, on the same day; the third, between France and England, on the 21st; the fourth, between France and Germany, on the 30th of October. By he treaty with the United Provinces, which was founded upon the treaties of Westphalia (1648) and of Nimeguen (1678), Louis XIV. agreed to restore all his conquests from that power, and the Dutch in like manner gave back to France their conquest of Pondicherry in the East Indies. A separate treaty of commerce between these two powers was also signed at the same time, the provisions of which it is unnecessary to detail. By the treaty with Spain, Louis restored Gerona, Rosas, and his other conquests in Catalonia, and also Luxembourg, Charleroi, Mons, and all the other places in the Low Countries of which reunions had been made by France since the peace of Nimeguen. A list of these reunions was appended to the treaty. By the treaty with England, all conquests during the war were mutually restored; and Louis acknowledged William III. as lawful king of Great Britain, and engaged not to furnish any succours to the deposed king James II. By the treaty with the emperor, Louis restored Fribourg, Philipsburg, and Brisac, undertook to demolish the fortifications of Huningen, and consented to the re-establishment of the duke of Lorraine; and the emperor ceded to France Strasburg and its dependencies, which were already in the actual possession of that power. The general peace that followed the treaties of Ryswick lasted till 1702.

Ryswik, or Ryswick, is a village in Holland, a league from the Hague, with about 2000 inhabitants, and the port of Nieuwburg. [PARTITION TREATIES.]

RY'TINA. [WHALES.]

RZESZOW is a circle in Austrian Galicia, containing about 1700 square miles and 231,000 inhabitants. It is situated along part of the southern frontier of the kingdom of Poland. The country is level and fertile: it produces corn and flax. A considerable part of it, especially in the north between the rivers San and Vistula, is covered with forests. There are no manufactures except linen, woollen cloth, leather, and wooden wares.

RZESZOW, the chief town, has nearly 5000 inhabitants, of whom rather more than half are Jews. Among the latter are many goldsmiths, or rather manufacturers of all kinds of trinkets composed of base metal with a very small mixture of gold, and known by the name of Rzeszow gold. The inhabitants have some linen and cloth manufactures, and carry on a good trade in corn, furs, &c. This town is considered to be one of the best built in Austrian Poland. There is a gymnasium, a district school for boys and girls, an hospital, and other useful institutions.

The other three towns are, Lezaisk, 3288 inhabitants; Przeworsk, 3000 inhabitants (a wretched place, consisting almost entirely of wooden houses); Lanzut, with only 2000 inhabitants, but remarkable for a fine palace of Prince Lubomirski, with beautiful gardens, and an avenue of limetrees two leagues in length.

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S.

S is the chief sibilant of the English alphabet, and is employed to represent two different sounds, as in *this* and *these*. The word *sugar* would seem to justify the addition of a third sound, *sh*; but in this word the vowel *u*, so often pronounced *yu*, has modified the pronunciation of the preceding consonant. *Syugar* would easily glide into *shugar*. In the Hebrew alphabet, whence those of Europe are derived, a common symbol is employed, with and without an affixed dot, to denote *s* and *sh*. The symbol referred to has for its name a word which also signifies *tooth* or *teeth*; and if we call to mind that the so-called Phœnician and Samaritan alphabets give older forms of the Hebrew letters than those now used, it will be easily believed that the symbol in its original shape [ALPHABET, p. 382] was the representation of two or three teeth; an origin which would agree with the fact that the sibilants are all formed by means of the upper teeth, and the sound *sh* by the upper and lower brought together. This explanation is confirmed by the consideration that in emitting the last-named sound the teeth are not only the sole organs employed, but more than usually exposed to view by the retraction of the lips. But for the strong evidence thus furnished by the Hebrew alphabet, the form and power of the letter might have been readily derived from an imitation of a hissing snake.

The letter *s* is subject to the following interchanges, many of which have been previously noted.

1, *s* with *d*. See D.

2, *s* with *th* and *sth*, as in the Laconian dialect of the Greek language in which θεος, Τιμοθεος, Αθηναια, take the forms σιορ, Τιμοσιορ, Ασαναια. Hence too τυπτομεσθα, &c. readily glided into τυπτομεθα, &c. The English language formerly wrote *loveth, hateth*, but now prefers *loves, hates*.

3, *s* with *t*. Thus again the Attic forms φησι, επεσον, Ποσειδων, συ, were by the Dorians written φατι, επετον (regularly enough from the present πιπ(ε)τω), Ποσειδαν, τυ. In like manner the German words *das, was, es, wasser, hassen, essen*, appear in English as *that, what, it, water, hate, eat*.

4, *s* with *z*. Thus the Greek island Ζακυνθος was the mother city of Saguntum in Spain, and no doubt gave its name to it. In fact, the MSS. of Livy (xxi. 7), with one exception scarcely worth mentioning, appear to have all got *Oriundi a Sagunto insula dicuntur*, not *Zacyntho*. But the most abundant evidence of the interchange is to be found in the Somersetshire dialect of our own tongue.

5, *s* with *sh*. Witness the Berlin pronunciation of all German words beginning with *st*. Moreover, the English words *sleep, slay, smear, snow*, have for their German equivalents *schlaf, schlag-en, schmier-en, schnee*.

6, *s* with *c, g*, and *h*. See those letters.

7, *ks* with *g*. See X.

8, *s* with *n*. See N.

9, *s* with *r*. See R.

10. *S* often appears before an initial consonant, where it is doubtful whether the older form be that with or that without the sibilant. Thus the Greek στεγω, σφενδονη, σφηξ, correspond to the Latin *tego, funda, vespa*. So σκελος and σκολοψ would be found upon close examination to be the equivalents of the Latin *crus* and *crux*, and σκαλευω to differ from *scru-ta-ri* only in the fact that the latter is a frequentative verb. Again the Greek possesses within itself the double forms σμικρος and μικρος, στρεφω and τρεπω. The English language contains numerous examples of the same variation, as in *melt* and *smelt, tumble* and *stumble, pike* and *spike*. The German as well as our own tongue not unfrequently prefixes an *s* when the Greek and often the Latin are without that letter. Thus the Greek κλει-ω (root κλεις or κλειδ), the Latin *claud-o* or *clud-o*, and *clavis*, the German *schliess-en*, and the English *shut* are all of one kin. Compare too the various forms of the words signifying *snow*.

11. The sound *sw* at the beginning of words is often degraded by the loss of the sibilant or *w*, or both. Thus to the Latin *suavis* and *suadeo* correspond the Greek ἁδυς, &c., the German *süss*, and the English *sweet*. Those who doubt the connection here assumed between *suavis* and *suadeo*, may, as regards form, compare *clavis* and *claudo*, or *viginti* with what must have been its older form, *duiginti*, while the connection in meaning will be readily established by the common comparison of *advice* with *medicine, unpalatable* but *salutary*, as in Lucretius, (i. 935), *Sed veluti pueris absinthia*, &c. Again *sop-or* and *somnus* (*sop-nus*) of the Latin correspond to the Greek ὑπ-νος, to the Gothic verb *in-swepp-an*, the German *schlaf*, and the English *sleep*; *socer* and *socrus* in Latin, to the Greek ἑκυρος and ἑκυρα, and the German *schwieger* as prefixed to *sohn, vater*, &c.; the Latin *sud-or*, to the Greek ἱδ-ος, ἱδρως, &c., to the German *schweiss* and English *sweat*; the Latin *sui, sibi, se*, to the Greek οὑ, οἱ, ἑ, although the Greek has also allied words beginning with σφ. The Latin *soror*, German *schwester*, English *sister*, have lost their correlative in Greek. Lastly this interchange will perhaps account for the fact that the river Oder has two antient names, *Suevus* and *Viadrus*, which have been the cause of much confusion in the geography of antient Germany. Indeed the mouth of the river is still called *Swinemünde*.

11. *Sp* is interchangeable with *ps*, *sk* with *ks*, and *sd* with *ds*. For the last we need only refer to the Doric use of σδ for ζ. Instances of the second interchange occur occasionally in Greek and Latin. Fιξος, the misletoe, is written in Latin *viscus*; ἐσχατος, ludicrously put down as a primitive in some lexicons, is of course only the superlative of the preposition ἐξ, for ἐξατος. The Latin *misceo* has for its participle *mixtus* as well as *mistus* (= *misctus*). The tendency to this interchange accounts too for the form *sescenti*, for *sexcenti* is never found in the best MSS. of the best authors. But the Anglo-Saxon and English afford the most numerous instances of this metathesis. Thus the former language has the double forms *väps* or *väsp*, a wasp; *äpse* or *äspe*, tremulous (whence the name of the *aspen* tree); *häpse* or *häspe*, a lock (Grimm, *Deutsche Grammatik*, p. 251); also *frosc* or *frox*, a frog; *fiscas* or *fixas*, a fish; *tusc* or *tux*, a tusk; *asce* or *axe*, cinder; *ascjan* or *axjan*, to ask (*ibid.*, p. 256). Hence it will be seen that it is a mere accident if in our own tongue *axe* and *waps* have been rejected as vulgarisms in favour of *ask* and *wasp*. The provinces still prefer the *ks* and *ps*. Thus a Kentish countryman talks of a *whips* rather than *whisp* of hay. May we not in this way establish the identity in name of several of our rivers, as *Axe, Exe, Esk*, and *Usk*?

12. *S* is often lost. Inattention to this fact is the cause of much confusion in the grammars of the Greek language. Thus the neuter nouns in ος must once have had a corresponding σ in the genitive, γενες, γενεσος, &c., afterwards γενος, γενεος. Hence the retention of the ς in the vocatives of proper names formed from neuter nouns of this class, as Διογενες, Δημοσθενες, Σωκρατες. (See *Journal of Education*, vol. iv., 333.) Above all, the neglect of this letter in the original (as here assumed) forms of certain present tenses leads to apparent anomalies in the derived forms. Thus from κλει(σ)ω we should have without any irregularity κεκλεισμενος; from γευ(σ)μαι without difficulty γευσ-τικος, as well as the Latin *gus-tus, gus-ta-re*; from δε(σ)ω, δεσμος, in which the sibilant corresponds, as it so often does, to the guttural in *liga-re, dica-re*, and the English *tight* from *tie*. The Latin language in such cases changes the sibilant into an *r*; but even this language is not at all unwilling to discard an *s*, particularly at the end of words, as in the double forms *magis* and *mage, videris* and *videre, ipsus* and *ipse, puer* for *puerus*. Nay, even the neuters of adjectives seem to have lost the final *s* of the nominative in this way. At any rate *potis* is used for a neuter nominative as well as *pote*. The third person of the Latin perfect may possibly owe its occasional long quantity (*perrupīt*, Hor.; *subiīt*, Hor.; *rediīt*, Ovid, &c., &c.) to an older orthography ending in *ist*; for as the other perfects of the indicative as well as those of the subjunctive and infinitive of the active verb, to say nothing of all the passive perfects, are evidently formed by the addition of the tenses of the verb *esse*, so *perrupistis* and *perruperunt* contain in the two last syllables the almost unaltered forms of *estis* and *esunt*, and seem to justify the idea that *perrupit* is a corruption of *perrupist*, i.e. *perrupest*. As to form, we might compare this corruption with what we know has occurred in the French subjunctive perfect, *fusse, fusses, fût*, that is, *fust*. The French language abounds in examples of the loss of the sibilant. Thus from the Latin *asinus, magister, noster*,

quadragesima, are derived, first, *asne, maistre, nostre, caresme*, and then, according to the modern orthography, *âne, maître, notre, carême*, to say nothing of the silent *s* in such words as *mais, vous, isle, est*, &c.

SA DE MIRANDA. [Miranda.]

SAAD-ED-DEEN (*Khoja Saad-ed-deen Mohammed Effendi*), the most celebrated of the Turkish historiographers, was born in the early part of the sixteenth century of our æra; his father, Hassan-Jan, a Persian by birth, held a post in the household of Sultan Selim I., and was highly esteemed by that ferocious monarch, whom he attended in his last moments. His son Mohammed received his education among the pages of the imperial palace, and having devoted himself to the study of Moslem theology and jurisprudence, became a muderris, or professor in the college attached to the great mosque of St. Sophia. The talents and learning which he displayed in this capacity gave him high celebrity; and he was appointed by Selim II., in 1573, khoja, or preceptor to his son Mourad, the heir apparent, who then held the government of Magnesia. The death of Selim, in December, 1574, called Mourad to the throne; and Saad-ed-deen was nominated cadhilesker, or military judge; but he continued to retain almost unlimited influence over his imperial pupil, who had recourse to his advice in matters of government so constantly as to excite the jealousy of the vizirs; and an attempt was made to ruin him by representing the erection of an astronomical observatory, which the sultan had founded at his instigation near Top-khana, as an evil omen for the stability of the empire. But though the observatory was demolished by the superstitious fears of Mourad, the favour with which he regarded Saad-ed-deen was unimpaired; and Mohammed III., who succeeded in 1595, continued to entrust the confidential adviser of his father with the management of the most secret diplomatic relations of the empire; the Khoja-Effendi (as Saad-ed-deen is frequently termed by Oriental writers) even attended Mohammed in the Hungarian campaign of 1596; and the great victory of Keresztes is ascribed in a great measure to his exhortations, which prevented the sultan from abandoning the field at the moment of extreme peril. He however incurred a temporary disgrace immediately afterwards, by his advocacy of the cause of the fallen vizir Cicala; but he was speedily restored to favour, and on the death of the mufti Bostan-Zadah, March, 1598, was raised to the highest ecclesiastical dignity by the sultan, in spite of the opposition of the grand-vizir Hassan, who proposed the elevation of the celebrated poet Baki. He did not however long survive his exaltation, dying suddenly in the mosque of St. Sophia, as he was preparing for prayers on the anniversary of the birth-day of the prophet, October 2, 1599 (not 1600, as stated in the *Biogr. Univ.*), A.H. 1008, and was interred in the cemetery of the mosque of Ayub, whither his remains were borne by his four sons, two of whom at subsequent periods also held the dignity of mufti. The great historical work of Saad-ed-deen, composed by order of Mourad III. (who created for the author the new office of shahnamehdji, or imperial historiographer), is entitled Tadj-al-Towarikh, or the crown of histories, and gives a full and copious narrative of the history of the empire, from its foundation in 1299 by Othman, to the death of Selim I. in 1520; the materials are principally drawn from the previous works of Neshri, Moulana-Edris, and Kemal-pasha-Zadah; but its chief merit, in the estimation of the Turks, consists in the florid and elaborate beauty of the diction, in which the author is certainly unrivalled by all other Turkish historians. Sir W. Jones has pronounced that 'for the beauty of its composition and the richness of its matter, it may be compared with the finest historical pieces in the languages of Europe;' but the meaning is too often concealed by a cloud of rhetorical tropes, and it is impossible to forget in the perusal of the work that it is the production of a courtier. It is singular that this valuable work has never yet been printed at the imperial press of Constantinople; but MS. copies are frequent in European libraries, and an Italian version was published by the Ragusan Vincenzo Bratutti (4to., part i., Vienna, 1646; part ii., Madrid, 1652), under the title 'Cronaca dell' Origine e Progressi degli Ottomani, composta da Saidino Turco, e tradotta in Italiano;' small portions have also been translated by Kollar, and by Grangenet de la Grange. A Turkish abridgement of the work, with a continuation, was published in 1696 (A.H. 1108), with a dedication to Sultan Mustapha II., by Saadi-Effendi of Larissa; and the resemblance of name has often led to this work (which served as the basis for the inaccurate compilation of Cantemir) being confounded with the great history of Saad-ed-deen. (See Von Hammer, in *Journal Asiatique*, January, 1824.) Besides this great work, Saad-ed-deen was the author of the 'Selim-Nameh,' a history of Selim I., or rather a collection of anecdotes of that prince, related to him by his father Hassan-Jan; this compilation, which is divided into fourteen sections, is valuable for its authenticity. His descendants appear to have flourished for several generations, and to have inherited the talents of their ancestor; two of his sons, as already noticed, Mohammed-Effendi and Assaad-Effendi, attained the rank of mufti; and a grandson or great-grandson of the latter, Mollah-Fayez, is mentioned as an eminent legist by Sheikhi, who notices his death in 1724.

(Von Hammer, *Histoire de l'Empire Ottomann;* D'Herbelot; *Biographie Universelle; Journal Asiatique.*)

SAADI, or (as his name is written in full in Arabic or Persian) *Sheikh Moslih Eddin Saadi Alshirazi*, the first part of the name being a title of honour, the two next words his epithet, and the last expressive of his being a native of the city of Shiraz, where he was born in the year of the Hegira 571 (A.D. 1175-6). He is probably better known by name to the European reader than any other poet or writer of the East, excepting Mohammed; and while this European reputation may be in some measure attributed to his renown amongst his own countrymen, a circumstance which would naturally recommend his work for perusal and translation to the few Persian students of two hundred years back, it may be also in a great degree ascribed to the simplicity and elegance of his style, so like that of the best periods of Christian literature, and so unlike that of the great mass of Persian writers. Saadi led the life of a dervish, or wandering monk, and passed most of his early years in travelling from one country to another. In the course of these journeys he was taken by the Crusaders and put to labour on the fortifications of Tripoli. He was redeemed from this slavery by a rich merchant, who afterwards gave him his daughter in marriage, with a dowry of an hundred pieces of gold. This is alluded to in the 'Gulistan' (tale xxxi. of ch. ii., p. 99 of Gladwin's translation, London, 1808). The lady sorely exercised the poet's patience. 'Once,' says he, 'she reproached me, saying, Art thou not he whom my father redeemed from captivity amongst the Franks for ten dinars? I answered, Yes, he ransomed me for ten dinars, and put me into your hands for a hundred.' A story of a livelier character is told of his meeting with a brother poet, Hemám of Tabriz, who, ignorant of the name, and knowing only the birth-place of his companion, held out to him the bottom of a cup (the Shirazians were noted for their early baldness), and asked, Why are the heads of the Shirazians like this? The dervish turned the hollow of the cup to Hemám, and asked, Why are the heads of the Tabrizians like *this?* Hemám asked his companion if he knew any of the verses of Saadi, and the dervish repeated some of the most beautiful. He then inquired, 'Do they make much esteem there of the poems of Hemám?' Saadi elegantly quoted a couplet of his companion's:—

'Between the object of my love, Hemám, and me, a veil is drawn,
But it is time the veil should be drawn back, and we enjoy the sight of one another:'

and thus the illustrious poets were made acquainted.

Another anecdote shows, in the fanciful language of Persian imagination, the high esteem in which the writings of Saadi were held even during his lifetime. Indeed he was fortunate enough to add a large share of this enjoyment of fame to the renown which 600 years have not diminished. A holy man of Shiraz, says the story, dreamed that he heard all the angels of heaven singing a verse which he could not understand, but which he was told was a couplet of Saadi's, and that it would be sung in heaven for a year to come. In the morning he went to the cell of the now recluse poet, and found him repeating the distich:

'On the green trees the clear eye of the wise beholdeth
In every leaf a book of the wisdom of God.'

Saadi died in 1291, at the age of 116 years, having spent, it is said, 30 years in travelling and in military service, during which, his wanderings reached as far as India on one side, and Asia Minor, or perhaps Eastern Europe, on the other; 30 years in religious solitude, digesting the results of his life of observation; and the 12 last years of his life in putting into a permanent form the fruits of the preceding 60. During this long life he performed the pilgrim age to Mecca fifteen times; the first time in the company of his teacher, Abdolkadir Ghilâni. He lived under the patronage of the Átabeg princes, Saad Ben Zenghi, and his successor, Abubekir Ben Saad. From the former of these princes, his father, who was in the royal service, gave his son the name of Saadi: this in the East is a not unusual mode of naming both men and books, and the name is often so contrived as to form a sort of *jeu de mots*.

The works of Saadi, collected by Ahmed Nasik Ben Sesân, consist of the Gulistan, Bostan, Gazels (or odes), Kasaid (or elegies), Mokataat (fragments), Rubayat (quatrains), and essays of various kinds in prose. Of all these the best known are the Gulistan and the Bostan. The former is a collection of stories, in prose, but intermixed with verses of the author's own composition, or borrowed from the writings of others, a mode of writing which the Eastern imaginative writers much affect. The Gulistan is divided into eight chapters: on the morals of kings; on the morals of dervishes; on the excellency of contentment; on the advantages of taciturnity; on love and youth; on imbecility and old age; on the effects of education; and rules for conduct in life. The first seven chapters consist chiefly of moral stories, some of them apparently from real history, others fables, each in some degree bearing upon the subject of the chapter, and having its moral interwoven in its texture. The last chapter is rather a collection of apothegms, though a part of this also is narrative. These stories are not connected by a general thread of narrative, as is the case with most oriental collections (the reader will remember the general and subordinate stories which connect the histories of the Arabian Nights and the Fables of Pilpay); they follow one another without any link, except that of their allusion to a common subject. Of this book there have been many translations: into French by Du Ryer, who was French consul at Alexandria, Paris, 1634; into German by Olearius, who, in his preface, acknowledges the assistance of an old Persian literator named Hakwird, and mentions an earlier German translation made from the French of Du Ryer, and soon after the appearance of the latter. The translation of Olearius is preceded by a letter from his friend Dr. John Reinboth, containing a précis of Persian history, and followed by a translation of Lokman's Fables. The translation is spirited, and so are the copperplates. This version was published at Sleswic in 1654, and a Dutch translation from the German appeared at Amsterdam in the same year. Olearius also translated the Bostan (a somewhat similar collection to the Gulistan, but all in verse) into German. The Gulistan has been translated into English by Gladwin, London, 1808; and by Ross for the Asiatic Society. There has also been a more recent French version than that of Du Ryer from the original by the Abbé Gaudin (1789). This translation is accompanied by 'An Historical Essay on the Legislation of Persia.'

The whole works of Saadi, in the original Persian and Arabic, were printed at Calcutta, in 2 vols. small folio, edited by Harrington (1791). The text of the Gulistan appeared first in the edition of Gentius, Amsterdam, accompanied by a Latin translation and notes. Gladwin published the text at Calcutta in 1806, which was reprinted in London in 1809. The text, with the translation in parallel columns (by Jas. Dumoulin), was printed at Calcutta in 1807, and there have since been more than one lithographed edition, one of which, we believe, has the Bostan on the margin—a form in which the two works often appear in manuscripts. Professor Falconer has given the Persian student an elegant selection from the Bostan, lithographed, containing about one-third of the whole work, and has also inserted in the 'Asiatic Journal' several excellent versions of detached stories, accompanied by the text, as collated from several copies, and by critical notes. The Gulistan is one of the best text-books for learning Persian, and the edition of Gentius perhaps the best for this purpose, from the extraordinary beauty and clearness of the type (no unimportant matter when Persian letters are in question), and the accompanying Latin translation. A good Life of Saadi is given in the introduction to Harrington's edition of his works (a translation from the Persian of Dowlet Shah); a briefer notice in D'Herbelot; and one of some length in Von Hammer's 'History of the Elegant Rhetoric of Persia' (*Geschichte der Schönen Redekünste Persiens*).

SAALFELD is a principality about 170 square miles in extent, with 23,000 inhabitants, which, since the extinction of the branch of Saxe-Gotha, and the partition of its territories among the three other branches, Saxe-Coburg, Meiningen, and Altenburg, belongs to Meiningen.

SAALFELD, the capital, is situated on the Saale, in a very pleasant country, and has two suburbs. The population is nearly 5000. There are manufactories of woollen-cloth, stuffs, leather, snuff and tobacco, succory, coffee, and cobalt; there are also vitriol and alum works, breweries, and a copper smelting-house on an island in the Saale, over which river there is a stone bridge of five arches. The town has four churches, a gymnasium, and two ducal palaces; the new palace, from which there is a very fine prospect, and the old palace, which contains the mint. The princes of Schwarzburg-Rudolstadt and of Reuss also make use of this mint.

SAAR-UNION. [RHIN, BAS.

SAARBRÜCK, or **SAARBRÜCKEN**, is the capital of a circle in the government of Trier (Treves), of the Prussian province of the Rhine, situated on the navigable river Saar, over which there is a stone bridge connecting the town with the suburb of St. John. It is a neat pleasant town, and the houses are all built of stone. It has a gymnasium, a Lutheran, a Calvinist, and a Roman Catholic church, and a synagogue. In this town are the court of justice for the circles of Saarbrück, Saarlouis, Ottweiler, and St. Wendel, a mining office, a salt-office, a custom-house, and other public offices. The inhabitants have manufactures of woollens, linen, tobacco, iron wire, porcelain, &c. They have also breweries, tanneries, and alum-works, and carry on a thriving trade by means of the river, especially in coals and timber. The population is nearly 5000, and, including the garrison, 7160. Saarbrück was formerly an independent county. The family of the counts becoming extinct in 1380, it fell to the house of Nassau, and was the residence of the princes of Nassau-Saarbrück, whose palace was reckoned one of the finest in Germany, but is now destroyed. By the treaty of Luneville, it was ceded to France, and made part of the departments of the Saar and of the Moselle. The congress of Vienna, in 1815, assigned it to Prussia.

SAARLOUIS, called during the French revolution Saarre-libre, is the extreme fortress of Prussia on the frontier next to France, which has been very much enlarged and strengthened since it has been in the possession of Prussia. It is situated in a plain on the left bank of the Saar, in the government of Trier, in the Rhine province. Including the garrison, the population is about 7000. The inhabitants manufacture iron and steel wire, hardwares, fire-arms, and leather. In the neighbourhood there are mines of iron and lead. There are considerable tanneries in the town, dockyards for building vessels for the navigation of the Rhine, the Moselle, and the Saar. Saarlouis, like Saarbrück, is the seat of various public offices, has a gymnasium, one Protestant and two Roman Catholic churches, a synagogue, an hospital, an arsenal, and two barracks. The fortress was erected by Vauban in 1680, to defend Lorraine. By the treaty of Ryswick, in 1697, France was left in possession of it, and in 1705 it was besieged by the allies without success. By the treaty of Paris, Nov. 30, 1815, France was obliged to cede Saarlouis with three other fortresses to the allied powers, who assigned it, with the two banks of the Saar above Saarbrück, to Prussia.

SAATZ is a circle of the kingdom of Bohemia, the area of which is 900 square miles, with 130,000 inhabitants, the majority of whom are Germans. It is bounded by Saxony, and by the Bohemian circles of Leitmeritz, Rakonitz, Ellenbogen, and Pilsen. It is on the whole a mountainous tract. In the north is the Erzgebirge, and in the south a part of the middle Bohemian chain, which is one of the most fertile parts of the whole kingdom. The principal river is the Eger, which receives all the smaller streams. The chief products are corn, flax, hops, timber, silver, iron, tin, cobalt, lime, precious stones, and cattle. The inhabitants manufacture linen, calico, muslin, lace, paper, and wooden-ware. There are 27 towns and 464 villages in the circle. Saatz, the chief town, is situated on a considerable eminence on the right bank of the Eger, over which there is a chain bridge, 204 feet long and 18 broad. The town has a gymnasium, a handsome town-house, a large parish church, several other churches, and a Capuchin convent. The population is 5000.

SAAVEDRA, MIGUEL DE CERVANTES, the celebrated author of 'Don Quixote,' was born at Alcalá de Henares, on Sunday, the 9th of October, 1547, of an antient family originally from Galicia, which had for some time bee established in Castile. His grandfather, Juan de Cervantes, was corregidor of Ossuna. His mother belonged to the illustrious family of Barajas. Very little is known of the early life of Cervantes, except that he received his first education at the place of his birth, and gave very early proofs of talent. Having attained the proper age, Cervantes repaired to Salamanca, where he entered himself as a student at the university, and remained two years. He then went to Madrid, where his parents placed him under the tuition of Juan Lopez de Hoyos, a learned theologian, who filled the chair of belles-lettres in that city. Under him Cervantes seems to have made considerable progress. He himself informs us ('Viage al Parnaso,' p. 54) that he composed several romances or ballads, besides a pastoral called 'Filena;' and when, in 1569, his master published a collection of poems on the death of Isabella of Valois, wife of Philip II., there appeared, among the rest, two poetical compositions by Cervantes, whom he calls 'our dear and beloved pupil.'

In 1568 Cervantes entered the household of Cardinal Aquaviva, then at Madrid, and accompanied that prelate on his return to Rome. He remained with him one year, after which he entered the army, and served as a volunteer under Marco Antonio Colonna, the commander of the papal forces against the Turks. He greatly distinguished himself at the battle of Lepanto (Oct. 7, 1571). Though suffering at the time from intermittent fever, he took an active part in the combat, and received three arquebuse wounds, two in the breast, and one in his left hand, which maimed him for life. He continued to serve under Don Juan of Austria, and his successor in command, the Marquis of Santa Cruz, until 1575, when he revisited his native country, and spent some time at Madrid among his friends and relations. Having early in 1576 obtained a command in a regiment about to be sent to the Low Countries, Cervantes embarked with his elder brother Rodrigo, also a soldier, on board the Spanish galley El sol (the sun). On the 26th Sept. however, the galley was suddenly surrounded by an Algerine squadron, under the command of Arnaut Mami, who, after a most obstinate defence, boarded and took it, and carried his prize into Algiers. The crew and passengers were sold as slaves. Cervantes, who had fought with desperation on the boarding of the galley, was reserved by Mami for himself.

The numerous interesting details which Cervantes has given us in his novel 'El Cautivo' (the captive), and which have also come down to us from undoubted and impartial sources, display so much gallantry and magnanimity on his part, that they cannot be read without calling forth our admiration. After many bold but unsuccessful attempts to regain his liberty, by which he ran great risk of losing his life, Cervantes was redeemed in 1580 by the Fathers of Mercy, established for that purpose at Algiers, who paid to Hassan Aga, then his master, the enormous sum of 500 gold ducats, which had been raised among his friends and relatives. On his return to his native country, Cervantes, being destitute of all resources, again resumed the military profession, and served in three successive expeditions against the Azores. It was not till his return to Spain, in 1584, that he appeared as an author, having soon after published his 'Galatea,' a pastoral romance in prose and verse, in imitation of 'La Diana' of Montemayor, a species of composition much in fashion at that time. In this romance Cervantes personified himself, as well as the lady of his love, Doña Catalina Palacios y Salazar, whom he married in the same year (1584), under the names of Elicio and Galatea. He next devoted all his attention to the composition of dramas, of which he wrote upwards of thirty, and which, he informs us, were all acted with considerable applause. These are however all lost with the exception of two, 'El Trato de Argel' (Algerine dealing), and 'La Numancia.' But notwithstanding his theatrical success, Cervantes must have been in bad circumstances, since in 1588 we hear of him at Seville, where he filled the office of assistant-purveyor to the Indian fleets. That he was not content with his situation, and that it was an insignificant one, would appear from the fact of his having shortly afterwards, in 1590, made an application to be employed in the New World. At length, the purveyorship having been abolished and his office suppressed in 1596, Cervantes earned a scanty livelihood by becoming agent to various municipalities, corporations, and wealthy individuals. We have few traces of the mode in which he exercised his pen during this interval, and with the exception of two burlesque sonnets (estrambotes), one of which was intended to ridicule the ostentatious arrival of the Duke of Medina at Cadiz, after this town had been plundered and abandoned by the Earl of Essex, we hear of no other production of his genius. It is probable however that during his stay at Seville he wrote some, if not all, of his 'Novelas Exemplares,' which he subsequently published. From 1598, when he left Seville, to 1602, when we hear of him at Valladolid, there is a gap in the history of this great man, which all the diligence of his biographers has hitherto failed in filling up, it not being known where he resided or what pursuits he was engaged in. Some indeed are willing to supply the deficiency by supposing him to have been engaged as tithe-collector in La Mancha, and they add, that whilst fulfilling the duties of his office he was put in prison by the alcalde of Argamasilla, a small town of that province, and that he thus wrote the first part of his 'Don Quixote' in confinement. The accuracy with which the country of La Mancha and the manners and customs of its inhabitants are described in that work, is certainly in favour of the conjecture that he resided some time there; but Navarrete ('Vida de Cervantes,' p. 95) has shown that the report of his imprisonment rests on no other foundation than vague tradition. However this may be, Cervantes was at Valladolid in 1602. Three years after he published the first part of his 'Don Quixote,' which he dedicated to Don Alonso Lopez de Zuiñga y Sotomayor, seventh duke of Bejar. Though the work excited no great attention at first, it suddenly came into vogue, and was eagerly read by all classes of society. No less than four editions of it were printed in various parts of the Peninsula within the first year after its appearance (1605); two at Madrid, one at Valencia, and another at Lisbon. Its fame spread rapidly to all the neighbouring countries. But notwithstanding this enthusiastic reception of his work, Cervantes continued poor, and he was accordingly engaged by the duke of Lerma, the minister of Philip III., to write an account of the festivities, bull-fights, religious ceremonies, and so forth, with which lord Howard, ambassador of James I., was received at Valladolid in 1605. On the return of the court to Madrid in 1606, Cervantes followed it, and he continued to inhabit that city to the end of his life. In 1608 he brought out a correct edition of the first part of 'Don Quixote,' and in 1613 his 'Novelas Exemplares' (Exemplary Tales), twelve in number, by which his literary reputation was greatly increased. In 1614 he published his 'Viage al Parnaso' (Journey to Parnassus), a work which cannot properly be ranked in any particular class of literature, but which, next to 'Don Quixote,' is the most exquisite production of its immortal author. This work however being intended as a satire upon the bad poets of his time, some took offence at it, and became Cervantes' bitterest enemies. One, among others, published, under the assumed name of Alonso Fernandez de Avellaneda, a continuation of 'Don Quixote,' full of invective and abuse (Tarragona, 1614). This probably hastened the publication of the second part, which was sent to press early in 1615, with a dedication to his patron the Conde de Lermos. His other works are a collection of comedies and 'entremeses' (interludes) written in the fashion of the new school introduced by Lope de Vega, but which were never acted (Mad., 1615, 4to.); and a novel entitled 'Persiles y Sigismunda,' composed in a style very different from that of his other works, and certainly the least successful of all his productions. (Madrid and Barcelona, 1617.)

Cervantes died at Madrid on the same day as his great contemporary Shakspere, on the 23rd of April, 1616, being then in his sixty-ninth year. He was buried without the least pomp in the convent of the nuns of the Trinity in the Calle del Humilladero, where his daughter Doña Isabel had four years before taken the veil. But the nuns having removed to another convent in the Calle de Cantaranas, the old one was pulled down, and the remains of Cervantes were lost. Within the last few years however two monuments have been erected in Madrid to the memory of this great man: one, in the Plaza de las Cortes, consisting of a beautiful bronze statue upon a square pedestal of granite, on the sides of which are bas-reliefs representing subjects taken from 'Don Quixote;' the other is his bust in white marble over the door of the house in the Calle de Francos, where he lived and died.

His works have been too often analysed to render it necessary here to dwell upon their merits. His first publication, 'Galatea,' is beautiful in its spirit, interesting and pleasing in its details, but not original; as a work, it is cast in the same mould as other pastorals written before his time. Cervantes had imagination and invention; he always wrote with purity, frequently with elegance; but he was not a poet: he wanted that severe taste, that power of concentration and perfect ear for harmony which form poetry. His plays therefore are, generally speaking, bad. But his master-work, 'Don Quixote,' is perfect in all its parts. The conception is admirable, and the author shows in every page a highly philosophic mind, the noblest sentiments expressed with inimitable simplicity, and a perfect knowledge of the human heart. Godwin said, 'At twenty, I thought "Don Quixote" laughable; at forty, I thought it clever. Now, near sixty, I look upon it as the most admirable book in the whole world.' Of his 'Novelas,' or 'Tales,' it may be said that they are not only interesting and amusing, but perfectly moral. The 'Voyage to Parnassus' is in many respects a master-piece of art, and the weapon of satire is handled dexterously, but without ill nature.

The Life of Cervantes has been written at great length by some of the most eminent Spanish authors: Father Sarmiento, Mayans, Los Rios, Fernandez, and Navarrete. The last has spared no trouble in investigating the most minute incidents of the life of Cervantes, and has produced a work which, accompanied as it is by many original documents, leaves nothing to desire. The editions of 'Don Quixote,' published in and out of Spain since the death of the author, have been so numerous as to render it almost impossible to give anything like a correct list of them. We shall therefore mention only a few of the best:—Madrid, 1780, 4 vols. 4to., with engravings on copper; London, 1781, by Bowle, 6 vols. 4to.; Madrid, 1797, by Pellicer, 5 vols. 8vo.; Madrid, 1819, by the Royal Academy of History, 5 vols. 8vo.; a new edition, with a full commentary and critical notes by the late Don Diego Clemencin, is now in course of publication. As to translations, it is well known that within a few years after the publication of 'Don Quixote,' it was rendered into almost every European language, and that no nation on the Continent has so fully appreciated its standard merits as our own, since we possess no less than eight different English versions, besides several other works more or less relating to it. Thomas Skelton was the first who translated it, London, 1620, 2 vols. 4to. Edmund Gayton next published his 'Pleasant Notes upon Don Quixote,' London, 1654, fol. J. Philips was the next who translated it, London, 1687, fol. Motteux (Peter), a Frenchman by birth, published also a version, London, 1712, 4 vols. 12mo. Ozell (John), London, 1725, 4 vols. 12mo. Thomas D'Urfey, London, 1729, 2 vols. 8vo. Jarvis (Charles), London, 1742, 2 vols. 4to. Smollett, London, 1725, 2 vols. 4to. Wilmot, London, 1755, 2 vols. 8vo. By far the best translation, as coming closer to the original than any other, is that of Jarvis, which has often been reprinted.

(*Vida de Cervantes*, por Navarrete, Madrid, 1819; Pellicer y Saforcada, *Vida de Miguel de Cervantes*, Madrid, 1800.)

SABA, a small island in the West Indies, belonging to the Dutch, is situated in 17° 40′ N. lat. and 63° 20′ W. long. The coast rises in perpendicular masses to a considerable elevation, and at a distance the island appears like a steep round rock. The shore is too steep to allow of landing, except on the southern side, where an artificial path has been made, which however is intricate, and admits only one person at a time. By this path a small place is reached which is built in a secluded valley. The circumference of the island does not exceed nine miles, and its area is about ten square miles. The small portion of it which is cultivable is appropriated to the growth of cotton, which the inhabitants work into stockings, for sale as well as for their own use. The common vegetables of the West Indies come to perfection. The population does not exceed 1500.

SABA. [SABAEI.]

SABADILLA. [CEVADILLA; VERATRUM.]

SABAEI (Σαβαῖοι), a people of Arabia Felix, on the borders of the Red Sea, in the northern part of the modern Yemen. They are described by Diodorus and Strabo as the most numerous, and, together with the Gerrhaei, as the richest people in Arabia. Their country produced frankincense, myrrh, cinnamon, and balsam in abundance, but was also infested by deadly serpents. The inhabitants are represented as living an idle life, on account of the abundance of the produce of the country, but are at the same time said to have carried on an extensive commerce with Syria and Mesopotamia, both with the productions of their own country and also with those of Ethiopia, to which they sailed in boats made of skins. The capital of their country is called Sabae by Diodorus, and Meriaba by Strabo, and is said to have been situated upon a mountain covered with trees. In this place the king resided, who might do anything that he pleased, except leaving his palace; and if he did, says Diodorus, he was stoned to death by the people, in pursuance of an antient oracle. (Strab., xvi., p. 778; Diod. Sic., iii. 46, 47; Plin., vi. 32.)

The country of the Sabaei is mentioned in the Old Testament under the name of Sheba (שְׁבָא), and is spoken of as rich in incense, spices, precious stones, and gold (1 *Kings*, x. 2; *Jer.*, vi. 20; *Is.*, lx. 6; *Ps.*, lxxii. 15), and as carrying on an extensive commerce with the other nations of Asia (*Ezek.*, xxvii. 22; *Job*, vi. 19; *Joel*, iii. 8). The queen of Sheba who visited Solomon (1 *Kings*, x. 1) is generally allowed to have come from this country, and not from Ethiopia, as Josephus relates (*Ant. Jud.*, viii. 6, sec. 5), who has confounded Sheba with Seba (סְבָא), which, as he tells us in another part of his work (ii. 10, sec. 2), was the antient name of Meroe. The Sabeans who are mentioned by Isaiah (xlv. 14) as 'men of stature' are probably the Ethiopian and not the Arabian people, and answer to Herodotus's description of the long-lived Ethiopians, who were 'the tallest and handsomest of all men' (Herod., iii. 20).

The capital of the Sabaei is called Saba by the Arabic writers, according to whom the founder of the city made in its immediate neighbourhood a vast mound or dam, to serve as a reservoir to receive the water which came from the mountains. Every family is said to have had a certain portion of this water distributed to them by aqueducts, and the building was reckoned so firm and strong that many of the inhabitants had their houses built upon it. But at length, say the Arabic writers, God being highly displeased at their great pride and insolence, and resolving to humble and disperse them, sent a mighty flood, which broke down the mound by night while the inhabitants were asleep, and carried away the whole city with the neighbouring towns and people. This inundation is said to have happened in the third century before the Christian æra; but if such were the case, it would appear from the account of Strabo that the Sabaeans had again recovered a large portion of their former prosperity.

(Korán, c. 34; Sale's *Preliminary Discourse to the Korán*, sect. 1; Pococke, *Specimen Historiæ Arabum*, p. 57; Edrisi, *Geographia Nubiensis*, p. 52.)

SABAISM was the name given to a religious system which antiently prevailed to a great extent in Arabia and Mesopotamia. Sabaism is frequently confounded with the Sabaei, and is sometimes described as the religion of the latter people; but the two words are quite distinct, and are written differently in the Semitic languages. The first letter in Sabaism is Tsade (צ), and consequently the word would be written more correctly Tsabaism.

Tsabaism was derived, according to its followers, from Tsabi, the son or brother of Enoch, but is more probably derived from their worshipping the 'Host of Heaven' (צְבָא הַשָּׁמַיִם). According to the Arabic writers, Tsabaism was the same as the religion of the antient Chaldæans, and appears to have been one of the earliest and simplest forms of idolatry. They believed in the unity of the Deity, but at the same time paid adoration to the stars, or the angels and intelligences, which they supposed to reside in them, and to govern the world under the supreme Deity. In the course of time images were made to represent the angels or intelligences dwelling in the stars; and the consequence of this would naturally be, that the common people would eventually worship them, as if they were gods. That the unity of the Deity was however still acknowledged in the religious system of the Tsabians is manifest from the way in which this religion is spoken of in the Korán; in which it is distinguished from polytheism, and is allowed to exist on the payment of tribute.

The religious books of Tsabaism were written in Syriac, and are referred to by early Arabic writers, but none of them are known in Europe. It appears that the Tsabians believed that the souls of wicked men would be punished for nine thousand years, and would afterwards be received to mercy. They were obliged to pray three times a day, at sunrise, noon, and sunset; and to observe three annual fasts, one of thirty days, another of nine, and a third of seven. They offered many sacrifices, but ate no part of them. They abstained from beans, garlick, and some other pulse and vegetables. They were accustomed to go on pilgrimage to Harran in Mesopotamia. (Prideaux, *Connection of the History of the Old and New Testament*, vol. i., p. 243, edition of 1821; Sale's *Preliminary Discourse to the Korân*, sect. i.; D'Herbelot, *Bibliothèque Orientale*, art. 'Sabi;' Hyde, *Religio Veterum Persarum*; compare also an Excursus to the third volume of Gesenius's *Isaiah*, 'On the Astral Worship of the Chaldæans.')

Tsabaism as a religious system no longer exists, but the name has been frequently, but incorrectly, applied to the Mandaites, or Christians of St. John, as they have been called. The name of Tsabians has been given to this sect by the Arabs, as they are accustomed to apply the term of Tsabians to many different religious sects. The Mandaites are found principally at the mouths of the Euphrates and near Bagdad, but they are not Christians, and the name of 'Christians of St. John' has been given to them in consequence of John being the name of the founder of their sect. From the manner in which John the Baptist is mentioned in the sacred books of the Mandaites, it appears that they supposed him to have been the founder of their religious system, and that his doctrines were corrupted by Christ. Their sacred books have been brought over to Europe; and an account of them is given by Silvestre de Sacy, in the *Journal des Savans*, Paris, 1819; but they are written in such a mystical style that it is exceedingly difficult to understand their meaning. There are three books—1, 'The Book of Adam;' 2, 'The Book of Yahya, or John the Baptist;' and, 3, 'The Kholasteh,' or Ritual. They are written in a peculiar character, which bears great resemblance to the Syriac or Western Aramæan; but the language in which they are composed more nearly resembles the Chaldaic or Eastern Aramæan. The greater part of the 'Book of Adam' was published, by Norberg, under the title of 'Codex Nasaræus, Liber Adami appellatus,' 5 vols. 4to., Lond. Goth., 1816-17. In the 'Book of Adam' the Christians, Jews, and Mohammedans are equally attacked; but the Mandaites appear to have adopted many things from Christianity, and they probably owe their origin to some of the Gnostic sects, which extensively prevailed in Asia.

SABBATH. The narrative in the book of Genesis of the creation of the world in six days is followed by these words: 'And on the seventh day God ended his work which he had made; and he rested on the seventh day from all his work which he had made. And God blessed the seventh day, and set it apart; because that in it he had rested from all his work which God created and made.' (*Gen.*, ii. 2, 3.) These words seem to imply that the seventh day is to be observed by all the rational creatures of God as a day of worship in acknowledgement of their Creator, and as a day of rest in imitation of his rest after the creation. We find no further mention of this ordinance during the patriarchal period, though some have supposed that there is a reference to it in the intervals of *seven* days observed by Noah in sending the raven and the dove out of the ark. (*Gen.*, viii.) It is next met with at the time of the Exodus, under the name of the *Sabbath* (שַׁבָּת, from שָׁבַת, *to cease from labour*), where *rest* from labour is the peculiar character attached to the day. (*Exod.*, xvi.) In the passage referred to, it appears to be spoken of as an institution already known, but this has been disputed. It was still more expressly enjoined upon the Jews at the giving of the law on Mount Sinai, when the reason assigned in *Genesis* for its institution was repeated. (*Exod.*, xx. 8-11.) The Mosaic laws respecting the Sabbath are contained in the following passages, besides the two just quoted: *Exod.*, xxiii. 12; xxxi. 12-17; xxxiv. 21; xxxv. 1-3; *Levit.*, xix. 3, 30; xxiii. 3; xxvi. 2; *Numb.*, xv. 32-36; xxviii. 9, 10; *Deut.*, v. 12-15. It was a day of divine worship, though as to what that worship consisted in, we only know that there was to be an additional sacrifice besides the daily one, and a holy convocation of the people. This part of the institution was intended, like many others of the Mosaic laws, to keep in the remembrance of the people their allegiance to the true God, and to distinguish them from the idolatrous nations among whom they dwelt. (*Exod.*, xxxi. 13, 17.) Its other feature was rest from labour, which was to be observed not only by every Israelite, but by resident strangers and beasts of burthen. This rest had partly a religious character, as it was an acknowledgement of belief in the God who created the heavens and earth in six days, and rested on the seventh. For this reason a wilful violation of the rest of the Sabbath was punished by death, as it was an act of rebellion against God. A second object of this rest was, of course, to afford leisure for the religious services of the day; and a third was the refreshment of man and beast after the labour of the week. (*Exod.*, xxiii. 12.) Moses does not however define the meaning of the term *work* in the Law; but it is evident from several passages in the Pentateuch that it was peculiarly all work of a servile character that was forbidden. Thus there is a special commandment to rest on the Sabbath in seed-time and harvest, as well as at other seasons (*Exod.*, xxxv. 21), and there were prohibitions against kindling fire (*Exod.*, xxxv. 4) or preparing food on the Sabbath (*Exod.*, xvi. 5, 22-30); the people were severely reprimanded by Moses for going out of their tents to gather manna (*Exod.*, *ibid.*), and a man was put to death by the express command of God for gathering sticks on the Sabbath. (*Numb.*, xv. 32-36.) This peculiar feature of the Jewish Sabbath was intended constantly to remind the people of their deliverance from their servile condition in the land of Egypt, as Moses states in his rehearsal of the Law, where the reason annexed to the fourth commandment in *Exodus* is omitted, and its place is supplied by the following words: 'And remember that thou wast a servant in the land of Egypt, and that the Lord thy God brought thee out thence through a mighty hand and by a stretched-out arm: therefore the Lord thy God commanded thee to keep the Sabbath-day.' (*Deut.*, v. 15.) All bodily labour which was necessary for the service of God formed an exception to the statute. Thus the sacrifices were doubled on that day, and the animals had to be killed; the perpetual fire on the altar of burnt offering was to be supplied with wood *every* day; and a child was circumcised on the Sabbath, if that day happened to be the eighth from its birth. (*Numb.*, xxviii. 3-10; *Levit.*, vi. 8-13; *Matt.*, xii. 5; *John*, vii. 22-23.) It seems to be satisfactorily proved by Michaelis that the unwillingness to fight on the Sabbath, which we meet with in the later periods of the Jewish history, was never felt before the Babylonish captivity. The general spirit of the Jewish law concerning the Sabbath may be gathered from the following words of Isaiah (chap. lviii., 13):—'If thou restrain thy foot from the Sabbath, from doing thy pleasure on my holy day; and call the Sabbath a delight, and the holy feast of the Lord honourable; and shalt honour him (or it), not doing thine own ways, nor finding thine own pleasure, nor speaking thine own words:' then follows a promise. The Sabbath was reckoned, like the Jewish day in general, from sunset to sunset.

The Rabbins of later times added many superstitious and vexatious observances to the Mosaic law of the Sabbath, such as the prohibition of travelling further on that day than twelve miles, or, as it was afterwards settled, two thousand cubits, that is, about one mile. For further information on these points the reader is referred to Lightfoot (*Works*, ed. Pitman, Index, art. 'Sabbath').

The word *Sabbath* was also used by the Jews as a general name for their religious festivals, and also as equivalent to the word *week*. (*Levit.*, xxiii. 15; *Deut.*, xvi. 9; *Matt.*, xxviii. 1; *Luke*, xviii. 12.)

The first teachers of Christianity abolished the Sabbath, but introduced a similar institution in its place, the observance, namely, of the *first* day of the week as a day of rest and of religious worship, in commemoration of God's resting on the seventh day, and also more especially of the resurrection of Christ. Hence it was called 'the Lord's day' (*ἡ κυριακὴ ἡμέρα*), just as the ordinance by which Christ's death was commemorated was called 'the Lord's Supper.' It has been held by many eminent divines that there is not sufficient evidence in the New Testament for such an institution, that the change of the day from the seventh to the first day of the week is an insuperable difficulty, that the Sabbath was a purely Jewish institution, and therefore that it is not binding upon Christians. The chief difficulties in this discussion appear to have arisen from a mistaken view of the question, as if it were, not whether the Christian church possesses *any* Sabbatical institution, but whether the *Jewish Sabbath* is binding upon Christians.

In its very nature the Sabbath appears to be intended for the whole human race. As a religious institution, designed to keep in remembrance the God who created the world, it belongs equally to all men, since all are the creatures of the same God, and all are prone to forget every religious truth which is not continually and *regularly* forced upon their attention. As a day of rest, if needed at all (and it is generally granted that such rest is necessary), it is needed by every one who wears the human body. Its appointment is coeval with the creation of man, and long before the giving of the Jewish law. These facts seem to prove that it was intended to be perpetual, which appears also to be indicated by those words of Christ (*Mark*, ii. 27), 'The Sabbath was made for man,' that is, not for the Jews merely, but for the benefit of the whole human race.

But if so, can the time or character of its observance be changed? To determine this question, it must be remembered that the Sabbath is not a *moral*, but a *positive* institution. For though it be a point of the highest moral obligation for man to worship his Creator, and though it be ssential to the maintenance of such worship that it be observed at fixed intervals of time, yet there is nothing, as ar as we can tell, in the nature of things to determine what this interval shall be. The appointment of every *seventh* day for this purpose can therefore rest upon nothing out the express command of God; and this also seems to be leclared in the text just quoted, 'the Sabbath was made or man, and not man for the Sabbath.' It is therefore, ike all positive institutions, susceptible of any change which he altered circumstances of those for whose benefit it was ntended may make desirable, provided that such change e made by competent authority. Now the *rest* of the Sabath is, of course, equally secured, on whichever day of the eek it falls. Its *religious* purpose, as commemorative of od's creating the world in six days and resting on the eventh, appears to be sufficiently answered by its observance very *seventh* day. But, as a religious institution, it was ntended to express more than this; it was designed to keep remembrance the *peculiar character* of the religion of hose who were to observe it, and hence it is susceptible of y change which may make it better adapted to express at character. Thus under the patriarchal dispensation it as intended to keep alive the worship of God as the creator, opposed to idolatry; and therefore it was observed on e day on which God rested after finishing the creation: the Jews, God was known further as their deliverer from e land of Egypt, by which act they were constituted a parate people; and therefore the Sabbath was still observed, but with the additional character of strict abstinence om all servile labour. The great fact of Christianity is the surrection of Christ, which was effected by the power of e same God who created the world: this occurrence took ace on the first day of the week; and to keep it in reembrance, we observe that day as our stated time of regious worship; or, as Bishop Horsley states the matter, By keeping a Sabbath, we acknowledge a God, and declare at we are not atheists: by keeping one day in seven, we otest against idolatry, and acknowledge *that* God who in e beginning made the heavens and the earth: and by eping our Sabbath on the first day of the week, we prost against Judaism, and acknowledge *that* God who, ving made the world, sent his only begotten Son to redeem ankind.'

If this argument be considered sufficient to prove that the ange from the seventh to the first day of the week is in ordance with the nature of the Sabbath, and with the nius of the Christian religion, it still remains to be shown ether, as a matter of fact, the change was made upon the thority of Christ and the Apostles. There is no direct nmand in the New Testament thus to set apart the first y of the week. But, on more than one occasion, Christ, arguing with the Jews upon the mode of observing the bbath, solemnly claimed for himself the prerogative of ng Lord of the Sabbath-day (*Matt.* xii., 8; *Mark*, ii. ; *Luke*, vi. 5, xiii. 5; *John*, v. 8, 9), which seems to ply that he designed the Sabbath, modified in some way, form a part of his religion. He seems, in fact, to announce fundamental principle of *his* Sabbath in the words, 'I l have mercy rather than sacrifice.' (*Matt.* xii. 7.) But actual celebration of this day could not of course comnce till the event occurred which it was designed to commorate, namely, the resurrection of Christ. Now twice er that event we find the disciples met together for relius worship on the first day of the week, and again on day of Pentecost, which was also the first day of week (*John*, xx. 19, 24; *Acts*, ii. 1). In *Acts* (xx. 7) assembling of the disciples, on the first day of the ek, to break bread (that is, to celebrate the Lord's pper, one of the most important parts of the Christian ship), is spoken of as if it were a customary thing; on the occasion referred to, Paul preached to them. In the First Epistle to the Corinthians (xvi 2), Paul commands the contributions for needy Christians to be laid by on the first day of the week. John expressly mentions the Lord's day as a time spent by himself in religious exercises (*Rev.*, i. 10). These allusions are perhaps scanty, but they are as much as we could expect, if the first Christians adopted the observance of this day without dispute; and the inference generally drawn from them is borne out by the voice of Christian antiquity. Pliny, in his celebrated letter to Trajan respecting the Christians (A.D. 107), says that they informed him that 'they were wont to meet on a certain day before day-break' for religious worship. (Plin., *Epist.* x. 97.) Ignatius, Justin Martyr, Dionysius of Corinth, Clement of Alexandria, Tertullian, Origen, and other early Christian writers speak of the Lord's day as observed among them (see the passages in Lardner's *Works*, vol. iv., p. 217, 218). Some of the early Christians, especially converts from Judaism, observed the Sabbath as well as the Lord's day, but this practice was not countenanced by the Apostles nor by the earliest Christian writers. (*Coloss.*, ii. 16; Lardner, *ibid.*). In examining the Fathers on this subject, it is necessary to remember that the Christian festival is always called by them the Lord's day, and not the Sabbath: where the latter word is used, it refers to the Jewish sabbath.

The Sabbath is used in the New Testament as a type of the eternal rest of heaven: 'there remaineth a rest (or sabbath-keeping, σαββατισμὸς) to the people of God.' (*Heb.*, iv. 9.) Some understand this passage of the Christian Sabbath.

(Michaelis *On the Laws of Moses*, arts. 194, 196; Lightfoot's *Works*, see the *Index*; Horsley's *Sermons*, 21, 23; Wardlaw *On the Sabbath;* Winer's *Biblisches Realwörterbuch*, art. 'Sabbath.')

SABBA'TIA, a genus of North American plants, belonging to the natural order Gentianaceæ. The genus is known by a 5-12-parted calyx, rotate 5-12-parted corolla, withering on its capsule, revolute anthers, stigma with two straight arms, becoming at length spirally twisted, and a one-celled capsule, with the valves turned a little inwards. There are several species of Sabbatia, all of which are characterised by the possession of a pure bitter principle, and on this account they are extensively used, in North America, in intermittent and remittent fevers, and as tonics. The species most commonly used is the *S. angularis.* It attains a height of one or two feet, and is known by its erect, square, winged stem; opposite, heart-shaped, 5-nerved, smooth, acute leaves; terminal flowers; angular, tubular, 5-parted calyx; 5-parted corolla, with segments twice as long as the calyx; ovate ovary; declined style, and one-celled capsule. It grows in damp wet soils, in the United States, and is common in moist meadows among high grass.

SABATI'NI, FRANCISCO, a Spanish architect, was born at Palermo, in 1722. Having completed his studies in literature and mathematics in his native city, he made choice of architecture as a profession, and visited Rome for the purpose of perfecting himself in it. On leaving Rome for Naples, he was employed as the second overseer of the works at the palace of Caserta, under his father-in-law, Luigi Vanvitelli, the architect of that immense edifice. While thus employed, the king bestowed upon him a commission of lieutenant in the artillery, and charged him with the erection of the cavalry barracks near the Ponte della Maddalena, and the arsenal armoury. When, on the death of his brother Ferdinand, the king succeeded to the throne of Spain as Charles III., in 1759, Sabatini settled at Madrid, where, besides being extensively employed in his profession, he rose to considerable military rank, being made lieutenant-general in 1790, and inspector-general of engineers in 1792, and had various appointments and distinctions conferred upon him. He made some additions and alterations at the royal palace of Madrid, and also at those of Aranjuez and the Pardo. Among his chief works in the capital are the Aduana, or Custom-house, the gate of Alcalá (a magnificent façade, with three lofty arches and two other entrances, making in all five openings through both fronts), and that of San Vincente, and the royal porcelain manufactory at Buen Retiro. He also designed the mausoleum of Ferdinand VI., in the church de las Salesas, the chapel in honour of Palafox in the cathedral of Osma, the grand altar in that of Segovia, and various other structures, both ecclesiastical and secular, including the arsenal at Caracas, and other works in Spanish America. He died at Madrid, December 19, 1798, with the reputation of great skill and judgment in his profession, and of an unusually correct taste.

SABELLA. [TUBICOLIDÆ.]

SABELLA'RIA. [TUBICOLIDÆ.]

SABELLIANS, an heretical Christian sect, which arose about the middle of the third century. They were the followers of Sabellius, an African bishop or presbyter, who resided in the Pentapolis of Cyrenaica. They held that there was only one person in the Godhead, namely, the Father; that Christ was a mere man, but that there resided in him a certain energy proceeding from God, or a portion of the divine nature; and they likewise deemed the Holy Spirit merely a divine energy, or an emanation proceeding from God. They illustrated their doctrines by comparing God to the sun, the Word to its illuminating power, and the Holy Ghost to its warming energy. They were successfully opposed by Dionysius of Alexandria, but continued for a long time to be an important sect. (Lardner's *Credibility* and *History of Heretics*; Neander's *Kirchengeschichte*; Mosheim's *Ecclesiastical History*.)

SA'BIA, a genus of plants named by Mr. Colebrooke from the Indian name, *sabja*, of one of the species. It is usually referred to the natural family Terebinthaceæ, but it is now attached as an anomalous genus to the group Anacardiæ which is separated from them. The genus was found originally in the Silhet Mountains, whence it extends to Nepaul and the more northern part of the Himalayas, where it is found at considerable elevations. It is characterised by having the calyx small, five-leaved; petals five, lanceolate; filaments five, shorter than the petals inserted at their base; anthers round; ovary superior, round; style short; stigma simple; drupe reniform, pulpy, and of a dark blue colour. The species form ornamental climbing-shrubs, with smooth lanceolate alternate leaves suited to the shrubberies of this country.

SABINE, River. [LOUISIANA; MEXICAN STATES.]

SABINES, SABINI, SABINA, SABINUM. [RIETI; ROME—*Antient History*.]

SABINIA'NUS of Volterra was elected bishop of Rome after the death of Gregory I., or the Great, A.D. 604. He had been employed on a mission to the court of Phocas, the usurper of the Eastern empire. He is said to have shown himself avaricious and fond of hoarding, and to have thereby incurred the popular hatred. If such was the case, he was very different from his predecessor, who was very generous towards the poor. Sabinianus died in about eighteen months after his election, A.D. 605, and was succeeded, after a vacancy of nearly one year, by Boniface III., the first bishop of Rome who was acknowledged by the imperial court of Constantinople as primate of the whole church.

SABINUS MASSURIUS. [ROME—*Roman Law*.]

SABI'NUS, AULUS, a Roman poet, was a contemporary and friend of Ovid, whom he followed and imitated in that species of poetry of which Ovid has left specimens in his 'Heroides.' All we know of him is that he died at an early age, and that he wrote a series of Epistles (Heroides), supposed to be addressed by heroes to heroines, and to be the answers to those epistles which Ovid had addressed to the heroes in the name of the heroines. The Heroides of Sabinus, according to Ovid (*Amor.*, ii. 18, 27, &c.), were—Ulysses to Penelope, Hippolytus to Phædra, Æneas to Elissa, Demophoon to Phyllis, Jason to Hypsipyle, and Phaon to Sappho. (Comp. Ovid, *Ex Pont.*, iv. 16. 13.)

There are extant only three Heroides, Ulysses to Penelope, Demophoon to Phyllis, and Paris to Oenone, which are generally ascribed to Sabinus. It has been doubted, by G. Vossius and others, whether these poems really belong to Sabinus; but J. Ch. Jahn (*De Publ. Ovid. Nason. et A. Sabini Epistolis Dissert.*, pars. i., Lips., 1826) and all modern editors of Ovid have maintained that they belong to Sabinus. They are however in every respect inferior to the poems of Ovid; the style is deficient in animation, and the poet's imagination seems to have been very limited.

The poems of Sabinus are generally printed at the end of the works of Ovid, and also in the separate editions of the Heroides of Ovid. (See *Ovidii et Auli Sabini Epistolæ, cum annotat., &c.*, by Vitus Loers, Coloniæ, 1829-30, 8vo. This edition is preceded by a valuable introduction on the poems of Ovid and Sabinus.)

SABLE. [WEASELS.]

SABLES D'OLONNE. [VENDEE.]

SACBUT (*Saquebute*, Fr.), the name formerly given in England to the TROMBONE, which see.

SACCHAROMETER, an instrument used principally in the operations of brewing and making sugar. It serves to indicate the density of the liquid extracted from malt, or the degrees to which the juice expressed from the sugar-cane is concentrated previously to undergoing the process of crystallization; and an instrument of the like kind, called a lactometer, is employed to exhibit the density of milk. Both of them are formed on the same principle as the hydrometer [HYDROMETER], and such instruments are sometimes comprehended under the word aræometer, or gravimeter. Their general use is to determine, when extreme accuracy is not required, the specific gravities of liquids which are of greater density than water, and even those of solid bodies in small quantities.

The saccharometer which is most commonly employed is made of copper, and differs in form from the instrument represented in the article HYDROMETER only in its stem, which is six inches long, having four equal faces, each less than a quarter of an inch in breadth. Three of these faces are graduated, and the volume and weight of the whole are such, that when the instrument is immersed in water it sinks till the top of the stem is but little above the surface. The line at which the surface of the water cuts the stem is marked as the zero of the scale; and the graduations are such, that when the instrument is immersed and floats upright in a vessel containing the saccharine matter, the number of the division at the surface expresses the density of the liquid by the number of pounds avoirdupois which ought to be added to the weight of a barrel of water, in order to show the weight of an equal volume of the liquid.

The lowest graduation on the first face of the stem is numbered 20; and if the density of the liquid be such that the instrument floats with that division at the surface, on applying a certain weight (No. 1) at the top of the stem the instrument will sink till a point near the top is at the surface, and a division at that place is numbered 20 on the second face. The graduations on this second face serve to indicate all densities from twenty pounds to forty pounds per barrel above the weight of a barrel of water. Again, if the density of the liquid be such that the instrument floats with the number 40 at the surface, on applying a certain other weight (No. 2) instead of No. 1 at the top of the stem the instrument will sink to a point near the top; and at this point is the division numbered 40 on the third face. The graduations on this face serve to indicate all densities from forty pounds to sixty pounds per barrel.

The instrument made by MM. Dring and Fage is supplied with an ivory scale, divided into one hundred parts, which are numbered from 50 to 150, to represent degrees of a Fahrenheit's thermometer; this slides upon a scale of box-wood, which is graduated so as to show the specific gravity of the liquid, that of water being 1000, the quantity per cent., and the quantity per barrel of dry material taken up with the wort in mashing, and the number per cent. of gallons of proof spirit which might be made from the wort. Having found the temperature of the wort by a thermometer, and its density by the number on the stem of the floating saccharometer at the surface of the liquid, that degree of temperature on the ivory scale is put in coincidence with the degree of density on the box-wood scale; and then, opposite to any other degree of temperature on the ivory scale will be found, by inspection on the other scale, the specific gravity, &c. corresponding to that temperature.

A more simple instrument of the like kind is sometimes made of glass.

For the general purpose of determining the specific gravity of fluids on the principle of the hydrometer and saccharometer, the best instrument is one which consists of a glass cylinder about seven inches long and three-quarters of an inch in diameter. It has at its lower extremity a stirrup carrying a small cup in the form of an inverted cone, and its opposite part is drawn out so as to form a slender stem or tube, which is terminated at the upper extremity by a small cup. About the middle of the stem a mark is made, and, in order that the instrument may be enabled to float vertically in a vessel containing the liquid whose specific gravity is to be determined, a constant weight, which may be a ball of glass containing mercury, is placed in the lower cup.

To find the specific gravity of the liquid, let W be the whole weight of the instrument, including the constant weight in the lower cup, and let *w* be a weight which when put in the upper cup, will cause the instrument to sink in the liquid till the above-mentioned mark on the stem comes to the level of the surface; also let w be the weight which will cause the instrument to sink in distilled water till the same mark comes to the surface. Then, since the volumes of the immersed part of the instrument are the same, and the weights of the instrument, including the ball, in the lower, and the additional weights in the upper cup, are equal to the weights of the fluid displaced; those weights are to one another in the same ratio as the specific gravities of water and of the liquid. Therefore $\frac{W+w}{W+w'}$ expresses the specific gravity of the liquid, that of water being unity.

Though the determination of the specific gravities of solids is no part of the ordinary use of a saccharometer, yet, as it may be sometimes convenient to employ the instrument for this purpose, it will not be improper to state here the means by which the determination may be made; the weight of the solid being supposed to be less than w'.

Place the instrument in distilled water, the ball of mercury being in the lower cup, and put the solid in the upper cup, with as much additional weight ($=p$) as will sink the whole to the mark above-mentioned on the stem: then $w'-p$ is the weight of the solid. Next, place the solid in the lower cup, and, because it will lose weight by being immersed in the water, let p' be the additional weight which must be placed in the upper cup, in order to sink the instrument down to the mark; then p' (the weight lost by immersion) is the weight of a volume of water equal to that of the solid. Consequently $\frac{w'-p}{p'}$ expresses the specific gravity of the solid, that of water being unity.

SA'CCHARUM, the name of a genus of plants of the natural family of Gramineæ, and also of that of the well known product Sugar. The derivation of the name from an eastern source will be evident when we have briefly considered its history. The name (*σάκχαρ*, *σάκχαρον*, and *σάκχαρι*) occurs in Greek authors, though it has been supposed, apparently on insufficient grounds, that the saccharum of the antients was not our sugar, but some other unknown substance, which by others has been supposed to be *Tabasheer*. This opinion, promulgated by Salmasius, it would be unnecessary to reply to, if it had not been adopted by the illustrious Humboldt, as well as by Sprengel, in his 'Commentaries on Dioscorides,' in Kühn's edition of that author. It seems to have originated from the generic term *kusb* having been applied by the Arabs to the bamboo-reed, as well as to the stem of the sugar plant, which is distinguished as *Kusb al Shukur*. Sugar and tabasheer are both Indian products which are mentioned by old Sanscrit authors; the only point therefore to ascertain is the period when they became known to other nations. The Arab authors on medicine and Materia Medica, though much neglected, afford considerable advantages in such inquiries. We know that Syrian Christians assisted them, or rather actually made the translations from Greek into Arabic; and we have lately had the most satisfactory evidence that Hindu physicians were, at the same time, present at the court of Harun-al Rashid. We may therefore place some confidence in the names and synonyms employed by Arab authors. Tabasheer is mentioned in early Sanscrit works on medicine, and was therefore introduced by the Arabs into theirs. The name in Sanscrit is Twak-kshira, which is, no doubt, the origin of the Tabasheer; khir, kshir, or chir, according o Professor Wilson, signifying milk, milky-juice, or exract. This substance is secreted by, and, as is now well known, deposited in the hollow stems of bamboos. It is composed of nearly pure silex, and is as hard and as tasteess as a piece of quartz crystal. This was not likely to be, nor was it, confounded by the Arabs with sugar, which is described by them, with one kind of manna, under the name *sukkur*, which in Persia is *shukkur*, and both, no doubt, derived from the Indian names, which, in Tamool, is *akkara*, and in Sanscrit, *sarkara*; whence also the Indian name *juggery* must be derived, as sugar-candy from *shukur kund*. All these are too similar to the Greek word (*σάκχαρον*) or it to have any other origin, and there is nothing very emarkable in sugar being known to the Greeks, as well as o many other Indian products which entered into the extenive commerce of the antients with India. That the properies were similar is evident from Dioscorides treating of sugar, immediately after the different kinds of honey, in the chapter 'On the Saccharum of Honey' (*περί σακχάρου μέλιτος*). Pliny (xii. 17) clearly describes it. Other instances may be adduced of sugar being called honey, especially at earlier periods, when the Indian name of sugar was probably unknown. Nearchus, as quoted by Strabo (xv., p. 894, Casaub.), calls it honey of canes: it is mentioned by Theophrastus as honey from reeds or canes; while Herodotus (iv. 193) states that the Zygantes, or Gyzantes, besides having honey prepared by bees, had a much greater quantity made by the hands of men, which is supposed to have been sugar in some of its forms. Dr. Harris inquires whether the term *shukur*, so frequently employed in Scripture, translated strong drink, and always coupled with wine, be not sugar? The production of manufactured articles in India is of very antient date, as Beckman observes, and as may be seen in the case of indigo.

The sugar-cane was introduced by the Saracens into the South of Europe, but the period is not well ascertained. Gibbon says they introduced it into Sicily soon after they got possession of the island. About the year 1420 sugar was much cultivated by the Portuguese in Madeira. In 1503 we read of sugar being imported from the Canaries, and in 1506 sugar canes were carried thence to Hispaniola in the West Indies. But, besides the Indian cane, another, and a much more prolific kind, that of Otaheite, was introduced into the West Indies about 1794, and about the same time, or in 1796, the China sugar-cane was introduced into India. The Chinese and Indians seem both therefore to have had independent means, that is, distinct plants from which they could extract sugar; and, as history shows, they did so at very early periods. [Sugar.]

The genus Saccharum contains numerous species, which are usually easily distinguished by their highly ornamental nature, by the light and feathery or rather silk-like inflorescence. The species are widely distributed through the tropical parts of the world. The genus is distinguished by the spikelets being all fertile and in pairs, one sessile, the other stalked, articulated at the base, two-flowered, the lower floret neuter with one palea, the upper hermaphrodite with two paleæ. Glumes two, membranous. Paleæ transparent, awnless; those of the hermaphrodite flowers minute, unequal. Stamens three. Ovary smooth; styles two, long; stigmas feathered with simple dentated hairs. Scales two, distinct, obscurely two or three-lobed at the point. Caryopsis smooth.

S. officinarum, the best known species, or that yielding sugar in India, is cultivated in all parts of that country, and several varieties are known. It was introduced into the South of Europe and the Canaries, and thence into the West Indies. Another species, introduced from China, was named *S. sinense* by Dr. Roxburgh. It was extensively distributed throughout India, and still is so to some extent, as the canes are large, rich in juice, and hard enough to resist the attacks of the white ants. Within the last few years, the Otaheite sugar-cane has been introduced from the Mauritius into India, and rapidly spread through the country. It is no doubt the same species that was many years since introduced into the West Indies. It is probably the 'Canne de Haite' of Tussac, or *Saccharum violaceum*

Some of the species of Saccharum, owing to the silex in their cuticle, are so durable, that they are employed in India for thatching, such as *S. canaliculatum* and *S. cylindricum*. This is the case with *S. spontaneum*, which also makes good mats. The natives of Bengal make their pens of the hollow stems of *S. semidecumbens* and of *S. fuscum*. The latter, as well as the culms of *S. porcerum*, are also used for screens and light fences, and other economical purposes.

SACCHETTI, FRANCO. This eminent contemporary of Boccaccio, who was distinguished, like him, though in less degree, as an Italian novelist, was one of the earliest cultivators of a prose style in the language. The precise date of his birth is not known, but Bottari has fixed it about 1335, for which he alleges various proofs derived both from Franco's own writings and other circumstances. His father was Benci di Uguccione, of the Sachetti family, one of the most considerable in Florence. He appears to have received an education of a superior kind, and to have been well versed not only in polite literature, but in severer studies; and that he was above the prejudices of his age, is proved by one or two of his tales, wherein he derides the pretended science of astrology, and inveighs against that false and mistaken devotion which substitutes superstitious observances for genuine piety. Literary studies however were to him rather relaxations from more serious duties than his chief occupation; for he was actively engaged in public life, and at various times, filled many important offices which were conferred on him by his fellow citizens. From what he says in one of his canzoni, it appears that in the earlier part of his life he visited 'Sclavonia,' for he describes the rude unpolished habits and manners of the people, and his eagerness to see Florence again. It is probable therefore that he was engaged there in commercial affairs, it being then the custom for Florentine and other Italian merchants to establish themselves in foreign countries. In 1383 he filled the office of one of the magistrates Degli Otto, or Council of Eight, at Florence; and two years afterwards was chosen, much against his inclination, as ambassador from the republic to Genoa, but he escaped that honour by happening at the same time to be elected podestà, or chief magistrate, of Bibbiena. He afterwards held the same office, first at San Miniato, and, in 1396, at Faenza, which latter he accepted merely because its emoluments were of consequence to him in his then straitened circumstances.

The time of his death is as much matter of uncertainty as that of his birth. Crescimbeni makes him live till after 1410, while Bottari conjectures that he must have died shortly after the beginning of the century. He was thrice married: first, in 1354, to Felicità, daughter of Niccolo Strozzi, to whom he was greatly attached, and by whom he had several children; secondly, in 1387; and lastly in 1396, when, supposing him to have been born in 1335, he was in his sixty-first year, which is one of the reasons brought forward by his biographer for assuming that he could not have been born much earlier than the date he assigns; yet in itself it is a most inconclusive circumstance. By his first wife he had several children, of whom only Filippo and Niccolo survived him. The latter, who was gonfaloniere at Florence in 1419, had a son named Franco, a person of some literary distinction among his contemporaries, which circumstance has led several writers to confound the grandfather and grandson, or rather to attribute the works of both to the same individual, whom they describe as an eminent poet and historian, and writer of tales.

Although his sonnets, canzoni, capitoli, and other metrical compositions obtained for him great repute as a poet among his contemporaries and his countrymen, it is chiefly by his 'Novelle' that the elder Franco is now known as a writer. It is singular however that although the 'Novelle' had previously been quoted as authorities for the language in the dictionary 'Della Crusca,' and spoken of by critics as next, both in style and merit, to those of Boccaccio, they existed only in manuscript copies until 1724, when they first issued from the press, edited by Bottari. The collection originally consisted of three hundred tales, but of that number only two hundred and fifty-five now remain. They do not show much invention, nor indeed do they correspond to their title, being for the most part not narratives, but merely short anecdotes, whose matter is frequently very trivial, owing to which their interest now consists almost entirely in their relating to historical personages, and in their throwing light upon many customs and other obscure matters. Some of them have been appropriated and adapted by modern writers; Bürger, for instance, has taken Sacchetti's fourth novella, and transformed it into his popular comic ballad entitled the 'Emperor and Abbot,' without mentioning the source of it.

Bottari mentions a comic poem entitled 'La Battaglia delle Vecchie colle Fanciulle,' existing in manuscript in the Gaddi Library, as attributed to Sacchetti, merely observing that he had never been able to procure a sight of it. This production, which is in two cantos, and consists altogether of only one hundred and thirty stanzas in *rima ottava*, was printed for the first time at Bologna in 1819, and dedicated to Lord Byron; and has since been reprinted in the 'Scelta di Poemi Giocosi,' published by Bettoni at Milan, 1833. Amati, the first editor, supposes it to have been written about 1354, and it may be allowed to entitle Sacchetti to the honour of being considered the father of Italian heroic-comic poetry.

SACCHETTI, GIAMBATTISTA, was born at Turin, where he studied architecture under Juvara, who, in his last illness, recommended him as his successor for carrying into execution the designs for the new palace at Madrid. He was accordingly summoned to that capital by Philip V. in 1736. The original design by Juvara was upon a most extraordinary scale, the plan forming altogether a square of 1700 feet to the side; but as the king insisted upon the new edifice being erected on the precise site of the former one (destroyed by fire in 1734), notwithstanding all remonstrances and advice to the contrary, both on the part of the architect and of many other individuals, Juvara's design was laid aside altogether, and his successor had to prepare an entirely new one, in which the plan was greatly curtailed, being reduced to a square of 470 feet. Even thus abridged, the present edifice (begun in April, 1737) is a vast pile, and one of unusual loftiness; for, owing to the great declivity of the ground, the height in some parts is about 150 feet, and, including those in the substructure and basement, there are no fewer than nine different floors. But so many different ranges of windows do not contribute to grandeur; on the contrary, they occasion a certain character of littleness, and give the whole the appearance of being too much cut up and crowded. This important work occupied Sacchetti so much as to leave him little leisure for anything else of importance, except completing the façade of the palace of St. Ildefonso as designed by Juvara. He was also director of the public school of architecture at Madrid; and on the Academy of St. Ferdinand being established, 1752, he was complimented with the honorary title of director in it, being excused, on account of his other avocations, from attending to its duties. Ill health at length compelled him to resign his professional engagements altogether in 1760, some time previously to his death, which did not happen till December 3, 1764.

SACCHI, ANDREA, one of the greatest masters of the Roman school of painting, was the natural son of Benedetto Sacchi, an obscure painter, and was born in the vicinity of Rome, 1599. He acquired the rudiments of his art from his father, who, perceiving the ability of his son, placed him at an early age in the studio of Albano, with whom he remained several years. He soon distinguished himself as the most promising of all Albano's scholars, and in a short time surpassed his master also, whom, while still his pupil, he excelled in every respect.

Sacchi enjoyed a local reputation while very young, and upon the accession of Urban VIII. in 1623, through his interest with the Barberini family, he was appointed to execute one of the great altar-pieces of St. Peter's; and he painted a large picture for the altar of Gregory the Great, representing the performance of a miracle by that saint. This piece, which in 1771 was executed in mosaic by Alexander Cocchi, is a grand composition, equally conspicuous for correctness of design and simplicity and harmony of colouring, and it established Sacchi's fame: and a great allegorical composition, representing the Divine Wisdom, which he executed in fresco in the Barberini Palace for Cardinal Antonio Barberini, the nephew of Urban VIII., gained for Sacchi the reputation of being the greatest master in Rome. He painted many other works for the same cardinal, who granted him a pension for life.

His next great work was St. Romualdo relating his vision to five monks of his order, which is considered Sacchi's masterpiece, and, notwithstanding its remarkable simplicity both of composition and colour, has been generally pronounced to be one of the four finest works in Rome. The scene is in the valley of Camaldoli in the Apennines, and the saint is represented seated at the foot of a great tree; the monks are standing in simple and attentive attitudes around him; all the figures are similarly attired in white, but the shadow of the tree is so admirably arranged as to give the whole a pleasing and grand effect. This picture was carried away by the French, but it is now in the museum of the Vatican; it has been excellently engraved by Frey. Sacchi also executed the following great works:—the Death of St. Ann (also engraved by Frey); the miracle of St. Antony; St. Joseph; St. Andrew; and eight pictures from the life of John the Baptist, for the church of San Giovanni in Laterano; and others of less importance.

Considering the great powers of Sacchi and the age to which he lived, he produced remarkably few pictures. It was a maxim with him that the merit of a painter consisted not in executing much of moderate merit, but little and excellent; he was however a man of decidedly dilatory habits. He spent much of his time in contemplating the great works of his favourite masters, and of all the pictures in Rome those which he most admired were the Transfiguration by Raphael, the Communion of St. Jerome by Domenichino, and St. Peter healing the Cripple by Cigoli (since destroyed). When reproached for his inactivity, he used to reply that Raphael and Annibal Caracci had disheartened him and filled him with despair. His admiration of Raphael amounted to absolute veneration; his contemporary Passeri relates that occasionally when some one of his scholars had shown him a study from that great painter, he has been led away from the consideration of the design before him into the contemplation of the great powers of the designer, and has passionately exclaimed, 'What! they would make me believe that Raphael was a man; no, he was an angel.' And when he made a tour through the north of Italy, subsequently to his painting the St. Romualdo, for the purpose of examining the works of the Lombard and the Venetian masters, being much struck with the delicacy and richness of effect of Correggio and Titian, he expected to feel a deficiency in the works of Raphael upon his return to Rome; but immediately he saw the Mass of Bolsena in the Vatican he exclaimed, 'here I find not only Titian and Correggio, but Raphael also.'

Sacchi's manner of execution was very broad, and his colouring subdued and perfectly harmonious; he is considered, after Raphael, the best colourist of the Roman school. His design was pure and grand; and his composition equally natural and simple: repose and dignity of character prevail throughout all his works. His forms are highly classical, though natural; he was thoroughly acquainted with the great works of antiquity. He preferred the style and proportions of the Antinous to those of any other antient statue; and he was as profound in the theory as he was excellent in the practice of his art. Sacchi died in 1661. He had many imitators, and notwithstanding the rivalry of Pietro da Cortona and the opposition of Bernini, he formed a numerous and celebrated school. Nicolas Poussin attended his academy, but his greatest scholar was Carlo Maratta, who, after the death of Sacchi, became the leader of the faction which was opposed to the imitators of Cortona. [ROMAN SCHOOL OF PAINTING.] (Passeri; Lanzi; Fiorillo.)

SACCHI'NI, ANTONIO GASPARO, a composer, whose strains once resounded in every lyric theatre in Europe, but of whom little more than the name remains, was born at Naples, in 1735, and there educated, at the *Conservatorio di Santa Maria*, under the once famous Durante, who himself is now nearly forgotten. So successful were Sacchini's studies, that the moment they were completed he was engaged to compose an opera for Milan, whither he proceeded for the purpose; but there the *prima donna* made so sudden and so deep an impression on a mind always too susceptible, that to her he devoted the time that ought to have been bestowed on his work, which at length he was compelled to begin and finish, we are told, in four days. This was *L'Isola d'Amore*, an opera that pleased not only the public, but the critics. Sacchini then went to Venice, next to Stuttgard, afterwards to London, and finally to Paris, in which cities his numerous operas were performed, but with most success in the last, where he set his music to French words for the *Académie Royale*. The Parisians, Dr. Burney tells us, almost adored Sacchini, and when he died—overwhelmed with debt and exhausted with gout—in 1786, he was honoured with a splendid public funeral, at which Piccini, once his rival, now his panegyrist, spoke his *éloge*.

SACCOLA'BIUM, a genus of plants of the tribe Vandeæ and natural family of Orchideæ, now extensively cultivated in hothouses especially dedicated to their cultivation. This is an Asiatic genus, found in the Indian archipelago, the Malayan peninsula, and thence extending north along the Himalayan Mountains to 30° 4′ N. lat., where *S. guttatum* is found on trees, as well as in more southern latitudes. The genus consists of caulescent epiphytes, with two-rowed coriaceous leaves, which are often oblique at the apex. The flowers are axillary, and either racemose or solitary.

SA'CCOMYS. [MURIDÆ, vol. xv., p. 514; RODENTIA, vol. xx., p. 62.]

SACER MORBUS (Ἱερὰ Νόσος), a term applied apparently by the antients to more than one disease, as Athenæus (*Deipnosoph.*, lib. vii., § 33, p. 289) speaks of *τὰς ἱερὰς καλουμένας νόσους*, and Heraclitus is said by Diogenes Laertius (*De Vit. Philosoph.*, lib. ix., cap. i., § 6 and 7) to have called Arrogance by that name: *τήν τε οἴησιν ἱερὰν νόσον ἔλεγε.* Generally however it is merely used as one of the numerous names of epilepsy [EPILEPSY], and this is the explanation given by Hesychius and Suidas *in voc.* It is first used by the author of the treatise Περὶ Ἱερῆς Νόσου, 'De Morbo Sacro,' which is published among the works of Hippocrates (tom. i., p. 587, ed. Kühn), though it was probably written by one of his successors in the Dogmatic school. (See Gruner, 'Censura Libr. Hippocr.,' Vratislav., 1772, 8vo., § 44, p. 162; and Ackermann, *Hist. Liter. Hippocr., ap. Fabricii Biblioth. Gr.*, ed Harles, and Kühn's *Hippocr.*, tom. i.) The term is also found in Aretaeus (*De Caus. et Sign. Diuturn. Morb.*, lib. i., cap. 4), Theophanes Nonnus (*Epit. de Curat. Morb.*, cap. 36), Artemidorus (*Oneirocrit.*, lib. ii., cap. 12, where see Reiff's note 35), and others. The meaning of the term is obscure and uncertain, and several derivations of it are mentioned by Aretæus (*loco cit.*): 'There is' (says he, in Dr. Reynolds's Translation) 'a sort of ignominy too in the character of epilepsy, for it seems to attack those who offend the moon, and hence the disease is termed "sacred;" or it may be from other reasons, either from its magnitude (for what is great is "sacred"), or from the cure not being in the power of man but of God, or from the notion that a demon has entered the patient, or from all put together, that it has been so called.' The author of a treatise 'De Morbo Sacro' seems to have considered the origin of the term to have arisen from the belief either that this disease proceeds more immediately from the anger of the gods, or that it is more wonderful than others, or that its cure depends more entirely upon divine assistance; as he refutes all these opinions at some length. (See also Galen, *Comment.* vi., in Hippocr. *Epidem.*, lib. vi., tom. xvii. B., p. 341, ed. Kühn.) The other reason that is given, viz. 'the magnitude of the disease,' is supported by the author of the 'Schol. MS. in Gregor. Nazianz. in Basilii Excerptis,' quoted in Gaisford's Suidas: *τινὲς ἱερὰν ἑτέραν τινα λέγουσι νόσον τῷ ὀνόματι τούτῳ, τὴν ἐπιληπτικὴν οἶμαι· ἱερὰ δὲ αὕτη κυριώτερον ἂν κληθείη, διαφέρουσα πασῶν τῇ κακώσει· ἐπεὶ καὶ μέγα τὸ ἱερὸν τοῖς γλωσσηματικοῖς εἴθισται καλεῖσθαι.* It is also indirectly supported by the analogous expressions *ἱερὸν μένος Ἀλκινόοιο* (Homer, *Odyss.*, lib. vii., v. 167), *ἱερὸς ἰχθύς* (see Athenæus, *Deipnosoph.*, lib. vii., § 17-20, pp. 282-4), and especially by the anatomical name *ἱερὸν ὀστοῦν*, 'os sacrum,' of which this seems to be the most probable interpretation. Cœlius Aurelianus gives the following interpretations: 'Appellatur Epilepsia "*sacra* passio," sive quod divinitus putetur immissa; sive quod sacram contaminet animam [which is supported by Apuleius, *Apolog.*, p. 58, ed. Price]; sive quod in capite fiat, quod multorum philosophorum judicio sacrum templum est partis animæ in corpore natæ [which is the reason given by Theophanes Nonnus, *loco cit.*]; sive ob magnitudinem passionis, majora enim vulgus *sacra* vocavit.' (*De Morb. Chron.*, lib. i., cap. 4, p. 291, ed. Amman.) Of all the explanations that have been proposed, perhaps that which derives the term from the disease being supposed to be under the more immediate direction of the gods is the most likely to be the true one, both as being the most antient and also as being that which Galen preferred: it is also indirectly confirmed by two popular names mentioned by Leo in his 'Synopsis Medicinæ,' lib. ii., cap. 2 (ap. Ermerins, *Anecd. Med. Gr.*, Lugd. Bat., 8vo., 1840), viz. *δαίμων* and *σεληνιασμός*. If this is not the real meaning of the term, it must have been applied '*ob magnitudinem passionis*,' for none of the other derivations bear the slightest marks of probability.

SACHEVERELL, HENRY, D.D., was descended from a family which, according to Boyer ('Reign of Queen Anne,' p. 406), had in one of its branches made a considerable figure in Derbyshire. His grandfather, John Sacheverell, who had been educated for the church, joined the Puritans in the reign of Charles I., and, after the overthrow of episcopacy, officiated as Presbyterian minister at Wincaunton in Somersetshire; but, refusing to conform, was of course silenced at the Restoration, and, being afterwards apprehended at a conventicle, endured an imprisonment of three years, which is said to have occasioned his death. Joshua, his son by a first marriage, however grew up a zealous churchman, and died minister of St. Peter's church, Marlborough, leaving a widow, with a numerous family, in very poor circumstances. Henry, one of the sons, the subject of the present notice, who appears to have been born about 1672, was adopted by one Edward Hearst, an apothecary of the place, who was his godfather; and by Hearst's widow he was, after having attended the grammar-school of Marlborough, sent to Magdalen College, Oxford. At college Sacheverell was chamber-fellow with Addison, and they remained intimate friends till politics separated them thirty years after. To Sacheverell Addison inscribed in a very affectionate dedication his 'Farewell to the Muses,' written in 1694, when he intended to enter into holy orders. Sacheverell himself also cultivated both English and Latin poetry; several of his pieces in Latin verse (some ascribed to his pupils, but others with his own name affixed to them) are contained in the 'Musæ Anglicanæ,' and he is the author of a translation into rhyme of part of Virgil's 'First Georgic,' dedicated to Dryden, which is printed in the third volume of Nichols's 'Collection of Poems.'

Sacheverell became a fellow of his college, and appears to have been rather celebrated and successful as a college tutor. The Whig accounts of him indeed are full of stories to his disadvantage in this as in every other part of his career, but they have all the air of the inventions or exaggerations of party malice. Among other things it is asserted that he was refused ordination by Dr. Lloyd, bishop of Lichfield and Coventry (afterwards of Worcester), on the ground of his deficiency both in divinity and classical knowledge; but afterwards, it is added, he was, on the recommendation of the bishop of Oxford, admitted into holy orders by this same Lloyd, 'with particular marks of favour.' He took his degree of M.A. in 1696, of B.D. in 1707, and of D.D. in 1708. The first living he held was Cannock in Staffordshire, but in 1705 he was appointed preacher of St. Saviour's, Southwark; and it was while in this situation that he delivered his two famous sermons, the first at the assizes at Derby, on the 15th of August, 1709, the second before the lord-mayor at St. Paul's, on the 5th of November in the same year. These discourses, having been printed, were both in December following brought under the notice of the House of Commons, which passed a resolution denouncing them as 'malicious, scandalous, and seditious libels, highly reflecting upon her majesty and government, the late happy Revolution and the Protestant succession as by law established, and both houses of parliament, tending to alienate the affections of her majesty's good subjects, and to create jealousies and divisions among them.' The author and printer were at the same time ordered to attend at the bar of the House, which they did accordingly on the next day (14th December); and then, after he had admitted the authorship of the sermons, it was moved and carried that Sacheverell should be impeached of high crimes and misdemeanours. It is asserted by Swift and other authorities that Sacheverell's real offence, in the eye of the Whig ministry of the day, was his having in one of his two discourses pointed, as was conceived, at the lord-treasurer Godolphin, in a passage about 'the crafty insidiousness of such wiley Volpones.' Volpone seems to have been before this a popular nickname of Godolphin. After various preliminary proceedings, the trial commenced before the House of Lords in Westminster Hall on the 27th of February, 1710, and lasted till the 20th of March, on which day a majority of their lordships (69 to 52) pronounced Sacheverell guilty; and three days after, sentence was passed, adjudging him not to preach for three years ensuing, and ordering his two sermons to be burnt by the common hangman. The populace, who had espoused the cause of the accused, considering him, with the great majority of the clergy, as the champion of the church, celebrated this impotent conclusion of the affair with bonfires and other rejoicings both in London and all over the kingdom; and when, in May following, he set out to take possession of the living of Salatin in Shropshire, to which he had been presented, his journey to Oxford, and thence by Banbury, Warwick, and Wrexham to his preferment, was a continued triumph; which was prolonged as he returned to London through Shrewsbury, Bridgenorth, Ludlow, Worcester, and other towns. It is admitted on all hands that nothing had so much effect as this affair of Sacheverell's in influencing the general election which took place this same autumn, and the immediate consequence of which was the overthrow of Godolphin and his colleagues.

On the expiration of his sentence, in March, 1713, Sacheverell preached at St. Saviour's church, on the Christian triumph, or the duty of praying for our enemies, and again published his discourse. 'I have been reading Sacheverell's long dull sermon, which he sent me,' says his friend Swift, in his Journal to Stella, under date of 4th April; 'it is the first sermon since his suspension has expired, but not a word in it upon the occasion, except two or three remote hints.' In a preceding entry he mentions that Sacheverell himself had told him the bookseller had given him 100*l.* for the sermon, and intended to print 30,000. 'I believe,' adds Swift, 'he will be confoundedly bit, and will hardly sell one-half.' Of his St. Paul's sermon Burnet states that about 40,000 copies were supposed to have been printed and dispersed over the nation. The fever had now probably somewhat cooled; but the popular enthusiasm of which he had been the object, and which had produced such decided public results, had necessarily made Sacheverell a person of importance, at least for a short time longer. Within a month after the removal of his suspension, the queen presented him to the valuable rectory of St. Andrew, Holborn; and it appears that he had interest enough with the new ministers to procure also a handsome provision for one of his brothers. He had besides the good fortune to have a considerable estate at Callow in Derbyshire left to him by his kinsman George Sacheverell, Esq. He never appeared again as an author, except in a dedication prefixed to a volume of posthumous sermons by the Rev. W. Adams, published in 1716; but he is stated to have made some noise in the world by his quarrels and law-suits with his parishioners—a sort of stimulus which his system possibly required after his having played so remarkable a part in the greater field of national affairs. He was also suspected of being concerned in the alleged plot of his friend Atterbury, who is believed to have written the defence which he delivered on his impeachment, and to whom, then in exile, he left a legacy of 500*l.* at his death, which took place 5th June, 1724. (*State Trials*, vol. xv., pp. 1-522; *Parliamentary History*, vol. vi., pp. 805-887; Burnet's *History of his own Time*, ii. 537, &c.; Boyer's *History of the Reign of Queen Anne*, pp. 406, &c.; Tindal's *Continuation of Rapin*, vol. iv., pp. 149, &c.; Swift's *Journal*, *Four Last Years of the Queen*, and other works; Duchess of Marlborough's *Account of her Conduct*. A note in Howell's *State Trials*, vol. xv., p. 14, informs us that 'There is a curious passage about Sacheverell in Harris's "James II.," p. 184;' but Harris wrote no Life of James II., nor can we find Sacheverell mentioned in any of his other Lives.)

SACHS, HANS, whose real name is said to have been Loutzdorffer, was the most eminent poetical genius that Germany produced at the period of the Reformation, to the doctrines of which he became a convert, and assisted the cause of Protestantism by his pen. This most prolific as well as original and highly gifted writer, was born November 5, 1494, at Nürnberg, where his father was a tailor, and after studying at the Latin schools, he was put to be instructed in the business of a shoemaker.

About two years after he entered his apprenticeship that is, about the age of seventeen, Hans became the disciple of Leonard Nunnenbeck, a weaver by trade, but also a meistersinger [GERMANY, *Literature*, p. 194], who initiated him into the mystery of weaving verses. As soon as his apprenticeship expired, he set forth on his wanderings through Germany in his double capacity, making it a point to visit those cities which were most renowned for their poetical societies and corporations of singers. Having finished his pilgrimage, he returned and settled at Nürnberg, where, in 1519, he married Kunegunda Kreutzer, who proved an excellent wife, and bore him five sons and two daughters. She died in 1560 (after surviving all her sons); and in the following year, when he was sixty-six, Sachs married Barbara Harscher, which union proved no less happy than the former one. His eyesight becoming impaired, and his hearing still more so, he withdrew from society, and shut himself up with his books; his natural serenity and cheerfulness of temper however were not disturbed by these misfortunes. Thus tranquilly he reached his 87th year, dying January 25, 1578.

If his literary character be estimated by the number of his productions, Hans Sachs was literally one of the greatest writers Germany has ever produced, for they amounted altogether to upwards of six thousand different compositions, of which only a portion are contained in the five folio volumes of his pieces printed at Nürnberg, 1576-79. He may therefore very well be paralleled to Lope de Vega; and considering that he had another business, the fertility of his pen is even more surprising than that of the Spaniard's. Such extraordinary writers however pay a double penalty: their productions are of necessity only extemporaneous effusions upon paper; and by far the greater bulk of them must be consigned to oblivion. By posterity they are known only as recorded literary phenomena: they preserve a name in the annals of poetry, and as much as that has been secomplished by a single composition, such as the 'Elegy in a Country Churchyard,' and 'Julius von Tarent,'—productions that immortalise the names of a Gray and a Leisewitz. For the student who is desirous of tracing the formation of the language and literature of Germany, the works of Sachs possess considerable interest independent of their intrinsic merits, which however, to be fairly appreciated, must be considered with reference to his own times and country. They display great shrewdness, liveliness, and keenness of satire, together with a steady manliness of tone. But they also frequently offend both modern taste and modern ideas of decorum. Their failing in that respect is the very reverse of refined immorality. Nor is that by any means their sole defect; for, as might indeed be expected, they are overlaid with a great deal of mere garrulous prosing, unrelieved by any charm of versification. Another great fault is, that all the subjects are too much in the same strain, stamped by the same manner; wherefore it has been remarked, that two or three of his pieces serve to render us acquainted with the whole. Yet it is easier to point out faults and imperfections of the kind above mentioned, than to estimate such a writer critically. After observing that Goethe has imitated Hans Sachs in his 'Faust,' his character is thus summed up in the 'Retrospective Review:' 'If three requisites are to be looked for in poetry—invention, expression, and enthusiasm,—we shall find all these blended in Sachs. He is an inventor of forms and of things: his allegories are lively, poetical, fresh, and brilliant; his expression rich; his language choice (?), harmonious (?), and teeming with new phraseologies full of character and point and beauty. But what especially enhances the interest of his compositions, is the fidelity of colouring with which he exhibits the characters and times which he paints.' This last remark must be taken with great limitation, and with reference only to the manners of his own age, for his anachronisms against history, costume, and probability are frequently quite startling—Semiramis and Cleopatra, Agrippina and Clytemnestra, appear together in the same piece. In fact, according to his own confession, he was acquainted with neither Greek nor Latin, and knew the works of the antients only through such translations as were then to be procured. Yet, though excluded from the learned languages, his reading was remarkably extensive. After all, whatever imperfections criticism may allege against the writer, biography has none to record against the man, save those which are common to human nature. He uniformly employed his pen with the best of motives—to reform and ininstruct; and not only was his personal character irreproachable, but the amiable *bonhommie* of his disposition such as to obtain for him the appellation of 'Honest Hans Sachs.'

SACHTLEVEN (or ZACHTLEVEN), CORNELIUS, was born at Rotterdam, in 1606. It is not known under what master he studied, but it is apparent that he was a careful observer of nature. He settled at Antwerp, and gained great reputation by painting subjects from low life in imitation of Brauwer. His corps-de-garde are much praised for their judicious grouping and truth to nature. He painted also the interiors of farmhouses, and the sports and recreations of the villagers, in the style and manner of D. Teniers. Though much inferior to the two great artists whom he chose for his models, his works have considerable merit, and are found in the best collections.

SACHTLEVEN, HERMAN, was born at Rotterdam, in 1609, and studied under John van Goyen. He did not however confine himself to the style of his master, but applied with the greatest diligence to the study of nature, making numerous sketches and designs, which are highly esteemed by the curious. The scenery of the Netherlands not being suitable to his taste, he visited the countries on the banks of the Rhine and the Meuse, which afforded him more picturesque subjects. Some writers have affirmed that he visited Italy, but the Dutch biographers appear to have proved that he never travelled farther from home than to the countries above mentioned. His pictures are highly finished, with a light free touch, and a skilful management of the aerial perspective. He generally introduces into his landscapes a great number of figures and boats, which are drawn with great correctness and spirit. His skies and distances are in general clear, and he often endeavours to express the effects of the vapour between the eye and remote objects, like Berghem and Wouvermans. His merit was justly appreciated by his contemporaries, and his best pictures, which are not common, are still highly esteemed. He died in 1685, at the age of 76.

SACK, a Spanish wine of the dry kind; in French, *Vin sec*. It is called *seck* in an article, cited by bishop Percy, from an old account-book of the city of Worcester: 'Anno Elis. xxxiiij°. Item, for a gallon of claret wine and *seck*, and a pound of sugar.' Other instances have been found. See the various notes on the two parts of Shakspere's 'Henry IV.' It is the same wine which is now named Sherry.

Falstaff calls it *Sherris sack*, that is, sack from Xeres in Spain. Blount, in his 'Glossographia,' describes it thus 'Sherry sack, so called from Xeres, a sea-town of Corduba in Spain, where that kind of *sack* is made.' Ritson pretended that the old sack of Falstaff's time was a compound of sherry, cider, and sugar, but he produced no good authority for the assertion. The chief difficulty about sack has arisen from the later importation of sweet wines from Malaga, the Canaries, &c., which were at first called Malaga or Canary sacks; sack being by that time considered as a name applicable to all sweet wines. Sweet wines were not so early imported. Howell says, in his 'Londinopolis,' p. 102, 'I read in the reign of Henry VII., that no sweet wines were brought into this realm but Malmsyes;' and soon after (p. 103), 'Moreover no sacks were sold but Rumney, and that for medicine more than for drink; but now many kinds of sacks are known and used.'

One of these sweet wines still retains the name of sack. It is little used, but being proverbial for sweetness, it has caused some misunderstanding as to the original dry sack. Falstaff says, 'A good Sherris sack has a two-fold operation in it.' (2 *Henry IV*., iv. 1.) Presently he calls it Sherris only; and soon after both names are used indiscriminately. The drinking of it with sugar was not peculiar to Falstaff. The same beverage occurs in the 'Wild-goose Chace' of Beaumont and Fletcher, act v., sc. 2. It is said also of a personage, in the 'Miseries of Inforced Marriage,' that 'he lies fatting himself with sack and sugar in the house, while his brothers are fain to walke with lean purses abroad.'

If further proof were wanting that Falstaff's sack was not a sweet wine, but was actually Sherry, it is abundantly furnished by Dr. Venner's work, entitled 'Via recta ad Vitam longam,' published in 1637. After discussing medicinally the propriety of mixing sugar with sack, he adds, 'but what I have spoken of mixing sugar with sack must be understood of Sherie sack; for to mix sugar with other wines that in a common appellation are called sack, and are sweeter in taste, makes it unpleasant to the palate and fulsome to the stomach.'

But the derivation of sack from *sec* may not be quite certain. Douce, in his 'Illustrations of Shakspere,' says, 'Ponet's "Treatise of Politike Power," 1556, 12mo., and Cotgrave, in his Dictionary, make sack to be *vin sec*.' This plausible etymology might have been wholly relied on if an ingenious female traveller, in speaking of the Tartar *Koumis*, a preparation of mare's milk, had not informed us that she should not choose to partake of it out of the goat-skin *sacks* in which it is carried, 'as the Spaniards,' says she, 'do their wine; which by the by is a practice so common in Spain as to give the name of sack to a species of sweet wine once highly prized in Great Britain.'

(Guthrie's *Tour through the Crimea*, 1802, 4to., p. 229; Nares's *Glossary*, *v.* 'Sack;' Douce's *Illustr. of Shakspere*, vol. i., p. 417.)

SACKATOO. [Soodan.]

SACKET'S HARBOUR. [New York.]

SACKVILLE, THOMAS, EARL OF DORSET, was born in the year 1536, at Buckhurst in Sussex. He was the only son of Sir Richard Sackville, the representative of a very antient family, who had been high in office under Edward VI., Mary, and Elizabeth. After studying some time both at Oxford and Cambridge, and taking the degree of M.A. in the latter university, he removed to the Inner Temple, and was called to the bar. Shortly afterwards he was elected a member of the House of Commons. His youth, though passed in dissipation and extravagance, was not wholly mispent, as is shown by his poems, which were written at an early period of life, and were the first fruits of his vigorous and fertile mind. At the time of his father's death, in 1566, he returned from the Continent, which he had visited after his marriage. In the same year he was created Lord Buckhurst by Elizabeth, and having on a sudden reformed his habits of profuseness, received from that time various marks of royal favour. In 1570 he was sent on an embassy to France, to treat of the marriage then proposed between the queen and the duke of Anjou; and in 1587 was employed as ambassador extraordinary to the United States of the Netherlands, to adjust the differences between them and the earl of Leicester, whose anger he drew upon himself in the discharge of this duty, and was in consequence imprisoned till the death of his formidable enemy in 1588, after which event he was at once restored to Elizabeth's confidence, and filled a variety of state offices. In 1598, on the death of Burghley, he was made lord treasurer, which situation he held during the next reign till his death, April 19, 1608, having, with rare good fortune, had his great services fully appreciated by two royal personages of very different character. His letters, many of which are preserved in the Cotton collection in the British Museum, show that he was distinguished by the qualities which befit a statesman, and they confirm the judgment of his contemporaries.

His poems are—the tragedy of 'Ferrex and Porrex,' called in a later edition 'Gorboduc;' 'The Induction,' or poetical preface to 'The Mirror for Magistrates;' together with 'The Complaint of the Duke of Buckingham,' in the same collection. Of these 'The Induction' possesses great merit, and reminds us of the poems of Spencer, to which, though inferior in richness of imagery, it bears great resemblance, not only in the curious exactness with which the lively portraiture of allegorical personages is made out, but in the language and metre. The earnestness and quaintness of antiquated forms of speech, and the stately structure of the verse, contribute much in the compositions of both poets to the solemn effect of the pictures which are presented in succession to the reader. Warton, in his 'History of English Poetry,' considers Dorset to have furnished the model upon which Spencer formed his style. For some further information, see Wood's *Athenæ Oxonienses* (Bliss).

SACKVILLE, CHARLES, EARL OF DORSET, was born January 24, 1637. In his youth he travelled into Italy, and returned a little before the Restoration; he afterwards sat in parliament for the borough of East Grinstead in Sussex. Being, like most young nobleman of his day, of a dissolute turn, he engaged in no public employment, and he became a great favourite with Charles II. In 1665, being then Lord Buckhurst, he attended the duke of York as a volunteer in the Dutch war; and on the eve of the battle in which the enemy were defeated, and Opdam, their admiral, killed, he is said to have composed the celebrated song beginning 'To all ye ladies now on land.' He was employed after this in short embassies to France. Having become earl of Dorset by the death of his father, 1677, he soon after chose for his second wife a daughter of the earl of Northampton.

Dorset was favourably noticed by James II., but ceased to be one of his adherents as he grew more violent in his measures. After the king's departure, he sat with other peers in council to preserve the public peace. At the accession of William III. he was appointed lord-chamberlain of the household, and received other marks of royal favour. His health after this declined, and he died at Bath, January 19, 1705-6. A rare felicity, both in speech and action, seems to have distinguished Dorset above all his contemporaries. This is admitted by those of his brother courtiers who were themselves most remarkable for wit and address. Something of the ease and sprightliness of his conversation has been transmitted to us through his poems, though there is little to justify the extravagant praises of Dryden and others, these compositions being few in number and on trifling subjects. They are printed among the minor poets. An elaborate panegyric by Prior, and a biography by Johnson, abridged from a longer one by Cibber, may be consulted for his life. See also Walpole's 'Royal and Noble Authors' (Park).

SACKVILLE, LORD GEORGE, a younger son of the ducal house of Dorset, was born January 26, 1716. During the reign of George II. he was actively engaged both as a statesman and a politician; he served at Dettingen and Fontenoy, and at the battle of Minden, fought in 1759, he commanded the British forces under Prince Ferdinand of Brunswick. To this he owes the greater part of his notoriety: having failed to execute the prince's orders to charge, by which default the victory was rendered less decisive than it might have been, he was insulted by his commander, and, at his own request, recalled to England, where he demanded, and with some difficulty obtained, a court-martial, by which, April 3, 1760, he was adjudged incapable of serving thereafter in any military capacity. George II., who was highly incensed at Sackville's conduct, took every means of rendering his punishment most galling; and among other things, erased with his own hand, in council, Lord George Sackville's name from the list of privy-councillors. In the reign of George III., to whom he was personally acceptable, he returned to public life; and having attached himself to Lord North, was made secretary of state for the colonies in 1775, and had the direction of the American war: with what success need not be here said. In 1782, he, with his leader, retired from office, having just before been raised to the peerage by the titles of Viscount Sackville and Baron of Bolebrook, titles united to the dukedom of Dorset by the accession of Lord George's eldest son to that superior dignity. In 1770 Lord George Sackville took the name of Germain, for an inheritance, under which name he is equally well known. He died August 26, 1785.

Two explanations may be found of his misconduct at Minden: one, lack of personal courage, of which he had before been suspected; the other, personal pique against Prince Ferdinand, indisposing him to act with vigour. The latter is hardly more creditable than the former. It is to be added however that some inconsistency seems to have existed in the orders delivered to him, which may have given rise to hesitation in a man unequal to the emergency, without gross cowardice or wilful and predetermined betrayal of trust.

SACRAMENTS and TRANSUBSTANTIATION. 'No religion,' wrote Barrow of the Christian, in the nervous language of the time, 'can be purer from superstitious alloys or freer from useless incumbrances than is this; the ritual observances it enjoineth being as very few in number, in nature simple, and easy to observe, so evidently reasonable, very decent, and very useful, able to instruct us in, apt to excite us to the practice of our wholesome duties.' Most religious denominations will agree in the truth of these remarks, although, as in the case of the doctrine of justification (the corner-stone of *individual* Christianity), various shades of interpretation have obtained currency; so, with regard to the particulars of the Sacraments (the entrance and centre of Christian fellowship), the greatest diversity of opinion prevails.

The Christian Sacraments are not merely certain high forms, but the highest acts of church membership. For the Christian church being but the outward visible representation of the internal fellowship of the faithful with Christ, and with one another; this twofold element of the church is most fitly corresponded to by the institution of external visible actions, intended to express an internal spiritual effect or grace. Such are the Sacraments, a term used to express 'Sacramentum,' by which the Greek *mysterion* is rendered in the old Italic versions, and also in the Vulgate.

With regard to the number of the Sacraments, as is well known, two opinions are current among Christian communities,—the Greek and Romish churches holding the number of seven, while all other Catholic bodies limit the number to two. The history of this difference may be briefly stated as follows. The term Sacrament was applied by the Fathers to the mysterious doctrines of religion, as the Trinity, the Incarnation, and, in some instances, to the ordinances of religion in a wide sense. In a certain sense the seven-fold system of the church of Rome may be considered as an abatement of the lax terminology of some of the Fathers. The title of Sacraments is by her limited to seven actions—baptism, or the sign of our spiritual birth; the eucharist, in which our spiritual life is nourished; confirmation, for the strengthening of the same; penance, for the restoration of the lapsed; extreme unction, as a preparation for death; matrimony, for maintenance of the race of mankind in general; and orders, for that of the race of God's ministers.

Without entering into the controversy on this subject, it will be sufficient to observe that the number of seven, as asserted by the church of Rome, is very far from being sanctioned by the uniform assent of ecclesiastical practice. Antecedently to a very modern synod (that of Florence) the number of seven had never been positively settled.

The two sacraments then, to which, in the judgment of all Catholic bodies (save the Greek and Romish communions) the number is properly limited, are those of baptism and the Lord's supper. It is asserted that on the basis of two Jewish rites of recognised typical import our Lord established, by direct command, those two sacraments, of which alone the authority is unquestionable. An indirect argument in favour of this more restricted view may be drawn from the Romanist statements respecting the relative value of the several sacraments. For although the authorities of that church are consistently anxious to prove the entire number of seven to be equal in rank, the dignity which they directly attribute to the eucharist, and that which they cannot withhold from baptism, may be in some sort alleged as an involuntary assent to the doctrine of the opposite party.

The principal feature of the scheme of salvation providentially offered to man is faith in the Saviour; that is, that through Christ a path is opened to heaven. The eye of this Christian faith is not confined exclusively to the doctrine, or the person, or the sufferings and death of Christ; but it comprises within its range the entire system. It consists in a perfect devotion to Jesus; in an internal union with him, and spiritual imitation of him, in which man appears as a new creature, both as regards knowledge, feeling, and action. The symbols of this faith, and the acts by which an obligation to it is expressed, are the two Christian sacraments, baptism and the Lord's supper.

I. Like the other sacrament, that of baptism is based on a Jewish custom. An examination of the antiquities and ritual of that people establishes this fact to an extent not generally known. Baptism denotes the admission of a dependence on Christ, and an entrance into fellowship with him; consequently, an appropriation of all that Christ bestows upon believers. By baptism is expressed the twofold relation of man,—to his previous condition, which he renounces—and the new one on which he enters; to his spiritual death with Christ, in that he appropriates by faith the work of redemption, which was completed by His death; and to his rising again to walk in newness of life through faith in His resurrection, the pledge of his own future one. From this fellowship with Christ, as the Son of God, result a new filial relation of man to the Father, and a participation in the Spirit imparted by Christ. Christ is the donor of the true spiritual baptism, of which that by water is a symbol only; and this adoption into the divine Spirit constitutes the difference between the Christian baptism and the baptism of John.

With regard to the effects produced by baptism, no dogmas, save those of grace and justification, have perhaps been so productive of disputes as this of baptismal regeneration and the kindred subject of infant baptism. The opinions held by the church of England, that of Rome, and the Lutheran, do not differ in material particulars; while those of other religious denominations will be found to vary (in a like measure with their leading principles) from what is usually known as the Catholic doctrine.

The Mennonites, whose doctrinal statements on this head may be considered as the most systematic of the various branches of the anti-pædobaptist family, define baptism as the act by which a party, being of mature judgment, is received, in the name of the Father, Son, and Spirit, into the Christian Church, and, in proportion to the sincerity of his contrition and the heartiness of his faith, is renewed inwardly, and guided into newness of life.

Faustus Socinus, in his epistles, speaks of baptism as an indifferent matter, destitute alike of perpetual obligation and of the original warrant of Christ or his Apostles. The Racovian Catechism, after limiting the ceremonial precepts of Jesus to the single one of the Lord's supper, calls it a 'vehement error' to attach any power of regeneration to baptism. This it considers as a simple external profession of belief in Christ, to be made by adult converts from heathenism or Judaism.

The main difference upon this point between the tenets of the Socinians and of the Remonstrants or Arminians appears to be comprised in the extension (by the latter) of the rite to infants, but as a matter of private opinion. The rejection of baptism by the followers of Schwenkfeld, and subsequently by the body of Friends, as an external, carnal institution, is perfectly in accordance with the spiritualism of these sects.

The accordance of the Lutheran church and that of Rome upon the sacrament of baptism being admitted in the main, it rests upon sufficient authority that the church of England has in this matter 'simply adopted those theological terms which through all ages of the Catholic church had been understood in the same unvaried meaning;' and further, which are held by the church of Rome in a meaning equivalent to that of the teachers by whom the church of England was restored.

It is an indisputable fact that in the authoritative formularies of the church of England the doctrine of baptismal regeneration is throughout asserted or implied. By baptism, when rightly received, 'the soul is admitted to the benefits of Christ's atonement,' and (to quote further from the same writer) 'is considered to be rightly received, when there is no positive obstacle or hindrance to the reception.' The admission of the first of these positions—simply, and as revealed in Scripture—would have obviated much unprofitable controversy. Leaving the first question on this footing, the second, as to the efficacy of baptism in cases where no positive obstacle or hindrance is opposed to the reception (which includes the case of infants), is answered in the affirmative by the Anglican, as by all Catholic branches of the Christian church. 'He which with imposition of hands and prayer did so great works of mercy for restoration of bodily health, was worthily judged as able to effect the infusion of heavenly grace into them whose age was not yet depraved with that malice which might be supposed a bar to the goodness of God towards them.' If these words of Hooker be coupled with the declaration of Christ, that, so far from destroying the law, he came to give it in all essentials a new and spiritual extension; that on all great occasions he built on a Jewish foundation; that the other sacrament was founded on the passover; that the Christian church was derived from the Synagogue: if all this be united with his declarations concerning infants, and his kingdom, and the entrance therein—it must be confessed that either our Lord declared infants capable of inheriting what they never could attain to, or that having so declared, he willed them to be qualified by a Christian adaptation of a rite already familiar. 'As for baptism of infants,' writes Archbishop Usher, 'it is sufficiently warranted by reasons of Scripture, though not by example.' So thought the apostles, and so likewise the early Christians. That infant baptism, from the time of the apostles, was ordinarily practised in the church, rests on very valid proof. In support of this, Origen, Cyprian, and Tertullian may be fairly quoted.

II. The various opinions respecting the exact import and appropriate benefits of the Lord's supper are of high antiquity. The difficulties connected with the question are increased by the general adherence to the words of Scripture, observable in the liturgical formularies. The non-existence of a dogmatical theology during the first ages of the church is well known, which renders it unnecessary to look for exact scientific definitions throughout that period. But, concurrently with the uniformity of practice above adverted to, there is to be found a threefold variety of interpretation, corresponding with the peculiar views of what may be considered the three principal schools of early Christian theology.

The church of Asia Minor, as also some great Origenists in the West, professed views of the holy eucharist which the church of Rome and the Lutheran have (to a certain extent) pleaded as the sentiments of antiquity supporting their own. Such were those of Ignatius, Justin Martyr, Irenæus, Hilary of Poitiers, Cyril of Jerusalem, Gregory of Nyssa, Ambrose, Chrysostom, and Theodoret. The common point of agreement among these writers is the communion of the body and blood of Christ in a high spiritual sense *generally*. But a considerable difference of statement regarding details is observable among them. For example, some expressions of Cyril of Jerusalem are directly and strongly opposed to the tenet of transubstantiation, which Gregory of Nyssa is not unfairly quoted as supporting.

The views of the church of North Africa, as expressed by Tertullian, Cyprian, and Augustine, differed as a whole from those just named. The African doctors may be considered as regarding the eucharist as an active and efficacious symbol.

A third party, that of the school of Alexandria, applied in some measure its usual allegorising views to this sacrament. But even in the absence of all approach on the part of these Fathers to corporeal views, a leaning to the sentiments of the first-mentioned party is observable in some portions of their writings.

Each of the many designations by which this sacrament was known until the close of the fourth century, bore some reference to the original object of its institution. This may be traced throughout the various expressions—breaking of bread, communion, Lord's supper, eucharist, oblation, commemoration, and passover. Ecclesiastical antiquity cannot be adduced with fairness in support of the literal interpretation applied by a large body of Christians to the words used by our Lord in his institution of this sacrament. John of Damascus, the principal writer of the Eastern church, maintained (it is true), on the authority of some of the Fathers, a literal change of the bread and wine into the body and blood of Christ. The figurative interpretation put upon the words of Christ by a council at Constantinople in A.D. 754, was denied at the second council of Nice in 787, when it was ruled that the sacred symbols are not figures or images at all, but the real body and blood. Theophylact and Euthymius Zigabenus coincide with John of Damascus. But it was reserved for the Western church to carry out into its remote consequences the doctrine of a material change, which, in common with her Eastern sister, she ultimately came to maintain. Great discrepancy of expression on this subject may be found in the writings of Western theologians anterior to the time of Charlemagne; the utmost however that can be fairly drawn from them is that the sacramental elements were not to be regarded as purely symbolical. But it is undeniable that a strong tendency to transubstantiation (as it was afterwards termed) is throughout discernible. This doctrine was maintained during the ninth century by Paschasius Radbert more precisely and authoritatively than before. He was opposed however by Rabanus Maurus, and Ratramn or Bertram (whose sounder and more scriptural views many centuries later found an echo in our own Ridley), and also by the suspected ingenuity of Scotus Erigena.

Various instances of opposition to the doctrine of transubstantiation subsequently occurred; but, supported by authority like that of Sylvester II. (the famous Gerbert), it continued to gain ground. During the eleventh century it had become an article, to dissent from which was heretical; although a doctrine substantially the same with that held by the Anglican church at the present day was preached by doctors such as Alfric, and although an archbishop of Sens, Leutheric, advocated opinions regarding the eucharist similar to those which involved Berengar of Tours in controversy with Lanfranc, and drew upon him the hostility and condemnation of popes and councils.

In this condition the dogma of transubstantiation passed into the hands of the schoolmen, whose marvellous ingenuity was devoted to establishing and explaining what became the centre and support of the theurgic pretensions of the hierarchy of the middle ages. The term transubstantiation was probably introduced into the ecclesiastical vocabulary by Hildebert of Tours. The dialectic talents of Lombard, Alexander Hales, Albert, and Aquinas were vigorously employed on this subject. It was invested with legal authority by Gratian. Finally, the doctrine was established as matter of faith at the Lateran Council in 1215. Even Occam assented to its truth, and it was subsequently ratified at Trent. Among the numerous controversies connected with the different theories on the subject, the more modern opinions are marked by a tendency to regard the eucharist as a purely symbolical rite. For transubstantiation Luther substituted (probably through the effect of Occam's writings) a corporal local presence, commonly called consubstantiation. There appears an inconsistency in the obstinacy with which Luther contended for his theory. He had abandoned the sacrifice of the mass and the theurgic pretensions connected with the real presence which made this dogma of such importance to the church of Rome. Luther's great object was to preserve this sacrament from being degraded by the same unspiritual *subjective* views (as he conceived) with which it was menaced by Carlstadt and his party. This evil would be best remedied by a bold assertion of the *objective* dignity of this sacrament, divested of the superstitious additions with which it was encumbered in the church of Rome. Hence the Lutheran doctrine of the eucharist. What has been said will suffice to show how ungrounded is the charge sometimes brought against Luther—that he threw away the substance while he retained the shell. But his tenacious adherence to scholasticism in this respect contrasts strangely with his uncompromising hostility to that philosophy respecting the fundamental dogma of justification by faith. Zwingli, on the other hand, together with a corporal and local presence, rejected all notion of a spiritual presence and graces. But the opinions of Calvin shortly afterwards superseded the colder ones of Zwingli, many of whose followers, to quote from Waterland, abandoned the 'notion of naked signs and figures to the Anabaptists of those times, where they rested, till again revived by the Socinians, who afterwards handed them down to the Remonstrants.'

The point of divergence between the adherents of Luther and Calvin respecting the eucharist may be stated thus. The former party held, according to the earlier Augsburg Confession and the Form of Concord, that the body of Christ was contained in, with, and under the sacramental bread. The others held the doctrine only of a real spiritual feeding on the body of Christ, which took place in the faithful contemporaneously with the reception of the outward elements. In the opinion of Waterland, 'Calvin refined upon Zwingli's scheme, steering a kind of middle course between the extremes. He appears to have set out right, taking his ground with good judgment; and had he but built as carefully upon it afterwards, no fault could have been justly found.'

The late Bishop Lloyd considered that the Anglican doctrine was borrowed from that of Calvin. The third and fourth clauses of the twenty-eighth article respecting the manner and means after and by which the body of Christ is taken in that sacrament, would seem to support this view. But the words of Waterland may be fairly quoted as expressing briefly the opinion held by the majority of Anglican teachers on this subject: 'Our divines who came after Calvin had some advantage in point of time, and a greater still in the rule or method which they pitched upon as most proper to proceed by. The sum of all is, that sacramental or symbolical feeding in the eucharist is feeding upon the body broken and the blood shed under the signs and symbols of bread and wine; the result of such feeding is the strengthening or perfecting our mystical union with the body glorified, and so, properly speaking, we feed upon the body as dead, and we receive it into closer union as living, and both in the eucharist when duly celebrated.'

SACRED WAR. [Philip, p. 74; Phocis.]

SACRIFICE, an offering made to God, in which the thing offered is wholly or partially destroyed. It is generally supposed that sacrifices were instituted immediately after the fall of Adam, when God made with him what is called 'the covenant of grace;' and that on this occasion the sacrifice was partly an atonement for Adam's sin, partly a ratification of the covenant. This supposition is founded on the fact that God clad Adam and Eve with the skins of beasts; and since animal food had not yet been given to man, it is thought that these beasts must have been slain as sacrifices. (*Genesis*, chap. iii.) In the next generation we meet with sacrifices as a divine appointment. (*Gen.*, iv. 1-5.) All over the world sacrifices have been found in some form or other, which is another proof of their great antiquity. Their chief object is to atone for sin [Atonement], but they have also been offered as the means of gaining the favour and assistance of God, and of expressing submission and gratitude to him. They may be divided into two classes, bloody and unbloody. In the heathen world human sacrifices have been very generally prevalent, apparently from a notion that human life is the most precious thing that can be offered to the divine Being. Sacrifices form a large part of the Jewish law. [Moses.] Christians believe them to be abolished since the death of Christ, since, as Paul argues in his Epistle to the Hebrews, that was the one great sacrifice which has for ever made atonement for the sins of men.

Valuable remarks on this subject will be found in the writings of most eminent theologians; but such notices are too numerous to be referred to here. See especially the article 'Sacrifice,' in Charles Taylor's edition of Calmet's *Dictionary to the Bible*.

SACRILEGE is 'the felonious taking of any goods out of any parish-church or other church or chapel.' By the common law it was a capital offence, though the offender seems to have been entitled to the benefit of clergy at the discretion of the ordinary. But even if it were not clergyable at the common law, yet the statute 25 Edw. III., c. 4, 'De Clero,' comprehended this as well as other crimes, and gave 'the privilege of holy church to all manner of clerks, as well secular as religious.' Afterwards, by the statutes of 23 Hen. VIII., c. 1, and 25 Hen. VIII., c. 3, revived by

5 and 6 Edw. VI., c. 10, all persons not in holy orders were excluded from the benefit of clergy who on an indictment for *robbing* any church, chapel, or other holy place were convicted, stood mute, or peremptorily challenged more than twenty of the jurors: and by 3 and 4 W. & M., c. 9, the same consequences followed upon their outlawry. It seems however that no sacrilege came within these statutes which was not accompanied by an actual *breaking* of a church, &c. But by 1 Edw. VI., c. 12, all persons in general were deprived of their clergy for the felonious taking of any goods out of any parish-church or other church or chapel in all cases, except that of challenging more than twenty: and by 3 and 4 W. & M., c. 9, upon such a challenging, as well as upon a conviction, &c. upon an indictment, whether in the same county wherein the sacrilege was committed, or in a different one. It seems that sacrilege was the only felony at common law which deprived the offender of the privilege of sanctuary.

The present state of the law of sacrilege depends on the statute 7 and 8 Geo. IV., c. 29, s. 10, which enacts that 'if any person shall break and enter any church or chapel, and steal therein any chattel, or having stolen any chattel in any church or chapel, shall break out of the same, every such offender, being convicted thereof, shall suffer death as a felon.'

By 9 Geo. IV., c. 55, s. 10, the same protection was extended to meeting-houses and all places of divine worship.

By statute 5 and 6 Will. IV., c. 81, the punishment of death was abolished, and transportation for life or for any term not less than seven years, or imprisonment with or without hard labour for any term not exceeding four years, was substituted in its place. These penalties were again altered by 6 Will. IV., c. 4, which limited the term of imprisonment to three years, and gave to the court a discretionary power of awarding any period of solitary confinement during such term. But now, by the statute 7 Will. IV., and 1 Vic., c. 90, s. 5, no offender may be kept in solitary confinement for more than one month at a time, or three months in the space of one year.

SACRO-BOSCO, JOHANNES DE, an eminent English mathematician of the thirteenth century, contemporary with Roger Bacon. The place of his birth is generally supposed to have been Holywood, but is not positively known, there having been at that period at least two towns in England of that name. According to Mackenzie, who has claimed him for a native of Scotland without any satisfactory evidence, he was admitted a member of the university of Paris in the year 1221, where he afterwards greatly distinguished himself as professor of mathematics. All the biographers agree in asserting that he spent the greater part of his life at Paris, and it is equally certain that he was some few years at Oxford, where he is said by Whethamstede to have lectured before large audiences with great applause. He died at Paris in the year 1256, as appears from the inscription on his monument in the cloisters of the Mathurine convent at that place. As an author, he is more distinguished by a few elementary works which he left behind him, and which obtained a most extended popularity, than for much originality of talent. His treatise 'De Sphæra Mundi,' which is merely a paraphrased translation of a portion of Ptolemy's 'Almagest,' continued to be used in the schools for nearly four centuries; it was printed for the first time in the year 1472, passed through more than twenty editions, and was commented on by several first-rate astronomers. In 1244 he composed a tract, 'De Computo Ecclesiastico,' which contains the common rules of that science; a curious colophon, which Wallis and Vossius give from old MS. copies, is our authority for the date of its composition. Perhaps however his most popular work is a tract 'De Algorismo,' one of the earliest known works on arithmetic in which the Arabic numerical notation is employed. This latter work, which is very common in manuscript, has been recently printed in Halliwell's 'Rara Mathematica,' p. 1-26, and a nearly contemporary English translation of it is preserved in manuscript in the Ashmolean library at Oxford.

SACRUM, OS (*ἱερὸν ὀστοῦν*), a name used by some of the antient medical writers in a larger sense than that which is now attached to it. Galen himself sometimes means to designate by this term the *os coccygis* as well as what is now called the *os sacrum* (See 'De Usu Part. Corp. Hum.,' lib. xii., cap. 12); in other passages he restricts its meaning to the modern signification, as do also Rufus Ephesius ('De Corp. Hum. Part. Appellat.,' p. 52, ed Clinch.) and Julius Pollux ('Onomast.,' lib. ii., cap. 4, § 182). The origin of the name is doubtful; some suppose it to have been given 'quòd in eo aliquid sacri arcanique insit, quoniam partûs tempore divinitus aperiatur, eductoque fœtu solidescat miro quodam naturæ opificio' (J. Gorræi 'Definit. Med.'); others again, 'quòd partes quæ huic ossi adjacent diis offerri in sacrificiis solerent, id quod Menandri testimonio confirmant, *οἱ δὲ τὴν ὀσφὺν ἄκραν θύσαντες*. Etymol. Magn. *in voce.*' (Ibid.) The most probable derivation however appears to be from the sense of *greatness* sometimes signified by the word ἱερὸς, which is perhaps also the meaning of the name *Sacer Morbus*. [SACER MORBUS, and the authorities there given.] It seems to have been called by various names by the old anatomists, viz. *πλατὺ ὀστοῦν* (Galen, 'De Usu Part. Corp. Hum., lib. xii., cap. 12, p. 50, &c.), *ὑποσπόνδυλον* ('Anonymi Isag Anat.,' cap. 35), *τρητὸς κόκκυξ* (Jul. Pollux, *loco cit.*) &c., and perhaps the first of these rather confirms the opinion that the epithet ἱερὸν, *sacrum*, also was applied to the bone in consequence of its size.

SACY, ANTOINE ISAAC SILVESTRE DE, was born at Paris, 21st Sept., 1758. His father Jacques Abraham Silvestre practised as a notary in that capital. At the early age of seven De Sacy lost his father, but his mother took great care of his education, which, owing to the delicate state of his health, was directed by a tutor under his maternal roof. His progress in classical studies was very rapid, as appears from his intimate acquaintance both with Latin and Greek literature. At the age of twelve he became acquainted with Dom Berthereau, a Benedictine of St. Germain-des-Prés, who was then engaged in preparing a collection of such Arabian historians as have written on the Crusades, and who inspired him with a taste for Oriental languages. Having finished his classical studies, De Sacy began the study of Hebrew. From Hebrew he proceeded to the Syriac, Chaldee, and Samaritan, and thence to Arabic and Ethiopic. With these laborious pursuits De Sacy combined the study of the Italian, Spanish, English, and German languages, with all which he made himself well acquainted. He soon added to his knowledge of Arabic that of Persian and Turkish, two languages which, being then very little known in Europe, required new investigations on his part. De Sacy's first literary labours were directed towards biblical researches. In 1780, at the age of twenty-three, he undertook the examination of a Syriac MS. in the Bibliothèque Royale, which contained a translation of the Fourth Book of Kings, and he made some notes on the subject which appeared in Eichhorn's 'Biblical and Oriental Repertory' (Leyden, vol. vii., p. 227, et seq.). In 1785 he was elected a titular member of the Academy of Inscriptions and Belles-Lettres. Immediately upon his appointment he wrote two memoirs, one upon the breaking of the dike of Irem in Arabia Felix, the other on the original vestiges of Arabian literature (*Recueil de l'Acad. des Inscriptions*, vol. xlviii., old series; vol. x., new series). In the same year De Sacy was nominated a member of a committee of the Academy which was appointed to make analyses and extracts from the most important inedited works in the Royal Library; and there is scarcely a volume of the collection entitled *Notices et Extraits*, &c. which does not contain some notice by him of a Persian or Arabic work. Among his contributions the most remarkable are his 'Biographies of Persian Poets' (vol. iv.), and a notice on four Arabic works relative to the conquest of Yemen by the Othomans in the sixteenth century (vol. iv.). Shortly after he wrote his admirable Memoirs on various antiquities of Persia, and deciphered the Pehlvi inscriptions of Nakshi-Rostem, near the ruins of the antient Persepolis. He also gave the various readings on the medals of the Sassanian kings, together with an abstract of their history translated from Mirkhond. The whole was published in 1793, in one vol. 4to. During the revolutionary period De Sacy withdrew with his family to a small country-house some leagues from Paris, and devoted himself entirely to the study of Oriental literature. Among his labours at that time are his 'Researches into the Religious Tenets and Customs of the Druses,' which however were not published till shortly before his death. In 1795 a school for teaching living Oriental languages being instituted by a decree of the Convention, De Sacy was appointed Professor of Arabic. He then gave all his attention to the composition of an Arabic grammar, which he compiled chiefly from the works of native grammarians; and about the same time (1799) he pub lished his 'Principles of General Grammar,' of which a third edition appeared in 1815, Paris, 12mo. In 1805 De Sacy was sent by the Imperial government to Genoa for the purpose of examining certain Arabic manuscripts which were said to exist in the archives of the city; and on his return to Paris in 1806 he made a report to the Academy on the historical documents which he had found there. In the same year De Sacy was appointed Professor of Persian, and he published his 'Chrestomathie Arabe,' or a selection of extracts from various Arabian writers, both in prose and verse, by far the most valuable work for the use of students that has yet appeared. In 1810 his Arabic Grammar, the fruit of fifteen years' almost incessant labour, was published, as well as his translation of Abd-al-latif's account of Egypt (*Relation de l'Egypt*, &c., 4to., 1810). About the same time he published a 'Memoir on the Orthography and Manner of reciting the Korán' (*Not. et Ext.*, vol. viii.), and was likewise one of the most zealous contributors to the 'Magasin Encyclopédique,' the 'Mines de l'Orient,' and the 'Annales des Voyages.' On the return of the Bourbons in 1814, De Sacy, who had received from the Imperial government the title of baron, became a member of the Chamber of Deputies, and was also appointed a member of the Council for Public Instruction. He took a prominent part in founding the Asiatic Society of Paris, of which he was the first president. In 1816 he published, under the title of 'Calila et Dinna,' the Arabic text of the Fables of Bidpai, and the Moallakah (or suspended poem) of Lebid, with a French version and critical notes. In 1819 appeared the 'Pend-Nameh' (Book of Counsels) in Persian and French, with copious notes. The whole of the 'Makamat' (Sessions) of Hariri, in Arabic, with a commentary also in Arabic, was his next publication, the edition being made with so much care that it met with a ready sale even in eastern countries. In 1826-27 De Sacy published a new edition of his 'Chrestomathie Arabe,' with corrections and considerable additions; and in 1829 he added a supplementary volume, entitled 'Anthologie Grammaticale Arabe.' The second edition of his Arabic Grammar appeared in 1831. In 1832 Louis-Philippe elevated De Sacy to the peerage, and appointed him keeper of the Oriental MSS. in the King's Library, and Perpetual Secretary to the Academy of Inscriptions. De Sacy's last work was his 'Exposé de la Religion des Druses,' which appeared at the beginning of 1838, in two volumes, 8vo. On the 19th of February of the same year, as De Sacy was returning from the Chamber of Peers, where he had taken an active part in the debate, he fell in the street in a fit of apoplexy. He was removed to his house, where he died on the following day, in the eightieth year of his age. Oriental literature is greatly indebted to the labours of this distinguished scholar. He not only contributed to extend our knowledge of every branch of Oriental literature, but it was on his recommendation that professorships of Chinese, Sanscrit, and Hindostanee were established in Paris; and it was also under his direction that the Russian and Prussian institutions for Oriental studies were raised to their present eminence. A very able paper, giving an account of De Sacy's life and writings, was read on the 23rd of June, 1838, before the Academy, by M. Reinaud, who was his personal friend. It has since been published under the title of 'Notice Historique et Littéraire sur M. le Baron Silvestre de Sacy.'

SADDUCEES (Σαδδουκαῖοι), one of the four Jewish sects at the time of Christ. Their origin is unknown, for little dependence can be placed on the Rabbinical tradition which makes them the followers of Zadok, a disciple of Antigonus Soccho. They denied the existence of any spiritual beings except God, and believed that the soul died with the body, and therefore that there was no resurrection. (*Matt.*, xxii. 23; *Acts*, xxiii. 8.) In consequence of this disbelief in a future state of rewards and punishments, they were inexorable in punishing crimes. They rejected the doctrines of predestination and providence, maintaining that men were left to determine their own course without assistance or hindrance from God. They rejected the traditions of the Pharisees, and adhered to the text of the Mosaic law. They have been accused of rejecting all the books of the Old Testament except the Pentateuch; but the passage of Josephus, on which this charge is founded, does not sustain it. Though inveterately opposed to the Pharisees, they united with them against Christ. During the period to which the New Testament refers, they seem to have been the stronger party in the Sanhedrim, and some of their body were high-priests, as Caiaphas and Ananias. It seems that they considerably modified their opinions in progress of time, and received the doctrines of angelic beings and of the resurrection; so that at last they were only distinguished by their rejection of tradition, from which circumstance they obtained the name of Caraites, in the eighth century A.D.

(Josephus, *Antiq.*, xiii. 5, 9, 10, 6; xviii. 1, 4; *Jewish War*, ii. 8, 14; Prideaux's *Connection*; Jahn's *Biblical Antiquities*; Calmet's *Dictionary*; Winer's *Biblisches Realwörterbuch*.)

SADLER, SIR RALPH, the eldest son of Henry Sadler, Esq., was born at Hackney in Middlesex, in 1507, where his family had been for some time settled. In early life he gained a situation in the family of Thomas Cromwell, earl of Essex, who introduced him to the notice of Henry VIII., by whom he was employed in the dissolution of the religious houses, and he had his full share of their spoil. In 1537 he commenced a long series of diplomatic services in Scotland; in the first instance, chiefly with the view of detaching that country from its close alliance with France, and persuading the king of Scotland to imitate his uncle's conduct toward the see of Rome and the clergy. In these objects however he failed. In 1540 he lost his patron Cromwell, who was beheaded; but retained his favour with Henry, who again sent him to Scotland in 1541. Upon the death of James V., Sadler lent his aid to the match projected by Henry VIII. between his son Edward and the young queen of Scotland, but this ended so unsuccessfully, that in December, 1543, Sadler was obliged to return to England, and Henry declared war against Scotland. In the meantime Henry was so satisfied with Sadler's services, even in this last negotiation, that he included him, by the title of Sir Ralph Sadler, Knight, among the twelve persons whom he named as a privy-council to the sixteen nobles to whom in his will he had bequeathed the care of his son and of the kingdom. When this will was set aside by the protector Somerset, and it became necessary to conciliate the king's executors and privy-councillors by wealth and honours, Sir Ralph Sadler received a confirmation of all the church lands formerly assigned to him by Henry, with splendid additions. At the battle of Pinkie, Sir Ralph Sadler greatly distinguished himself, and was raised to the degree of knight-banneret on the field of battle; but we hear nothing more of him during the reign of Edward VI., except that in the fourth year of that king we find him mentioned as master of the great wardrobe. In Queen Mary's reign, although he appears to have been in her favour, he retired to his estate at Hackney, and resigned the office of clerk of the hanaper, which had been conferred upon him by Henry VIII. On the accession of Elizabeth he again appeared at court, was called to the privy-council, and retained to his death a large portion of the esteem of that princess. He was a member of her first parliament as one of the knights of the shire for the county of Hertford. When Elizabeth thought proper to favour the cause of the Reformation in Scotland, and to support the nobility who were for it against Mary, Sir Ralph Sadler was her principal agent. He was also concerned in the subsequent measures which led to the death of Mary, and was appointed her keeper in the castle of Tutbury; but such was Elizabeth's jealousy of this unfortunate princess, that even Sadler's watchfulness became liable to her suspicions, and on one occasion a heavy complaint was made against him that he had permitted Mary to accompany him to some distance from the castle of Tutbury, to enjoy the sport of hawking. Sir Ralph Sadler expostulated upon the miserable life which he passed at Tutbury, and upon the misconstruction put upon his actions, and Mary was finally committed to a new keeper. Elizabeth however did not withdraw her confidence from Sir Ralph Sadler in other matters, and, after the execution of Mary, employed him to go to the court of James VI. to dissuade the Scotch king from entertaining thoughts of a war with England on his mother's account, to which, there was reason to think, he might have been excited. In this Sir Ralph had little difficulty in succeeding, partly from James's love of ease, and partly from the prospect he had of peaceably succeeding to the throne of England. This was the last time Sir Ralph Sadler was employed in the public service, for soon after his return from Scotland he died, at his lordship of Standon in Hertfordshire, March 30, 1587, in the eightieth year of his age, and was buried in the church of Standon, where his monument was decorated with the king of Scotland's standard, which he had taken at Pinkie.

The transactions of Sir Ralph Sadler's most memorable embassies are recorded in 'Letters and Negociations of Sir Ralph Sadler,' &c., printed at Edinburgh, 1720, 8vo., from MSS. in the Advocates' Library: but a more complete collection was published of his 'State Papers and Letters,' edited by Arthur Clifford, Esq. of Tixal, his descendant, in 1809, in 2 vols. 4to., to which was added, a 'Memoir of the Life of Sir Ralph Sadler,' by Mr. (afterwards Sir) Walter Scott, with historical notes: to which the preceding account is principally indebted.

SADOLE'TO, JA'COPO, born at Modena in 1477, studied at Ferrara, and afterwards at Rome. He applied himself especially to the Greek and Latin classics, and became a distinguished scholar. Leo X. appointed him one of his secretaries, together with Bembo, and afterwards made him bishop of Carpentras in the county of Avignon, but still kept him at Rome. After Leo's death, his successor, Adrian VI., who had no partiality for learned men, neglected Sadoleto, who repaired to his diocese of Carpentras. When Clement VII. ascended the pontifical throne, in 1523, he appointed Sadoleto his secretary. But Clement's tortuous and selfish policy disgusted Sadoleto, who asked and obtained leave to return to his diocese, and accordingly he left Rome about a month before Bourbon and his band sacked the city. At Carpentras he wrote several works; among the rest, a learned commentary on the Epistle of St. Paul to the Romans. Some expressions in this commentary, which referred to the abstruse doctrines of predestination and grace, were considered heterodox at Rome, and his work was prohibited. Sadoleto wrote to Paul III., who had succeeded Clement VII., an explanation of his opinions, which satisfied the pope, and Sadoleto was cleared of all suspicion of heresy. Soon after he was made a cardinal, and was employed in several important affairs. In 1542 he was sent as legate to Francis I., to mediate a peace between that king and the emperor Charles V., in which however he did not succeed. In 1544, being old and infirm, he obtained leave to resign his see of Carpentras in favour of his nephew Paul Sadoleto, whom he had educated himself, and withdrew into retirement. He died in 1547. His unspotted character, the mildness of his manners, his sincere piety, and his love of letters have caused him to be compared with Fénélon.

Sadoleto wrote a work on education, 'De Liberis recte Instituendis,' which contains much excellent advice. He also wrote a disputation, in two books, on the merits of philosophy, on the model of Cicero's 'Tusculanæ,' which Bembo praised greatly, as worthy of the Augustan age. A poem which he wrote in Latin hexameters, on the discovery at Rome of the group of the Laocoon, was likewise much admired.

SADYATTES. [Lydia.]

SAFETY LAMP. [Lamp, Safety.]

SAFFLOWER, or *Bastard Saffron*, has already been noticed under the botanical name of the plant [Carthamus tinctorius] yielding it, of which the generic name appears to be derived from the Arabic *koortum*, a term applied to its seeds. This plant has been cultivated in Eastern countries from the earliest times, both on account of the oil expressed from its seeds and for the colouring matter procurable from its flowers, which in their dried state form the Safflower of commerce. The plant is noticed by Greek authors under the name *knekos* (κνῆκος); Arabian authors give *kunikus* as the Greek synonym of *koortum*. The oil of the seeds of Carthamus was valued by the antients as a laxative medicine, and is still employed by the Asiatics for the same purpose, as well as for external application. It is most extensively used as a lamp-oil. The seeds are eaten by some birds, especially parrots, whence they are called 'graines de perroquets.' The plant is however chiefly cultivated on account of its flowers, not only in China, India, and Egypt, but also in the south of Europe. That from China is the most valued, fetching as high a price as 30*l.* per cwt., whilst Bengal Safflower is not worth more than 7*l.* per cwt. This might be remedied probably by selecting and sowing only the seed of the most highly coloured flowers, and then adopting the Chinese method of gathering the crop when the flower is in the highest perfection, and only picking off the upper and coloured parts of the floret, instead of the whole floret, of which the lower part is whitish-coloured. Besides this, careful drying is essential to the preservation of the colour, or, as Mr. E. Solly has recommended, gradual drying 'in close chambers with some organic substance, or perhaps with hot sand;' but the natural heat of the climate in darkened chambers would probably be sufficient.

SAFFRON consists of the dried stigmas of the *Crocus sativus*, a plant native of Greece and Asia Minor, but extensively cultivated in Austria, France, Spain, and also formerly in England. The Sicilian saffron is said to be the produce of the Crocus odorus, but both in antient and modern times this sort has been little esteemed. England is chiefly supsupplied from France and Spain; that of Spain being preferred. In Germany however Spanish saffron is not in such repute as the Austrian, great pains being taken in the cultivation of the plant in that country. The cormi or stems are subject to the attacks of a fungus, Sclerotium Crocorum, by which they are extensively destroyed. When the flowers expand, and are thoroughly open under the influence of the sun, the stigmas, of which there are three, are plucked out, a portion of one style remaining attached to them, and spread upon paper, to be dried either by means of portable kilns over which a hair-cloth or fine sieve is stretched, or in a room by the sun. The stigmas are from an inch to an inch and a half long, narrow and roundish where they are attached to the style, but spreading out and club-shaped towards the apex, which is truncate. The upper part is of an orange or brownish red; the part of the style termed Féminelle is yellowish. The stigmas have a penetrating, aromatic, and, when in large quantity, stupifying odour, and a bitter aromatic taste; by mastication the mouth and saliva are rendered yellow. By long internal use of them many of the secretions acquire a yellow colour. The stigmas of Crocus Pallasii, C. longiflorus, and C. Susianus are not so long as those of the genuine saffron crocus, and are altogether devoid of the strong odour. They and many other articles, such as the florets of the safflower (Carthamus tinctorius), those of the marigold (Calendula officinalis), slices of the flowers of the Punica granatum, and pieces of dried flesh are used to adulterate the true saffron. The saffron of English commerce is generally very pure; but the high price offers much temptation to sophistication, which might be diminished by collecting the stigmas of the Crocus vernus, which are little inferior in colour or potency to those of the autumnal crocus. According to Mr. Pereira, one grain of good saffron contains the stigmata and styles of nine flowers; hence 4320 flowers are required to yield one ounce of saffron. Saffron was formerly met with in two forms, *hay saffron* and *cake saffron*, the former is now alone in demand, the latter being entirely an artificial compound of the florets of the safflower, gum, and some other materials. Genuine saffron is often moistened with oil, which gives an appearance of freshness to old and dry saffron; but the mixture is easily detected. Saffron consists of a volatile oil, in variable proportion, which is heavier than water, of polychroite, which is a compound of a volatile oil and a bitter red substance (or polychroite properly so called), gum, and other principles. [Polychroite.]

Saffron had formerly many powerful and important properties assigned to it, none of which, on the most careful experiments, it is found to display, except in the cases of a very few susceptible persons, who suffer from the odour, as is found in other instances—of the violet, &c. [Aromatics.] On the Continent it is much used as a condiment with food. In England it is used in medicine, chiefly as a colouring principle. It is also employed as a dye.

SAFFRON WALDEN. [Essex.]

SAGALASSUS. [Pisidia.]

SAGAN, a mediatised principality in Lower Silesia, 450 square miles in extent, with 42,000 inhabitants, is a circle of the government of Liegnitz in that province. It was originally a part of the principality of Glogau, and in consequence of a partition between the sons of Henry VIII., in 1395, it had princes of its own. It came afterwards to the crown of Bohemia, and was given by the emperor Ferdinand II. to the celebrated Wallenstein, after whose murder it reverted to the crown. It was sold in 1646 to Prince Lobkowitz, from whose family it was purchased, in 1786, for 1,100,000 florins, by Peter Biron, duke of Courland, on whose death, in 1800, it fell to his eldest daughter and heiress, Catherine, princess of Courland, who took the title of duchess of Sagan. Sagan, the capital of the principality, is situated on the right bank of the river Bober. It is strongly fortified, has three gates, three suburbs, two handsome squares, and a fine ducal palace, with beautiful gardens and park. The inhabitants, now nearly 6000, are for the most part Roman Catholics. There are six Roman Catholic churches and chapels, one Protestant church, a Roman Catholic gymnasium, several Protestant and Catholic schools, a seminary for Roman Catholic schoolmasters, a theatre, and three hospitals. The inhabitants manufacture linen, woollen cloths, calicos, sealing-wax, paper, and looking-glasses. On an antient tower near one of the gates the celebrated astronomer Kepler had an observatory in the time of Wallenstein, who possessed the principality from 1627 to 1634.

SAGAPE'NUM, said by Willdenow to be yielded by Ferula persica, which no one regards as certain, though it is generally believed to be furnished by some species of Ferula. The plant (or plants) which yield it grow in Persia and other regions of the East. It is procured in the same way as assafœtida. It occurs either in tears or irregular masses, of a dirty brownish colour, containing in the interior white or yellowish grains. It is difficult to break (unless when very old), is tenacious, and not easily powdered, except in winter. It has the same alliaceous odour, but less powerful, as assafœtida, with a nauseously bitter, acrid, guttural taste.

It consists of, in the 100 parts, according to Pelletier:—

Resin	54·26
Gum	31·94
Bassorin . . .	1·0
Peculiar substance . .	0·60
Acidulous malate of lime .	0·40
Volatile oil, including loss .	11·80
	100·

Brandes found only 3·73 per cent. of volatile oil, and less resin than in the above; and Geiger says it has less volatile oil than asafœtida; while Pelletier's analysis gives nearly three times as much. The resin, by the action of hot hydrochloric acid, becomes first reddish, then blue, and at last brown. Formerly there were two kinds of Sagapenum in commerce, but at present only the worst of the two is met with. It is said to be adulterated with assafœtida and bdellium. Its action on the human system is the same as that of assafœtida and other fetid gum-resins. [ASSAFŒTIDA.]

SAGE. [SALVIA.]

SAGE, LE, ALAIN-RENE', was born May 8, 1668, at the village of Sarzeau, which is situated on the peninsula of Ruis in the department of Morbihan, in France, about ten miles from Vannes, the capital of that department. His father, Claude Le Sage, who was a lawyer, and held the office of registrar of the Cour Royale of Ruis, died in 1682; he bequeathed a moderate property to his son, and entrusted both son and property to an uncle, who sent young Le Sage to be instructed in the Jesuits' college at Vannes, where he became an especial favourite of Père Bochard, then at the head of that college, who bestowed much pains on his education. The uncle is said to have dissipated the property, and young Le Sage, on leaving the college, appears to have obtained and held for five or six years an office in the collection of the taxes in his native province of Brittany.

Le Sage, having been deprived of his office, went to Paris in 1692, with the intention of going through a course of philosophy and law, and at the same time of making interest to obtain another situation. His handsome person and agreeable manners, his talents, and his taste for elegant literature procured him admission to the best society. In 1694 he married the daughter of a citizen of Paris. Danchet, with whom he had become intimate while prosecuting his studies in the university of Paris, persuaded him to produce, from the Latin version of Jaques Bongars, the Letters of Aristænetus, which is rather an imitation than a translation. It was printed in 1695 at Chartres, but with the imprint of Rotterdam, 1 vol. 12mo., at the expense of Danchet, who was then professor of rhetoric at Chartres.

Le Sage had been admitted avocat au parlement de Paris, but he subsequently dropped the designation, and also relinquished some small office which he held, in order that he might devote himself to literature. The Abbé de Lyonne became his patron, and bestowed upon him a pension of 600 livres; and to him also Le Sage appears to have been indebted for his introduction to the Spanish language and literature. He now produced 'Le Traître puni,' a comedy in five acts, imitated from the 'Traicion busca el Castigo' of F. de Roxas (Paris, 1700); 'Don Felix de Mendoce,' taken from a piece by Lope de Vega (Paris, 1700); and 'Le Point d'Honneur,' a comedy in five acts, from the 'No hay Amigo para Amigo' of F. de Roxas, which was performed at the Théâtre Français, but with little success. The two first plays were not represented, and the last, when he afterwards reduced it to three acts, and brought it out at the Théâtre Italien in 1725, under the title of 'L'Arbitre des Différends,' was only played twice. Le Sage's next effort was 'Les Nouvelles Aventures de Don Quichotte,' translated from Avellaneda's frigid continuation of the work of Cervantes (1704-1706, 2 vols. 12mo.). This translation obtained as little favour from the French public as the original had from the Spanish.

Le Sage was now 38 years of age, and his labours had hitherto been to little purpose; but he had been training himself for a brighter display of his powers. He had made himself familiar with the literature of the Spanish drama, unrivalled for its richness of invention; he had been filling his mind with Spanish scenes and incidents and characters drawn from that great storehouse; and he had been perfecting his style, originally formed on the sound principles of a classical education, by free translations. In 1707 'Don César Ursin,' a comedy in five acts, imitated from Calderon, was performed at the Théâtre Français without success, while a little piece of his own, 'Crispin, Rival de son Maître,' played at Paris on the same day, had a brilliant run, and indeed is said, in liveliness, interest, and especially truth of dialogue, to be hardly inferior to Molière. Soon afterwards appeared his 'Diable Boiteux,' of which he had borrowed the name and the leading idea from 'El Diablo Cojuelo' of Luis Velez de Guevara, and of which indeed it is properly a continuation (Paris, 1707). Its success was prodigious, which was no doubt in a great measure owing to much of the satire being aimed at contemporary characters of eminence in Paris; but the true drawing and rich colouring of its pictures, which are copied from all ranks of society, and its nervous, clear, and correct style, have made its reputation lasting. In 1726 he augmented the work by an additional volume, and in 1737 added to it the 'Entretien des Cheminées de Madrid,' and 'Les Bequilles du Diable Boiteux,' the first a continuation of the work by Le Sage himself, and the last a eulogy of it by the Abbé Bordelon.

Le Sage had offered to the Théâtre Français a piece in one act called 'Les Etrennes,' which was to have been performed January 1, 1708, but the actors refused to play it; upon which Le Sage extended it to five acts, and gave it the title of 'Turcaret.' The piece was levelled at the corruptions of those who managed the revenue and farmed the taxes, the maltotiers, traitants, and others of that class. This powerful body, being aware of the aim of the piece, of which Le Sage had read some parts to his literary friends, used their utmost exertions to prevent its performance, and even offered the author, it is said, 100,000 francs to suppress it, but he refused the bribe. They had better success however with the players, and would have triumphed, if an order of Monseigneur, dated October 13, 1708, had not been addressed to the actors in these terms:—'Monseigneur having been informed that the king's company object to perform ('font difficulté de jouer') a piece entitled "Turcaret, ou le Financier," commands them to learn it and to play it forthwith.' The performance took place February 14, 1709, and the success was even greater than had been anticipated. This comedy is entirely Le Sage's own, and is greatly superior to any of those which he had borrowed from the Spanish. A little piece called 'La Tontine,' which had been accepted at the Théâtre Français, was, owing to intrigue within or without the theatre, not performed till 1732. Disgusted with this and other conduct of a similar kind, Le Sage resolved to relinquish the legitimate drama and the royal theatre. We find him in 1710 assisting his friend François Petis de la Croix, who was then beginning to publish his 'Mille et Un Jours,' by correcting the language and improving the style of the translation.

Le Sage's next work was his novel of 'Gil Blas de Santillane:' 2 vols. 12mo. were published in 1715, vol. 3 in 1724, and vol. 4 in 1735.

Three different and indeed discordant charges have been made against this work.

The first charge was made by Bruzen de la Martinière, and followed up by Voltaire, who says ('Siècle de Louis XIV.') that the novel is entirely taken from the 'Relaciones de la Vida del Escudero Don Marco Obregon' of Vincent Espinel. This charge was soon found to be as absurd as it was malignant, by merely looking into Espinel's work, which presents no resemblance to the work of Le Sage either in the narrative, the characters, or the dialogue.

The next charge was made by the Jesuit Father Isla, who translated 'Gil Blas' into Spanish, and gave it the title of 'Gil Blas de Santillana buelto à su Patria.' This work was completed by the Père Isla at Bologna in Italy, in 1781, but was not published till 1787 (Madrid, 4 vols. 4to.). Isla died in 1783. He asserts that 'Gil Blas' was originally written in Spanish in 1635; that the work was denounced to the government of the day, which prohibited the printing of it, and seized the MS.; but that the author, having had time to take a copy, fled with it to France, where he died in 1640; that this MS. having accidentally fallen into the hands of Le Sage, he formed his 'Gil Blas' out of it. It has been asserted that a MS., apparently that which had been seized from the author, is still in the Escurial, and that this MS. is evidently not a translation from the French work. This statement is disproved by the facts that Isla translated Le Sage's work, and not the original, that such original has never been published, and that there is no evidence of its having ever been seen.

These two charges were examined and refuted by Le Comte François de Neufchâteau, in an 'Examen de la Question de savoir si Le Sage est Auteur de Gil Blas, ou s'il l'a pris de l Espagnol,' 1819.

Another charge was made by the Jesuit Llorente, in a small volume published in 1822, 'Critical Observations on the Romance of Gil Blas,' in which he asserts that it is taken from an unpublished work called 'The Bachelor of Salamanca.' We have not the means of examining into the particulars of this charge, but have no doubt that it is just as unfounded as the two former.

Le Sage had ceased, as we have said, to write for the Théâtre Français, but he had three sons and a daughter, for whom the means of respectable subsistence must be procured. Le Sage's character was one of independence, and he seems to have had a preference for the fruits of honest industry at a time when place and pension were eagerly and unscrupulously sought for by literary men in France. High as his reputation had now become, he was not ashamed to employ about six and twenty years of his life—1713 to 1738—in writing small pieces for the theatrical exhibitions at the fairs of St. Germain and St. Laurent. Fuzelier, D'Orneval, Autrau, Piron, Lafont, and Fromaget were his fellow-labourers. Upwards of 100 pieces were produced in the period above mentioned, of which Le Sage was the sole author of 24, and conjointly of many of the others. These pieces, with hardly an exception, were excessively popular. He published the greater part of them, in conjunction with D'Orneval, in a collection which they called the 'Théâtre de la Foire,' 9 vols. 12mo. and 10 vols. 12mo.

In the mean time however Le Sage was occupied with other compositions. His 'Roland l'Amoureux,' an imitation rather than a version of Bojardo's 'Orlando Innamorato,' was published in numbers from 1717 to 1721. He is said to have got rid of most of the exaggerations of the Italian, but to have lost his fire. In 1732 appeared 'Les Aventures de Guzman d'Alfarache,' a compressed imitation of 'La Vida y Hechos del Picaro Guzman de Alfarache' of Aleman, but superior to the original, and which has entirely superseded the previous translations. In the same year he published 'Les Aventures de Robert dit le Chevalier de Beauchesne,' 2 vols. 12mo. This work is not properly a fiction, but a narrative of the extraordinary adventures of a pirate, extracted from the memorials furnished by his widow. This was followed in 1734 by the two first parts of 'L'Histoire d'Estevanille Gonzales, surnommé le Garçon de bonne Humeur,' 2 vols. 12mo., which Le Sage professes to be an imitation of 'El Escudero Obregon' before mentioned, but to which it bears little resemblance except in a few circumstances of narrative which have been borrowed. In 1735 he published 'Une Journée des Parques,' 12mo, a dialogue full of philosophy and wit, the thoughts bold and original, and expressed with great energy. This was also the year in which he completed 'Gil Blas,' a work which he seems to have written especially for posterity, and to which he devoted a large portion of the best period of his life. In 1738, the year in which he produced the last of his little operas, he published 'Le Bachelier de Salamanca,' 2 vols. 12mo., and in 1740 'La Valise trouvée,' 12mo., anonymously, which consists of about thirty letters supposed to be written by different persons on satirical subjects. His last work was 'Un Mélange amusant de Saillies d'Esprit et de Traits Historiques les plus frappants,' 1 vol. 12mo.

Le Sage appears to have passed his life of literary activity in great domestic happiness, which was only disturbed by his eldest and his third son having become actors, a profession to which Le Sage had a strong dislike. He had brought his eldest son up to the bar, but he left it, and, under the assumed name of Montménil, acquired a high reputation as an actor. Le Sage had ceased to have any intercourse with him; but the second son, who had obtained the preferment of a canon at Boulogne-sur-Mer, contrived, by a manœuvre, to get the old man to see his son play a character in 'Turcaret,' with which he was so much delighted that a reconciliation took place, and they afterwards lived on terms of the greatest friendship. It is related that while Montménil was at the theatre, Le Sage passed his evenings at a café in the neighbourhood of his residence, where the company used to assemble round him, and to get upon chairs and tables to listen to 'the old man eloquent.' The death however of this favourite son, in September, 1743, at the age of forty-eight, was a severe blow for him.

At the end of 1743 he retired to Boulogne, with his wife and daughter, in order to be near his son the canon, and here he died, November 17, 1747. His wife survived till 1752: both of them died at the age of eighty.

The great work of Le Sage is his 'Gil Blas,' perhaps of its kind the first of all novels, and one that has the rare merit of always being read with new pleasure. This superiority is not owing to the interest of the story, for when a story is well known, a novel loses that part of its attraction, and its permanent success must depend on other qualities. When a person has finished a chapter of 'Gil Blas,' he will generally have nearly equal pleasure in beginning to read it over again; and the reason is this—'Gil Blas' is a series of pictures of human life under all its aspects. The various adventures of Gil Blas concern us little; we only recollect him because of the persons with whom through him we become acquainted. We neither like him nor dislike him; we do not admire or respect him. He introduces us to a great variety of personages of all classes and conditions, whose failings and vices are painted in enduring colours. Though somewhat of the interest of the novel arises from the great variety of adventures, and the delineation of manners peculiar to Spain, it is as a gallery of portraits that the work will always maintain its interest. It is true that the author generally gives us the portraits of rogues or fools, or of persons whose distinguishing trait is some weakness of character; but it is also true that the portraits are likenesses, and represent a large class. As in all great works of the kind, the author is never obtruded on us. We think not of the wonderful art which has produced what appears to be completely simple and natural. It would be difficult to find an idle or unmeaning phrase in the whole book, particularly in the first two volumes, which in many respects are the best. The expression is suited to the thought with perfect propriety; there is nothing superfluous, and nothing wanted in the way of explanation. While we admire the innumerable delicate touches which make up the whole of a picture, we find them blended in one harmonious whole, to which each part bears its just proportion; a merit which arises from the author's clear perception of what was required for the delineation of each character, and the exquisite taste which guided him to the adoption of a pure, simple, and nervous style of expression. A great work or a great intellectual power of any kind is always the fruit of mature years. Le Sage, as already observed, published the first two volumes of Gil Blas in 1715, when he was 47 years of age, and the fourth and last in 1735, when he had attained his 67th year.

The greater part of the works of Le Sage have been collected and published under the title of 'Œuvres Choisies de Le Sage,' Paris, 1783, 15 vols. 8vo., and 1810, 16 vols. 8vo. Most of his novels have been frequently reprinted, but especially 'Gil Blas,' which has appeared in all forms from the most splendid typography and embellishments to the humblest. It has been translated into all the languages of Europe; the English translation is by Dr. Smollett. 'Le Diable Boiteux' is translated into English under the title of 'The Devil on Two Sticks;' and we have also translations of the 'Bachelor of Salamanca,' and of most of the other novels.

SAGERE'TIA, a genus of plants of the natural family Rhamneæ, formed, by M. A. Brongniart, of old species of Zizyphus and of Rhamnus, and named after M. Sageret, a French vegetable physiologist. The species are found in both South and North America, Java, China, and in India along the foot of the Himalayas. The genus is characterised by having a five-cleft pitcher-shaped calyx; petals five, convolute or cucullate; stamens five, bearing ovate two-celled anthers; disk fleshy, cup-shaped, girding the ovary; ovary almost immersed in the disk, three-celled; style short, thick; stigmas three, sessile or three-lobed; fruit unknown. The species form shrubs, with slender, usually thorny branches; leaves nearly oblong, lanceolate and serrate; flowers small, crowded in axillary or terminal spikes. The only species which requires particular notice is S. theezans, which is remarkable as being employed as a substitute for tea, even in China, where the poor are described by Osbeck as making use of the leaves in the same manner as those of the true tea, and for which it makes a good substitute from its astringency and fragrance.

SAGHALIEN. [TARAKAI.]

SAGI'NA, the name of a genus of plants, from *sagino*, to cram or fatten, a name not very appropriate. This genus belongs to the natural order Alsinaceæ, and is characterised by possessing an inferior calyx, with four spreading permanent sepals, four ovate obtuse petals, shorter than the calyx, four stamens, superior ovary, with four short styles, capsule splitting into four valves, and numerous minute seeds attached to a central placenta. Four species are indigenous to Britain. They form small herbs, which are very generally diffused over the temperate regions of the globe.

SAGITTA (the Arrow). This constellation is one of the old ones, and is situated over the back of AQUILA. In CONSTELLATION it is stated that Sagitta is a part of Aquila in Aratus; but this, though very commonly stated, is erroneous, as is noticed by Grotius in his notes on Aratus; though the edition of Grotius himself countenances the error in the plates. Grotius traces the mistake to Germanicus in his Latin version.

The principal stars are as follows:—

Character. Not in Bayer ( )	No. in Catalogue of		Magnitude.
	Flamsteed.	Astron. Society.	
	1	2231	6
	2	2263	6
ε	4	2298	6
α	5	2305	4
β	6	2309	4
δ	7	2322	4½
ζ	8	2327	6
	10	2342	6
	11	2347	6
γ	12	2348	4
(χ)	13	2353	6
(y)	14	2362	6
(z)	15	2365	6
η	16	2366	6
	18	2390	6

SAGITTA'RIA (from *sagitta*, an arrow, a term indicating the shape of the leaves), the name of a genus of plants belonging to the natural order Alismaceæ. The genus is characterised by possessing barren and fertile flowers, with a 3 leaved calyx and three petals. The fertile flowers have numerous pistils collected into a head, and one seeded compressed and margined pericarps. The species of this genus are water-plants, and are found in the hotter and temperate parts of the globe, and are frequently remarkable for the beauty of their flowers. The only species indigenous in this country is the *S. sagittifolia*, common arrowhead, which is known by its arrow-shaped leaves with lanceolate straight lobes. The rhizomata of many of the species contain amylaceous matter, and form a nutritious food, for which purpose they are said to be used by the Calmuc Tartars.

SAGITTA'RIUS (the Archer), one of the constellations of the zodiac, the figure of which is that of a centaur drawing the bow, and situated below Aquila, between Scorpius and Capricornus: it must not be confounded with CENTAURUS. The mythological account of this constellation is very meagre, and confirmatory of the reason given in CONSTELLATION why the Greeks could not have been the first to give names to the constellations. Hyginus can find no more illustrious mortal to fix in this part of the heavens than one Crotus, the son of Eupheme, the nurse of the Muses; but it is worth noting that he says many (in his time) denied that the original figure was that of a centaur.

The principal stars are as follows:—

Character. Not in Bayer ( )	No. in Catalogue of		Magnitude.	Character. Not in Bayer ( )	No. in Catalogue of		Magnitude.
	Flamsteed. (Piazzi.) [Bradley.] Zach, Z.	Astron. Society.			Flamsteed. (Piazzi.) [Bradley.] Zach, Z.	Astron. Society.	
	2	2020	6	β²	(62)	2244	4
(p)	3	2039	6		(67)	2246	7
δ*	4	2054	6½	α	(68)	2252	4½
(i)	5	2056	7	(v¹)	(79)	2126	6
	6	2062	7		(82)	2128	6
α†	7	2067	6	(p)	(84)	2255	6
	9	2074	7		(88)	2130	7
γ	10	2079	3		(92)	2132	6
μ	13	2096	4		(94)	2133	7
	14	2097	7	(v²)	(96)	2135	6½
	15	2098	6		(99)	2136	7
	16	2099	7		(102)	2140	7
	17	2102	7	(O)	(102)	2261	6
δ	19	2105	3		(107)	2262	6
ε	20	2110	3		(110)	2264	7
	21	2118	6		(112)	2144	7
λ	22	2122	4		(117)	2006	6½
	24	2141	7		(121)	2149	7
	26	2157	6		(125)	2150	6½
φ	27	2163	5	(Q)	(126)	2273	7
	28	2164	7		(129)	2152	6
r	29	2174	6		(131)	2154	6½
	30	2175	6		(138)	2276	6
	31	2176	6	(s)	(155)	2162	6
ν¹	32	2179	5		(159)	2282	7
	33	2178	6		(162)	2024	7
σ	34	2180	3½		(165)	2285	6½
ν²	35	2181	5		(166)	2286	7
ξ¹	36	2185	5		(176)	2291	7
ξ²	37	2187	4		(180)	2293	7
ζ	38	2196	3		(186)	2029	7
ο	39	2205	4		(201)	2300	6½
τ	40	2208	4		(223)	2040	7
π	41	2220	4		(225)	2183	6
ψ	42	2227	5		(227)	2042	5½
d	43	2230	6		(230)	2310	6
ρ¹	44	2248	5		(231)	2044	7
ρ²	45	2250	6		(237)	2312	6½
υ	46	2251	6		(243)	2047	7
χ¹	47	2256	6		(255)	2195	6½
χ²	48	2257	8		(260)	2197	7
χ³	49	2258	6		(261)	2199	6½
	50	2260	6		(265)	2318	6½
h¹	51	2287	6	(S)	(267)	2202	6
h²	52	2290	5		(271)	2319	7
	53	2299	6		(293)	2212	7
e¹	54	2302	6		(294)	2211	6½
e²	55	2308	6		(294)	2052	5
f	56	2313	6	(E)	(297)	2331	4½
	57	2328	6		(301)	2215	7
ω	58	2335	5		(304)	2057	6½
b	59	2339	5		(312)	2063	6
a	60	2344	5		(316)	2221	7
g	61	2343	6		(323)	2069	6
c	62	2352	6	γ¹	(339)	2076	5
	63	2354	6		(342)	2078	7
(Y)	64	2361	6		(351)	2349	6
	65	2364	6		(356)	2083	7
	(4)	2224	6		(359)	2085	5
	(5)	2223	7	(L¹)	(366)	2355	5
	(7)	2225	6½		(367)	2088	6
	(22)	2229	6½		(369)	2356	6½
g	(24)	2103	5½		(386)‡	2093	6
(R)	(29)	2378	6		[2402]	2217	6½
	(50)	2236	6		1220 Z	2123	6
	(52)	2114	6		1294 Z	2270	6
β¹	(54)	2240	4		1299 Z	2280	7
	(61)	2241	6		1324 Z	2345	7

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* So marked erroneously: Bayer's *b* is 59.

† Ditto ditto Bayer's *a* is 60.

‡ This is the star which an error in reduction made Flamsteed mark λ.

SAGO, a word signifying, in the language of the Papuas, *bread*, since it constitutes the staple article of food of the inhabitants of the Eastern Archipelago and other parts where the plants which yield it grow. It is not a seed, as sometimes supposed, but the farina from the stem of several palms and palm-like vegetables, the chief of which are the Sagus Rumphii, Willd. (Metroxylon Sagus); the Sagus lævis, Rox.; the Saguerus Rumphii, Rox. (Gomutus Gommuto, Rumph.; Sagus vinifera, Pers.); the Phœnix farinifera, Corypha umbraculifera, some Cycases, and even a Zamia, but these last yield a very inferior sort. The seeds of Dolichos chinensis are used in North America for bread, and also a starch procured from the tubers of the Convolvulus Batatas is beat up with the farina of the Euterpe caribæa into sago in the West Indies. Of late years a very fine sago has been brought from Brazil, which is most likely procured from the Mauritia flexuosa, and some of the other magnificent palms of that country. Sago is a variety of starch, prepared by the plant for the use of the flowers and fruit, and is most abundant just before the evolution or appearance of the spadix or flower-bud, which is known by a whitish dust transuding through and covering the leaves. At this time the stem is cut down, near the base, and then divided into pieces of five or six feet in length. 'A part of the outer hard wood is then sliced off, and the workman, coming to the pith, cuts across the longitudinal fibres and the pith together, leaving a part at each end uncut, so that when it is excavated there remains a trough, into which the pulp is again put, mixed with water, and beaten with a piece of wood; the fibres, being then separated from the pulp, float at the top, and the flour subsides. After being cleared in this manner by several waters, the pulp is put into cylindrical baskets made of the leaves of the tree; and, if it is to be kept some time, those baskets are generally sunk in fresh water to keep it moist, for the pulp will keep long if preserved from the air, but if exposed it presently turns sour.' (Forrest's *Voyage to the Moluccas*, p. 39.)

The quantity yielded by one tree is prodigious. Five or six hundred pounds are not an unusual produce for one tree; and as the vegetation still remains after being felled, a stem again springs up, which goes through the different stages of growth till it is fit for the axe.

The flour or powder is rarely imported, granulated sago being the state in which it is commonly brought to Europe. 'To bring it into this state from the flour, it must be moistened and passed through a sieve into an iron pot (very shallow) held over a fire, which enables it to assume a globular form. Thus all our grained sago is half baked, and will keep long.' (Forrest.) Of this granulated sago there are two varieties, the common or brown sago, and pearl sago. The latter is in small hard horny or semi-transparent grains, about the size of a pin's head; the former are in larger grains, about the size of the grains of pearl barley. Both are inodorous, and with an insipid taste. They swell in cold water, and are nearly thoroughly soluble in boiling water, so as to form a thick starch-like solution, which may be used as a pudding, or prepared in other ways as an article of diet for children and invalids, if a farinaceous diet is required.

SAGOUIN. [JACCHUS, vol. xiii., p. 69.] The term *Sagouins* or *Sagoins* is also employed by M. F. Cuvier and others to distinguish the second division of the monkeys of the New Continent, with long but not prehensile tails. Under this division M. Lesson arranges the genera *Saguinus*, Lacép.; NOCTHORA, F. Cuv.; and *Pithecia* [SAKIS], Desm.

The genus *Saguinus* is thus defined by M. Lesson:—Same character as in the SAPAJOUS, excepting that the ears are very large and deformed, and that the tail is covered with short hairs. Body slender. Facial angle, 60 degrees

Dental formula:—

$$\text{Incisors } \frac{4}{4}; \text{ canines } \frac{1-1}{1-1}; \text{ molars } \frac{6-6}{6-6} = 36.$$

M. Lesson arranges the following species under the genus:—*Sciureus, personatus, lugens, amictus, torquatus, Moloch, melanocheir*, and *infulatus*.

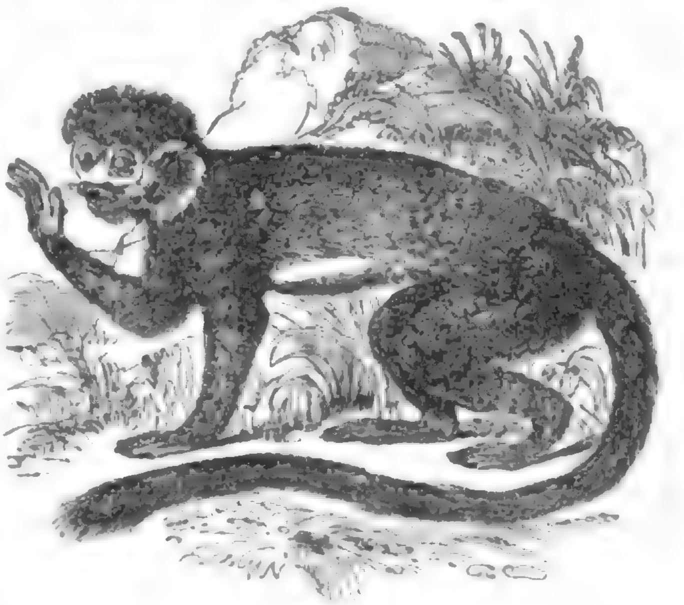
Example, *Saguinus Sciureus*.

Description.—Size about that of a squirrel, hardly more than ten inches in length without the tail, which measures thirteen or fourteen inches. Body greenish yellow above, becoming greyish on the thigh and arms; body beneath, nearly white. Feet, legs, and fore-arms reddish chestnut. Muzzle dark; the rest of the face and ears flesh-coloured. Tail black at the tip. In both extremities the nails of the thumbs are broad: those of the rest of the fingers are more claw-like.

This is the *Simia sciurea*, Linn.; *Callithrix sciureus*, Geoff.; *Sagoin Saïmiri*, and *Saïmiré* of the French; *Saimiré* of the natives of the Orinoco; and *Titi* of Humboldt.

Localities.—Brazil and Guyana.

This pretty species is often kept by the natives in confinement. One in the Paris menagerie is described by M. F. Cuvier as very playful and good-humoured. The tail, when the animal was at rest, was wound round the body or limbs, a position in which it was kept when the little creature slept, which it did in a sitting posture, with the head bent down between the fore-legs; but the tail was never used as a support. This is not an uncommon species.



The Saimiri.

Cuvier will not allow the *Sagouins* and *Saïmiris* to be classed together, and indeed he separates the *Saïmiri* above described and figured from the *Sagouins*, making the *Sakis* intervene between the forms. He says that in the *Saïmiri* the tail is depressed, and ceases to be prehensile, and that the head is very flat. He also observes that there is a membranous space in the interorbital partition in the skeleton.

Of the *Sagouins* (*Callithrix*, Geoff.) he says that they have the tail slender, and that their teeth do not project, remarking that they had for a long time been associated with the *Saïmiris*, but that the head of the *Sagoins* is higher, and that their canines are much shorter. Such, he observes, are the *Sagouin à masque* (*Callithrix personata*, Geoff.), and the *Sagouin en deuil* or *La Veuve* (*La Viduita*, *Simia lugens*, Humb.).

The first of these, *Callithrix personata* (*Saguinus personatus*) is greyish-yellow, with the head and the four hands black, and a reddish tail.

Locality.—Brazil, where it is found between the 18th and 21st degrees of south latitude, on the banks of rivers.

The second, *Callithrix lugens* (*Saguinus lugens*), has the body of a shining black, with a purplish lustre on some parts: the hair soft and shining. The face has the appearance of a bluish-white square mask, which is surrounded by a narrow margin of a purer tinge, while two stripes of the same colour run from the eyes to the temples. The throat is marked with a band of white, of which colour are the anterior hands on the outsides, so that they there resemble a pair of white gloves, to which the natives compare them.

Habits, Localities, &c.—This species, which is the *Macavacahou* of the natives, appears to be extremely rare. Humboldt saw only one specimen, and that in the forests bordering the rivers Cassiquiare and Guaviare. It was said to live in pairs; and this opinion was confirmed by the fear and dislike shown by the captive when placed near even some of the most diminutive species of the genus. It was very shy, and was active only when alone. When in the vicinity of persons, though they were occupied in general business, it would remain immoveably attentive to all that passed, refusing food even, notwithstanding a long fast. When alone its behaviour was very different. If a bird was introduced, the monkey was instantly roused at the sight of it, darted upon it like a cat, and swallowed it instantly, its whole habit at such moments being that of a carnivorous animal.

SAGUENAY, River. [CANADA.]

SAGUERUS. [ARENG.]

SAGUNTUM. [PUNIC WARS.]

SAHA'RA, or **SAHRA**, is a country of immense extent, which occupies the central parts of Northern Africa. Its western extremity is washed by the Atlantic, along which it extends from Cape Nun, 28° 46′ N. lat., to the mouth of the river Senegal, 17° N. lat. From the shores of the Atlantic it extends eastward nearly across the continent of Africa, being separated from the Red Sea only by the valley of the Nile and the rocky country which lies between that river and the Red Sea. The valley of the Nile constitutes the eastern boundary of the Sahara. The western edge of that valley occurs between 30° and 32° E. long., and as the African shore along the western boundary of the Desert is between 11° and 17° W. long., the Sahara extends from east to west, on an average, through 44 degrees of longitude, or about 2650 miles. The northern and southern boundaries are very imperfectly known. On the north the Sahara reaches to the base of the Atlas Mountains; but we are unacquainted with the exact position of this portion of the mountains, which is laid down on our maps according to the vague information collected from the natives. Some geographers suppose that between the Atlas and the Sahara a fertile and tolerably level country occurs, which is called Biledulgorid, or Balad-al-Jarid, *i.e.* the country of palm-trees; but it is more probable that this name is applied by the Moghrebins to the southern declivity of the Atlas, as the valleys in those parts, being open to the Sahara, experience that extraordinary degree of heat without which dates would not ripen, or at least would not come to perfection. The Atlas constitutes the northern boundary of the Sahara from Cape Nun on the west to 10° E. long. on the east. From this meridian as far east as the valley of the Nile (30° E. long.), a stony and broken country extends between the Sahara and the Mediterranean, comprehending the countries belonging to Tripoli, including Barca and the stony desert which lies between Barca and Egypt. In these parts the northern boundary of the Sahara is better known. The hilly and stony country terminates on the south between 29° and 30° N. lat., except between 15° and 20° E. long., where a wide and mountainous tract advances to the south as far as 27° N. lat. The northern edge of this tract is known by the name of Harutsh-el-Assoud, or Black Harutsh; it is the Mons Niger of Pliny. It consists chiefly of basalt, and rises towards its extremity to a considerable elevation. The southern edge, called Harutsh-el-Abiad, consists of calcareous hills of moderate elevation. This rocky region terminates in the desert near 20° E. long., and on the east of it the Sahara appears to extend to the shores of the Mediterranean. Hornemann, when crossing the plain of Sultin, east of the Harutsh-el-Assuat, near 29° N. lat., did not perceive any mountain or even hill towards the north; and Della Cella, who travelled at a short distance from the shores of the Gulf of Sidra, south of 30° N. lat., observes that no mountains were visible, and that only low sand-hills appeared near the shores. It seems then that between 17° and 19° E. long. an arm of the Sahara reaches the shores of the Mediterranean, at the innermost corner of the gulf of Sidra or Greater Syrtis, and the rocky region of Barca is thus divided from that district, of which the ranges of the Harutsh constitute the most eastern portion. This northern branch of the Sahara has probably an average width of about 100 miles. On the shores of the gulf it occupies the space between Geria and Haen-Agan.

The southern boundary of the Sahara is best known towards the Atlantic, where it extends to the vicinity of the Senegal river, and between 15° and 4° W. long. approaches the parallel of 15° N. lat. Farther east the river Joliba or Quorra constitutes the dividing line between the Desert and Soodan as far as the meridian of Greenwich, so that Soodan advances to 17° N. lat., near Timbuctoo. Between that place and the lake Tchad the exact line of the boundary is not known, but it probably lies near 14° N. lat., and this parallel may also be considered as dividing the Sahara from Eastern Soodan as far as the frontier of Dar-Fur, near 23° E. long. Farther east it lies between 16° and 17° N. lat. We may therefore suppose that on an average the Sahara extends from north to south over 14 degrees of latitude, or 960 miles. The area of the Sahara, within these limits, occupies more than 2,500,000 square miles, or more than two-thirds of the area of Europe.

The Sahara is a desert, but it is not, as is commonly supposed, covered in its whole extent by a fine and loose sand. There certainly are tracts of considerable extent, the surface of which is covered with a thick layer of fine and loose sand, and with low sandy hills; but if we may judge from the scanty information that we have respecting this immense country, it would seem that the greater part of it consists of a firm soil, in many parts composed of indurated sand, in others of sandstone. The surface of other tracts consists of rocks, especially granite, frequently mixed with quartz. But whatever may be the soil in any given place, it is extremely poor, and almost entirely destitute of vegetation. It is true that there are tracts covered with bushes and coarse grass, but they are few, and invariably of moderate extent. This general sterility is chiefly owing to the dryness of the atmosphere. The Sahara is situated in that part of the globe which separates the region of the winter rains from those of the summer rains, and it does not participate in either of them. In the greatest part of this extensive region a drop of rain never falls to refresh the arid soil: and in those districts which approach the countries which have abundant rains, only a few showers occur in August and September, and even these not every year. This want of rain renders the whole region unfit for any kind of cultivation, but not uninhabitable, as the lower depressions contain a few wells, in the vicinity of which the soil is covered with grass and bushes, that afford pasture to camels, goats, and sheep. These animals supply subsistence to the nomadic tribes, who wander about in this boundless waste. Travellers who cross this region are exposed to many dangers, both from the nature of the country and from the character of its inhabitants. Though the camels occasionally find some shrubs or grass to satisfy their hunger, no provisions can be got along the whole route, which exceeds 1000 miles in length. The traveller must carry everything with him. The wells of drinkable water occur only at a distance of ten days' journey from one another, and sometimes the distance is still greater. The traveller in the desert must therefore provide himself with as much water as is required for his consumption until he reaches the next well; and if the season is drier and hotter than usual, the well is dried up, and he runs imminent risk of perishing of thirst. If he loses his way in the wilderness, a certain death awaits him from hunger and thirst. In those tracts which are covered with fine loose sand, the whirlwinds often blow with great force, and raise a large portion of the sand to a considerable height, and deposit it again at some distance. Such pillars of sand have buried many caffilas. The inhabitants of the desert lead a wandering life, and, like all nomadic tribes, are always ready to attack the traveller, to deprive him of his goods, and to reduce him to slavery. In spite of all these dangers, the Sahara is annually traversed by several caffilas, which carry on the commerce between Soodan and the countries on the shores of the Mediterranean.

There is however a track across the desert, in which these dangers are comparatively small. It lies between 13° and 16° E. long., and owes its advantages partly to its climate and partly to its soil. It is remarkable that this track occurs where no elevated country lies between the Mediterranean and the Sahara, but only the low range of the Harutsh, which joins that arm of the Sahara that reaches the shores of the Mediterranean. The country along the shores of the gulf of Sidra, between 12° and 19° E. long., and between the gulf and the Sahara, does not appear to rise in any part more than 1000 feet, and in most parts it is much lower. Through this wide gap the northern winds, which frequently blow a gale, and bring moisture from the countries north of the Mediterranean, which at that season are drenched with rain, find access to the Sahara, and produce a considerable degree of cold even as far south as Mourzuk. Hornemann observes that these winds chilled the air to such a degree that not only the natives, but even himself was compelled to have recourse to a fire; and Denham observes that the thermometer sometimes sinks as low as 41° of Fahrenheit. To these winds also we may probably ascribe the rain which falls in this season in the kingdom of Fezzan, and renders it the most fertile tract of the Sahara. These rains appear to extend to 21° N. lat., and as the northern limit of the tropical rains occurs near 16° N. lat., the tract between the two limits of rain does not exceed five degrees of latitude, whilst in other places it occupies more than double that extent. The advantages of this tract as a thoroughfare for caffilas consist in the smaller extent of the sandy tracts and of the continuous or broken ridges of rocks. Though the rocky parts within the rainless region resemble the sandy tracts in being without vegetation, the wells which occur between them are more numerous, and rarely more than a few days' journey from one another. The road through this country gives the easiest access to the interior of Africa from the north, and requires a more particular notice.

After leaving the town of Tripoli, the road runs south-east to the northern boundary of Fezzan, over a country which partakes in some degree of the nature of the Sahara, presenting a succession of plains and ridges of hills. The surface of the plains is in general a firm sand, with a few rocky eminences and patches of gravel. In some spots not a vestige of vegetation appears, and the ground is in no place completely covered, except in a few small oases, where there is a turf. The hills are of inconsiderable height, generally not exceeding 400 feet, and never rising above 600 feet. Many of them consist of limestone overtopped by lava; others are only sand-hills. They are without vegetation, but contain between them many fertile valleys. This country, which extends to the town of Sokna in Fezzan, has abundance of wells and water. The town of Sokna, which contains above 3000 inhabitants, is enclosed by walls and surrounded by groves of date-trees, the produce of which is of excellent quality. South of this place extends the Harutsh Assouat, or Mons Niger, occupying a width of about 35 miles in a straight line. The lower strata consist of a yellowish limestone, almost entirely composed of marine remains; but large masses of tabular basalt and irregular precipices occur in the hills, and extend over all the contiguous plains. There is no vegetation and no water. Travelling is extremely difficult, as the hills are furrowed by deep chasms and narrow ravines. Fezzan, which extends from this mountain tract to the northern tropic, consists of numerous small oases separated from each other by comparatively narrow tracts of sand. [Fezzan.] Water is abundant, except towards the southern boundary, where a level desert occurs, which can only be traversed in four days; but in the middle of it there is a small place called Gatrone, surrounded by sandy hills and mounds covered with small trees. The soil of this desert towards the north consists of a mixture of sand and salt, but the greater part is merely covered with a fine reddish sand. At Kasrowa and Tegerhy there are extensive plantations of date-trees and abundance of water. From the southern boundary of Fezzan to the town of Bilma, or from 23° to 18° 30′ N. lat., a continuous ridge of steep rocky hills, elevated from 300 to 500 feet above the plain, runs almost due north and south; and from five to twenty miles east of this ridge there are isolated hills, mostly composed of sand, but in some places of rock. Between these rocks the road runs over a stony plain without the least vegetation, but Denham says that after the rains a grass quickly springs up, which is several feet high, and that the rains fall in torrents as far as the Tiggerindumma hills. It would therefore appear that in this tract the northern rains extend to 21° N. lat. No part of this country is inhabited, but wells of drinkable water occur at distances of three or four days' journey. Near 19° N. lat. however there are several small towns or villages, which owe their existence not so much to a certain degree of fertility in the soil, as to numerous small lakes which lie along the foot of the rocky range, and in which trona crystallizes. In the vicinity of some of these lakes there are groves of date-trees and pasture-ground for cattle. In some parts the soil is covered with incrustations of pure trona, which extend for several miles in every direction. In a few places mimosa-trees are found. Bilma is noted for its extensive salt-pits [Bilma], and in its vicinity there are a few spots covered with vegetation. South of Bilma is the most difficult portion of the road. It runs over loose hills of fine sand, in which the camels sink nearly knee-deep. The hills sometimes disappear in a single night by the drifting of the sand, and all traces of the passage, even of a large caravan, vanish in a few hours. Wells are rare. After four days' travelling from Bilma, the wells of Dibla are met with, and after four days more, those of Aghadem. The last-mentioned wells are abundant, and situated in a wooded valley, which however is not inhabited. After three days more the country is reached which enjoys a small portion of the tropical rains, and the soil improves. At first the sandy soil is interspersed with clumps of grass, and here and there with low bushes; trees soon appear, and then increase in number Thus the desert ceases near 16° N. lat., but no permanent habitations are met with until the vicinity of Lari is reached, a town which is situated a short distance from lake Tchad (14° 20′ N. lat.). The desert between Bilma and Lari is called the Desert of Tintuma.

The tract just noticed as traversing the desert from north to south, divides the Sahara into two unequal portions, of which the western and larger is known among the natives by the name of Sahel, and the eastern and smaller among geographers by that of the Libyan Desert.

Coast.—Until lately many misconceptions prevailed respecting this coast, which extends perhaps more than 1200 miles along the Atlantic. It was said that the coast was sandy, and so low that it could only be discovered at a very short distance; that it was lined by extensive sand-banks and shoals; and that the current set perpendicularly towards the shore. It was added that a fog frequently concealed it from the navigator, who was driven towards it by a strong wind which blew directly on the coast. All these circumstances, it was supposed, contributed to the number of shipwrecks which annually occurred on this coast, and threw a great number of Christians into the hands of the Moors, who reduced them to slavery. Modern surveys of the shore however have shown that nearly the whole of the coast is elevated, and consists of sandstone, which in most parts rises to the height of 100 feet and more, but in some does not exceed 60 or 80 feet. These cliffs are generally separated from the sea by a narrow beach; but in some places their base is immediately washed by the ocean; and in others sand-hills are observed, which rise gently to a moderate height: at the back the country is generally elevated. A low coast only occurs between cape Mirik (19° N. lat.) and the mouth of the river Senegal, but here also dunes are found at no great distance from the shore, and behind these the flat country seems to have a considerable elevation above the sea. The whole coast as far south as Cape Blanco is free from sand-banks and shoals, and has regular soundings. The depth gradually increases from the beach, and at the distance of four miles there are from 30 to 34 fathoms; at twelve miles, from 50 to 60 fathoms; and at the distance of thirty miles, about 100 fathoms. The water then deepens very suddenly. A large sand-bank however extends from Greyhound Bay (21° N. lat.) to Cape Mirik; it is known by the name of the Bank of Arguin, and on it the French frigate Medusa was lost in 1816. As to the currents Lieut. Arlett observes that they do not set in towards the land, but run invariably in the direction of the coast, except east of Cape Juby (27° 58′ N. lat. and 12° 55′ W. long.), where the coast turns suddenly from south-west to west; and the current, having hitherto followed the direction of the coast, strikes obliquely on the shore previous to attaining its regular course. This is the most dangerous place in the whole coast-line, as the swell is almost invariably from the north-west, and consequently almost directly on the coast; besides this, the fine particles of sand which cover the desert, being blown into the sea and mingling with the haze occasioned by the heavy surf, render this coast very indistinct. Lieut. Arlett thinks that it would be nearly impossible for a merchant ship embayed here to work off shore. The greatest strength of the current is usually at the distance of three to six miles from the land, and it gradually decreases as it recedes from it. Its average rate from Mogadore to Cape Juby is from one-half to three-quarters of a mile per hour. At Cape Juby it increases to one mile and a quarter per hour, and at Cape Bojador its rate is about one mile. It is however true that the wind almost without exception blows from the north-west or west, and frequently in hard gales, especially in the night. As the trade-winds, which blow from a nearly opposite quarter, prevail in these parts, it is supposed that the rarefaction of the air, produced by the arid soil of the Sahara being heated to an extraordinary degree by the almost perpendicular rays of the sun, gives rise to the westerly winds along the coast of the Sahara.

Soil.—The Sahel, or western part of the desert, is by far the worst part of the Sahara. It does not appear that in all this vast extent a single oasis occurs the soil of which is fit for agriculture or for the growth of date-trees. The soil however varies greatly, passing from a fine to a coarse sand and gravel, and then gradually to a bare layer of broken stones and rocks. In many places hills of moderate elevation occur. Some of them consist of sand, and are subject to be changed in size and form by the winds; others consist of rocks, frequently of granite and quartz. All these soils are destitute of vegetation, which only appears in the depressions between the hills and sometimes at the base of the rocky elevations, but it consists only of a few grasses and shrubs. It would however appear that there must be numerous tracts, though probably of small extent, which are fit for pasture; for according to all accounts, the number of individuals who find subsistence in this part of the Sahara is far from small, and they subsist altogether on the produce of their herds. It is true that the great commercial road which traverses the desert between Drah in Marocco and Timbuctoo in Soodan runs through a country which is incapable of affording subsistence to a single family. It is however stated, and with some degree of probability, that the caravan road has been purposely formed through the worst part of the desert, the merchants being less afraid of the dangers of the country than those which they would have to encounter if they traversed a tract which is inhabited by numerous independent tribes, each of which is eager to enrich itself by plundering the caravans or subjecting them to a heavy tax for a free passage through their territories. It is at least certain that the country along the coast is far from being entirely destitute of inhabitants, as they always make their appearance when a vessel approaches or is cast on the shore. It would also appear that at no great distance from the sea the country contains extensive pasture-grounds, though of very inferior quality, and frequently interrupted by tracts which are completely sterile. Farther inland desert tracts entirely destitute of vegetation and inhabitants occupy a much greater portion of the country, but it is perfectly sterile and uninhabited only along the caravan road, so that the caffilas generally terminate their long journey without meeting with a single person. The different tracts covered with sand, gravel, and rocks, as well as the ridges of low hills which occur along the caravan road, run east and west, a fact which may perhaps be accounted for by the circumstance of the wind almost without exception blowing from the east. The country between this road and the above-mentioned country between Tripoli and Lari is less known than the western portion of the Sahel, but the tribes of the Tuaricks which inhabit it appear to be numerous, and to consist of many individuals.

The Libyan desert, or eastern part of the Sahara, contains a considerable number of oases or fertile tracts, which support a moderate population. Nearly all of them contain extensive groves of date-trees and fields in which dhurra is grown. Besides several oases which lie at the distance of two to three days' journey from the valley of the Nile on the west, and which are noticed in the article EGYPT, several others of some extent occur along the caravan route which leads from Dar-Fur north-east to Tibesti, but our knowledge of the countries along this road is very imperfect, as no European has ever crossed it. Other oases occur near the northern boundary of the Libyan desert, among which are Siwah and Augila. [AUGILA.]

Climate.—Few European travellers have traversed the Sahara, and we are very imperfectly acquainted with its climate. It is certain that no rain falls along the coast south of Cape Juby, but it is also certain that some showers fall annually in the countries south of Mount Atlas, but it is not known how far inland they extend. These showers fall between August and November. Along the coast heavy dews occur in the summer months, but they appear to be quite unknown in the interior, as Caillié never makes any mention of dew. In the interior the wind blows almost without interruption from the east, and in the day-time frequently with the violence of a gale, which however is generally followed by a dead calm after sunset. The strong wind moderates the heat of the burning sun, and hence the nights are usually more insupportable than the noon-day heat. The violent gales frequently raise the loose sand in such quantities, that a layer of nearly equal portions of sand and air, and rising about twenty feet above the surface of the ground, seems to divide the purer atmosphere from the solid earth. This sand, when agitated by whirlwinds, sometimes buries caffilas, and often puts them into the greatest confusion. 'One of the largest of these pillars of sand,' says Caillié, 'crossed our camp, overset all the tents, and, whirling us about like straws, threw one of us on the other in the utmost confusion. We knew not where we were, and could not distinguish any thing at the distance of a foot. The sand wrapped us in darkness like a fog, and heaven and earth seemed confounded and blended in one. Whilst this frightful tempest lasted, we remained stretched on the ground, motionless, dying of thirst, burned by the heat of the sand, and buffeted by the wind. We suffered nothing however from the sun, whose disc, almost concealed by the cloud of sand, appeared dim and deprived of its rays.' The degree of heat to which these countries are subject has not been determined by exact observation. Davidson briefly states that in the country near Wadi Nun, lying at the foot of the Atlas, and contiguous to the Sahara, the thermometer in summer at noon varied between 120° and 140°. Golberry states that at St. Louis on the Senegal, a place situated on the southern border of the Sahara, the mean temperature of the spring (April, May, and June) at six o'clock in the morning is 83°, and at noon 96°. In summer (July, August, and September) the thermometer in the morning generally rises to between 82° and 83°, and at noon to 107°. The greatest degree of heat which is experienced in the interior of the Sahara seems to occur in August and September, at which time caravans do not travel, though it is the season in which the northern parts of the desert are refreshed by showers of rain.

Productions.—The most useful domestic animal is the camel, without which these extensive deserts could not be traversed. The camels which are reared by the tribes that inhabit the desert are distinguished by their extraordinary speed and abstinence, and known in northern Africa by the name of *heiries* or *maharhies*. Next to the camel the most useful animal is the goat, which is very abundant in the Sahel, as the dry pastures are more adapted to it than to sheep. Sheep however are also common. There are some black cattle of a small breed, but only in those places which have good pasture. Horses are rare in the Sahel, but more numerous farther east. There are lions and panthers, and some other smaller wild animals. Gazelles are frequent in all places where bushes and shrubs occur, and in a few places antelopes also are met with. In the deserts bordering on Egypt the dipus jerboa abounds. In the Sahel ostriches are very numerous, and they are hunted by the natives for their feathers from May to July. Vultures and ravens are the only birds that inhabit the deserts, except on some of the lakes along the rocky hills between Fezzan and Bilma, where there are snipes and wild ducks. In some parts the Guinea-fowl occurs. There are also serpents in the desert. As honey is used in some districts, it would seem that bees must be kept, but we find no mention of them by travellers.

The vegetable productions are few in number. Date-trees are only found in the oases of the eastern districts and at the foot of Mount Atlas. The Tibboos, a native tribe of the Libyan desert, cultivate *gufsub*, a species of millet, and a little cotton. As millet constitutes a part of the daily food of the Moors who inhabit the western part of the Sahel, it would seem that this grain is also raised there; but there is no authority for saying that it is. Among the wild plants there are some species of mimosas, of acacias, and the *Hedysarum alhaji*, a thorny plant about eighteen inches high, which remains green all the year round, grows in many parts of the desert in the sand, and is eagerly eaten by the camels: it is nearly the only plant that supplies them with food while they are traversing the desert. Near the most south-western corner of the Sahel are extensive woods consisting of acacia-trees, from which by far the greatest part of the gum is obtained which in Europe is consumed under the name of gum arabic. It is collected by the Moors, and then sold to the French and English merchants in St. Louis on the banks of the Senegal river.

The minerals are limited to iron-ore and salt. Iron-ore occurs between Fezzan and Bilma. Salt is obtained from springs and lakes, and it occurs also in extensive beds in the Sahel. It is of great importance to the inhabitants, as it furnishes them with the most abundant article of commerce. The countries south of the Sahara, comprehended under the name of Soodan, appear to have no salt, and all the salt which is consumed in them is brought from the Sahara. The only places permanently inhabited in the Sahel are those in the neighbourhood of which salt is found.

Inhabitants.—A great number of independent tribes are dispersed over the Sahara. They belong to four nations, the Moors, the Tuaricks, Tibboos, and Arabs. The Moors seem to be in possession of the whole country west of the road leading from Timbuctoo to Drah. They are a branch of the Moors who inhabit Marocco, but have a greater mixture of negro blood in them. Their complexion is in general nearly black, but the red colour under it is perceptible;

their hair is not woolly, like that of the negroes, but straight; they have a spare body, and rather slender legs; the spine is slightly curved, the face long, the cheeks hollow, the eyes sunk but lively. They speak the Moghrebin dialect of the Arabic language, and though they live on the produce of their herds, and consequently lead a nomadic life, they take care of the education of their children, all of whom are taught reading and some part of the Korán. They are very expert in tanning and preparing leather, and in manufacturing, with only a hammer and a little anvil, bracelets, earrings, and necklaces of gold, in making knives and daggers and other arms, and they are even expert in weaving. Many of them are merchants, and a still greater number are employed in accompanying the caffilas on the route between Drah and Timbuctoo. The best known of the Moorish tribes are those in whose territories the gum forests are situated, and who bring their produce to the European settlements on the Senegal.

The numerous tribes of the Tuaricks occupy the centre of the Sahara, or that country which lies between the two great caravan routes that traverse it from north to south. The form of their body and their language prove that they belong to the aboriginal inhabitants of Northern Africa, who are known by the name of Berbers, and in Marocco are called the Amazirghis. They are much stouter than the Moors, and their complexion is not so dark. Their nose is aquiline, the eyes large, the mouth finely formed, the face long, and the forehead rather elevated. Their language is said to be similar to that of the Amazirghis, but this fact has not yet been well ascertained. They live on the produce of their herds and by transporting salt to Soodan, but they have also compelled some districts of those countries to pay them a tribute, as they are very warlike and enterprising, though their arms are only a lance and a poniard: they never use fire-arms.

The Tibboos occupy the tract between Fezzan and Lake Tchad, and an extensive country extending east of this line towards the boundary of Egypt. In features they strongly resemble the negroes. Most of them are quite black, though some have copper-coloured faces; they are slim and well made, have high cheek-bones, the negro nose, large mouth, and their teeth are much stained by the quantity of tobacco and trona which they use. They are above the middle size. They live principally on the produce of their herds and flocks, but also cultivate some millet and cotton. They are less warlike than their neighbours the Tuaricks, and much exposed to be pillaged by them where the two nations live near one another. They are armed like the Tuaricks.

Along the boundary-line of Egypt and Nubia there are some Arabian tribes, which have preserved the manners and language of the Bedouins, and resemble them in every respect. The use of fire-arms, which they have universally adopted, renders them the terror of their more numerous neighbours the Tibboos, and even of the braver Tuaricks.

Commerce.—Though the Sahara only supplies three commercial products, salt, gum arabic, and ostrich feathers, a considerable traffic is carried on between the countries north and south of the desert, which is frequently traversed by caffilas, or caravans, consisting of from 200 to 500 persons, and of from 500 to 2000 camels. A camel's load is five hundred pounds. The caravans export from the countries situated on the Mediterranean chiefly goods of European manufacture, such as fire-arms, gunpowder, and some cotton stuffs, to which are added some articles manufactured at Fez, and tobacco, dates, &c. Their returns consist of gold, ostrich feathers, ivory, and slaves. In traversing the desert they usually buy large quantities of salt, which they sell in Soodan at a great profit. The road which the caravans take between Tripoli and Bornou has been already noticed. Another road, less frequented by caffilas, runs from Timbuctoo northward to Fez. About 150 miles north of Timbuctoo it passes through El Arawan, a place containing about 300 houses, and 3000 inhabitants, Moors and Tuaricks. Near the town there are some good wells, and also some grass, but nothing is cultivated, and provisions are brought from Sansanding in Bambarra. After leaving that town no inhabited place is met with until the southern declivities of the Atlas are reached. There are a few wells in the central and northern districts through which the road passes, but in those which lie contiguous to El Arawan there is only one well, which is more than 200 miles from that place. After having reached the southern declivities of the Atlas, the caffila passes through the countries of El Harib, El Drah, and Tafilelt, and then over the elevated range of mountains to Fez. The road which leads from Mogadore to Tarudant or Terodant, and thence to Tatta, is to be considered a branch of this road. From Tatta it takes an eastern direction, and soon falls in with the great caravan line. These two roads are much used. A third road also begins at Timbuctoo or El Arawan, and passes first nearly north until it reaches, near 26° N. lat., the oasis of Touat or Tawat, whence it continues in a north-eastern direction to Gadames, which is on the southern declivity of the hilly region which divides the Sahara from Tripoli. On this road caravans travel eight days without finding a well. A caravan route traverses the Libyan desert, beginning in Soodan at Wara, the capital of the country of Dar-Zaleh or Wadai, and traversing Borgou and Tibesti in a north-western direction. From the last-mentioned place it runs westward to the great road that leads from Bornou to Tripoli. No European has ever travelled along this road. The most eastern caravan road that traverses the Sahara connects Dar-Fur with Egypt: it begins at Cobbe, the commercial town of Dar-Fur, and passing through the small oases of Bir-el-Malha, Leghea, Selimah, and Sheb, it reaches Wady Khargeh, or the Great Oasis (25° N. lat.), whence two roads lead to Egypt, one to the town of Girgeh and the other to Siout. [DAR-FUR.]

Salt is got in great abundance at three places in the Sahel: at Toudeny, which is situated near 21° 30′ N. lat. and 4° W. long.; at Hoden or Waden, near 20° N. lat. and 13° W. long.; and at Shingarin, near 17° 30′ N. lat. and 4° W. long. The town of El Arawan sends the abundant produce of the rock-salt mines of Toudeny to the countries on the banks of the Joliba, especially to Sansanding and Yamina, and receives in return ivory, gold, slaves, wax, honey, cloths of Soodan, and cured provisions. The salt obtained from the rock-salt mines of Hoden and Shingarin is carried to the same places and to Sego by the caravans of the merchants of Walet, a town which is said not to be inferior in extent and population to Timbuctoo, which contains about 12,000 inhabitants. The position of Walet is not well ascertained. According to Mungo Park, it lies between 15° and 16° N. lat. and between 5° and 6° W. long., on the border of the Sahara, and is surrounded by a sterile country. The caravan route from Timbuctoo to Benown in Ludamar passes through Walet.

An extensive fishery is carried on along the coast of the Sahara by the inhabitants of the Canary Islands. This fishery commences on the north at Cape Nun; the fishermen seldom venturing to go farther north, although fish are equally abundant there, from fear of the Moors on that part of the coast, who possess boats. From Cape Nun to the bank of Arguin, which is the extent of the fishery, the inhabitants of the desert have not a single boat. The fish taken here are porgy, mullet of several kinds, rock-cod, and red snapper. The tonnage of the schooners employed in this fishery is from 100 to 150. The fish are very abundant, and weigh from eight to sixty pounds each. Every schooner takes daily on an average three hundredweight. The number of persons employed in this fishery is considerable. It gives employment to between 400 and 500 men from the island of Lanzerote, to about 250 from Fuerteventura, and to a considerable number from the other islands. Fish constitutes the principal food of the poorer inhabitants of the Canaries. The fishermen frequently land, not only to procure water, but to barter their fish with the inhabitants of the desert for wool and orchilla.

Discoveries.—The nature of the Sahara opposes insuperable obstacles to the progress of a conqueror. The Greeks and Romans were only well acquainted with the oases of the Libyan desert, which are at no great distance from the western edge of the valley of the Nile, and with those which are contiguous to the rocky region that divides the desert from the Mediterranean, as the Ammonium (now Siwah), Augila, and Cydamum (now Gadames). The coast of the Sahara was discovered by the Portuguese between 1412 and 1443 [AFRICA, vol. i., p. 174], but the interior of that country was unknown up to the end of the eighteenth century, with the exception of what knowledge might be derived from a few notices in the writings of Leo Africanus. The first impulse to discovery in the interior of Africa was given by the establishment of the African Association in 1788, but before their labours produced any important result, Browne had succeeded (in 1793) in penetrating to Dar-Fur, with the

Soodan caravan, through the oases which lie west of the valley of the Nile. Before he published his Travels (1800), Mungo Park had returned from the banks of the Joliba, where he had collected some information respecting the south-western districts of the Sahara, though he had only been on the borders of the desert. Two years afterwards the travels of Hornemann were published, who had penetrated from Egypt to Fezzan by the way of Siwah and Augila. Though more had thus been done towards discovering the interior of Africa in the last ten years of the eighteenth century than in all previous time, no important addition to our knowledge of the Sahara was made during the next twenty years, except a few facts contained in the narrative of a shipwrecked American sailor named Adams, which was published in 1816. Hornemann indeed is said to have crossed the Sahara, and to have proceeded as far as Nyffe, supposed to be about 10° 30′ N. lat., but no record has been preserved of his journey.

In 1819 Captain Lyon entered Africa from Tripoli, and although he did not add much to our knowledge of the Sahara, as he did not proceed farther than Tegerhy (24° N. lat.) near the southern boundary of Fezzan, he collected much interesting information, which was published in 1821. Denham, Clapperton, and Oudney (1822-1824), following the same route, not only traversed the desert in all its width from Tripoli to Bornou, but discovered a considerable extent of Soodan. These important discoveries were to be enlarged by the travels of Major Laing, who in 1825 likewise departed from Tripoli, and passing through the oasis of Gadames, traversed the whole width of the Sahara, and reached Timbuctoo, but on attempting to return to Marocco by the way of El Arawan, he was murdered by the natives before he reached El Arawan. No record of his travels has has been preserved. Two years afterwards Caillié, a Frenchman, who in 1827 had traversed the southern portion of Senegambia, between 10° and 12° N. lat., and then passed through the western countries of Soodan to Timbuctoo, departed from the last-mentioned place, and reached Fez by the route which is frequented by the caravans that carry on the trade been Soodan and Marocco. A few years ago Davidson made an attempt to reach Timbuctoo by the route from Wady Nun to Tatta, and hence to rejoin the great caravan road, but he was murdered by the natives.

All the nomadic tribes which inhabit the Sahara are independent; but Fezzan and Gadames are subject to Tripoli, and the oases along the western edge of the valley of the Nile, as well as Siwah, depend on the pasha of Egypt.

(Mungo Park's *Travels in the Interior Districts of Africa*; Browne's *Travels in Africa, Egypt, and Syria*; *Journal of F. Hornemann's Travels from Cairo to Mourfouk*; Robert Adams's *Narrative, &c.*; Lyon's *Narrative of Travels in Northern Africa in the years* 1818-1820; Denham, Clapperton, and Oudney's *Narrative of Travels in Northern and Central Africa*; Caillié's *Travels through Central Africa to Timbuctoo*; Golberry's *Travels in Africa*; Savigny's and Corréard's *Narrative of a Voyage to Senegal and the Shipwreck of the Medusa*; Captain Belcher's *Observations on various points of the West Coast of Africa*, in the *London Geogr. Journal*, vol. ii.; Lieut. Arlett's *Survey of some of the Canary Islands and of part of the Western Coast of Africa*, in the *London Geogr. Journal*, vol. vi.; and *Letters from Mr. Davidson*, in the *London Geogr. Journal*, vol. vi. and vol. vii.; Paolo della Cella's *Narrative of an Expedition from Tripoli to the Western Frontier of Egypt*.)

SAHARUNPORE. [Seharunpore.]

SAID IBN BATRIC, the name of a person more commonly known by the appellation of Eutychius (Εὐτύχιος, Arabicè *Eftishious*), which signifies 'Happy' in Greek, as 'Said' does in Arabic. He was born A.H. 263 (A.D. 875), at Fostat in Egypt, and was originally brought up as a physician; and we are told by Ibn Abi Osaibiah (*Oiyún Al-Ambá fi Tabacát Al-Atebbá*, 'Fontes Relationum De Classibus Medicorum,' cap. 14, sec. 10) that he excelled both in the theory and practice of that profession, and that he composed a work on the subject of medicine. But it is as an historian that he is best known, and as one of the Melchite[*] patriarchs of Alexandria, to which dignity he was raised A.H. 321 (A.D. 938), and assumed upon the occasion the name of Eutychius. He died A.H. 328 (A.D. 940). His principal work is a general history of the world, from the creation to his own time, written in Arabic, and edited by Pocock, Oxon., 1656,[*] 4to. 2 vols., Arab. and Lat., with the title 'Nadhm Al-Jauáhir: Contextio Gemmarum, sive Eutychii Patriarchæ Alexandrini Annales.' This is styled by Gibbon, chap. 51, note m., 'a pompous edition of an indifferent author, translated by Pocock to gratify the Presbyterian prejudices of his friend Selden,' who defrayed the expense of the work, and promised to add some annotations, which however his death, in 1654, prevented him from contributing. He had himself published a small portion of the same work, entitled 'Eutychii Ægyptii, Patriarchæ Orthodoxorum Alexandrini,—Ecclesiæ suæ Origines,' Arab. and Lat., Lond. 1642, 4to., with a learned commentary. He selected this particular chapter, because his 'Presbyterian prejudices' were delighted at finding in it that St. Mark, in founding the church at Alexandria, appointed a college of twelve presbyters or elders, who, whenever the Patriarchate was vacant, elected one of their own number to fill the office. This little extract of Selden's was very severely criticised in a work entitled 'Eutychius Patriarcha Alexandrinus vindicatus, et suis restitutus Orientalibus; sive Responsio ad Joannis Seldeni Origines, auctore Abrahamo Ecchellensi, Maronita ex Libano,' Romæ, 1661, 4to. Three other smaller works are mentioned in Wüstenfeld, 'Gesch. der Arab. Aerzte,' but this only has been published. (Nicoll and Pusey, 'Catal. MSS. Arab. Biblioth. Bodl.;' D'Herbelot, 'Biblioth. Orient.;' Schnurrer, 'Biblioth. Arab.,' p. 144.)

SAIDE. [Syria.]

SAÏGA. [Antelope, vol. ii., p. 73.]

SAIL, a quantity of canvas attached to the yards or stays of a boat or ship in order to receive the impulse of the wind, and thus give motion to the vessel. The depth of a sail is capable of being diminished at pleasure, according to the force of the wind, by means of the reef-points.

The principal sails of large vessels can be placed at right angles to the direction of the keel of the ship, and this position is given to them when the vessel goes before the wind; in other cases the same sails may by means of the braces be placed obliquely to the keel. The sails which are attached to the ship's stays, and the sails of boats or small vessels, are generally in a vertical plane passing through the keel; a certain degree of obliquity to that plane may however be given to them at their lower extremities if necessary. Sails are strengthened by cords sewn along their edges in order to prevent them from being easily torn by the action of the wind.

When a vessel is in still water, the pressure of the wind against the sails overcomes its inertia, and motion takes place in some direction. The motion goes on increasing by the accelerative power of the wind, as the motion of a descending body is accelerated by the force of gravity; but at the end of a certain time the resistance in an opposite direction, both of the air against the sails and hull of the ship, and of the water against the latter, becoming equal to the accelerative power of the wind, the ship acquires a terminal or uniform velocity, and in this state (neglecting the resistance of the air) there may be said to be an equilibrium between the pressure of the wind against the sails and of the water against the vessel.

The principal problem connected with the motion of vessels on the water has for its object the determination of the relation between the velocities of the wind and of the vessel; and its solution consists in finding algebraic expressions for those pressures, and making them equal to one another. But many practical difficulties present themselves in investigating that relation; for the pressure of the wind is modified by the form which the sail assumes when acted upon, by the obliquity of the wind's direction to the general plane of the sail, and by the interference of one sail with another, by which interference the wind may be partly intercepted, or currents may be produced in directions different from the general direction of the wind. The resistance of the water is also greatly modified by the form of the ship's hull and by the direction of its motion with respect to the line of the keel. These difficulties cannot be removed: therefore the results of mathematical researches concerning the motion of ships can only be considered as very remote approximations to the rules which should guide the practice of the seaman. And in order to simplify the problem, it is necessary to suppose that the ship is furnished with only one sail, whose area is such that the action of the wind upon it may be equivalent to the efficient action of the wind upon all the sails. The *centre velique*, as it is called by foreign writers, or the centre of pressure, must also be supposed to be at the centre of gravity of the sail. That part of the ship's surface which is resisted by the water must moreover be represented by a plane surface whose area is such that this resistance shall be equivalent to the efficient action of the water on the ship.

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[*] This name, which signifies *Royalists*, was the title applied to the Catholic or Orthodox party in the East, in consequence of the active part taken by the emperors Marcian and Leo in enforcing with arms and edicts the decrees of the Synod of Chalcedon, A.D. 451. 'The name was unknown till the tenth century, and appears to be of Syriac origin. It was invented by the Jacobites, and eagerly adopted by the Nestorians and Mohammedans; but it was accepted without shame by the Catholics, and is frequently used in the Annals of Eutychius.' (Gibbon, chap. 47.)

[*] Both the title and the date vary very much in different copies. See Nicoll and Pusey, 'Catal. MSS. Arab. Bodl. Biblioth.,' pp. 47 and 591.

The pressure of the air perpendicularly against a plane surface equal to one square foot is usually estimated at $\frac{1}{500}$lb. avoirdupois, the surface pressed being at rest, and the wind moving with a velocity equal to one foot per second, or about 0·68 mile per hour; also the resistance of water against a like surface and moving with an equal velocity is estimated at 1·5 lb. The pressure or resistance, by the laws of hydrodynamics, varies with the square of the velocity; and, from the resolution of forces, it may be shown [AERODYNAMICS] that the effective force with which a fluid strikes a plane surface obliquely, when estimated in a direction perpendicular to the plane, varies with the square of the sine of the inclination to the plane. It must be observed however that no dependence can be placed upon this law; for, from the experiments of Bossut, D'Alembert, and Condorcet, it appears to hold good only for inclinations between 50° and 90°. The experiments of Smeaton indicate that the pressures vary nearly with the sine of the inclination, when the latter is between 50 and 60 degrees; at greater inclinations the pressure is some fractional power of the sine, and at very small inclinations it approaches nearly to the square. From those of Dr. Hutton it is found that at inclinations between 50° and 90° the pressures vary nearly as the sines of the inclinations.

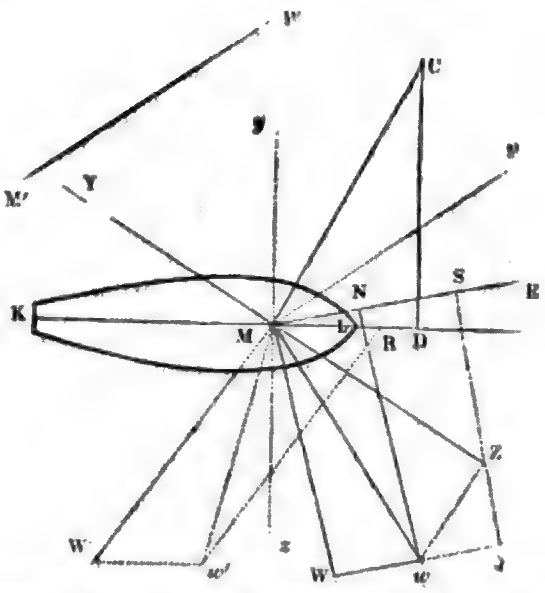
In determining the pressure of a fluid against the surface, which is in motion, it must be observed that, by the laws of the collision of bodies, the efficient velocity of impulse is to be expressed not by the absolute, but by the relative velocity of the impelling power. Hence, when the wind and ship are moving in the same direction, the effective velocity is the difference, and when they are moving in opposite directions, it is the sum of their several velocities. It must also be observed that the force of the wind and the reaction of the water are to be considered as taking place in horizontal directions, and that the effective pressure of the wind on a flat sail is in a direction perpendicular to the plane of the sail, whatever be the position of the latter and the direction of the wind.

Now when a ship sails before the wind in still water, if we consider the sail as a plane surface at right angles to the keel of the ship and to the direction of the wind; representing the pressure of the air on a square foot, when the velocity is one foot per second, by P, and the pressure of the water on a square foot with an equal velocity by P′; also putting V for the velocity of the wind, and V′ for that of the ship, both being expressed in feet per second; A for the area of the sail, and A′ for that of a vertical section through the immersed part of the ship taken perpendicularly to the keel; the equation of equilibrium will evidently be

$$A.\ P.\ (V-V')^2=A'.\ P'.\ V'^2;$$

and from this equation V′ may be easily found. It follows from the same equation that, when the other terms are constant, $\frac{V'}{V-V'}$ varies with $\sqrt{A}$, or the velocity of the wind in the sail is to the velocity of the ship as unity is to the square root of the surface of the sail.

But while the plane of the sail is supposed to be perpendicular to the keel of the ship, let the direction of the wind be oblique to both, and let the force of impulse perpendicularly to the sail be proportional to the square of the sine of the inclination of the wind to the sail; then, if KL be the keel, M the place of the mast, *yz* the position of the yard, and W′M represent the direction and velocity of the wind, we shall have $W'M.^2 \sin.^2 W'Mz$ for the force of impulse with which a particle of air acts on the sail. This value of the impulse is however correct only at the moment before the ship begins to move; for, let the ship be advancing in the direction KL with a velocity such that the sail moves parallel to itself from M to R, while a particle of air would move from W′ to M if the ship were at rest,—it will



be evident now that a flag at M, which, when the ship is at rest, would have its plane in the direction W′M produced, being carried by the motion of the ship from M towards L, would be acted on by the particles of air coming against it, as if it were resisted by forces parallel to MR and tending from R towards M; therefore the forces parallel to W′M and RM being respectively proportional to those lines, the flag will by the composition of forces take the direction *w*′M, the diagonal of the parallelogram W′R. This is the efficient direction of the wind, and its velocity may be represented by that diagonal, when that of the wind in its true direction is represented by W′M: consequently the impulse of the wind perpendicularly to the plane of the sail must be represented by $P.A.\ w'M^2.\ \sin.^2 w'Mz$. By this impulse motion is produced in the ship in the direction of its keel, and the whole expression may be made equal to $A'.\ P'.\ V'^2$, the former expression for the resistance of the water. The values of W′M and of MR, that is, V and V′, the absolute velocities of the wind and ship, and also the angle LMW′ being known, the value of *w*′M may be computed.

When the direction of the wind is not coincident with the line of the ship's keel, its power to impel the ship forward will be increased by placing the sail in some oblique position as YZ. In this case let MC, perpendicular to YZ, represent the velocity with which, if not resisted by the water, the ship would move by the action of the wind. Then, by the resolution of motions, letting fall CD perpendicularly on KL, MD and DC will represent the velocities in those directions; and, in the case of equilibrium between the actions of the wind and water, the resistance of the latter against the side of the ship perpendicularly to the keel will be to that against the bow, parallel to the keel, as CD to DM, or as tang. ∠CMD to radius. Let A″ be the area of a vertical section through the immersed part of the ship in the direction of the keel, and A′, as before, the area of the vertical section perpendicularly to the keel; also suppose that, in consequence of the reaction of the water, the ship's motion, instead of being in the direction MC, should be in some other, as ME. Then V′ representing the velocity of the ship in this direction, and the resistance of the water being supposed to be proportional to the square of the velocity and square of the sine of the inclination, we have $P'.A''.V'^2 \sin.^2 EMD$ for the resistance of the water against the ship's side, and $P'.A'.V'^2 \cos.^2 EMD$ for the resistance against the bows. Therefore

$$\tan. CMD : \text{radius} :: A'' \sin.^2 EMD : A' \cos.^2 EMD;$$

consequently, the ratio of A′ to A″ being supposed to be known, the value of EMD, that is, the ship's lee-way, might be found. If ZMD=45°, and the ratio of A″ to A′ be assumed to be as 12 to 1, the lee-way will be found to be 16° 6′; and if ZMD=30°, the lee-way will be 20° 49′. But experiment alone can determine this element, for, with equal velocities and equal quantities of sail, it varies in different ships; and, in the same ship, with the velocity, and the disposition and quantity of the sail.

Let MN represent the velocity of the ship in the direction ME; then *w*M, the diagonal of the parallelogram WN, will represent the efficient velocity of the wind in that direction, WM being the true direction of the velocity; and letting fall on YZ the perpendicular *w*Z, this last line will represent the velocity perpendicularly to the sail. Therefore the force of the wind in this direction will be proportional to wZ^2; then drawing wQ parallel to ME, to meet SQ drawn through Z perpendicularly to ME and wQ, we have ZwQ equal to the compliment of ZME, and consequently wZ^2 being resolved in the direction ME or wQ, becomes wZ^2 cos. ZwQ, or wZ^2 sin. ZME. But wZ varies as sin. $\angle wMZ$; therefore the force of the wind to impel the ship in the direction ME is proportional to sin.^{2} wMZ sin. ZME; and the force of impulse being proportional to the square of the velocity produced by it, it follows that the velocity of the ship will vary with sin. wMZ $\surd$ sin. ZME, Now making the differential of this expression equal to zero, considering wME as constant and ZME as variable, it will be found that this product is a maximum when $\angle wME$ is so divided that tan. wMZ : tan. ZME :: 2 : 1, or that sin. $(wMZ-ZME)=\frac{1}{3}$ sin. wME.

In Maclaurin's 'Fluxions' (art. 912) there is given an investigation of the angle WMZ, between the true direction of the wind and the plane of the sail, when the velocity of the ship's motion in ME is a maximum. The general expression is complex, but when the direction of the wind is perpendicular to the ship's course we have tan. WMZ= $\sqrt{\left\{2+\frac{9}{4}\frac{V'^2}{V^2}\right\}}+\frac{3}{2}\frac{V'}{V}$; V′ being the velocity of the ship and V that of the wind.

Therefore, if the velocity of the ship were very small, we should have tan. WMZ= $\sqrt{2}$ nearly, or WMZ=54° 44′ nearly. But, on making V′ equal to ½, ⅓, and ¼ of V, we obtain for $\angle$WMZ the several corresponding values 61° 27′, 63° 26′, and 66° 58′. It may be observed also that, if both $\angle$ZME and V are given, the velocity of the ship will be a maximum when the angle WMZ is a right angle, or when the sails are perpendicular to the true direction of the wind.

In the same work (art. 917) there is given the investigation of an equation from which may be determined the angle ZME, between the plane of the sail and the line of the ship's motion when the velocity is a maximum; and from that equation it is inferred (art. 919) that, if the wind is perpendicular to the sail, the velocity is the greatest (provided the velocity of the ship before the wind be not less than one-third of the velocity of the wind) when sin. ZME : radius :: $(V-1)^{\frac{2}{3}}$: 1·5874; the velocity of the ship being expressed by unity, and V, the true velocity of the wind, by a multiple of that velocity. It may also be inferred from the same equation, that if the velocity of the wind be such as to cause the velocity of the ship to be greater than one-third of itself, the ship will sail faster when the course is oblique to the wind than when coincident with its direction.

The force of the wind, which is denoted by P.A.wM^2 sin.^{2} wMZ sin. ZME, being made equal to $P'.A'.V'^2$ (which will express the resistance of the water, if A′ represent the area of the immersed section of the ship perpendicularly to ME), the value of V′, the velocity of the ship, might from thence be obtained; and from the expression of that value it may be seen that, while the other terms remain the same, the velocity of the ship varies with the relative velocity of the wind and ship, with the sine of its inclination to the plane of the sail, and with the square root of the area of the sail. Hence also, when the velocity of the wind and both the area and position of the sail are constant, the velocity of the ship varies with sin. wMZ; that is, with the sine of the angle made by the apparent direction of the wind with the plane of the sail. It may be inferred from the general equation, that, by sufficiently increasing A and the angle wMZ, the velocity (V′) of the ship may be made to exceed wM, which is that of the wind.

If it were required to find the course of the ship and the position of the sails, so that the ship might recede most rapidly from any point of danger, as from a lee-coast situated, for example, in the position indicated by M′P′, at right angles to wM, the direction of the wind; we must imagine MP to be drawn parallel to M′P′, that is, perpendicular to wM. Then, the velocity of the ship in the direction ME being represented by sin. wMZ $\surd$ sin. ZME, let this velocity be resolved into the direction perpendicular to MP; that is, let it be multiplied by sin. EMP: the ship will recede most rapidly from M′P′ when the expression sin. wMZ. sin. EMP $\surd$ sin. ZME is a maximum. On making the differential of this expression equal to zero, we shall find that the velocity perpendicularly to MP is the greatest when $\angle wMP$ is divided so that the tangents of the angles wMZ, ZME, and EMP are to one another as the numbers 2, 1, and 2. If the velocity of the ship be very small, we shall have $\angle wME$, or its equal ZMP, =54° 44′ nearly; and $\angle wMZ$ = 35° 16′ nearly. And since receding at right angles from a line M′P′, when that line is perpendicular to the direction of the wind, is an advance towards the wind; it follows that the above value of wMZ will indicate the position which the sail should have with respect to the wind, in order that the ship may get to windward with the greatest possible velocity. If the velocity of the ship be taken into consideration, the angles wME and wMZ will, as before, be modified by the relation between the velocities of the ship and wind.

Since the lee-way, which a ship always makes when her sails are oblique to the direction of the wind, destroys the equality of the reaction of the water which would take place on the two bows if her movement were in the direction of her keel, and gives rise to an excess of pressure against the lee-bow; it follows that in these circumstances the ship's head is constantly forced to windward, and that the tendency of the ship to turn on the axis of the rotation is so much greater as the bows are more acute. To oppose, in some measure, this tendency, the quantity of sail in front of the centre of rotation is greater than that which is behind it; but, notwithstanding such disposition, it always requires some movement of the rudder to complete the counteraction.

SAILING, or THE SAILINGS, a term applied to the different ways in which the path of a ship at sea and the variations of its geographical positions are represented on paper. It is also applied occasionally to the rules by which, in particular circumstances, a ship's place and its motion are computed.

Plane sailing consists in representing the line of a ship's course or way, for a given time, with the difference between the latitudes and between the longitudes of the two extreme points of such course by the three sides of a right-angled plane triangle, of which the distance actually sailed is the hypotenuse; the spaces on all the lines being expressed in nautical miles or equatoreal minutes of a degree, as if the earth were a plane surface and the terrestrial meridians and parallels of latitude were straight lines respectively parallel to each other.

Middle-latitude sailing and *globular sailing* have been briefly defined under those words; and the first of these methods, together with *parallel sailing* and *Mercator's sailing*, have been explained under Reckoning at Sea. The term globular sailing is only a general designation for all those which have been above named, except plane sailing, and it includes also that which is called great-circle sailing; because in these methods the rules of computation are founded on the hypothesis that the earth is a sphere.

Great-circle sailing consists in determining a series of points in an arc of a great circle between two points on the surface of the earth, for the purpose of directing a ship's course as nearly as possible on such arc; that is, on the curve of shortest distance between the place from which she sets out and that at which she is to arrive.

If a ship were to sail on the circumference of the equator, or of any meridian, the direction of her course would be invariably east and west, or north and south, and the spaces passed over would be differences of longitudo or differences of latitude merely. If the points of departure and arrival are in any other direction, the ship's course on the arc of a great circle joining them will, with respect to the points of the compass, vary at every moment; and, when great-circle sailing is attempted, it is usual, for the sake of simplicity, to consider each portion of the circular arc (the differences of longitude or latitude between its extremities not exceeding four or five degrees) as coincident with some rhumb line. If a series of such portions are determined by means of the latitudes and longitudes of their several extremities, the portions, represented by right lines, may be transferred to a Mercator's chart, on which they will then serve to indicate the successive courses which a ship must take in order that it may continue to sail nearly in the required direction.

The longitudes and latitudes of the points of departure and arrival being supposed to be given, the distance between those points and also the two angles of position, or the angles between the meridians of the two points and the great circle joining them, may be computed. Then, if points be assumed on the arc at any convenient equal intervals of longitude, and the latitudes of those points be computed, the positions of the several portions on the great circle will be completely determined. In these computations the rules of spherical trigonometry may be employed, but the operations will be facilitated by the use of the spherical traverse tables, which show, on inspection, the values of the two terms in the cosine of an angle of a triangle whose three sides are known. (Raper, *Practice of Navigation*, p. 71.)

Traverse sailing is merely a general term for the determination of a single course equivalent to a series of successive courses, whatever be the manner of finding the lengths of the lines forming the triangles.

Oblique sailing consists in determining the position of a ship by observing with a compass the bearings of two or more objects on the shore, whose places are given on a chart, and drawing lines from those places so as to make angles with their meridians equal to the observed bearings; the intersection of the lines gives on the chart the position of the ship. This is sometimes called the method of *cross bearings*. The term oblique sailing is also applied to any problem in which (when the triangles are not right-angled) the distance of the ship from any object on the shore, or of such objects from one another, are computed by the rules of plane trigonometry from bearings observed at the ship when the latter is at two or at a greater number of stations.

Current sailing is the method of determining the true motion of a ship when, besides being acted upon by the wind, she is moving in a current. [RECKONING AT SEA, p. 326, col. 2.] Lastly,

Windward sailing is a term applied to that mode of navigating a ship in which the latter endeavours to gain a port situated in the direction from whence the wind is blowing. The ship in this case is made, by frequent tacking, to sail as near as possible to the wind.

The use of the compass in enabling the seaman to give to the ship any required direction, or in ascertaining that which the ship is taking when by the force of the wind she is beyond his control, is so great as to render it imperative that he should take every opportunity of finding by celestial observations the position of the magnetic needle with respect to the terrestrial meridian, that is to say, its declination or variation; and one of the problems of nautical astronomy consists in determining this element, generally by an observed altitude of the sun. [AZIMUTH.]

But two circumstances almost constantly operate to render the true course of the ship uncertain. One of these is the *lee-way*, that is, the angular deviation of the ship's line of motion from the direction of her keel [SAIL], which direction alone is indicated by the compass; and the other is the attraction exercised by the iron-work in the ship on the magnetic needle. By this attraction the needle is prevented from taking that direction which it would assume from the effect of terrestrial magnetism; and the application of the *correcting plate*, by which the local attraction is neutralized, may therefore be with propriety introduced here.

This apparatus, for which the seaman is so much indebted to Mr. Barlow, the inventor, consists of two thin circular plates of iron, about twelve inches in diameter, between which is interposed a circular board, in order to increase the thickness without much increasing the weight; the plates are pressed close together by small screws near their edges, and by a screw at each end of a brass socket passing through the centre. A brass rod about two feet long passes through this socket perpendicularly to the plate, and is inserted at one end, into the box or stand supporting the compass, the plate being capable of sliding on the rod so as to be placed at any required distance from a vertical line passing through the pivot of the compass.

One of the methods put in practice by Mr. Barlow, in order to find, on board a ship, the effect of local attraction on a compass in different directions tending from the latter, was to station one observer with a compass or theodolite in some convenient situation on shore, and another with a compass on board, at the spot where the ship's compass was to be permanently fixed. Then (the zeros of the instruments having when on shore been brought to coincide with the magnetic meridian by the observed bearings of some distant object) while the ship was swinging round as nearly on its centre as possible through 360 degrees, the observers, with their respective instruments, took by signal each other's bearing when the ship's head tended towards each *point* of the compass. It is evident that the two observed bearings, in each pair, ought, if no cause of error existed, to be diametrically opposite; and the difference between them is due to local attraction in that position of the ship. The direction of the resultant of all the local attractions may then be determined by the composition of forces. The position in which the plate is to be applied to the compass, as a partial corrector of the local attractions, must be found by trial; and, for this purpose, the compass, with its stand or support, is taken on shore, and turned gradually round on its vertical axis. Then, on successively applying and removing the plate, the attraction of the latter must be observed, and such a position found for it that the effects may agree with those which resulted from the experiments on board. When the compass is set up in the ship, the plate must be fixed at a distance from the pivot equal to that which was found on shore, but in an azimuth diametrically opposite to that of the resultant of the local attractions in the ship.

In the 'Phil. Trans.,' 1839, Mr. Airy, the astronomer-royal, gave a theory of the magnetism induced by the iron of a ship, in which he has investigated the separate expressions for the disturbing forces or local attractions on the north end of the needle, in directions tending towards the magnetic north, the magnetic east, and vertically downwards. Of these the only force which it is necessary to destroy is the second; and Mr. Airy, having computed the force produced by Barlow's plate when in the position assigned to it as a corrector, combined it with the local attraction towards the east, in order to ascertain what part of the resulting force was really corrected. The result was, that one of the two terms in the expression for the force was destroyed, and that the other was doubled. In order to destroy this term also, in a steam-boat having a compass on the deck or in a cabin, so that the iron work may be nearly equally diffused above and below it, it would be necessary, in addition to Barlow's plate, to have a mass of iron on the same level as the compass, but either on the starboard or larboard side, and in a situation found by trial, so that the compass may point correctly when the ship's head lies north-east, south-east, south-west, and north-west. The compass will then point correctly in all magnetic latitudes.

As a general rule for the application of iron in order to correct the local attractions on ships' compasses, Mr. Airy remarks that if a mass of iron be placed opposite an equal mass, both in azimuth and elevation with respect to the compass, the disturbing effect of one mass is doubled. If one mass be placed opposite the other in azimuth, and at the same elevation or depression, or if it be placed in the same azimuth, but with an elevation instead of a depression, and *vice versâ*, it destroys one term in the disturbing force and doubles another. And if one mass be placed on the same level as the compass, its effects may be destroyed by placing another mass at the same level, but at a distance in azimuth equal to 90° on either side.

Instead of an iron plate for the correction of local attractions, Mr. Airy recommends an iron scroll, or a long box containing an iron chain, with one end only directed towards the compass; by this means the inequality of magnetic action in different parts of a broad plate will be avoided.

Mr. Barlow gives the following rule for finding the effect of local attraction on an observed azimuth of the sun:—Take the bearing of the sun by the azimuth compass, or rather, take a mean of several observed bearings in the usual way; first without the correcting plate, and afterwards with the plate attached to the compass; the difference between the two observations, or between the means of the several observations, is due to local attraction. Then if the observations without the plate are diminished by using the plate, the local attraction is to be added to the bearings observed without the plate, in order to give the true bearing or azimuth. If the first observations are increased, the local attraction is to be subtracted.

SAIMA LAKES. [RUSSIAN EMPIRE.]

SAÏMIRI. [SAGOUIN.]

SAINFOIN, *Hedysarum onobrichis*, is a plant of the family of the Leguminosæ, which grows luxuriantly and spontaneously on the calcareous mountains of the middle and south of Europe. It has been in regular cultivation for upwards of two centuries for the purpose of supplying fodder for cattle, either in the green state or when converted into hay. There are few plants which have more rapidly improved the value of poor thin calcareous soils than sainfoin; and in the richer kinds of loam, which contain a considerable proportion of calcareous matter, its value surpasses even that of broad clover, giving fully as great a return, with a much smaller expenditure of manure. The plant has a strong woody and fibrous root, which insinuates itself into the fissures of calcareous rocks, and finds moisture in the dryest seasons, while its spreading fibres keep the earth from being washed down the steep slopes of the hills. Being nearly perennial, or at least of many years duration, it binds the soil together. In favourable situations, it may be made into hay twice in the year, or cut oftener as green fodder. In the most arid and exposed situations, it gives at least one good crop of hay. The plant grows about two feet high, and the stem, which branches out into many compound leaves, is crowned with a beautiful spike of flowers of the papilionaceous kind. After it has been mown, it shoots out rapidly again, and may be advantageously depastured by every kind of cattle or sheep. There are varieties of the plant which differ in the rapidity of their growth: the best is called in France *esparcette* or *sainfoin à deux coupes*. From France it has been introduced into England. The duration of sainfoin depends on the nature of the soil, and the state it was in with respect to weeds when it was sown. A cold wet subsoil soon destroys the roots, whereas a free and dry one, whether rocky or gravelly, gives them vigour. Grass and weeds, which choke the crown of the plant, soon cause it to decay, as is the case with lucern. With every advantage, it may last in vigour ten years, especially if it is occasionally invigorated with a top-dressing of manure or ashes, or, which is best of all, with diluted urine, or the drainings from dunghills. During that time it may be cut twice for hay every year, taking care to cut it before the flower is faded or the seed formed; and if sheep are folded on it after the second cutting, the next crop will well repay the trouble. It is usually sown in spring in a crop of barley or oats, which should be sown thin in order that the sainfoin may not be smothered. The land should have been prepared by a cleansing crop, such as turnips fed off by sheep folded on them. From three to four bushels of seed may be sown, harrowed in, and rolled. It is not often drilled, although this method, by allowing the use of the hoe between the rows, would much strengthen the young plants, and protect them against coarse grasses, which are their greatest enemies. In the first year the sainfoin should not be fed off by sheep; and if it is mown, it should not be mown too close to the ground. The crown of the root in the young plant rises a little above the ground; and if this be bit off, or cut with the scythe, the plant dies. It is useful to harrow the ground lightly, to draw the earth round the roots, and to destroy seed weeds soon after the barley or oats are reaped. The sainfoin does not produce a large crop the first year; for some of the seeds will lie a twelvemonth in the ground before they spring up. It is in perfection after the second year, when a portion may be reserved for seed. Sainfoin hay is extremely nourishing for every kind of cattle, especially if it has been made without rain. Although it is not apt to heat in the stack, it must be put up in a very dry state; and if it has suffered from rain, too much care cannot be taken thoroughly to dry it; for the water insinuates itself by capillary attraction into the hollow stems, and is long in evaporating, so that when it feels quite dry it may yet contain much water. The mode of discovering this is to twist it strongly in the hands into a rope, when the moisture, if there is any, will ooze out. It is better to let it dry thoroughly, than, by carrying it in a hurry, to run the risk of its becoming mouldy within. In very precarious seasons it may be carried in a green state, provided there be no moisture in it from dews or showers, and stacked in alternate layers with good straw. It will impart some of its fragrance to the straw, and loose none of its nutritive qualities. The same may be done with lucern or clover. The most advantageous use of sainfoin however is to cut it green and give it immediately to the cattle. There is no danger of their being hoven by it, for it ferments very slowly, owing to the fibrous nature of the stem. If the situation of the field admits of occasional irrigation, without danger of the water stagnating, the produce of the sainfoin will be greatly increased; and it may then be cut four or even five times in a season without fear of exhausting its strength. When it begins to appear thin on the ground, and other plants seem to get the better of the sainfoin, it is time to break it up. The land will be found much improved in fertility by the sainfoin. A poor chalk or gravel which before would scarcely repay the seed sown in it, will now, by the gradual decay of the roots and fibres of the sainfoin, produce several good crops without any other manure. The prudent farmer however will not entirely destroy, by repeated crops of grain, that cohesion of the soil which is produced by the roots of the sainfoin; but by a judicious course and proper application of the manure, which the sainfoin enabled him to make, he will keep up the newly acquired fertility until, in the course of ten or twelve years, he can again sow sainfoin seed in it with the prospect of a crop more abundant than the first. Many a poor barren tract of calcareous rock and gravel has been fertilised and raised in value by the sole effect of the sainfoin, without which it must have remained in its unproductive state.

Although a chalky soil is best adapted to the growth of sainfoin, it may be sown with advantage in all light loams, provided the substratum be sound and dry. On very rich deep moulds lucern is a more profitable crop; but sainfoin will thrive where lucern would fail; and it is particularly adapted for poor dry soils.

There is nothing peculiar in the manner in which sainfoin is made into hay. It should not be shaken about too much, for fear of injuring tha flower and breaking off the leaves. The swarth should be merely turned over, when dry on one side, and then, as soon as it is dry through, it should be put into small cocks, occasionally spread out in the sun, when the dew is off the ground, and carried to the stack as soon as it is sufficiently made. It should take a good heat in order to make it compact, but without acquiring too dark a colour. Experience alone can teach the exact time when it should be stacked. When it is left for seed, it should be examined carefully after the blossom fades. The lower pods will be filled with ripe seed before the blossoms at the top of the spike of flowers are withered or the seed formed in them. If the sainfoin were left standing till these seeds were ripe, the lowest would be shed; but by cutting it at a proper time these may be preserved, while most of the later will ripen in the straw sufficiently to vegetate when sown. Rainy weather is very injurious to the seed crop; a fine time should therefore be selected, if possible, even at the risk of a smaller crop. The seed is only gathered for sowing; but in case there should be more than is required for that purpose, and no ready sale, it is excellent food for horses. The produce varies from three to five or even six sacks per acre. It is easily threshed out, and this operation is often done on a cloth in the field, when the weather permits. It is readily done by a threshing-machine, and winnowed like corn. On the whole, there are few plants the cultivation of which is so advantageous as that of sainfoin on the soils on which it thrives best.

SAINT, derived from the Latin 'sanctus' through the French 'sainct,' properly signifies a holy or pious person, and is so used in the Christian church. From the commencement of the Christian religion, great veneration was always shown to persons remarkable for their holiness or piety, and their memory was cherished after their death. In course of time it became the custom to implore departed saints to assist the living by their prayers and intercessions with the Deity; and as man has in all ages felt the want of a mediator between himself and the Deity, the practice of praying to saints increased rapidly, and superstition multiplied the number of such mediators to so great an extent, that it was at length found necessary to put some restraint upon the practice. It was accordingly decreed by the ecclesiastical councils in the ninth century, that no departed Christian should be considered as a saint to whom prayers might be addressed, until the bishop in a provincial council, and in the presence of the people, had pronounced him worthy of that honour. Even in that century many divines thought that it was proper that the decisions of bishops and councils should be confirmed by the consent and authority of the pope, who was regarded as the supreme and universal bishop. It was not however till the following century that any person was sainted by the bishop of Rome alone: and this honour was first conferred on Udalric, bishop of Augsburg, by John XV. Shortly afterwards the privilege of declaring departed Christians to be saints was confined to the pope; and the creation of saints was distinguished by the name of 'canonization.'

The invocation of saints in the Roman Catholic church is frequently stigmatised as idolatry; and the church of England condemns the Romish doctrine on the subject as 'a fond thing vainly invented, and grounded upon no warranty of Scripture, but rather repugnant to the word of God.' (Article xxii.) In this, as in any other case of religious controversy, it is right to take the account of the doctrine from the persons who believe in it, and not from a statement of their opponents. Thus Bellarmine says, 'It is not lawful to ask of the saints to grant to us, as if they were the *authors* of divine benefits, glory, or grace, or the other means of blessedness. This is proved, first, from Scripture: "The Lord will give grace and glory" (*Psalm* 84). Secondly, from the usage of the church; for in the mass prayers and the saints' offices we never ask anything else but that at their prayers benefits may be granted to us by God. Thirdly, from reason; for what we need surpasses the power of the creature, and therefore even of saints; therefore we ought to ask nothing from saints beyond their impetrating from God what is profitable to us. Fourthly, from Augustine and Theodoret, who expressly teach that saints are not to be invoked as Gods, but as able to gain from God what they wish. However, it must be observed, when we say that nothing should be asked of saints but their prayers for us, the question is not about the words, but the sense of the words. For, as far as words go, it is lawful to say, "St. Peter, pity me, save me, open for me the gate of heaven;" also, "give me health of body, patience, fortitude, &c.," provided that we mean "save and pity me by praying for me;" "grant me this or that by thy prayers and merits." For so speaks Gregory Nazianzen, and many others of the antients.' (*De Sanct. Beat.*, i. 17.) The doctrine of the Roman Catholic church is explicitly stated in the council of Trent: 'Though the church has been accustomed sometimes to celebrate a few masses to the honour and remembrance of saints, yet she doth not teach that sacrifice is offered to them, but to God alone, who crowned them; wherefore neither is the priest wont to say, I offer sacrifice to thee, O Peter, or O Paul, but to God.' (*Sess.*, 22.)

The Lives of the Saints have been written in the 'Acta Sanctorum,' 45 vols. fol.; and in Alban Butler's 'Lives of the Saints,' 12 vols. 8vo.

SAINT ANTHONY'S FIRE. [ERYSIPELAS.]

SAINT EVREMOND. [EVREMOND.]

SAINT IVES, a municipal and parliamentary borough in the county of Cornwall, on the northern coast of the county, near its western extremity, 277 miles from London by Basingstoke, Andover, Salisbury, Dorchester, Exeter, Launceston, Bodmin, Redruth, and St. Erth.

St. Ives was originally called St. Iie's, from Iia, 'a woman of great sanctity, who came hither from Ireland, about the year 460.' In the early part of the sixteenth century it appears to have suffered much from the encroachment of the sand on the coast. Leland thus describes the situation of the town and the injury sustained by it from this cause:—'The place that the chief of the toun hath, and partely dooth stond yn, is a very peninsula, and is extendid into the se of Severn as a cape. Moste parte of the houses in the peninsula be sore oppressid or over-coverid with sandes that the stormy windes and rages castith up there. This calamite hath continuid ther litle above twenty yeres.' At the present time a range of sandy downs, covered with a thin turf, and affording pasturage to sheep, extends along the coast north-eastward from St. Ives nearly to Padstow. Beneath these downs, which are in some places a mile broad and fifty or sixty yards above the level of the sea, is found a vegetable soil, with regular enclosures and remains of houses.

The town stands, as described by Leland, partly on a peninsula or headland at the north-western extremity of St. Ives Bay, extending inland along the roads to Penzance and to Redruth. The municipal borough is co-extensive with the parish, and includes an area of 1850 statute acres, with a population, in 1831, of 4776; there were 924 inhabited houses, 41 uninhabited, and 37 building. The houses on the Redruth road are well built and roofed with slate. In other parts they are inferior, and the streets are generally narrow and uneven, neither lighted nor regularly paved. The general appearance of the town is mean. There are a town-hall and a market-house, rebuilt in 1832, and a small gaol, with two apartments or cells, on the staircase of the town-hall. The church is a spacious building, with a lofty tower; and there are one or two Methodist meeting-houses. There is a pier, built above half a century ago by subscription, and a building, formerly a lighthouse, now used for keeping government stores. A breakwater was commenced, at an expense of 5000*l.*, but has never been finished. A battery defends the approach by sea.

The chief business of the place is connected with the mines or pilchard fisheries of the neighbourhood. Some ship-building and rope and sail making are carried on. The exports are chiefly pilchards, of which large quantities are cured and sent to Italy and other countries on the shores of the Mediterranean, and tin and copper ore, which are sent to Bristol. There are on the streams near the town several flour-mills and mills for preparing the ores. There are two weekly markets, one of them inconsiderable, and two (antiently four) yearly fairs.

St. Ives was a corporate town in the reign of Philip and Mary, when it first sent representatives to parliament, but the only charter is one of James II., A.D. 1685. Under the Municipal Reform Act the boundary of the borough remained unaltered; but a more contracted one has been recommended by the boundary commissioners, excluding the rural districts of the parish. The corporation consists of four aldermen and twelve councillors, and the borough has a commission of the peace. The Court of Record for the borough, granted by the charter, has not been used in modern times. Petty-sessions are held weekly, and quarter-sessions. By the Parliamentary Reform Act the number of representatives was reduced to one. By the Boundary Act the parishes of Lelant and Towednack, adjacent to the borough, were added to it for parliamentary purposes. The number of voters on the register in 1834-5, was 599; in 1835-6, 504.

The living is a perpetual curacy, of the clear yearly value of 103*l.*, in the archdeaconry of Cornwall and diocese of Exeter.

There were in the parish, in 1833, twelve infant or dame schools, with 145 males and 169 females; seven other day-schools, with 147 males and 110 females; and three Sunday schools, with 264 males and 305 females.

SAINT JOHN, H. [BOLINGBROKE.]

SAINT VITUS'S DANCE. [CHOREA.]

SAINTE CROIX. [STE. CROIX.]

SAINTE MARIE. [STE. MARIE.]

SAINTE MARIE-AUX-MINES. [RHIN, HAUT.]

SAINTES, a town in France, capital of an arrondissement in the department of Charente Inférieure; 254 miles in a direct line south-west of Paris, or 304 miles by the road through Orléans, Tours, Poitiers, Niort, and St. Jean d'Angély; in 45° 44′ N. lat. and 0° 39′ W. long.

This town was known to the Romans by the name of Mediolanum or Mediolanium; and was the chief town of the Santones or Santoni, from whom, in the latter period of the Roman domination, it took the name of Santones, whence by corruption the modern name 'Saintes' has been derived. It is mentioned in the 'Antonine Itinerary,' the 'Theodosian Table,' and the 'Notitia Provinciarum;' and by Strabo, Ptolemy, Ammianus Marcellinus (who speaks of it as one of the most flourishing towns of Aquitania), Ausonius and Sidonius Apollinaris (who call it Santonus and Santoni). There are several Roman remains, especially a large triumphal arch with two archways through it, constructed of enormous stones without cement; the remains of an amphitheatre, almost as large as that of Nîmes, but in a more ruinous condition, of an aqueduct, and of a circus. Several antiquities of minor importance were discovered in 1815 and 1816. On the downfal of the Roman empire, it was occupied successively by the Visigoths and the Franks, and in A.D. 850 was pillaged by the Northmen or Normans. It became the seat of a bishopric in the tenth century, and several ecclesiastical councils were held here. It was the capital of the province of Saintonge, and was, with it, included in the duchy of Guienne; the heiress of which, Eléonore, retired to an abbey here after the dissolution of her marriage with Louis le Jeune. It came, through her subsequent marriage with Henry II., into the hands of the kings of England, who retained it until it was taken from them by Charles V.

The town stands in a pleasant situation at the foot of a hill rising from the left bank of the Charente, over which river is a stone bridge: it has a pleasant appearance at a distance; but the interior does not correspond, for the streets are narrow, crooked, and dirty, and the houses generally ill built. The ex-cathedral is popularly said to have been erected by Charlemagne; it has a fine Gothic steeple. The church of St. Eutrope or Eutropius has also a fine steeple, erected by Louis XI. The buildings of the abbey to which Eléonore retired are now occupied as a cavalry barrack; and the ex-episcopal palace is the hotel of the subprefect. The theatre and the college present nothing remarkable in their architecture; in the latter is the public library of 24,000 volumes.

The population of Saintes, in 1826, was 10,300 for the commune; in 1831, 7521 for the town, or 10,437 for the whole commune; and in 1836, 9559 for the commune. The manufactures are of light woollen stuffs, hosiery, and earthenware; there are dye-houses, tan-yards, and cooperages. The town stands in the midst of a rich wine country, and much wine and excellent brandy (Cognac brandy) is produced; these articles, with grain and wool, and the goods manufactured in the town, form the chief articles of trade. There are twelve fairs in the year. There are quarries of excellent stone near the town.

Saintes has a consistorial reformed church; an agricultural society; a departmental nursery; a college or high school, with a cabinet of natural philosophy annexed; a public library, and a museum of natural history. There are some judicial and fiscal offices. From the time of the division of France into departments, to the year 1810, Saintes was the capital of the department, but it has now yielded that dignity to La Rochelle. Its arrondissement had, in 1831, a population of 104,933.

SAINTONGE, a province of France, lying on the coast of the Atlantic. It was bounded on the north-west by the little province of Aunis, from which it was in one part separated by the Charente, on the north-east by Poitou, on the east by Angoumois or Angoumais, on the south and south-west by Le Bordelais or Guyenne Proper, from which it was separated by the Gironde, and on the west by the ocean. It was united with Angoumois into one military government; and the district of Brouageais, which extended along the sea-coast between the Charente and Gironde, was detached from it, and annexed to the government of Aunis, so as to deprive Saintonge of its maritime character.

Saintonge was divided into Haute and Basse, or Upper and Lower, separated from each other by the Charente. Haute or Upper Saintonge, which was south of the Charente, was by far the larger of the two, and comprehended among its subdivisions the districts of Brouageais and the Isle of Arvert, which latter is a peninsula, and not an island, between the little river Seudre and the Gironde. The chief town of Haute Saintonge and of the whole province was Saintes [SAINTES]: among the other towns were Marennes (population 1969 town, 4605 whole commune), Jonzac (population 1798 town, 2618 whole commune) [CHARENTE INFERIEURE], and Barbezieux (population 2437 town, 2756 whole commune) [BARBEZIEUX]. Basse or Lower Saintonge had for its chief town St. Jean d'Angély (population 5326 town, 6031 whole commune) [JEAN D'ANGELY, ST.]. Among the other towns were Tonnay Charente (population 1791 town, 3206 whole commune), and St. Savinien (population 2465 town, 3559 whole commune). [CHARENTE INFERIEURE.] The population of these towns is from the census of 1831. Saintonge is now comprehended in the department of Charente Inférieure, except a very small part which is included in the department of Charente.

The province obtained its name from the Celtic people the Santones or Santoni, by whom, in Cæsar's time, it was inhabited. Under the Romans, it was included in Aquitania; and on the subdivision of that province, in Aquitania Secunda. It fell into the hands successively of the Visigoths and the Franks, and formed part of the duchy of Aquitaine, afterwards Guienne. [SAINTES.]

SAJOU. [SAPAJOU.]

SAKIS. The genus *Pithecia* of Desmarest and Illiger comprehends those American monkeys which are generally known by the name of *Sakis*, or rather those Sakis which have for the most part long and bushy tails, and thus have obtained the name of *Fox-tailed Monkeys;* for the term *Saki*, in its general application, designates any American monkey whose tail is not prehensile.

Pithecia.

Generic Character.—Facial angle, 60 degrees; head round, muzzle short, ears moderate, rounded; canine teeth very strong; tail shorter than the body, not prehensile, and covered with very long hairs; feet pentadactyle, nails claw-like, short and bent; habits nocturnal.

Dental formula:—Incisors $\frac{4}{4}$; canines $\frac{1-1}{1-1}$; molars $\frac{6-6}{6-6}$ = 36.

These *Night monkeys* or *Fox-tailed monkeys* are gregarious.

Examples, *Pithecia Satanas*, *Pithecia Melanocephala*.

Pithecia Satanas.—*Description.*—Colour entirely dusky black, paler beneath, where the hair becomes very thin, and has a purplish tinge which is visible on the face and hands. Hair of the very bushy tail, which is nearly of the length of the body, long and soft. Total length, including the tail, about two feet nine inches.

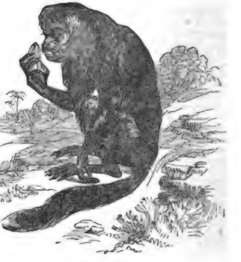
The hair of the head is thick, and falls over the forehead, and the beard is very much developed.

The *female* is rusty brown.

This is the *Cuxio* of Humboldt; *Cebus Satanas*, Hoffm.; *Brachyurus Israelita* of Spix.

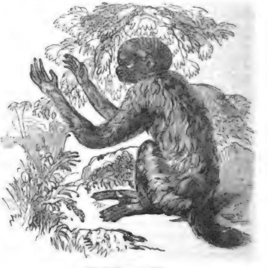
Locality.—The forests of Brazil; Para, on the banks o. the Orinoco.

Food.—This species is partial to the fruit of a kind of palm; and it is represented in the act of eating of it, by Humboldt, from whose figure ours is taken.



Pithecia Satanas.

Pithecia Melanocephala.—Head very round, naked, and of a dull black colour; its physiognomy reminding the spectator of an old negro. The hair of the head directed forwards; eyes large and sunk, and the eye-brows composed of strong bristles. Nose flat; separation of the nostrils wide. No beard. Ears bare and very large. Body covered with yellowish-brown, straight, long, and shining hair; but the breast, belly, and outsides of the arms are of a lighter hue. Hands black, fingers very long, nails flattened. Tai. thick, about a sixth shorter than the body, and of the same colour, except at the end, which is black.



Pithecia Melanocephala.

This is the *Simia Melanocephala* and *Cacajao* of Humboldt and Bonpland, also called in America *Caruiri*, *Monofeo*, *Chacuto*, *Chucuzo*, and *Mono-robon*. The scientific travellers just named considered it to be very rare, and only met with one individual, which they saw in an Indian hut at San Francisco Solano; it is well described as being among its congeners what the *Magot* of Barbary is among the long-tailed *Macaques*.

Locality.—The forests which border the rivers Rio Negro and Cassiquiare.

Food, Habits, &c.—All kinds of fruit are acceptable to the voracious *Cacajao*, which is a weak, very inactive, mild-tempered, and timid animal. It even shrank from some of the small *Sapajous*. It trembled violently at the sight of a crocodile or serpent. When about to seize anything, it stretches forth its arms in the manner represented in the cut, but holds the object with difficulty, on account of the length and slenderness of the fingers. It lives in troops.

We cannot quit this race of monkeys without laying before the reader Humboldt's graphic account of another species, *Pithecia Chiropotes*, the *Capuchin of the Orinoco*, which is very like *Pithecia Satanas*, except in colour, indeed so like, that an uncoloured figure of the one might well serve for that of the other. *Pithecia Chiropotes* is brownish red; the beard is blackish brown, arises below the ears, and covers a part of the breast. The eyes are sunk and large; the tail, like that of *P. Satanas*, is bushy; the claws are bent except on the thumbs.

Humboldt says, that of all the monkeys of America, the *Capuchin of the Orinoco* bears the greatest resemblance in its features to man. The eyes have a mingled expression of melancholy and ferocity, and the facial angle appears much less than it really is, in consequence of the chin being concealed by the long thick beard. Strong, active, and fierce, it is very difficult to tame, and when its angry passions are roused, it raises itself upon its hinder extremities, and leaps round the aggressor grinding its teeth. It drinks but seldom; when it does so, the draught is not taken by applying the lips to the liquid, as the other American monkeys do, but the water is taken up in the hollow of the hand, and carried to the mouth, the head being inclined on the shoulder. The spectator who would see this action, which is performed with great deliberation, must remain concealed. If the beard is wetted, the *Capuchin* becomes furious, and it is Humboldt's opinion that the method of drinking above described, has been adopted from the impossibility of applying the lips to the water, in the ordinary way, without wetting the beard.

This species is not gregarious; nor is the male often found in company with the female. Its hoarse and hollow cry is seldom heard.

SAL AMMONIAC. [AMMONIA.]

SALA. [SWEDEN.]

SALA'CIA, a name applied to a genus of plants of the natural family of Hippocrateaceæ, which has been so differently defined by different botanists, that it sometimes includes species found in Asia, Africa, and America. At other times the American species are referred to the genus Tonsella, and the African species to the genus Calypso, and those of India to the genus Johnia, the last named in compliment to Dr. John, a Danish missionary, who was one of the founders of the Botanic Garden at Tranquebar, and sent many new plants to Dr. Roxburgh. The whole are formed of species which have little beauty, but the fruit of both the species of Johnia is eatable.

SALADIN. [SALAH-ED-DEEN.]

SALAH-ED-DEEN (*Malek-al-Nasser Salah-ed-deen Abu-Modhaffer Yusef*), better known to European readers by the famous name of *Saladin*, was born A.D. 1137 (A.H. 532), in the castle of Tecrit on the Tigris, of which his father Ayub, a Koord of the tribe of Ravendooz, was governor for the Seljookian sovereign of Persia. Ayub and his brother Shîrakoh subsequently transferred themselves to the service of Zenghi, *atabek* of Syria, by whose son, the famous sultan Noor-ed-deen [NOUREDDIN], they were raised to high military honours; and when Shîrakoh (in 1163) was appointed general of the troops designed to reinstate the vizir Shawer in Egypt, a subordinate command was entrusted to his nephew,[*] whose disinclination to the service was overruled by the express mandate of Noor-ed-deen. In 1166 he again accompanied Shîrakoh into Egypt, where his defence of Alexandria for three months against the superior forces of the Franks of Palestine established his military reputation, and gained for him, according to the Christian writers, the honour of knighthood from the king of Jerusalem, Amawry; but the Syrian forces were again compelled to evacuate the country, and it was not till the third expedition (1168) that the subjugation of Egypt was completed. Shîrakoh now became, with the nominal rank of vizir to the Fatimite caliph, viceroy of the kingdom for Noor-ed-deen; but dying the same year, bequeathed his authority to his nephew, who continued to govern Egypt, assisted by the advice and experience of his father Ayub, who had been invited from Damascus to share the prosperity of his son. The last of the Fatimites, Aded Ledini'llah, still bore the title of caliph of Egypt; but even this shadow of schismatic sovereignty was hateful to the bigotry of Noor-ed-deen; and in obedience to his orders, his lieutenant deposed the Fatimite dynasty by a simple ordinance that the *khotbah* or public prayer should be read in the name of the Abbasside caliph Mostadhi; and Aded opportunely dying eleven days after, this important revolution was effected (A.D. 1171, A.H. 567) 'without so much' (in the words of Abulfeda) 'as two goats butting at each other.' The extinction of the Fatimites left Salah-ed-deen virtually sovereign of Egypt; and though in compliance with the prudent counsels of his father he continued to render every external mark of allegiance to Noor-ed-deen, he pertinaciously evaded all the requisitions for military assistance addressed to him by his liege lord, who was preparing to enforce obedience by arms, when Salah-ed-deen was spared the odium of this ungrateful contest by the death of Noor-ed-deen, A.D. 1173, A.H. 569.[*] His heir, Malek-al-Saleh Ismail, a boy eleven years old, was inadequate to the weight of empire: disputes speedily arose among his emirs, and Salah-ed-deen availed himself of the confusion to seize Damascus, which he occupied unopposed (1174). Emesa, Hamah, and other towns dependent on Damascus shared its fate; and when Malek-al-Saleh attempted to regain them by the aid of his cousin Seif-ed-deen Ghazi, atabek of Mosul, the combined forces were routed in two great battles, and Saleh, besieged in Aleppo, was forced to purchase peace by the cession of all southern Syria. Salah-ed-deen now assumed the title of Sultan and all the prerogatives of established royalty, and extended his dominions by the conquest of most of the petty sovereignties on the frontiers of Syria and Mesopotamia. The Ismailis, or Assassins of Lebanon, whose emissaries had attempted his life at the siege of Aleppo, were also chastised and reduced to submission; but in his first encounter with the Franks of Palestine he sustained a disastrous defeat near Ramla from Reginald de Chatillon, Nov. 1177, A.H. 573. The four next years were spent principally in Egypt, the affairs of Syria being conducted by his lieutenants; but in 1182 he quitted Cairo for the last time, and resuming his encroachments on the territories of the atabeks, captured in succession Edessa, Amida, Nisibin, &c.; and though repulsed before Moussoul, succeeded (1183) in possessing himself of the long-coveted city of Aleppo, by a convention with Amad-ed-deen Zenghi II., who had succeeded Malek-al-Saleh. From Yemen to Mount Taurus in Cilicia, and from Tripoli in Africa to the Tigris, the continuity of the rule of Salah-ed-deen was now interrupted only by the Latin kingdom of Jerusalem; and the violation by Reginald de Chatillon of a four years' truce, concluded in 1185, soon afforded a pretext for hostilities. In the famous battle of Hittin, or Tiberias (July 1187, A.H. 583), the Christians, betrayed by the count of Tripoli, were utterly overthrown; the king, Gui de Lusignan, was taken prisoner, and received by the victor with royal generosity; while his partner in captivity, Reginald de Chatillon, was decapitated, as a punishment for his perfidy, by the hand of Salah-ed-deen himself. All the towns of the Frank kingdom, Acre, Beirout, Ascalon, now rapidly fell before the arms of the sultan; and his triumph was crowned by the capture of Jerusalem, which surrendered after a siege of fourteen days (Oct. 2, 1187), after having been 88 years subject to the Franks. The two next years were principally employed in reducing the fragments of the Latin dominion; but Tyre was successfully defended by Conrad of Moutferrat, and the appearance of the third Crusade (1189) enabled the Christians again to take the field. The two years' siege of Acre (1189-91) is memorable in the history of the Crusades. The kings of France and England, Philip-Augustus and Richard Cœur-de-Lion, animated by their personal exertions the efforts of the besiegers, while the Moslems, directed by the sultan, strove with equal zeal for the relief of the invested fortress: 'never' (in the words of Gibbon) 'did the flame of enthusiasm burn with fiercer and more destructive rage;' but Acre was at length forced to capitulate, and the Crusaders advancing along the coast, took Cæsarea and Jaffa, while Ascalon, after an incessant battle of eleven days during the march, was only saved by being dismantled and rendered untenable.

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[*] D'Herbelot ('Bibliothèque Orient.' art. *Salaheddin*) erroneously speaks of Shîrakoh and Salah-ed-deen as brothers; but under *Schirgouch* (Shîrakoh) he correctly describes the former as uncle of the latter.

[*] D'Herbelot (art. *Noureddin*) incorrectly states that Noor-ed-deen actually invaded Egypt, and reduced Salah-ed-deen.

In the spring of 1192 hostilities were resumed; and the Franks, led by the king of England, penetrated to within a short distance of Jerusalem, where Salah-ed-deen awaited their attack; but the dissensions of the Crusaders occasioned their retreat; and both sides, wearied by the never-ending struggle, were not unwilling to listen to terms of accommodation. The first extraordinary proposal of Richard, that Malek-al-Adel Seif-ed-deen, brother of Salah-ed-deen, should, after embracing Christianity, marry his sister and become king of Jerusalem, though seriously entertained for a time, was ultimately abandoned; and the three years' truce which was concluded, Sept. 1192, A.H. 588, left Jerusalem to the sultan, while the Christians were confirmed in possession of the coast from Jaffa to Tyre. Salah-ed-deen survived only a few months the termination of the war. His constitution was broken by the constant toil to which he had for many years been subjected; and a bilious fever which had seized him at Damascus, carried him off after twelve days' illness, March 4, A.D. 1192, Sefer 29 (Abulfeda; not 27, as stated in the *Art de Verifier les Dates*), A.H. 589, aged 57 lunar years, of which he had reigned more than twenty, reckoning from the death of Noor-ed-deen.

The popular tales of the shroud displayed for a standard, as an emblem of departed greatness, and of the equal distribution of alms among Moslems, Christians, and Jews, are unnoticed by Oriental writers, and are probably fictitious. The character of Salah-ed-deen has been, like that of his predecessor Noor-ed-deen, a favourite theme for eulogy among the writers both of the East and the West. The historian Abulfeda, who was himself descended from a collateral branch of the Ayubite family, and the cadhi Bohadin (whose biography of his sovereign and friend has been rendered familiar by the edition of Schultens, Leyden, 1755), are scarcely more profuse than the Christian chronicles of the Crusades in their panegyrics on the valour, justice, and magnanimity which shone conspicuous in the life and actions of the sultan of Egypt and Syria. His ingratitude to the family of his early benefactor Noor-ed-deen, and the insatiable ambition which led him to despoil so many minor princes of his own faith, are more than atoned for in the eyes of the Orientals by his exploits in the holy war against the Frank invaders of Palestine, and by the rigid justice which he administered impartially to the meanest suppliant for redress; and his generous humanity to the helpless multitude of captives which fell into his hands at the capture of Jerusalem may be favourably contrasted with the massacre of the garrison of Acre, after the capitulation, by the orders of Cœur-de-Lion. The supremacy of his power and virtues was recognised by the voluntary homage of contemporary princes; and Abulfeda relates that on one occasion his stirrup was held by Kaissar-Shah, a Seljookian prince of Anatolia, while Ala-ed-deen, atabek of Moussoul, of the race of Zenghi, arranged his robes after he had mounted. His zeal for the improvement of his territories was attested by the erection of numerous fountains and caravanseras, particularly on the road to Mecca; and the numerous public buildings with which he decorated his first and favourite realm of Egypt, though attributed in the lapse of years, from the similarity of name, to the patriarch Joseph (Yusef), still remain as monuments of his splendor. At the death of Salah-ed-deen, his vast dominions were again divided: the three eldest of his sixteen sons received the kingdoms of Egypt, Damascus, and Aleppo, while the others were provided with appanages under the suzerainté of their brothers; but discord speedily succeeded, and the dominions of the first-named branches were eventually seized by their uncle Seif-ed-deen (the Saphadin of Christian writers), whose son Malek-al-Kamel was married to the only daughter of Salah-ed-deen. The branch of Aleppo maintained itself longer; and on the extinction of the Ayubites descended from Seif-ed-deen in Egypt and Damascus, by the revolt of the Baharite Mamelukes (A.D. 1250, A.H. 648), the reigning sultan of Aleppo, a great-grandson of Salah-ed-deen, and bearing, like his ancestors, the titles of Malek-al-Nasser Salah-ed-deen Yusef, succeeded in reuniting Damascus to his dominions; but ten years later his power was overthrown by the irruption of the Moguls from Persia; Malek-al-Nasser submitted to their leader Hulagu-khan, and was put to death by his orders (A.D. 1260, A.H. 658), and with him ended the direct line of Salah-ed-deen.

(Bohadin, *Saladini Vita et Res Gestæ;* Abulfeda; Abulfaraj; Isfahani; Vinisauf; D'Herbelot; De Guignes; Gibbon; Von Hammer, *History of the Assassins;* &c.)

SALAMANCA (*Salmantica*), a city of Spain, and the capital of the province of that name, is built in the form of an amphitheatre on the banks of the Tormes, which washes part of its walls. The numerous monastic buildings and fine old churches give this city so venerable an aspect, that the Spaniards of old called it 'Roma la chica' (Little Rome). (Medina, *Grandezas de España*, f. xcvi.) The new cathedral, begun by Juan Gil de Hontañon in 1513, but which was not finished till 1734, is a magnificent building, in a style partly Gothic and partly Italian, and ornamented with exquisite oak carvings and marble sculptures. Among the latter the most admired are the Adoration of the Sages, which is placed in bold relief over the principal gate, and the Entrance of Our Saviour into Jerusalem, over another gate. The cathedral is 378 feet in length and 181 in width: the height at the nave is 130 feet. It contains some good pictures by Blas de Navarrete, surnamed 'El Mudo' (the dumb), Gaspar Becerra, and Juan de Juanes. Close to this is the old cathedral, a very remarkable Gothic building of the 12th century, containing many interesting monuments. In one of its chapels mass is still said according to the Muzarabic ritual. [MUZARAB.] Besides the above, there are in Salamanca twenty-five parish churches, and thirty monasteries of both sexes, now shut up. During the middle ages this city acquired great celebrity by its university, one of the first in Europe. It was founded in A.D. 1200 by Alfonso IX. of Leon, and afterwards, in 1239, extended by Alfonso X., surnamed 'El Sabio' (the learned), so celebrated for the progress which astronomy made under his auspices, who incorporated with it that of Palencia. It soon rose into importance, and its professors became eminent in Europe by their acquaintance with the Arabian writers on medicine and philosophy, and through them with the writings of the Greeks. It remained however stationary during the 15th century; and whilst sound science was spreading throughout the rest of Europe, very little was taught there except medicine and dogmatic theology. The number of students, which in the 16th century amounted to 8000, is now reduced to about 1500. The university buildings consist of two divisions, separated by a wide street There are twenty-five private colleges attached to it, besides four 'collegios mayores' (superior colleges), so called from their being designed for the children of the nobility. Among these the Colegio del Arzobispo and the Colegio del Rey, which latter is a foundation of Philip II., deserve particular notice for their size and architecture. The Jesuits had likewise a college, built in 1614; but since their expulsion in 1768 it has been divided, and the southern side is appropriated to the use of the Irish students.

The city is badly built, with narrow, crooked, and dirty streets. It has however some fine squares with ornamental fountains. The principal square (Plaza Mayor), which is in the centre of the city, is a quadrangle surrounded by an arcade, embellished with marble medallions, representing several Spanish heroes, and all the kings of Castile and Leon, down to Charles III., under whose reign the square was built. Salamanca suffered greatly during the Peninsular war, having sustained several sieges, during which some of the finest monastic buildings were either completely destroyed or riddled with cannon-shot. Among the buildings which suffered is the Carmelite convent, built by Herrera, the architect who made the designs for the Escurial. West of Salamanca an engagement took place (July 22nd, 1812) between the British under Wellington and the French under Marmont. The French had abandoned the place on the first attack by the allies; but Marmont, having received reinforcements, advanced against the British line, and, after various movements, the battle took place in the narrow space between the Tormes and the city. The French commander having imprudently extended his left wing too far, Wellington took advantage of his error, and the enemy was defeated with great loss. Marmont himself was so severely wounded that General Clausel was obliged to take the command.

Under the Romans, Salamanca was a municipium of the province of Lusitania. It was the tenth military station between Saragossa and Merida on the road called *Via Lata*, most of which remains to the present day in excellent preservation. A portion of the Roman wall which formerly surrounded the city is likewise standing, as well as a colossal bull and several stones with inscriptions. The splendid bridge on the Tormes, 500 feet long, and resting on 27 arches, is also attributed to Trajan. The population of Salamanca is computed at 20,000. It has little or no trade: 41° 5′ N. lat., 5° 13′ W. long.

SALAMANCA. [MEXICAN STATES.]

SALAMANDER. [SALAMANDRIDÆ.]

SALAMA'NDRIDÆ, a family of Batrachians. The general arrangement of the Salamanders will be found in the article REPTILES. The genera comprehended under the family by Mr. Bell are *Triton*, Laur. (the ordinary or warty Newts), and *Lissotriton*, Bell (the smooth Newts); but it must be remembered that Mr. Bell treats only of the reptiles belonging to these islands.

Tschudi (*Classification der Batrachier*) makes the *Salamandrinæ* consist of the following divisions and genera:—Pleurodeles, viz. *Pleurodeles*, Waltl.; *Bradybates*, Tsch.; Salamandræ, viz. *Salamandra*, Linn.; *Pseudosalamandra*, Tsch.; *Ambystoma*, Tsch.; *Onychodactylus*, Tsch.; *Plethodon*, Tsch.; *Cylindrosoma*, Tsch.; *Œdipus*, Tsch.; *Salamandrina*, Fitz.:—Tritones: viz. *Geotriton*, Bonap.; *Hemidactylium*, Tsch.: *Cynops*, Tsch.; *Hynobius*, Tsch. *Pseudotriton*, Tsch.; *Triton*, Laur.; *Xiphonura*, Tsch:—Tritonides: viz. *Megalobatrachus*, Tsch. (*Sieboldtia*, Bonap.); *Andrias* (fossil), Tsch.; *Menopoma*, Harl.:—Proteideæ: viz. *Siredon*, Wagl. (Axolotl); *Amphiuma*, Gard.; *Menobranchus*, Harl.; *Hypochton*, Merr. (Proteus); and *Siren*.

The Prince of Canino, in his 'Amphibia Europæa ad Systema Nostrum Vertebratorum ordinata,' which gives a valuable arrangement of the European reptiles, makes his family *Salamandridæ* consist of the following subfamilies and genera:—subfam. Pleurodelina: genera, *Pleurodeles*; *Bradybates*. Subfam. Salamandrina: genera, *Seiranota*; *Salamandra*; *Geotriton*; *Euproctus*; *Triton*. The *Proteus* is placed in his family *Sirenidæ*, and subfamily *Hypochthonina*.

The following arrangement of the *Batrachians* has just been published (1841) by MM. Duméril and Bibron, in their elaborate *Erpétologie générale*:—

Characters
Body, varied in form; skin naked; most frequently without either carapace or scales.
Head, with two occipital condyles, not carried upon a narrower neck.
Feet, variable, as regards their presence, their number, their proportion—toes most frequently without claws.
Sternum, most frequently distinct, never united to the ribs, which are short or null.
Male organs of generation not projecting; eggs with soft not calcareous shells; young subject to metamorphosis

Limbs		Suborders.		Groups,			Families.
Null: body serpentiform		PEROMÈLES		OPHIOSOMES			1. Cæciloïdes.
Four or two	No tail	ANOURES, with a tongue	Distinct	PHANEROGLOSSES: with the upper jaw	Toothed: ends of toes	Little or not dilated	2. Raniformes.
						Very dilated	3. Hylæformes.
					Without teeth		4. Bufoniformes.
			Null	PHRYNAGLOSSES			5. Pipæformes.
	A tail	URODÈLES, with a neck	With neither holes nor branchiæ	ARÉTODÈRES			6. Salamandrides
			With slits or distinct holes	TRÉMATODÈRES: with branchiæ		Null	7. Amphiumides.
						Visible and persistent	8. Protéides.

ORGANIZATION OF THE SALAMANDRIDÆ.

Skeleton.—The skull of the terrestrial salamander (*Lacerta Salamandra*, Linn.; *Salamandra terrestris*, Aldr. and Ray) is well described by Cuvier as being nearly cylindrical, widened in front in order to form the semicircular face, and behind for the two crucial branches resembling those of the frogs, and containing the internal ears. But though the composition of the head resembles that of the frogs in the back and under parts, it differs remarkably in other parts: there is no girdling bone (os en ceinture), and the only representation of the ethmoid bone appears in a membranous state.

Above, the cranium is divided nearly equally between the two frontal and the two parietal bones. The anterior part of the frontal bones is articulated forwards with the bones of the nose; and, laterally, with the anterior frontal bones. The apophyses rising from the intermaxillary bones are very large, which places the external osseous nostrils very far apart. The nasal bone is placed on the upper part of each of them, between the intermaxillary, the frontal, the anterior frontal, and the maxillary bones. The anterior frontal bone occupies the cheek in front of the anterior angle of the orbit, but does not descend into the cavity, the anterior wall of which is simply membranous. Cuvier believed that he saw a very small lachrymal bone at the external angle of the anterior frontal bone. The dental part of the upper maxillary bone is carried backwards as usual, but without forming a junction with either the pterygoïd or jugal bones. Cuvier found only two occipital bones, as in the other batrachians, and each of them was intimately united with a part analogous to the *os petrosum* (rocher). A great round hole serves for the entry to the vestibule, and consequently to the *fenestra ovalis*. In the living animal it is closed by a cartilaginous plate, without any stem, and entirely hidden under the muscles. To this bone, which occupies the place of both the occipital, lateral, and petrous bones, are attached three, the lower of which (the pterygoïd), with its triangular figure, brings to the mind of the observer the three branches of which it is formed in the frogs. Its anterior angle, as has been stated, does not reach the maxillary bone, and is only connected to it by a ligament; neither does the internal angle reach the sphenoïd bone: the external angle exists under the second of the three bones here noticed, viz. the intermediate bone, that to which belongs the facet for the articulation of the jaw. This bone, Cuvier remarks, is very difficult to define; and he further says that he shall perhaps be considered very rash if he names it the jugal bone, for, far from being placed horizontally, and going forwards to join the maxillary, it lies transversely on the posterior border of the pterygoïd bone: nevertheless there is a ligament which unites it to the posterior point of the maxillary bone. The third and upper of these bones lies upon the preceding, and in the same direction; it is oblong and flat, and is attached by its internal extremity upon the lateral occipital bone, without reaching to the parietal. Supposing the jugal bone to be well named, this would be the tympanic bone; and, in fact, if the little plate which covers the *fenestra ovalis* had a handle (manche), it would pass behind the bone of which we speak, as in the frogs it passes behind the tympanic bone.

Below there is only a single sphenoïd bone, which is oblong. Two large triangular bones, which are manifestly analogous to those named *vomers* by Cuvier in the frogs, form the flooring of the nostrils below, and give off each a slender apophysis, which extends backwards under the sphenoïd parallel to its correspondent. It is to these bones and to their apophyses that the two longitudinal rows of the palatal teeth of the Salamanders adhere. Between the anterior part of these bones, behind the intermaxillaries, is a large oval space, which is filled by the membrane of the palate only: their posterior and dentary apophysis extends nearly as far backwards as the sphenoïd bone. Perhaps, observes Cuvier, it is divided at certain periods into two by a suture, and a palatine bone may then be distinguished, but he had not been able to perceive one. There is in the orbit, at its anterior wall, a great membranous space between the maxillary bone, the anterior frontal, and the vomer; and it is at the bottom of this space, and in a notch of the vomer, that the internal nostril is pierced on each side. The bottom of the orbit, on the side of the cranium, between the frontal and parietal bones on one side and the vomer and sphenoïdal bones on the other, is occupied by an oblong bone in which the optic hole is pierced, and which can only answer to the orbital wing of the sphenoïdal bone. It is this part which is membranous in the frogs, and has no existence in the serpents, in which the parietal and frontal bones each supply it by halves: here it is elevated to the state of a particular bone. The two occipital condyles are very much separated from each other, and placed at the two sides of the occipital hole.

The cranium of the European aquatic Salamanders differs in general from that of the terrestrial in having the entire head more oblong, the external nostrils more approximated, the space between the vomers a simple small hole, the pterygoïd bone a mere plate, wide behind and pointed before, &c. They also differ among themselves by sufficiently marked traits. Thus the *Triton Gesneri* has a small hole on the front of the muzzle, between the bones of the nose; and at the frontal, a post-orbital pointed process, very well marked, and directed backwards. The hole becomes a little slit in *Triton Alpestris*, in which the muzzle is shorter, and the post-orbital apophysis smaller and more transverse. In the *Triton cristatus* the post-orbital apophysis is but little marked, and the singularly rugose anterior region of the cranium has but a simple pit in lieu of a hole. In *Tritones punctatus* and *palmatus* the post-orbital apophysis is even longer than it is in *Triton Gesneri*, and on the front of the cranium are two slightly projecting lines, which unite forwards in the shape of a Y. In the Great Salamander of the Alleghanies, the *Hellbender* of the Americans (*Menopoma gigantea*), the principal frontal and anterior bones are narrower and more elongated. The first penetrate pointedly backwards between the parietal bones; forwards they extend to the external aperture of the nostrils. The nasal bones touch each other between them, and are placed between the frontal bones, the intermaxillaries, and the apertures of the nostrils. The orbital wings are but little elevated, pierced with very small optic holes, and leaving between them and the *ossa petrosa* a membranous space. The *ossa petrosa* are very distinct from the lateral occipital bones, and are entirely separated from them by a cartilage, in which the *fenestra ovalis* is pierced. The pterygoïd bones are very wide, and are articulated by one of their sides to nearly the whole of the external border of the sphenoïdal bone, which last is very much flattened and very wide: the two vomers carry their teeth not longitudinally, but transversely, on their anterior border, and parallel to the intermaxillary and maxillary teeth. Cuvier remarks further that the head of the aquatic Salamanders in the larva state offers differences which deserve to be better studied than he had been enabled to do in the midst of so many occupations. Thus, he observes, the bones which he has named vomers are less fixed at the base of the nostrils; and instead of a single row of teeth, they have their whole surface furnished with them, an observation of Signor Rusconi which Cuvier verified. The ascending apophyses of the intermaxillaries are longer and narrower, the maxillary bones are less developed, &c., circumstances all of which are found in the *Axolotl*, and of which traces are to be seen even in the *Siren*. The Salamanders have a true dental lower jaw, forming a symphysis with its congener, and carrying teeth nearly as in the generality of lizards. The rest is composed, in the ordinary adult Salamanders, of a single piece, which doubles the preceding at the posterior half of its internal surface, forms a coronoïd crest, a prominence backwards, and carries the articular tubercle, which is intimately soldered to it. In the Great American Salamander this second bone is itself divided into two portions, viz. a coronoïd and an articular portion. (*Ossemens fossiles*.)

Professor Owen, in his elaborate and excellent 'Odontography,' has a most interesting chapter on the *Teeth of Batrachians*. He remarks that the variations which the dental system presents in the Batrachian order of Reptiles are more conspicuous in the number, situation, and structure of the teeth, than in their form or mode of attachment. Certain Batrachians, he observes, are edentulous, the genus *Hylaplesia* among the tree-frogs, for example, and the *Bufonidæ*, or Toad family, with the exception of some species of *Bombinator*. The teeth when present are described by him as generally numerous, simple, of small and equal size, and close-set, either in a single row or aggregated, like the teeth of a rasp, and he points out a characteristic condition of the dental system in fishes, namely, the absence of teeth on the superior maxillary bone, as being continued in those genera of perennibranchiate Batrachians which stand lowest in the class of Reptiles; not only the superior maxillary teeth, but the bones themselves are absent, he observes, in *Siren*, *Menobranchus*, and *Proteus*. In the *Siren*, he describes the lower margin of the intermaxillary bones, and the sloping anterior and upper margin of the lower jaw as trenchant, and each encased in a sheath of firm, albuminous, minutely fibrous tissue, harder than horn. The bones thus armed slide upon each other, he tells us, like the blades of a pair of curved scissors, when the mouth is closed, and are well adapted for dividing the bodies of small fish, aquatic larvæ, worms, &c. The horny substitute for teeth in the lower jaw is supported by the bony element corresponding with the premandibular of the lepidosiren. [PROTOPTERUS.] A second bony piece applied to the inner surface of the branch of the jaw (representing the splenial or opercular element in the jaw of the crocodile) is beset with numerous minute pointed teeth, set in short oblique rows, and directed obliquely backwards. The palatal surface of the mouth is described as presenting on each side two flat, thin, and moderately broad bones, forming an apparently single, oblique, oval plate, which converges to meet its fellow at the anterior part of the palate, so as conjointly to constitute a broad rasp-like surface in the form of a chevron. The Professor regards the anterior long plate on each side as the representative of the divided vomer, and it supports six or seven oblique rows of small pointed retroverted teeth; the smaller posterior plate, which he thinks may probably be the homologue of the pterygoïd, is beset with four rows of similar teeth; and thus we have ten or eleven rows on each side of the chevron of the palate. The greatest number of denticles (11 or 12) is in the middle rows; in the anterior and posterior rows they are fewer; all are of similar size and form, corresponding with those of the lower jaw opposed to them. 'The condition of the dental system in this, the lowest of the class of reptiles,' says Mr. Owen, 'is not without interest, independently of the absence of the superior maxillary teeth, and of the presence of the palatal and inferior maxillary "dents en carde." If, for example, the dense sheath of the trenchant anterior parts of the upper and lower jaws had been completely calcified and converted into hard dentine, the correspondence between the siren and the lepidosiren would have been very striking in this part of their structure; but the maxillary sheaths of the siren being composed of horn, and being moreover easily detached from the subjacent bones, much more closely resemble the deciduous mandibles of the tadpoles of the higher Batrachians' (Part ii., pp. 188, 189.)

In the AXOLOTL also Professor Owen notices the ichthyic character of the rasp-like teeth aggregated in numerous rows upon the palatal region of the mouth, and upon the splenial or opercular element of the lower jaw; but here, he observes, the superior maxillary bones are developed, and support teeth. The premandibular and the intermaxillary bones, he adds, instead of presenting the larval condition of the horny sheath, have their alveolar border armed with a single row of small, equal, fine, and sharp-pointed denticles, which are continued above along the maxillaries; thus, he observes, establishing the commencement of the ordinary batrachian condition of the marginal teeth of the buccal cavity. As in the siren, the dentigerous bones of the palate consist of two plates on each side; the anterior pair, or vomers, converge and meet at their anterior extremities, and the minute denticles which they support are arranged quincuncially; the posterior pair of bones continued backwards, according to the usual disposition of the pterygoïds, abut against the tympanic or quadrate bones; and the denticles are confined to the anterior part of their oral surface, resembling, in their arrangement and anchylosed attachment, those of the palatal series, of which they are the posterior termination.

The superior maxillaries and their teeth are, it appears, wanting in *Menobranchus* [Necturus]; but Professor Owen observes, that in this form an advance to a higher type of dentition is perceptible by the arrangement of the teeth in a single row both upon the roof and at the margins of the mouth. The intermaxillary bones are produced backwards, and the single row of small pointed teeth which they support is opposed to a similar series upon the premandibular bones below. The palatal teeth form a single row on each of the broad bones which correspond with those described by Cuvier as the divided vomer in the higher Batrachians, and extend backwards upon the pterygoids, which support a few teeth.

The three preceding genera are perennibranchiate, and though the Proteus, like them, always retains its external gills, Professor Owen remarks that it offers a further advance to the dentition of the higher Batrachians, and to that of the *Amphiuma* especially Each intermaxillary bone carries on its alveolar border a row of eight or ten minute, fine, sharp-pointed teeth, and each premandibular bone is armed with a greater number of similar but larger teeth, arranged also in single series. The palatine bones (two vomers of Cuvier) support a row of denticles, similar to the intermaxillary crescentic series and parallel with them; but Mr. Owen points out that the horns of the palatal dental crescent are continued much farther back, terminating, as in Menobranchus, on the anterior part of the pterygoid bones. Twenty-four teeth are contained in each half of the 'crescentic or chevron-shaped series,' as the arrangement is appropriately designated by the Professor, who adds that the superior maxillary bones are represented in this form by mere cartilaginous rudiments.

Professor Owen next notices the **Amphiuma**, which, he observes, like the Proteus, presents the batrachian disposition of the teeth in a single close-set series along the alveolar border of both upper and lower jaws. 'The upper series,' he observes, 'extends along well-developed maxillary and intermaxillary bones, and in the extent of the maxillary and palatal series, especially in *Amphiuma tridactylum*, the indication of a highly interesting character in regard to the affinities of an extinct race of gigantic Batrachians with biconcave vertebræ is discernible. [Salamandroïdes.]

In the Amphiuma the palatal teeth run in a single close-set row along the lateral margins of the vomer, forming an acute angle at its anterior portion, whence the series is extended backwards on either side nearly longitudinally, and parallel with the maxillary teeth. 'All the teeth are conical, pointed, slightly curved backwards and inwards; their points glisten with a yellow metallic lustre,' whence Dr. Mitchell's name *Chrysodonta*. The number of teeth in *Amphiuma means* is, Professor Owen informs us, considerably less than in *Amphiuma tridactylum*.

We now approach a most interesting part of the inquiry illustrative of a fossil that has made some noise in the world, but which is now justly degraded to its proper place in the scale of animals, and is not a whit less interesting for such degradation. 'The Menopome exhibits,' says Professor Owen, 'the same essentially batrachian condition of the teeth as the Amphiume; but in their disposition, and in the disposition and form of the vomer, it makes a near approach to the caducibranchiate group, and allies itself most closely with the gigantic newt of Japan (*Sieboldtia*, Bonap.), and with that equally gigantic extinct species of Newt so noted in palæontology as the *Homo diluvii testis* of Scheuchzer. In the persistence of the branchial apertures, and the more complex structure of the *os hyoïdes*, the Menopome however manifests its generic distinctness from the Sieboldtia. The single close-set series of small, equal, conical, and slightly recurved teeth describes a semicircle on both the upper and lower jaws: the row of similar but smaller teeth on the anterior expanded border of the divided vomer runs parallel with and at a short distance behind the median part of the maxillary series. The premandibular teeth are received into the narrow interspace between the two rows in the upper jaw when the mouth is closed. The teeth of the Menopome, as of the Amphiume, are anchylosed by their base and part of its outer side to a slightly elevated external alveolar ridge.

'*Sieboldtia.*—The perennibranchiate or fish-like Batrachians, "doubtful reptiles," as they have been termed, lead by so easy a series of transitions to the caducibranchiate group, in which all external trace of the branchial apparatus is lost, that the artificial nature of such a division of the order is evident, and some naturalists have even hesitated whether to separate, generically, the last of the perennibranchians from the species *Sieboldtia gigantea*, with which the description of the dental system in the higher division of the Batrachians is here commenced. As regards the teeth, the difference between the great aquatic salamander of the volcanic mountains of Japan and that of the Alleghanies is very slight, and merely specific; the form, disposition, and attachment of the teeth are the same in *Sieboldtia* as in *Menopoma;* they differ slightly in relative size, those of the Japanese newt having the advantage in this respect, with a somewhat deeper implantation of their anchylosed base, and the alveolar parapet of the intermaxillary bones is higher and is slightly incurved. There are fourteen teeth in each intermaxillary, seventy-two in each superior maxillary, and sixty-four teeth in each vomer of the *Sieboldtia gigantea*.'

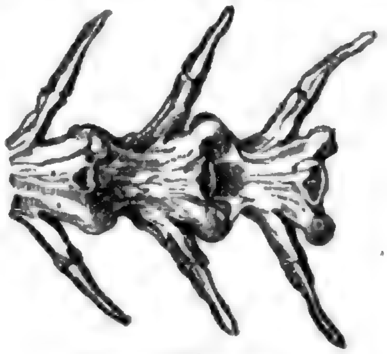
Professor Owen then points out that the disposition, form, and attachment of the teeth in the great fossil newt or salamander (*Andrias Scheuchzeri*, Tschud.) are the same as in the Menopome and Sieboldtia, but that they appear to have been relatively smaller than in the latter genus; and perhaps less compressed, and with more conspicuous basal grooves.

The Professor further remarks that all the caducibranchiate Batrachians with tails, as the newts and land salamanders, have teeth on the inferior maxillary and vomerine bones, as well as on the intermaxillaries and superior maxillaries. In the common newts (*Tritones palustris, cristatus*, and other allied species of the old world) the teeth are, he observes, confined to the bones above mentioned; they are, he informs us, equal, subcompressed, fine, sharp-pointed cones, arranged in a single close-set row, along the upper and lower margins of the mouth, and extending far back upon the roof of the mouth, in a single row along the outer margins of each vomer, the vomerine teeth being extremely minute. But it further appears, according to the same author, that most of the North American newts have a fourth locality for teeth, reminding the observer of a peculiarity in the dental system of some of the highly organised clupeoïd fishes of the South American rivers, viz. upon the under surface of the sphenoïd bone. Four rows of these sphenoïd teeth are found in the subgenus *Pseudotriton;* and in *Salamandra glutinosa*, Maclure (*Plethodon*, Tschud.) they are, Professor Owen informs us, aggregated *en brosse* to the number of three hundred and upwards, upon both the basi-sphenoïd and basi-occipital bones; a single row is set nearly across the posterior margin of each vomer, and the marginal teeth of the mouth, maxillary and intermaxillary, are arranged in a single series both above and below.

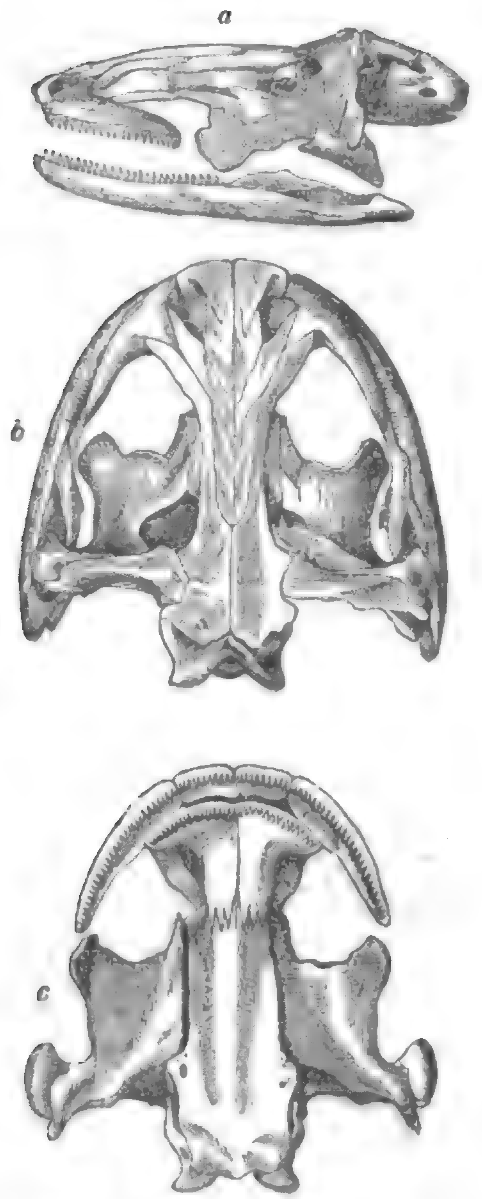
For a particular account of the teeth of the *Ranidæ* we must refer the reader to the work itself, observing here only that the frogs have no teeth on the lower jaw, though in some species (*Ceratophrys* for example) the alveolar edge of the lower jaw-bone is finely notched or dentated. The *Bufonidæ*, as a general rule, are toothless, but in the *Bombinatores* the subgenus *Hyladactylus* has teeth upon the vomer, and *Sclerophrys* has teeth on both the intermaxillary and maxillary bones. Professor Owen remarks that in microscopic structure the teeth of the existing Batrachians, like those of most Saurians, correspond with the simple mammalian teeth, and, after an elaborate description of the microscopic appearances in the tooth of a frog, proceeds to the description of the dental system in the extinct genus *Labyrinthodon*, which will be noticed in this work under the title Salamandroïdes.

Thus we are indebted to Professor Owen for a most able exposition of the dentition of the Batrachians generally, showing the gradation by which that order of reptiles is linked to the fishes on the one hand and the Saurians on the other, and the various stages of development by which the Batrachians are connected with each other. (*Odontography.*)

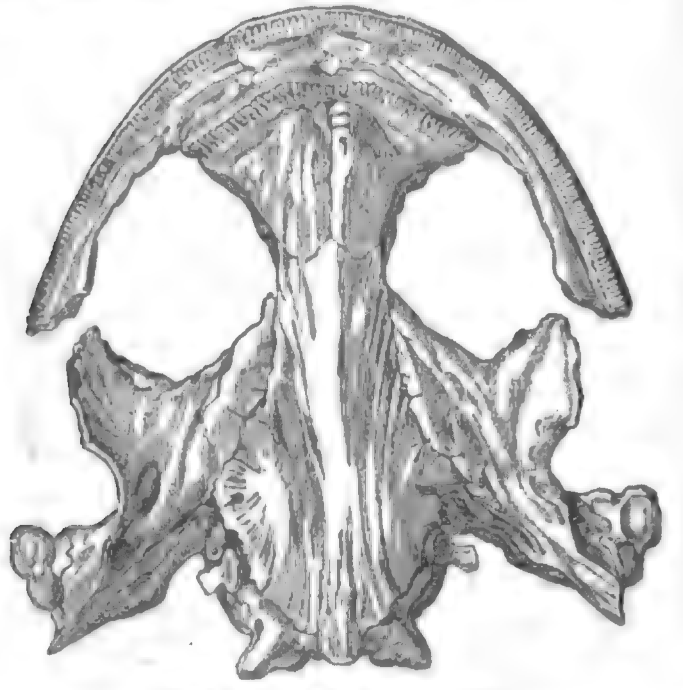
To return to the salamander, we find, as indeed might be expected from the metamorphosis which it undergoes, that its os hyoïdes is subject to changes analogous to those of the frog, though not so complete. In its larva state it has, Cuvier observes, two hyoïdian branches springing from the occipital bones, uniting forwards under the lower jaw, and a cartilaginous branchial apparatus suspended at the point of union of those branches, and supporting four arches on each side, the first of which is attached to an intermediate stem, the three following to a second two-jointed stem, and these two pairs of stem to an unequal branch, as is more clearly manifested in the axolotl. The adult aquatic salamanders preserve in the bony state the branches which still are attached below the fenestra ovalis, and terminate forward by a truncation under the middle of the lower jaw; but the anterior articulation of these branches is now become membranous. The unequal stem, in the bony state, supports on each side an osseous branch consisting of two joints, terminated by a cartilaginous point, and moreover, internally, another branch which is simple and reduced to a filament, which goes from the unequal stem to the second articulation of the external branch. In the terrestrial salamander, which can only pass a very short time in the larva state, all remains cartilaginous. The two suspensive branches or anterior horns are delicate and flat, and do not join the cranium; and the unequal stem with its two branches soldered on each side by their two ends, forms only a single chevron-shaped cartilage, each branch of which is pierced with a considerable gap. This remainder or vestige of the branchial apparatus does not prevent the co-existence of a larynx and the rudiment of a sternum; both indeed weak and membranous rather than cartilaginous. The shoulder of the salamander is, Cuvier remarks, very curious on account of the close junction of its three bones into a single one, which has the glenoïd fosset at its anterior edge, sends towards the spine a square lobe slightly enlarged above, which is the omoplate, and towards the breast a rounded disk, slightly lobated, which is composed of the clavicle and coracoïd bone, where a suture which separates them may for a long time be observed, and where there always remains a small hole. The omoplate has its spinal edge augmented by a cartilaginous prolongation. The cleido-coracoïd is also surrounded with a great cartilaginous blade in form of a crescent, which crosses upon its congener under the breast, for the only vestige of a sternum remaining is a cartilaginous blade placed behind the two preceding, and which represents the xiphoïd. The atlas of the salamander is articulated with the head by two concave facets, and with the second vertebra by the face of its body, which is also concave; for, contrary to the case of the frogs and lizards, all the anterior faces of the bodies of the vertebræ are convex in the salamanders, and all the posterior faces concave; the upper part is flat. The articular apophyses are horizontal, and united on each side by a crest, which, joined to that of the other side, gives to the vertebra a sort of roof which is rectangular, but with its lateral borders a little re-entering. The posterior parts of a vertebra lie on the anterior parts of that which follows it. In lieu of spinous apophyses, there is only a slight appearance of a longitudinal ridge. The body of the vertebra, which is cylindrical and narrowed in its middle, adheres under the roof above noticed. The transverse apophyses also adhere under the lateral crests, are directed slightly backwards, and divided by a furrow on each of their faces, so that their extremity has as it were two tubercles for carrying those into which the base of the small rib is divided. These small ribs adjoin all the cervical, dorsal, and lumbar vertebræ, except the atlas, but are only two or three lines in length, and are far from surrounding the trunk or reaching the sternum. Among the aquatic salamanders, the *Triton Gesneri* has the crest of the dorsal vertebræ more elevated and sharp than the terrestrial salamander; this crest is also rather more developed in *Triton Alpestris* and even in *Tritones punctatus* and *palmatus*; but what, adds Cuvier, is very singular, it is precisely in *Triton cristatus* that this crest is most effaced, and the upper part of the vertebra nearly plain. The vertebræ of the tail (25 or 26 in number) in the terrestrial salamander have crests and tranverse apophyses like those of the back; they become smaller and smaller, and, counting from the third caudal, there is under the body a transverse blade directed obliquely backwards, pierced with a hole at its base, which represents the chevron bones of the lizards and the other long-tailed genera. Cuvier counted 33 caudal vertebræ in the *Tritones alpestris* and *cristatus*, 34 in *Triton Gesneri*, and 36 in *Triton punctatus*. They form, he observes, a tail flattened laterally, in consequence of the elevation of their upper and lower crests. The bones of the limbs are, says Cuvier in continuation, proportioned to the smallness of the members themselves. The humerus has, above, a round head; a little lower, forwards, there is a compressed and obtuse tuberosity; and backwards, a little lower still, another very pointed one. Its lower head is flattened from before backwards, and widened to suit the condyles, between which is an articular head, rounded for the fore-arm, and above, forwards, a small fosset. The aquatic salamander has this bone more widened above than the terrestrial species. The fore-arm is composed of two separate bones. The radius has a round upper head, a narrowed body, and a compressed and widened lower head. The cubit is more equal in size, and its olecranon is very short and rounded. The carpus has five bones and two cartilages, which occupy the place of bones, seven pieces in all: the whole of these are flat, angular, disposed in a pavement-like order, and in some respects announce the structure to be seen in the ichthyosaurus. In the first rank are two, of which the smallest or radial is cartilaginous. The greatest belongs to the radius and ulna; between them on the second rank is a single one; then come, on the third rank, four for the metacarpals. The first remains cartilaginous. The metacarpals are short, flat, and narrowed in their middle. Cuvier found only one phalanx ossified on the first finger, two on the second and fourth, and three on the third. The variety of points by which the pelvis is attached to the spine is, he remarks, a very singular thing. He had individuals of the terrestrial salamander in which it was suspended from the fifteenth vertebra (counting in the atlas), and others in which it was suspended from the sixteenth; and he refers to a specimen (species undetermined) seen by M. Schultze, in which it was suspended on one side to the sixteenth vertebra, and on the other to the seventeenth. With regard to the aquatic salamanders, Cuvier found it constantly suspended to the fourteenth in *Tritones palmatus* and *alpestris*, to the fifteenth in *Tritones punctatus* and *Gesneri*, and to the seventeenth or eighteenth in *Triton cristatus*. He had an individual of the last-named species, in which it was suspended on one side to the seventeenth vertebra, and on the other to the eighteenth. The pelvis itself is quite differently formed from that of the frogs: the vertebra which supports it is like those which precede it, and has, like them, on each side a small rib, at the extremity of which the os ilii is suspended by a ligament. It is cylindrical, and widens a little on arriving at the cotyloïd cavity. The pubis and ischium are soldered together, and form, with those of the other side, from which they are distinct, a large disk, concave above, flat below, cut square in front and at the anterior parts of the sides, notched laterally and narrowed behind the cotyloïd fossæ, and terminated backwards in a concave arch. The pubis remains cartilaginous much longer than the ischium, with which it is united by a suture which makes a cross with the symphysis, and in front of this symphysis is a cartilage in the form of a Y in the muscles, which recalls to the observer the marsupial bones of the opossums. The upper head of the femur is oval; at the internal face of the neck, there is a very pointed apophysis, occupying the place of a trochanter: the lower head is widened and flattened from before backwards. There are two bones in the leg. The tibia, which is very stout upwards, has in front a ridge, which detaches itself from the upper part of the bone in the form of a slender stem, resembling the vestige of a fibula discernible in various Rodents, but this does not prevent the development of a true fibula as large as the tibia, and which descends a little lower. There are nine tarsal bones, all flat and disposed in a pavement-like order: the lower rank has five for the five metatarsal bones; the four others consist of one small (the tibial) at the internal border, one great (the fibular) at the external border, an oblong one between them, placed obliquely and answering to the tibia and fibula, and one square in the middle of all the others. Cuvier found but one phalanx on the first finger, two on the second, three on the third and fourth, and two on the last.



Vertebræ of Sieboldtia



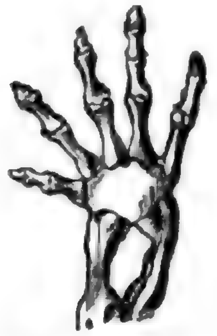
Skull of Menopoma. a, seen in profile; b, seen from above; c, cranium seen from below.



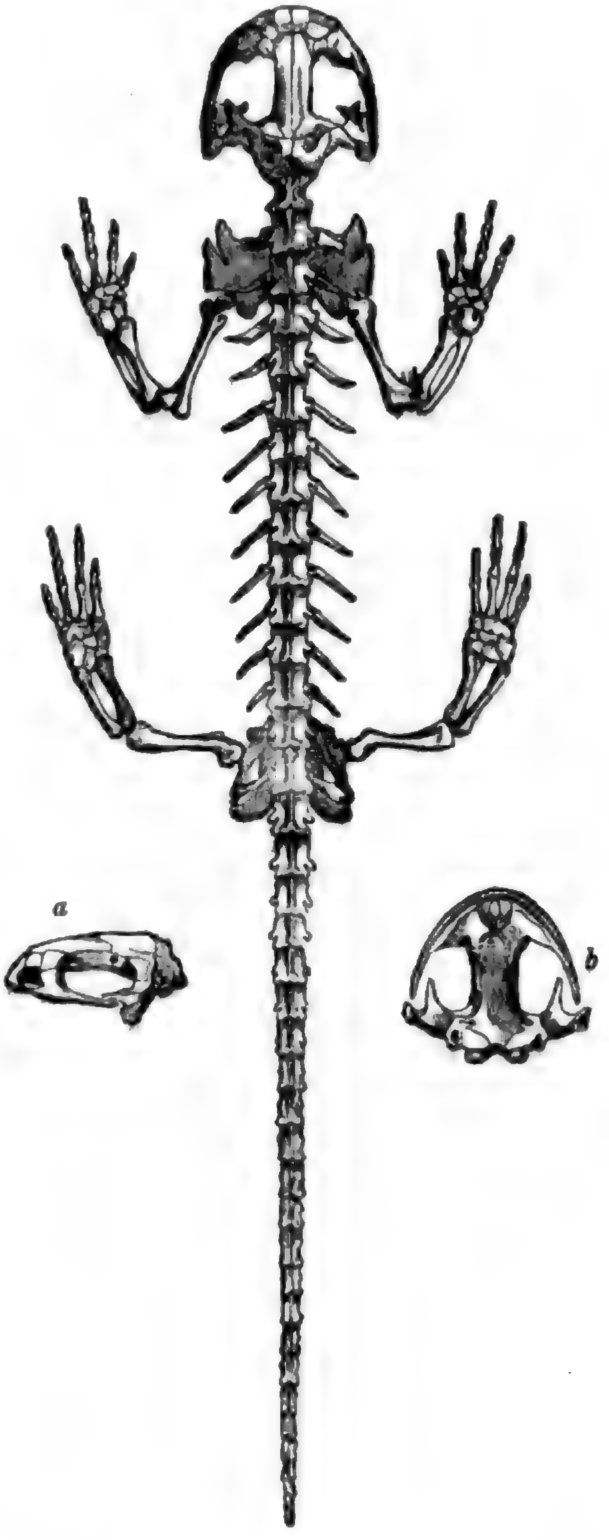
Skull of Sieboldtia, seen from below.

Generation.—Such particulars of the generation of the *Salamandridæ* as require notice will be found under the titles of the genera treated of in this article.

Reproduction.—The power of reproducing excised or injured parts has been observed in no family among the reptiles more carefully than in the *Salamandridæ*. Plateretti, Spalanzani, Murray, and others have recorded their observations with respect to this power; and Bonnet particularly has given most accurate descriptions and figures of his careful experiments. The arms or thighs of Tritons amputated



Fore-hand of Sieboldtia.



Skeleton of terrestrial Salamander.
a, Skull seen in profile; b, seen from below.

sometimes on one side, sometimes on the other, or both on the same side, were constantly reproduced, and the toes were gradually again formed and endowed with motion. The tail too, cut off at various points, was renewed, pushing out by little and little from the amputated base. In one case the same limb was reproduced four times consecutively in the same animal. Bonnet found that this reproduction was favoured by heat and retarded by cold. He observed that the parts of excised limbs were often reproduced with remarkable alterations, either of defect or excess; the deficiency or exuberance of certain parts taking upon themselves very singular forms. In many species of Tritons the long bones of the limbs detached from their principal articulation, and remaining suspended by some points which still caused them to adhere to the flesh, were found completely consolidated in a few days. The most extraordinary observation was that consequent on the total extirpation of the eye, which was extirely reproduced and perfectly organized at the end of a year. Dufay has recorded their faculty of remaining frozen up in ice for a long period without perishing.

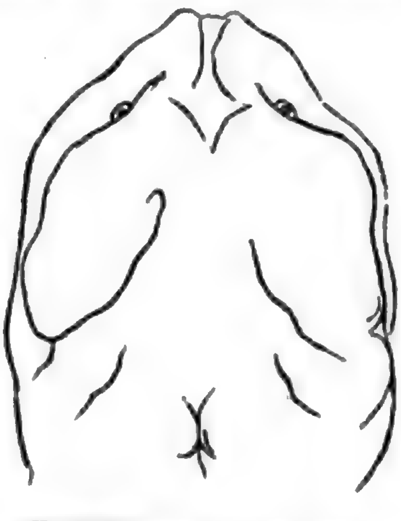
Their tenacity of life was strongly shown in an experiment made by M. Duméril. Three-fourths of the head of a *Triton marmoratus* were removed with a pair of scissors. The mutilated animal was placed by itself at the bottom of a large glass vessel in fresh water about half an inch deep, and which was carefully renewed at least once a-day. The animal, although deprived of the four principal senses, without nostrils, without eyes and ears, and without a tongue, continued to live and move slowly. Its only communication with externals was carried on by touch alone. M. Duméril relates that it was evidently conscious of existence, and walked slowly and cautiously. It raised the stump of its neck towards the surface of the water, and during the first days was seen making efforts to breathe. In less than three months reproduction and cicatrization had so done their work that there remained no aperture for the lungs or for food. At the end of three months, M. Duméril was compelled to leave it to the care of another during an absence, and it died, in all probability, as he observes, from want of attention on the part of the person who undertook the care of it. This specimen is now preserved in the Paris museum, and exhibits, as M. Duméril remarks, the singular fact of an animal having lived without a head; and a proof of the possibility and necessity, even in the Batrachians, of a sort of respiration by means of the skin. In this animal M. Duméril states that respiration was certainly thus carried on for three months, although the stump of the amputated part presented a cicatrice, the smooth surface of which proved, even when examined by a magnifying glass, that there was a complete *obturation* of the œsophagus and larynx.

Dr. von Siebold has also recorded his observations on the reproduction of wounded or lost parts in the *Triton niger*.

We now proceed to illustrate the Salamandridæ by a consideration of the genera *Menopoma*, *Sieboldtia*, *Triton*, *Lissotriton*, and *Salamandra*.

Menopoma.

Generic Character.—Head flat, broad; two concentric rows of teeth (the inner row palatine) in the upper jaw, and a single row only in the lower jaw; tongue free in front; operculum situated about halfway between the posterior edge of the rictus of the mouth and the fore leg; three opercular cartilages, between the posterior two of which is the aperture; feet fimbriated on their outer edge; toes four on the anterior feet, and five on the posterior; of the latter the fourth and fifth are webbed and without claws.



Head of Menopoma, seen from above.

This is the *Abranchus*[*] and *Menopoma* of Harlan; *Protonopsis* of Barton; *Cryptobranchus* of Leukardt and Fitzinger; *Salamandrops* of Wagler.

Example.—The only species known is *Menopoma Alleghaniensis*, Harl.; *Salamandrops Alleghaniensis*, Wagl.

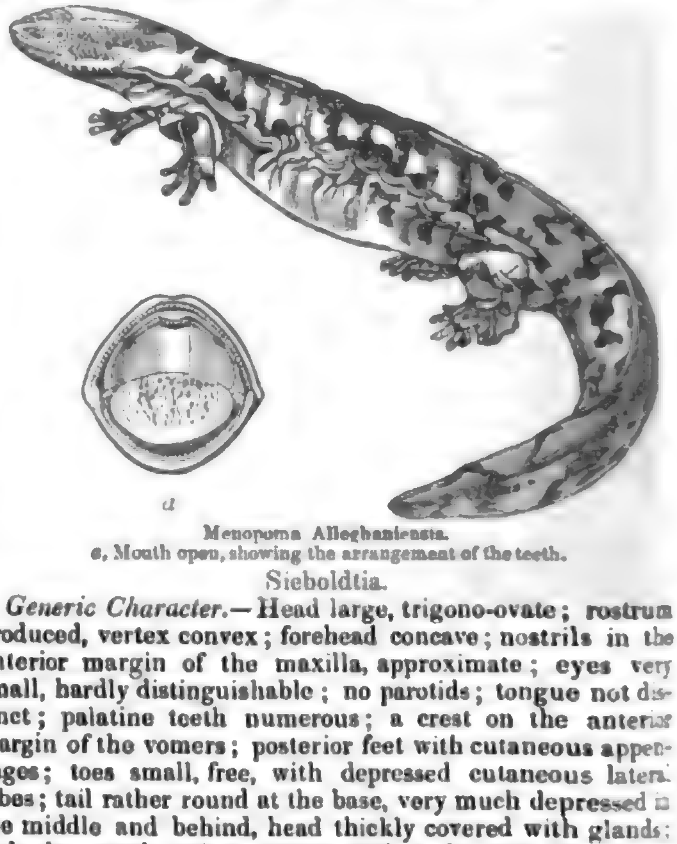
Description.—Length about two feet; head broad and flattened; mouth wide; nostrils projecting; body thick and stout; tail compressed vertically, and nearly as long as the body; legs stout and short; colour slaty with dark spots on the body; a dark line runs through the eyes.

This is the *Tweeg* of the Indians; *Hellbender*, *Mud Devil*, *Ground Puppy*, and young *Alligator* of the Anglo-Americans; and *Fischsalamander* of the Germans.

Locality.—The Ohio and Alleghany rivers.

Habits, &c.—This batrachian is carnivorous and very voracious; nothing that it can devour is spared by it. The fishermen dread it very much, and believe it to be poisonous. Indeed the appearance of the animal is altogether uncouth and forbidding.

Michaux appears to have been the first traveller who discovered and noticed the Menopoma. He states that in the torrents of the Alleghanies is found a species of Salamander, called by the inhabitants 'Alligator of the mountains,' and that there are some two feet in length. Bosc noticed the animal which Michaux procured, and which was placed in the Paris museum, very shortly in the article *Salamandre* (*Nouv. Dict. d'Hist. Nat.*). Barton's memoir enters at some length into the subject. There is a well preserved skeleton of *Menopoma Alleghaniensis* in the museum of the Royal College of Surgeons in London.



Menopoma Alleghaniensis.
a, Mouth open, showing the arrangement of the teeth.

Sieboldtia.

Generic Character.—Head large, trigono-ovate; rostrum produced, vertex convex; forehead concave; nostrils in the anterior margin of the maxilla, approximate; eyes very small, hardly distinguishable; no parotids; tongue not distinct; palatine teeth numerous; a crest on the anterior margin of the vomers; posterior feet with cutaneous appendages; toes small, free, with depressed cutaneous lateral lobes; tail rather round at the base, very much depressed in the middle and behind, head thickly covered with glands; body depressed, with transverse folds and a long thick cutaneous appendage on each side.

Cuts of the skull, showing the teeth, of the skeleton of the fore hand, and of some of the vertebræ, are given above.

This is the genus *Megalobatrachus* of Tschudi; but the Prince of Canino's name, *Sieboldtia*, has the right of priority. The genus belongs to the subfamily *Andriadinæ* of the Prince's *Salamandridæ*.

Example.—*Sieboldtia maxima.* This, which is the *Salamandra maxima* of Schlegel (*Fauna Japon*, vii., tab. vi., vii., viii.), was found by Dr. Von Siebold in a lake on a basaltic mountain in Japan. He brought away a male and a female; but the former devoured the latter during the passage, is now alive at Leyden, about a yard long, and feeds on small fishes. The gill-aperture-slit always remains open in *Menopoma*, but in this great newt the slits are closed. This animal is the nearest living analogue of *Andrias Scheuchzeri*, the celebrated *Homo diluvii testis* of Scheuchzer, which will be noticed in the account of the fossil *Salamandridæ* at the end of this article.

Triton.

Generic Character.—Head rounded, convex; vertex somewhat flattened; tongue small, semi-globular, slightly free at each side, free and pointed behind; palatine teeth numerous, disposed in two rows; body granulous; no parotids; tail compressed, as long as the body; glandular pores behind and over the eyes, and a longitudinal row of distant similar pores along each side. Toes four on the anterior and five on the posterior feet. Crests of the back and tail (in the male) separate.

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[*] Afterwards changed to Menopoma by Dr. Harlan, *Abranchus* having been pre-occupied by Van Hasselt to designate a genus of mollusks.

Example, *Triton cristatus*.

Description.—Blackish, orange-coloured beneath, sprinkled with round black spots; sides dotted with white; upper lip overhanging the lower, but not having a distinct lobe; body warty or tuberculated; tail rather smooth, compressed, sharp, trenchant above and below. Length six inches.

Male (in the spring) with an acute toothed dorsal crest; tail with a longitudinal white stripe. In winter without a crest, and much resembling the female.

Female.—No crest; lower edge of the tail orange.

Young.—Olive-brown with a sulphureous dorsal line; abdomen orange, spotted with black; lower edge of the tail orange-red.

This is the *Lacerta palustris* of Linnæus; *Salamandra aquatica* of Ray; *Salamandra cristata* of Schneider, Daudin, &c.: *Triton palustris* of Fleming; *Salamandra platycauda* of Rusconi; *Molge* of Merrett; *Grosse Wassersalamander* and *Sumpfsalamander* of Bechstein; *Warty Lizard* of Pennant; *Common Warty Newt* and *Great Water-Newt* of the British.

Geographical Distribution.—The whole of Europe; Western and Northern Asia.

Habits.—The ponds and ditches of this country abound with this the largest British newt, and a most voracious animal it is. Aquatic insects, and indeed any small living animals which come in its way, are unsparingly devoured. It is a great destroyer of tadpoles, and the smaller water-newt, *Lissotriton punctatus*, frequently falls a victim to its ferocity and voracity. Mr. Bell has taken them more than once in the act of swallowing an individual of the smaller species, which was so large as to occasion great difficulty and delay in the act of deglutition. In swimming, the legs are turned backwards to lessen resistance, and the animal is propelled principally by the tail. Every one has observed the newts, or efts, as they are called in many places, floating motionless at the surface of the water, with their limbs extended at right angles with the body, and their toes spread out. Their progression at the bottom of the water and on land is performed creepingly with their small and weak feet.

Generation.—This is the species which was the principal object of the observations of Rusconi, to which we shall presently advert; but before we do so, it is necessary to apprise the reader of the remarks made by Mr. Bell. He observes that the male seeks and follows the other sex: the tail of the former is vibrated, and, as it were, smacked by a motion similar to that of smacking a whip, several times during a few moments. Rusconi, observes Mr. Bell, asserts, and he has been followed by most subsequent writers, that impregnation is effected without contact; but the latter remarks that he has reasons, the result of his own repeated observations, for believing this to be a mistake, at least in some species.

Spallanzani has stated that the eggs, when excluded by the female, fall at once to the bottom of the water; and Cuvier, that they come forth from her 'en longs chapelets.'

Rusconi procured, in the month of May, several of these newts, which he put into a large tub, at the bottom of which he found, three days afterwards, about twenty eggs glued together endwise, three to three and four to four, so as to resemble portions of a string of beads. He gathered up these eggs carefully, and placed them in a vessel filled with some of the water from the tub. After observing them two days, he saw that they became enlarged and irregular on the surface, which he regarded as preparatory to the evolution of the germ. These appearances increased up to the fifth and sixth days, but instead of producing young animals, as he had expected, the eggs had lost their transparency, had become covered with a sort of mould, and in short had lost the faculty of evolution. The Salamanders left in the tub had in the interval deposited more eggs: these he collected as before, and thinking that the water which he had previously employed might have been improper for the purpose, he procured some from the ditches whence the newts had been taken: still without success. He then turned his attention to artificial impregnation, remembering Spallanzani's success: here too he failed. Accident, as in so many other cases, gave to Rusconi the key of the mode by which the young were brought into life. He had observed, whilst following out his experiments for artificial impregnation, that the Salamanders which had been left in the tub from time to time pressed back their hind limbs beneath the belly, and that in a few moments after this action they laid one or two eggs; these eggs did not always fall to the bottom of the water, but sometimes remained attached for a moment to the vent itself, so that some of the animals might be seen running to and fro in the tub with two or three eggs thus attached. He was at a loss to account for this pressing action of the hinder limbs, and was thinking of making some arrangement in order to enable his salamanders to support themselves at their ease during the night at the surface of the water for respiration, with a view to continuing his observations on them, when a fresh parcel of these animals were brought to him in a pail, in which many plants of *Polygonum Persicaria* had been placed to prevent the overflow of the water from the pail. He made a small bunch of these plants, and put the stems of them under a large stone to confine them at the bottom. In the evening he inspected the tub, and found all his salamanders so comfortably accommodated by the help of the plants, that by keeping the head a little elevated their nostrils were kept above the surface of the water, so that their respiration was easy. A few days afterwards, when Rusconi was examining his salamanders with the view of selecting a male and a female for repeating his experiments of artificial impregnation, he remarked that there was not one egg at the bottom of the tub. Whilst under the influence of surprise at this, he observed one of his salamanders approach one of the leaves of the plant, and direct its snout to it as if to smell it. The animal then moved gently on the leaf in the direction of its breadth, and resting upon it, pushed back its hind limbs, so as to fold back and enclose the leaf between its feet. It stayed about a minute in this position and then went away, leaving the leaf so that its apex was turned back on the petiole. After a lapse of three minutes Rusconi saw the salamander approach another leaf, apparently disposed to place itself thereon, when, casting his eyes accidentally on the branches of *Persicaria*, he discovered many other leaves doubled back just as he had seen the salamander double back that above noticed. He immediately took the bunch of plants from the tub, and on examining the doubled leaves he found that each of them enclosed an egg. He further observed that these leaves were unable to reassume their natural position, because their two surfaces were held together by the gluten with which the egg is covered; and he had to overcome the adhesive resistance before he could expand the leaf.

Rusconi enters into minute detail of the actions of the male from the time of its first pursuit of the female to the discharge of the prolific fluid, for which we refer the reader to the work itself.* During the time that the male is lashing the female with his tail, she remains immoveable; at last she moves, and slowly goes in search of a plant proper for receiving her eggs, choosing almost always the *Persicaria*. She first approaches her head to the edges of a leaf, and turns it with her snout in such a way that the lower surface of the leaf, which was towards the bottom, is turned towards her breast: then with her fore paws she passes the turned leaf beneath her belly, seizes it with her hind paws, and conducts it beneath the vent, folding it at the same time, and forming with it an angle the opening of which is directed towards the tail. The egg in escaping from the vent would thus pass through the middle of the angle formed by the leaf, but the salamander stops it in its fall by her hind feet, shuts up this angle with them, and thus forms in the leaf a fold in which the egg is held. Still on the removal of the feet the egg would fall to the bottom of the water; but the careful parent, before she quits the leaf, folds it so firmly with her hind feet that the gluten with which the envelope of the egg is surrounded spreads from the pressure on the two internal surfaces of the leaf, and prevents the folds from opening. When several eggs have been laid in this manner, in different leaves, the female remains quiet until another male comes to caress her. Rusconi did not ascertain how long the period of laying continued; but he found eggs as early as the middle of April and as late as the middle of July.

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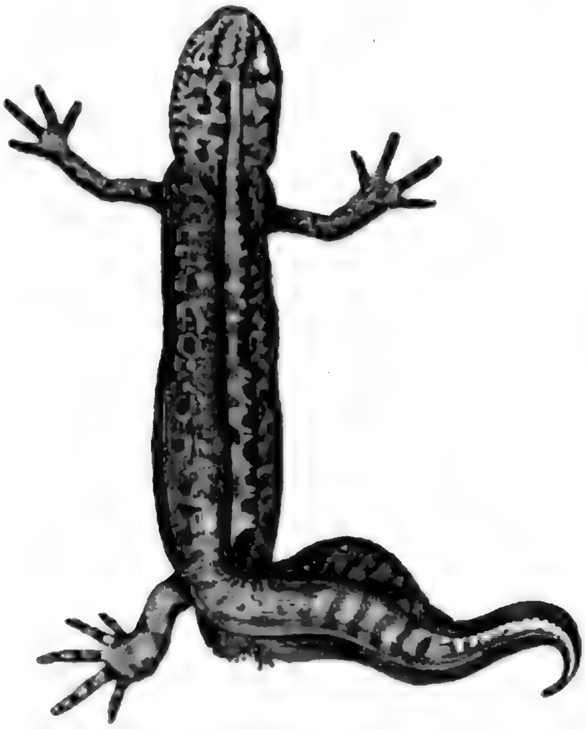
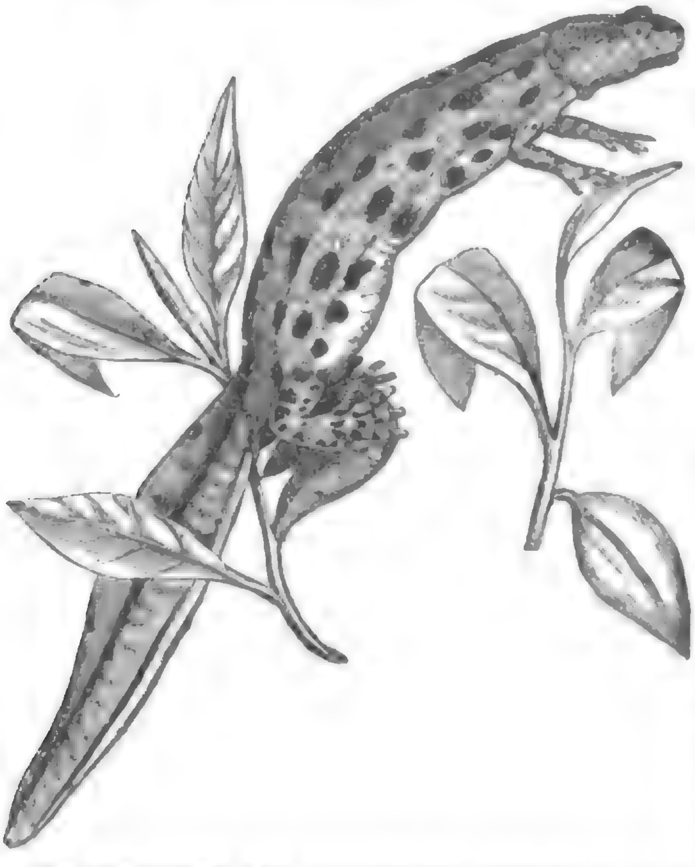
* 'Amours des Salamandres Aquatiques, et Developement du Tetard de ces Salamandres depuis l'œuf jusqu' à l'animal parfait,' Milan, 1821.

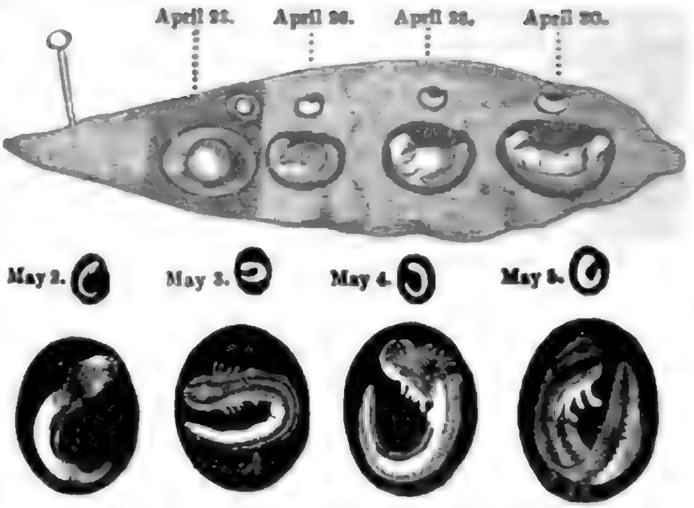


Triton cristatus, male, in the spring season, seen from above.



Triton cristatus, female, in the act of compressing a turned leaf upon her included egg. The leaves folded back represent those in which eggs have already been thus laid. (Rusconi.)

The following figures, given by the same author, exhibit the several stages of the evolution of the egg which was kept on its proper leaf: these stages are denoted by the dates of the days on which the drawings were made. Thus the figure marked 23rd April shows the egg of its natural size, and the figure below it the same magnified.


April 23.
April 26.
April 28.
April 30.
May 2.
May 3.
May 4.
May 5.

The temperature of the water during the period of Rusconi's observations varied from 22° to 27° of the centigrade scale. The globule in the centre of the ovum is white with a yellow tint, and is environed with a glairy matter, to which it is not attached, so that it can move freely in every direction. Its envelope is membranous, of glassy transparence, and covered with a very clear viscid matter: the specific gravity of this matter appears to be less than that of the globule. In three days the globule had undergone the change exhibited at April 26. Under the microscope may be observed in the embryo the commencement of the parts which are to become the head, the belly, and the tail. The globule at first becomes enlarged, then elongated, and its previously smooth surface presents some small eminences. If it has not been fecundated, or has lost its prolific power, it enlarges, nevertheless, during the first days, as in ordinary cases, but afterwards changes so as to resemble a vesicle half filled with water: when this appearance came on, the egg had lost its vitality.

On the 28th April (fifth day) the embryo has grown so long that it becomes bent in order to accommodate itself to the circumscribed envelope. Now the head, abdomen, and tail are easily distinguishable, and near the head (the larger extremity) small elevations (the rudiments of gills and forefeet) are perceptible. These parts become more apparent by the 30th, when in the concave side of the embryo and towards the head a small furrow is seen which separates the head from the abdomen, and the rudiments of a spine are distinctly visible along its convex border.

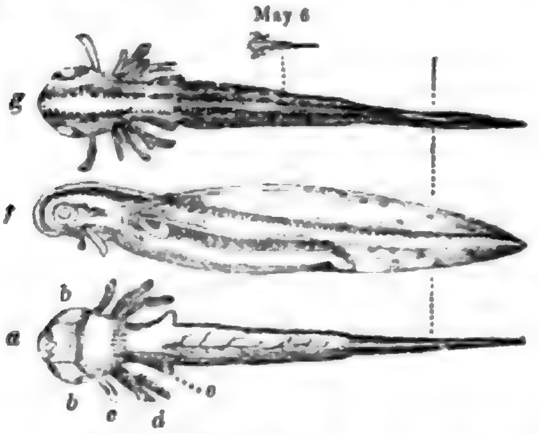
By the 2nd of May the position of the embryo is changed and the tail has already assumed its oar-like form. There is not as yet any appearance of mouth or eyes; but towards the extremity of the head small blackish points may be observed, and a slight degree of contraction between the rudiments of the gills and those of the fore-feet, distinguishing the head from the chest. Now the embryo begins to move, and its heart may be seen to beat: colour too begins to be present. This appears to be a critical state of the embryo; for almost half of those whose development was watched by Rusconi died at this period or soon after.

3rd May. The embryo, which has changed its position three or four times during the last twenty-four hours, shows in that which it here presents all the upper part of the body, which is sprinkled with little blackish spots disposed into two longitudinal bands, which extend from the head to the tail. On the side of the head, and before the two elevations which are the rudiments of the fore-feet, filaments to the number of four on each side may be observed. The two first are not gills, as some authors suppose, but are organs of station, which the author designates as claspers or hooks (crochets) on account of their analogy to the two hooks by which the embryos of the green frog suspend themselves to the leaves of the lentil.

4th May. The changes of position become more frequent. In that here presented the embryo shows the lower part of its head and trunk, which is white inclining to green. On the chest between the gills of the two sides, where the pulsations of the heart are seen, small irregular blackish spots are observable. Before the two claspers are seen also other blackish spots, forming the junction of the two bands which run along the back, as shown in the preceding figure. The circulation of the blood, which is simple, and performed by a single curved vessel, is seen in the gills, which are of a glassy transparence, and consist only of a single filament without leaflets as yet. The blood is white. The claspers or hooks in front of the gills are lengthened, and larger towards their ends than at their origin. The sides of the embryo are dotted with deep green in two irregular bands, extending from the fore-feet to the extremity of the abdomen.

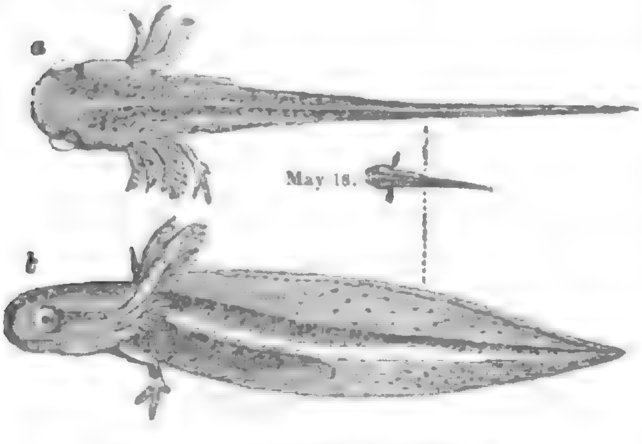
5th May. Traces of the eyes may now be just seen; and the rudiments of two leaflets are perceptible on the two longest gills. The embryo now changes its position rapidly, and appears constrained by the confinement of its prison. It tries to extend itself in a straight line, and continually applies a strong pressure to the walls of its envelope. The membrane which forms the upper border of the tail has now extended itself, diminishing in its progress, to the shoulders.

6th May. The upper small figure shows the young salamander, seen from above, and of the natural size, just escaped from the envelope. Before its escape, the embryo as it enlarges gradually dilates the envelope, which at last it tears, and so forces its way out. If it be slightly touched, it makes lateral movements with its trunk and tail, and thus swims, after a fashion, but in a different manner from that which it afterwards adopts. It moves like an automaton, striking now against a leaf, now against the side of the vessel, and as soon as it does so, it suspends itself to the body struck by its two hooks, whose extremities are covered with a viscous matter. The young salamander possibly sleeps continually at this period of its existence; for if the vessel be slightly shaken, its body oscillates with the motion of the water, as though it were inanimate. Several hours are now passed without motion. Afterwards it makes some lateral movements with its tail, without any apparent external cause, and swims in its own manner; then again suspends itself to some other leaf, and continues to sleep, or in complete repose for half a day or more. If at this period it meets with nothing to which it could attach itself, it falls to the bottom of the water, where it continues reposing, sometimes on its side and sometimes on its belly. As yet the eyes are scarcely defined, though they form two prominences on the sides of the head, and its mouth is so slightly traced that attentive observation is required to detect it; for it is indicated only by a slight transverse depression beneath the head, and between the two prominences formed by the eyes, and in the middle of the space between the anterior border of the head and the origin of the neck. Its fore-feet begin to separate like buds from the gills, which last are gradually furnished with small leaflets. In this stage the author is of opinion that the life of the salamander is purely organic.



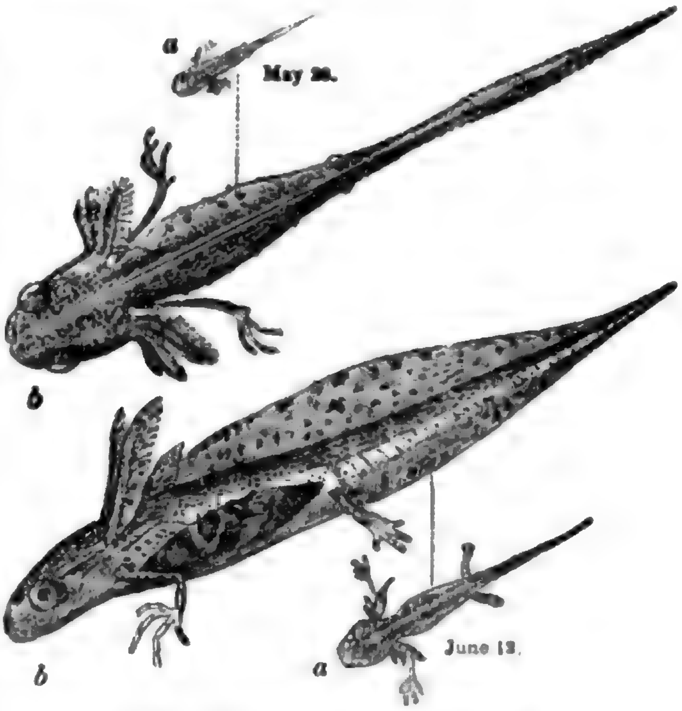
Stages of development of Triton cristatus after exclusion from the egg.

a shows the salamander in this stage, magnified and seen from below. *bb* are the two prominences formed by the globes of the eyes, and between them is the slight depression which afterwards becomes the mouth. *c*, the hook of the right side; *d*, the gills of the same side; *e*, rudiment of fore-feet of the same side; *f* represents the same seen in profile, and *g* the same seen from above.



Further stages of development of Triton cristatus.

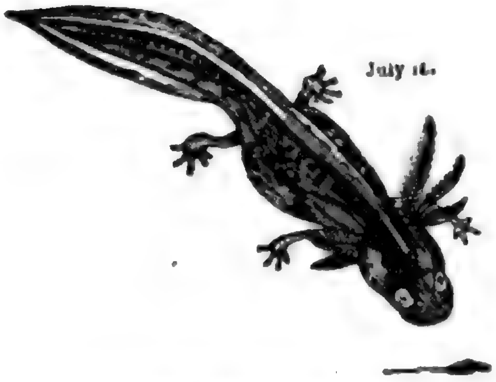
Here Rusconi has shown, in the middle and small figure, the natural size of the Salamander-tadpole on the eighteenth of May, twelve days after its exclusion from the egg. By this time the fore-feet have become lengthened, and are divided at their extremity like a bicuspid tooth: these two tubercles elongate, and are converted into two toes. Now the eyes are disclosed; the pupil black, the white speckled with various colours. The yellow back of the little animal has become green, and the gills are now furnished with leaflets, in which red blood circulates. The transverse depression between the eyes above noticed has become a very large mouth, whose extremities extend on the sides of the head to the eyes. The head, hitherto narrow behind, has become much enlarged near the origin of the gills. The two hooks by which the animal anchored itself have disappeared, and the opaque body has become so transparent that the action of the heart and the form and disposition of the abdominal viscera may be observed in the living animal. With this advance in organization the sluggishness of the animal has vanished, and its habits are now manifested. It may be seen near the surface, hiding beneath leaves or swimming with rapidity. If, while it floats at rest, a small aquatic insect should pass before it near the surface, it pursues it deliberately, and as soon as it approaches within reach, darts upon it and swallows the prey. Here then we have the little salamander in the enjoyment of active animal life.



Further stages of development of Triton cristatus.

a, shows the young salamander at this stage, natural size, seen from above; and *b*, the same magnified, seen from above and in profile.

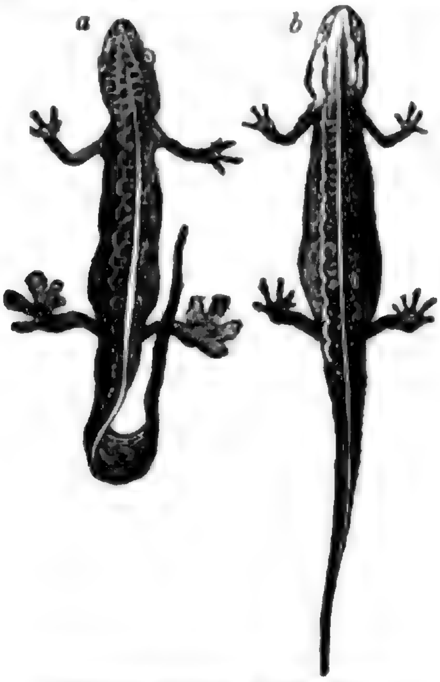
By the 28th of May the salamander has put on the form above given in the upper figures, seen from above. About this time the hind-feet begin to appear, and the fore-feet are well developed; these last are, as will be seen, long in proportion to the trunk. The following are the principal points manifested under the microscope in this stage:—1, two small eminences or excrescences, extending from the axillæ to the abdomen; 2, the parietes of the abdomen take the colour of the insects on which the animal feeds; 3, the changes of colour from yellow to green, during the growth of the tadpole, are purely accidental, and commence immediately on the escape of the animal from the egg; 4, the inner toes first push forth, and this holds good also with regard to the hind feet; 5, the amylaceous bone of the organ of hearing is now formed, and may be seen through the skull and skin; 6, at this period, and even sooner, the animal begins to expel air from the mouth. The two lower cuts show the same salamander on the 12th June; the small figure represents it of the natural size and as seen from above, and the larger figure magnified and in profile. Now the hind feet have almost attained their development, though the fifth toe is wanting. The lungs extend about half-way down the trunk, and are visible through the parietes of the abdomen. The longest gills, which were furnished with only thirteen or fourteen leaflets thirteen or fourteen days previously, have now nearly twenty.



Last stage of the tadpole of Triton cristatus.

On the 18th of July the young salamander, as represented above, had arrived at the maturity of its tadpole state, and it is represented watching a small mollusk to ascertain whether it is living and fit for prey. Rusconi found that on this day the gills appeared rather shorter than on the day before. On the next day the leaflets at the extremities of the gills were obliterated, and the gill-stem itself was shortened. This shortening and obliteration went on daily, till, at the end of five days, they were reduced to mere bud-like eminences covered with a continuation of the skin of the head. While this was going on, the duplicature of skin, which partially covered the branchial apertures, became gradually united to the chest; the trenchant membranous crests, which the arches bore externally, were obliterated; the aperture at the ears, through which the water taken in at the mouth was discharged, was daily more and more contracted; and the crest of the tail, which extended up to the head, was contracted also. Within, other great changes had been in progress. Both jaws, but especially the lower, were much ossified, and the teeth of the lower jaw were hard enough to resist the point of a needle strongly. Rusconi remarks that if he were to arrange the component parts of the skeleton at this period, according to their hardness, the lower jaw would stand first, then the upper one, then the bones of the skull, the vertebræ, and those of the four limbs. On the 27th of July the salamander had lost even the smallest trace either of gills or of branchial apertures. It respired atmospheric air only, and having arrived at its perfect state, made strong efforts to escape from the vessel in which it had undergone its metamorphosis.

In its complete state this species habitually lives in the water, and is seldom to be found on land unless the pond which has been its abode is dried up, and the animal finds itself obliged to walk in search of another.



Lissotriton punctatus, seen from above.

a, Male, the toes of whose hind feet are furnished in the breeding season with a black-spotted membrane, in the act of lashing his tail; b, female.

Mr. Bell confirms the interesting details given by Rusconi, remarking that he had observed the process many times, and long before he was acquainted with Rusconi's book; but he allows that Rusconi has the merit of first publishing an accurate account of the development of this species.

The development of the common smooth newt, *Lissotriton punctatus*, Bell; *Triton punctatus*, Auct.; *Triton palustris*, Laur.; *Salamandra punctata*, Daud.; *Molge punctata*, Merr.; *Salmandra exigua*, Rusc.; and *Brown Lizard* of Pennant, was also observed by Rusconi; but it did not require particular notice, being very similar to that of *Triton cristatus*. *Triton punctatus* however showed itself much the more brisk animal of the two; and the lashings of the tail of the male in his approaches to the female were much more rapid.

Salamandra.

Generic Character.—Head thick; eyes large; gape of the mouth ample; tongue broad; palatine teeth arranged in two long series; parotids large; body sprinkled with many small glands; toes free; tail rather smooth.

Example, *Salamandra maculosa*, Laur.

Description.—Black with yellow spots; numerous prominent warty excrescences on the sides; tongue very large; palatine teeth spatuliform; toes smooth.

This is the *Salamandra* of Gesner; *Salamandra terrestris* of Aldrovandus, Ray, and others; *Salamandre de terre* of the French; and *Gefleckte Erd-Salamander* of the Germans.

Locality.—Central Europe and the mountainous parts of the south of Europe.

Generation, Habits, &c.—This land Salamander is, unlike the Tritons, ovoviviparous, though the young, at first, inhabit the water and undergo metamorphosis till they arrive at the mature state which fits them for living upon land, where they haunt cool and moist places, being not unfrequently found about fallen timber or old walls. The food principally consists of insects, worms, and small molluscous animals. In the winter it retires to some hollow tree or hole in an old wall, or even in the ground, where it coils itself up and remains in a torpid state till the spring again calls it forth. As it increases in size, it constantly sheds its skin, which is moulted in flakes; at least such was the process in *Salamandra subviolacea*, observed by Dr. Barton.

We have seen that the body of the Salamander is largely covered with warty glands. These secrete a milky fluid of a glutinous and acrid nature like that of the toad [FROGS, vol. x., p. 193], which, if not capable of affecting the larger and more highly organized animals, appears to be a destructive agent to some of those which are less highly organized. Thus Laurenti provoked two grey lizards to bite a salamander, which at first attempted to escape from them, but being still persecuted, ejected some of this fluid into their mouths; one of the lizards died instantly, and the other fell into convulsions for two minutes and then expired. Some of this juice was introduced into the mouth of another lizard; it became convulsed, was paralytic on the whole of one side, and soon died. According to Dr. Barton this fluid,—which the animal secretes in large quantities when irritated, and is then capable of ejecting it to some distance,—is not soluble in water, though it dissolves readily in spirit of wine. He found the taste of the juice of *Salamandra subviolacea* extremely acrid, resembling corrosive sublimate, and very astringent.

Such is the extent of the foundation for the long cherished assertion that the Salamandra was one of the most venomous of animals. Nicander, in his *Alexipharmaca*, gives an appalling picture of the symptoms produced by its bite. The Romans looked on it with horror, as most destructive, and considered it as deadly a part of the poisoner's laboratory as aconite or hemlock. Hence came a proverb that he who was bitten by a Salamander had need of as many physicians as the animal had spots; and another still more hopeless,—'If a Salamander bites you, put on your shroud.'

Not only was its bite considered fatal and the administration of the animal itself taken internally believed to be deadly, but anything that its saliva had touched was said to become poisonous. Thus, if it crept over an apple-tree, it was supposed to poison all the fruit with its saliva; and even herbs on which the fluid fell were believed to affect those who tasted them with vomiting. These fables had taken such strong hold, that it was thought worthy of record in the *Acta Acad. Nat. Cur.* that a man had eaten a salamander, which his wife had put into his food in the hope of becoming a widow, without suffering any inconvenience. Maupertuis applied the teeth of a salamander to the thigh of a fowl from which he had plucked the feathers, to the lips and tongue of a dog, and to the tongue of a Guinea fowl; in neither case were any symptoms of poison manifested. Another prejudice against this reptile was that it sucked cows and dried up their udders.

But the grand absurdity of all was the belief that the salamander was incombustible; that it not only resisted the action of fire, but extinguished it, and, when it saw the flame, charged it as an enemy which it well knew how to vanquish.

Aristotle, whose Salamandra (σαλαμάνδρα) this appears to be, has been quoted as giving his sanction to this belief, and indeed he cites it as a proof that there are animals over which flame has no power; 'the Salamandra, as they say, when it goes through fire, extinguishes it.' (*Hist. An.*, v. 19.) Now this is evidently only a reference to report; and it is not improbable that a copious secretion of the fluid above noticed might, in a rapid and short passage, so damp the fire, that the animal might get through comparatively unhurt. Ælian (ii. 31) says not only that it will live in the flames, but that it attacks fire like an enemy. Nicander, Dioscorides, and Pliny all add their authority; and the latter not only relates that they extinguish fire by their touch, but that they are without sex and produce nothing. He dwells on their poison as being of the worst description, and is profuse in his catalogue of remedies. (*Hist. Nat.*, xxix. 4.) But even so late as 1789 there was an attempt to revive these wondrous tales. A French consul at Rhodes relates that while sitting in his chamber there, he heard a loud cry in his kitchen, whither he ran and found his cook in a horrible fright, who informed him that he had seen the Devil in the fire. M. Pothonier then states that he looked into a bright fire and there saw a little animal with open mouth and palpitating throat. He took the tongs and endeavoured to secure it. At his first attempt, the animal, which he says had been motionless up to that time (two or three minutes), ran into a corner of the chimney, having lost the tip of its tail in escaping, and buried itself in a heap of hot ashes. In his second attempt the consul was successful, drew the animal out, which he describes as a kind of small lizard, plunged it into spirit of wine, and gave it to Buffon. This appears to be very circumstantial, and M. Pothonier, whose head was evidently filled with preconceived opinions, may be acquitted of any intention to deceive. That the animal was in the fire there can be no doubt, and it is very likely that it was brought in with the fuel; that the secretion might have enabled it to resist the action of the fire for a few moments, so as to prevent its being entirely consumed, is not improbable, but that it remained unhurt for two or three minutes in the midst of a bright fire is incredible. Ordinary people are never more loose than in measuring time, especially when excited. Still it is very probable, such is the appetite for the marvellous, that M. Pothonier's story, which was published, might have perpetuated error a good while longer, had it not received the *coup de grace* from Sonnini, who happened to come to Rhodes shortly after this extraordinary capture. Of M. Pothonier he speaks as being a very amiable man, but completely ignorant in all that related to natural history. The consul was very communicative to him about the prodigy, and showed him the lizard. Sonnini immediately saw what the excited M. Pothonier did not see, namely, that the feet and some parts of the body of this so-called incombustible animal were half roasted.

To go back: Galen knew that it would burn, and Matthiolus saw it burn.

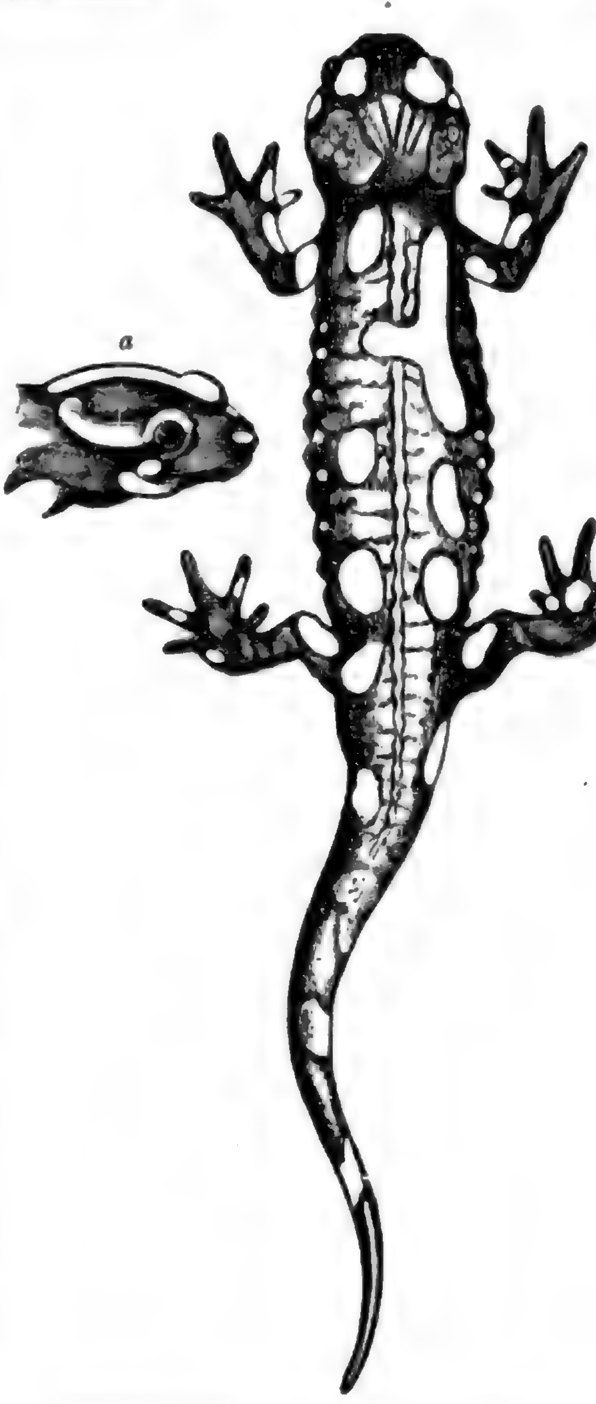
That the skin of an animal which could resist the action of fire should be considered proof against that element is not to be wondered at. We accordingly find that a cloth said to be made of the skins of salamanders was incombustible, as is noticed by Marco Polo, who however was shrewd enough to observe that these fire-proof cloths were really made of a mineral substance (asbestos, no doubt, which the old writers termed *salamander's wool*). Such most probably was the salamander-cloth sent by the Tartar king to the Roman pontiff, in which the holy napkin (*sudarium Domini*) is preserved.

Among the other fables may be noticed the belief that the saliva of the salamander was depilatory. Thus Martial (lib. ii., Ep. lxvi.):—

'Desine jam Lalage tristes ornare capillos,
Tangat et insanum nulla puella caput.
Hoc salamandra notet, vel sæva novacula nudet,
Ut digna speculo fiat imago tua.'

Its heart, worn as an amulet, was considered to be a prophylactic against fire, and it was used in medicine to eradicate leprosy.

It could hardly be expected that the alchymists would neglect animals of which such wonders were rife; and we accordingly find that the power of transmuting quicksilver into gold was attributed to them. To this end the wretched reptiles were placed in a vessel on the coals, and quicksilver introduced through an iron tube was poured upon them. This experiment was supposed to be accompanied with danger to the life of the operator. Those who would further dwell on the legends connected with this subject may consult Funk's work, *De Salamandræ Terrestris Vita, Evolutione, et Formatione.*



Salamandra maculosa, seen from above. *a*, profile of head.

FOSSIL SALAMANDRIDÆ.

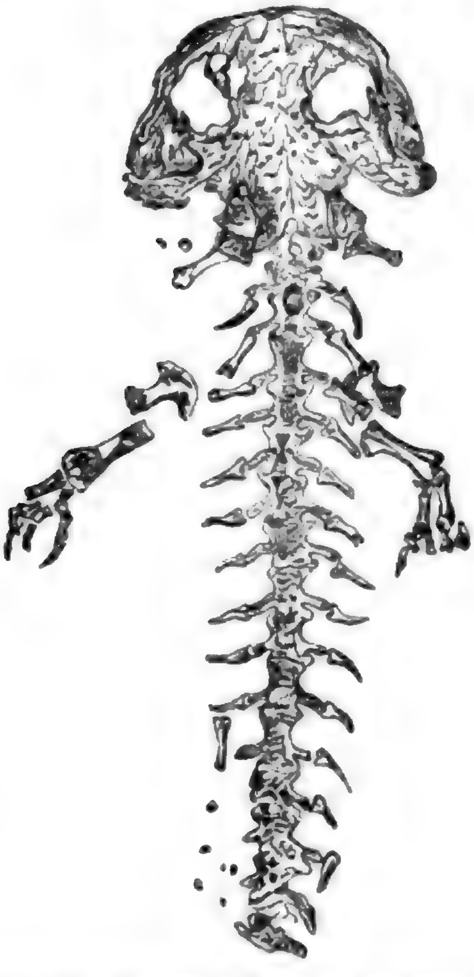
Andrias.

Few fossils have awakened more curiosity than the *Homo diluvii testis* of Scheuchzer, who was unwearied in collecting organic remains, which he considered irrefragable evidence of the general deluge. At length he obtained from the Œningen beds (Miocene period of Lyell) a fossil which he viewed with transport as the unequivocal remains of man himself. A short description of this specimen was published by him in the 'Philosophical Transactions' for 1726. He again brought forward this piece of *good fortune*—in his rapture he writes the two last words in Greek—in his 'Physica Sacra,' where he tells us that previously he had only possessed two dorsal vertebræ. Of the humanity of his prize he certainly entertained no doubt:—'quia,' says he, speaking of the fossil, 'indubium, quia non unam exhibet partem, sed bene multas, imo pene dimidium sceleton. Quia non duntaxat impressa figura, ex qua vaga et superba imaginatio fingere possit quidlibet ex quolibet, sed ipsa lapidi immersa substantia ossium, imo carnium, et partium carnibus molliorum, præcisa in magnitudine proportio: verbo λείψανον maledictæ illius et aquis sepultæ gentis, unum ex rarissimis.' He gives no bad figure of the fossil in tab. xlix. of the work last quoted. When we look at that figure, it is difficult to conceive how such remains could have appeared to a physician, who must have had some acquaintance with osteology, to be those of man; and we can only account for it by the blindness which an excited imagination and a determined adherence to theory can produce. The iteration and determination of Scheuchzer had its effect, and naturalists adopted his opinions. Gesner (1758) appears to have been the first who threw deserved doubt on the alleged nature of the fossil; for though he quotes it as an anthropolite, he nevertheless, having become possessed of a similar specimen, offers his conjecture that it was a fossil fish (*Silurus Glanis*, Linn.), and the obsequious naturalists were now as ready to follow him as they had been eager to run after Scheuchzer.

Gesner's specimen does not appear to have been engraved, nor another which was said to be in the convent of Augustins at Œningen; but a third specimen, more complete than Scheuchzer's, came into the possession of Dr. Ammann of Zürich, and is now in the British Museum. A figure of this was published by Karg, in the 'Memoirs of the Society of Naturalists of Suabia.'

Cuvier well observes that a comparison of the specimen with the skeleton of man must at once have destroyed the idea that it was an anthropolite; and it would be a waste of space to repeat here the details of that comparison which Cuvier so well follows out, and to which we refer. (*Ossemens Fossiles*, tom. v., pt. 2, p. 433, ed. 1824.)

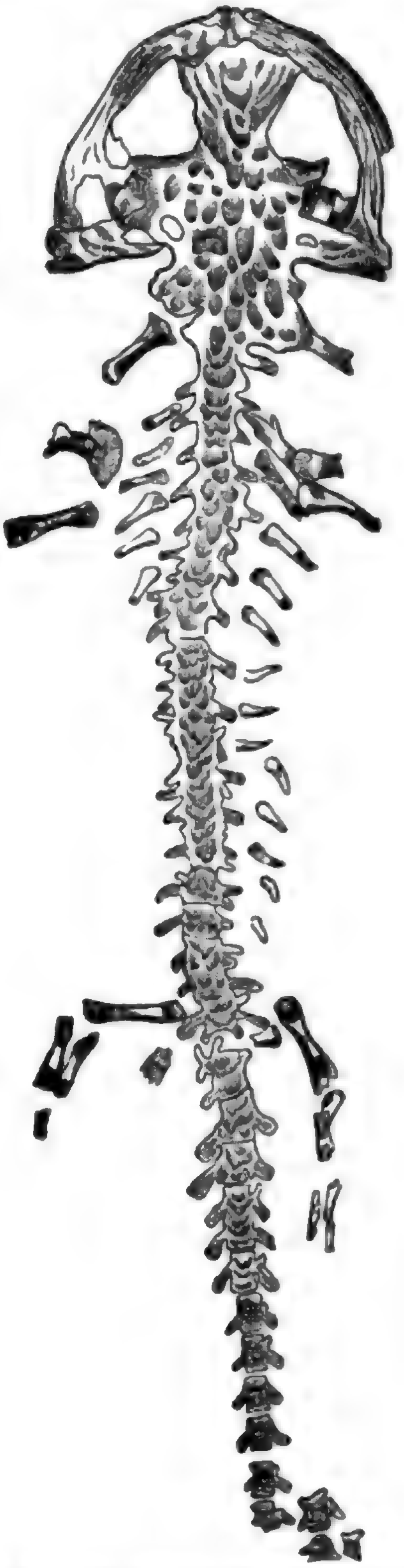
Karg, after figuring Dr. Ammann's specimen, expressly stated that he had no doubt that the fossil was a *Silurus*, an opinion which Jæger refuted by placing by the side of the figure of the fossil, one of the skeleton of *Silurus glanis*. Cuvier disposes of this opinion with the same success as attends his former demonstration.



Anterior part of Andrias Scheuchzeri, Tschudi, seen from above. (Cuv.)

The rounded head and great orbits of the fossil struck Cuvier as strongly resembling the head of a frog or a salamander; and he states that, as soon as he beheld Karg's figure, he perceived in the vestiges of the hind feet and the tail evidence in favour of the last-named genus. He adds that he learnt with great pleasure, from the note appended by Jæger to Karg's memoir, that M. Kielmeyer had entertained the same idea; and he observes that in a letter from Pierre Camper to Burtin, the former remarks that a petrified lizard has been able to pass for an anthropolite.

Cuvier, being at Haarlem in 1811, obtained permission to work upon the stone which contained the pretended anthropolite of Scheuchzer, for the purpose of uncovering any bones which might be still hidden there. During the operation, the figure of the skeleton of a salamander was placed before the operators; and Cuvier relates the pleasure which they felt, as they saw, while the chisel chipped away pieces of the stone, the bones which the figure had already announced.



Andrias Scheuchzeri, Tschudi, seen from above. (Cuv.)

But by far the finest head of Andrias Scheuchzeri is figured by Tschudi, in his work above quoted, tab. 3; and many most interesting details are given in tab. 4 and tab. 5. These show how nearly allied this gigantic fossil newt was to *Sieboldtia maxima*.

Salamandra ogygia, Goldf., is found in the Braunkohle (Tertiary), where also *Triton Noachicus*, Goldf., occurs. *Triton palustris? fossilis* of Karg is from the Œningen slate.

⁂ Human fossil bones have been discovered in the Belgian bone-caverns, with bears, rodents, &c., and are figured by Dr. Schmerling, in his interesting work on the bones found in a cavern near Liège.

Dr. Buckland (*Bridgewater Treatise*) remarks that frequent discoveries have been made of human bones and rude works of art, in natural caverns, sometimes enclosed in stalactite, at other times in beds of earthy materials, which are interspersed with bones of extinct species of quadrupeds. These cases, he thinks, may be explained by the common practice of mankind in all ages to bury their dead in such convenient repositories. 'The accidental circumstance,' continues Dr. Buckland, 'that many caverns contained the bones of extinct species of other animals, dispersed through the same soil in which human bodies may, at any subsequent period, have been buried, affords no proof of the time when these remains of men were introduced. Many of the caverns have been inhabited by savage tribes, who, for convenience of occupation, have repeatedly disturbed portions of soil in which their predecessors may have been buried. Such disturbances will explain the occasional admixture of fragments of human skeletons and the bones of modern quadrupeds, with those of extinct species introduced at more early periods and by natural causes. Several accounts have been published within the last few years of human remains discovered in the caverns of France and in the province of Liège, which are described as being of the same antiquity with the bones of hyænas and other extinct quadrupeds that accompany them. Most of these may probably admit of explanation by reference to the causes just enumerated. In the case of caverns which form the channels of subterranean rivers, or which are subject to occasional inundations, another cause of the admixture of human bones with the remains of animals of more antient date may be found in the movements occasioned by running water.'

The same learned author observes that the most remarkable and only recorded case of human skeletons imbedded in a solid limestone rock is that on the shore of Guadaloupe, adding that there is however no reason to consider these bones to be of high antiquity, as the rock in which they occur is of very recent formation, and is composed of agglutinated fragments of shells and corals which inhabit the adjacent water. Such kind of stone is frequently formed in a few years from sand-banks composed of similar materials, on the shores of tropical seas. (*Bridgewater Treatise*, vol. i.) One of these skeletons, described by Mr. König (*Phil. Trans.*, 1814), is in the British Museum. See further as to the rock in which the skeletons are imbedded, *Linn. Trans.*, 1818, vol. xii.

Dr. Lund, a good observer, has lately published his discovery of human remains with those of *Megatherium*, &c.; and he is of opinion that the former are of the same epoch as those of the latter. The cranium has the peculiar shape which distinguishes the antient Peruvian.

SALAMANDROÏ'DES. Under this generic title Professor Jäger described a fossil reptile from the German Keuper, giving it the specific name of *giganteus*. This fossil now appears to be identical with MASTODONSAURUS and PHYTOSAURUS. Professor Owen therefore proposes to designate this gigantic genus of extinct Batrachians—for to that order he has satisfactorily shown that the form belongs —by the name of *Labyrinthodon* (from the extraordinary structure of its teeth, to which we shall presently advert), in his paper 'On the Teeth of species of the genus *Labyrinthodon* (*Mastodonsaurus*, *Salamandroïdes*, and *Phytosaurus* (?) of Jäger) from the German Keuper and the sandstone of Warwick and Leamington.' Of this paper the following abstract is given in the *Proceedings of the Geological Society of London* for 1841:—

'The Warwick sandstone having been considered by some geologists to be the equivalent of the Keuper,* and by others of the Bunter Sandstein,† and as its true position remains to be determined, Mr. Owen, in the preliminary remarks to his memoir, pointed out the assistance which the discovery of reptilian remains in the Warwick sandstone, of the same generic characters as those of fossils obtained in the Keuper of Germany, may afford in determining the question.

'Before he proceeded to describe the fossils forming the immediate object of his paper, Mr. Owen showed that the genus *Phytosaurus* was established on the casts of the sockets of the teeth of *Mastodonsaurus*; and that the latter generic appellation ought not to be retained, because it recalls unavoidably the idea of the mammalian genus *Mastodon*, or else a mammilloid form of the tooth, whereas all the teeth of the genus so designated are originally, and, for the greater number, permanently of a cuspidate and not of a mammilloid form; and because the second element of the word, *saurus*, indicates a false affinity, the remains belonging not to the Saurian, but to the Batrachian order of reptiles. For these reasons, and believing that he had discovered the true and peculiarly distinctive dental characters of the fossil, he proposed to designate the genus by the term *Labyrinthodon*.

'The only portions of the Batrachian found in the Keuper of Germany which have hitherto been described, consist of teeth, a fragment of the skull, and a few broken vertebræ, and in the Warwick sandstone of teeth only. In this memoir therefore Mr. Owen confined his attention to a comparison of the dental structure of the Continental and English remains. The teeth of the *Labyrinthodon Jaegeri* (*Mastodonsaurus Jaegeri*, Meyer) of the Keuper are of a simple conical form, with numerous fine longitudinal striations; and the teeth transmitted to Mr. Owen from the Warwick sandstone by Dr. Lloyd bear a very close resemblance to them. Their external characters not being sufficient to establish either specific or generic identity, Mr. Owen had sections prepared for microscopic examinations of portions of teeth of the *Labyrinthodon Jaegeri* forwarded to him by Prof. Jäger, and of the English reptile; and though from his previous examination of the intimate texture of the teeth of the Plesiosaur, Megalosaur, as well as of the crocodile, Monitor, and most recent Lacertians, he did not hope to detect such modifications of structure as would obviously mark specific or even generic identity, yet the slices exhibited such decided characters, and those of the German fossils agreed so intimately with the sections obtained from the Warwick specimen, that Mr. Owen was enabled not merely to separate these fossils from all known reptilian animals, but to establish a generic community of character in the Keuper and sandstone remains. It was not however until he had caused sections to be made in various directions, and had studied them attentively in comparison with the teeth of true Saurians, Batrachians, and other animals, that he was enabled to comprehend the principle of the singular cerebriform convolutions which pervade the dental structure of this remarkable reptile. The base of the tooth of the *Ichthyosaurus* approaches most nearly in character to the peculiarities of nearly the entire tooth of the *Labyrinthodon*. It is impossible to convey clearly without illustrations the structure alluded to. It may however be stated that in the fang of the tooth of the *Ichthyosaurus* vertical folds of the external layer of cement (the enamel ceasing at the base of the crown) are inflected inwards at pretty regular distances around the circumference of the tooth, towards the centre, to a distance about equal the breadth of the interspaces of the inflected folds; the interspaces being occupied by corresponding processes of the dentine, which radiate from the central mass of that substance. The thickness of this interblended cement and dentine surrounding the pulp-cavity is about one-eighth of the diameter of the tooth.

'The plan and principle of the structure of the tooth of the *Labyrinthodon* are the same as those of the tooth of the *Ichthyosaurus*, but they are carried out to the highest degree of complication. The converging vertical folds of the external cement are continued close to the centre of the tooth, and instead of being straight simple lamellæ, they present a series of irregular folds, increasing in complexity as they proceed inwards, and resembling the labyrinthic anfractuosities of the surface of the brain; each converging fold is slightly dilated at its termination close to the pulp-cavity. The ordinary laws of dental structure are however strictly adhered to, and every space intercepted by a convolution of the folds of the cement is occupied by corresponding processes of the dentine. These characters were presented by a transverse section of a fragment of a tooth of the *Labyrinthodon Jaegeri* from the German Keuper, which included about the middle third part of a tooth, and Mr. Owen considers that the entire length of the tooth might be 3½ inches, and the breadth at the basis 1½ inches.

'The external longitudinal grooves, which correspond to the inflected folds of the cement, extend upwards from the base of the tooth to about three-fourths of its height, do creasing in number as the tooth diminishes in thickness, and disappearing about half an inch from the summit of the tooth. Each fold of cement penetrates less deeply as the groove approaches its termination; and Mr. Owen conceives that the structure of the upper part of the tooth may be more simple than that of the lower, but he has not yet been able to extend his investigations to it.

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* See 'Proceedings,' vol. ii., p. 453

† Ibid., vol. ii., p. 565.

'The dentine consists of a slender, central, conical column, or "modiolus," hollow for a certain distance from its base, and radiating outwards from its circumference a series of vertical plates, which divide into two, once or twice, before they terminate at the periphery of the tooth. Each of these diverging and dichotomizing vertical plates gives off throughout its course narrower vertical plates, which stand at nearly right angles to the main plate, in relation to which they are generally opposite, but sometimes alternate. Many of the secondary plates which are given off near the centre of the tooth also divide into two before they terminate. They partake of all the undulations which characterise the inflected folds of the cement.

'The central pulp-cavity is reduced to a line, about the upper third of the tooth; but fissures radiate from it, corresponding in number with the radiating plates of the dentine. One of these fissures is continued along the middle of each plate, dividing where it divides, and penetrating each bifurcation and process; the main fissures extend to within a line or half a line of the periphery of the tooth; the terminations of these, as well as the fissures of the lateral processes, suddenly dilating into subcircular, oval, or pyriform spaces. All these spaces constitute centres of radiation of the fine calcigerous tubes, which, with their uniting clear substance, constitute the dentine. The number of these calcigerous tubes, which are the centres of minor ramifications, defies all calculation. Their diameter is the $\frac{1}{7000}$th of a line, with interspaces equal to seven diameters of their cavities.

'Mr. Owen then compares the structure of the section of the tooth procured in the sandstone of Coton-End Quarry, and lent to him by Dr. Lloyd of Leamington. The tooth nearly resembles in size and form the smaller teeth of *Labyrinthodon* figured by Prof. Jäger. All the peculiarities of the labyrinthic structure of the Keuper tooth are so clearly preserved in this specimen, that the differences are merely of a specific nature.

'At the upper part of the tooth a thin layer of enamel,[*] besides a coating of cement, is inflected at each groove towards the centre of the dentine; but about the middle of the tooth the enamel disappears, and the convolutions consist of interblended layers of cement and dentine. Thus, on the supposition that the tooth of the *Labyrinthodon* of the German Keuper is capped with enamel, its extent must be less than in the tooth of the Warwick sandstone.

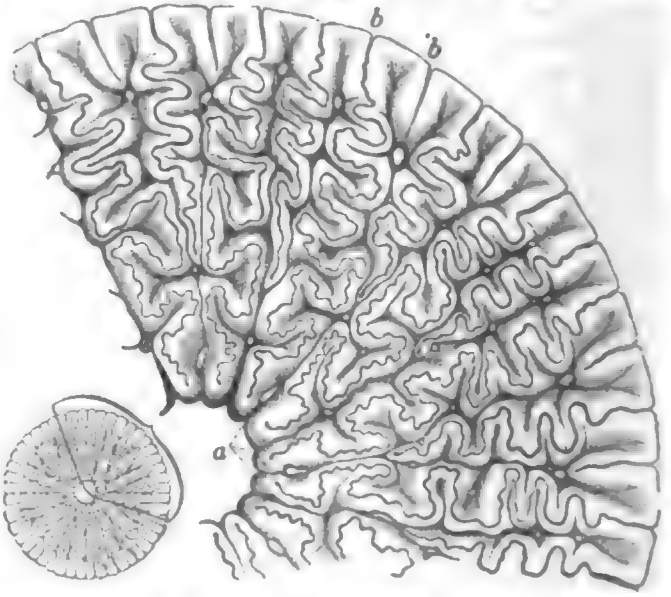
'The inflected folds are continued for a greater relative distance before the lateral inflections commence than in the German species, and the anfractuosities are fewer in number, and some of the folds are reflected backwards from near the central pulp-cavity for a short distance before they terminate.

'The modifications of the complex diverging plates of the dentine hardly exceed those of a specific character, and the dentine itself is composed of calcigerous tubes of the same relative size and disposition as in the *Labyrinthodon Jaegeri*.

'In the section taken from the middle of a smaller and relatively broader and shorter conical tooth from the Warwick sandstone, Mr. Owen found that the anfractuosities were more complicated, with numerous secondary and tertiary foldings, and the external layer of cement was relatively thicker than in the *Lab. Jaegeri*.

'The generic identity of the reptiles indicated by the teeth from the Warwick sandstones, with the *Mastodonsaurus* of the German Keuper, Mr. Owen believes to be fully established by the concordance of their peculiar dental structure above described. And in conclusion he observed, that if on the one hand geology has in this instance really derived any essential aid from minute anatomy; on the other hand, in no instance has the comparative anatomist been more indebted to geology than for the fossils which have revealed the most singular and complicated modification of dental structure hitherto known, and of which not the slightest conception could have been gained from an investigation, however close and extensive, of the teeth of existing animals.'

By the permission of Professor Owen we are enabled to give a section of this highly complicated tooth, from his elaborate *Odontography* (pl. 64, A.), in which the subject is treated with minute detail (part ii., p. 203, &c.).



Transverse section of tooth of Labyrinthodon Jaegeri (Owen); Mastodonsaurus Jaegeri (Meyer): nat. size, and a segment magnified. *a*, pulp cavity, from which the processes of pulp and dentine radiate; *b*, cement.

We have now to call the reader's attention to a subject of considerable interest, which has lately been studied with much care and success, and has become of such importance as to be considered a distinct branch of inquiry under the name of *Ichnology*.[*]

This department of geological investigation is conversant with the phenomena of footsteps impressed by animals on the strata of the earth.

In 1828 Mr. Duncan's account of tracks and footmarks of animals impressed on sandstone in the quarry of Corn Cockle Muir, Dumfriesshire, appeared in the *Transactions of the Royal Society of Edinburgh*. Dr. Buckland caused a living *Emys* and *Testudo Græca* to walk on soft sand, clay, and paste or unbaked pie-crust. He found the correspondence of the footsteps of the latter with the fossil footsteps sufficiently close, allowing for difference of species, to render it highly probable that the fossil footsteps were impressed by *Testudo Græca*. In 1831 Mr. G. Poulett Scrope found, after visiting the Dumfries quarries, minute undulations resembling the ripple-marks of waterupon sand, together with numerous foot-tracks of small animals (crustaceans probably) on the strata of forest marble near Bath. [RIPPLE-MARK.] The footsteps of the so-called *Chirotherium* of Hessberg and the ORNITHICHNITES of Connecticut are among the most interesting of the discoveries in this department.

But it is not in the older beds alone that those traces of animals have been noticed. Dr. Buckland (*Address*, 1840) observes, that in recent excavations for making a dock at Pembray near Llanelly, in Pembrokeshire, tracks of deer and of large oxen have been found on clay subjacent to a bed of peat, the lower peat being moulded into footsteps; similar impressions were also found upon the upper surface of the peat beneath a bed of silt, and bones both of deer and oxen in the peat itself. Footmarks of deer have been also noticed, he adds, in Mr. Talbot's excavations for a harbour near Margam burrows on the east of Neath.

But we must now return to the impressions left upon the more antient strata, and to the tracks of the so-called *Chirotherium*.

In Saxony, at the village of Hessberg near Hildburghausen, fossil footsteps were, a few years ago, discovered in several quarries of grey quartzose sandstone alternating with beds of red-sandstone, nearly of the age of the red-sandstone of Corn Cockle Muir. Dr. Hohnbaum and Professor Kaup state that those impressions of feet are partly concave and partly in relief; the depressions are described as being upon the upper surfaces of the sandstone slabs, but the footmarks in relief are only upon the lower surfaces, and cover the depressions. In short, the footmarks in relief are natural casts formed in the subjacent footsteps as in moulds. On one slab, six feet long by five feet wide, many footsteps of more than one animal and of various sizes occur. The larger impressions, which seem to be those of the hind foot, are generally eight inches in length and five in width, and one was twelve inches long. Near each large footstep, and at a regular distance (about an inch and a half) before it, a smaller print of a fore-foot, four inches long and three feet wide, occurs. The footsteps follow each other in pairs, each pair in the same line, at intervals of fourteen inches from pair to pair. The large as well as the small steps show the great toes alternately on the right and left side; each step makes the print of five toes, the first or great toe being bent inward like a thumb. Though the fore and hind foot differ so much in size, they are nearly similar in form.

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[*] Mr. Owen has subsequently ascertained that this is not true enamel, but a layer of firm dentine, separated from the rest by a thin stratum of fine calcigerous cells.

[*] Ἴχνος, a footstep, and λόγος, a discourse.

The name of *Chirotherium* was proposed by Professor Kaup as the provisional name for the great unknown animal that impressed the larger footsteps, from a supposed resemblance in the marks of both the fore and hind feet to the impress made by a human hand; and he thought that they might have been derived from some quadruped allied to the *Marsupialia*. Dr. Siekler, in a letter to Blumenbach (1834), gave a further account of these footsteps. Fragments of bones were found in the quarries where the footsteps had been impressed, but those fragments were destroyed.

Dr. Buckland (*Bridgewater Treatise*) expresses his opinion that the presence of two small fossil *Mammalia* related to the opossum, in the oolite formation of Stonesfield [MARSUPIALIA, vol. xiv., p. 464 et seq.], and the approximation of this order to the class of reptiles, are circumstances which give probability to such a conjecture. Dr. Buckland further observes that in the Kangaroo the first toe of the fore foot is set obliquely to the others, and that the disproportion between the fore and hind feet is also very great; and he figures several specimens of these footsteps. (*Bridgewater Treatise*, pl. 26′, 26″, 26‴.) In his description of the plates, Dr. Buckland remarks that M. Link has made out the footsteps of four species of animals in the Hildburghausen sandstone; and that it has been conjectured that some of these have been derived from gigantic Batrachians. He further designates the footsteps figured by him in pl. 26‴ as those of a small webb-footed animal, probably crocodilean.

But these footsteps are not confined to foreign lands, and within the last three years able observers have contributed largely to this interesting subject. Dr. Buckland thus sums up the evidence obtained in this country:—'Near Liverpool Mr. Cunningham has successfully continued his researches begun in 1838, respecting the footsteps of *Chirotherium* and other animals in the new red-sandstone at Storeton Hill, on the west side of the Mersey. These footsteps occur on five consecutive beds of clay in the same quarry; the clay-beds are very thin; and having received the impressions of the feet, afforded a series of moulds in which casts were taken by the succeeding deposits of sand, now converted into sandstone. The casts of the feet are salient in high relief on the lower surfaces of the beds of sandstone, giving exact models of the feet and toes and claws of these mysterious animals, of which scarcely a single bone or tooth has yet been found, although we are assured by the evidence before us of the certainty of their existence at the time when the new red-sandstone was in process of deposition. Further discoveries of the footsteps of *Chirotherium* and five or six smaller reptiles in the new red-sandstone of Cheshire, Warwickshire, and Salop, have been brought before us by Sir P. Egerton, Mr. J. Taylor, jun., Mr. Strickland, and Dr. Ward. Mr. Cunningham, in a sequel to his paper on the footmarks at Storeton, has described impressions on the same slabs with them, derived from drops of rain that fell upon thin laminæ of clay interposed between the beds of sand. The clay impressed with these prints of rain-drops acted as a mould, which transferred the form of every drop to the lower surface of the next bed of sand deposited upon it, so that entire surfaces of several strata in the same quarry are respectively covered with moulds and casts of drops of rain that fell whilst the strata were in process of formation. On the surface of one stratum at Storeton, impressed with large footmarks of a *Chirotherium*, the depth of the holes formed by the rain-drops on different parts of the same footstep has varied with the unequal amount of pressure on the clay and sand, by the salient cushions and retiring hollows of the creature's foot; and from the constancy of this phenomenon upon an entire series of footmarks in a long continuous track, we know that this rain fell after the animal had passed. The equable size of the casts of large drops that cover the entire surface of the slab, except in the parts impressed by the cushions of the feet, record the falling of a shower of heavy drops on the day in which this huge animal had marched along the antient strand: hemispherical impressions of small drops, upon another stratum, show it to have been exposed to only a sprinkling of gentle rain that fell at a moment of calm. In one small slab of new red-sandstone found by Dr. Ward near Shrewsbury, we have a combination of proofs as to meteoric, hydrostatic, and locomotive phenomena, which occurred at a time incalculably remote, in the atmosphere, the water, and the movements of animals, and from which we infer, with the certainty of cumulative circumstantial evidence, the direction of the wind, the depth and course of the water, and the quarter towards which the animals were passing: the latter is indicated by the direction of the footsteps which form their tracks; the size and curvatures of the ripple-marks on the sand, now converted to sandstone, show the depth and direction of the current; the oblique impressions of the rain-drops register the point from which the wind was blowing at or about the time when the animals were passing.'

The *Address* from which the above passage is taken was delivered at the anniversary of the Geological Society of London, on the 21st February, 1840; and at that time all was conjecture as to the nature of the animal called *Chirotherium*. Professor Owen's paper, read on the 20th January in this year, the abstract of which is given above, proved the existence of a gigantic Batrachian at the period when the new red-sandstone was formed. Scarcely was that memoir communicated, when additional materials of the highest importance were brought forward by the liberal possessors of them, and the result was a second paper, read before the Geological Society of London on the 24th of February last, in which three species of *Labyrinthodon* were defined, and evidence relating to the ichnology of those extinct Batrachians was adduced, which may be briefly stated as follows:—

1st. Proof from the skeleton that *Labyrinthodon* had hind extremities much larger than the anterior extremities.

2nd. That the foot-prints of *Chirotherium* are at least as much like those of certain Toads as those of any other animals.

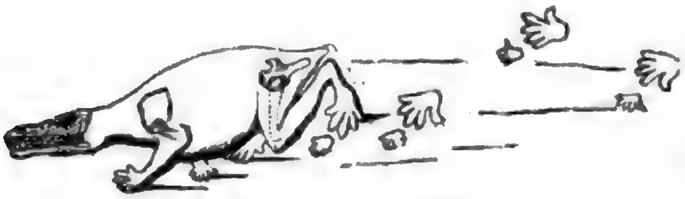
3rd. That the size of the known species of *Labyrinthodon* corresponds with the size of the foot-prints of the different species of *Chirotherium*: *e.g. Labyrinthodon Jaegeri*, with the foot-print of *Chirotherium Hercules* (Egerton); *Labyrinthodon pachygnathus*, with the foot-marks of the common *Chirotherium*; and *Labyrinthodon leptognathus* with the impressions of the smaller batrachian figured in the memoir by Mr. Murchison and Mr. Strickland.

4th. *Labyrinthodon* occurs in the new red-sandstone strata to which Chirotherian impressions are peculiar. And

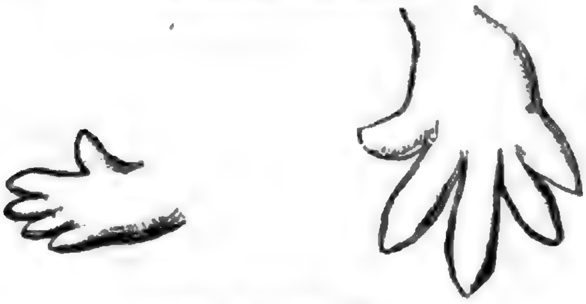
Lastly, no remains of animals that could have left such impressions as those of the *Chirotherium* have been found in these strata, except the remains of the Labyrinthodons.

It is true that the structure of the foot is still wanting, and that a more connected and complete skeleton is required for demonstration: but the circumstantial evidence above stated is strong enough to produce the conviction that Chirotherian and Labyrinthodontic foot-impressions are identical; and that *Mastodonsaurus*, *Salamandroïdes*, *Phytosaurus*, *Chirotherium*, and *Labyrinthodon* are one and the same genus, which ought for the future to be designated by the last-mentioned name. We owe this evidence principally to the use of the microscope in skilful and judicious hands; and it is impossible not to be struck with the wonderful applicability of that instrument to the largest of created bodies as well as to the smallest, when we look at the results of Professor Owen's discovery of the highly organised dental structure in *Labyrinthodon*, an extinct animal of a low grade, where it could hardly have been expected to occur.

The reading of Professor Owen's last memoir was accompanied by the exhibition of a diagram representing a restoration of two species of *Labyrinthodon*. By the Professor's kindness, we are enabled to give a greatly reduced copy of one of them. The bones which appear within the outline are those which were known when the paper was read. The animal is represented as impressing its footsteps on a shore of sand, now new red-sandstone. There is reason for believing that this formidable batrachian was not smooth externally, but that it was protected, on certain parts at least, by bony scutella.



Labyrinthodon pachygnathus.



Fore and hind foot of the same.

Specimens of the foot-prints may be seen in the British Museum and in that of the Royal College of Surgeons in London.

SALAMANDROPS, Wagler's name for the Menopome. [SALAMANDRIDÆ.]

SA'LAMIS (Σαλαμίς), now Kolúri, is a small island adjacent to the coast of Attica. It forms the southern boundary of the beautiful Bay of Eleusis, and is only separated from the mainland, at the eastern and western extremities respectively, by a narrow winding channel. The bay is surrounded on the west, north, and east by the high land of Attica, of which the northern shore of Salamis seems like a continuation, and thus the bay has the appearance of a large lake. The two channels have deep water, and a vessel may enter the Bay of Eleusis through them with any wind.

The form of the island is very irregular. On the west side it is indented by the deep Bay of Koluri, on which the village of Koluri stands, and on the east side a long narrow peninsula projects towards the coast of Attica. Its greatest length from north to south is about ten miles, and the longest line than can be drawn in the island, from about east to west, is a little more; but the area is probably not above 50 square miles. The soil, though scanty, is productive; and some districts are well suited to the olive. It produces good honey, and with proper care excellent wine might be made. There is only one stream in the island, which enters the sea on the south-west coast, and is probably the Bocaros or Bocalias of Strabo. The village of Koluri, with two others called Mulki and Ambelákia (vineyards), and a convent, contained a few years ago the whole population of the island.

The old city of Salamis, which was deserted in the time of Strabo, stood on the south coast opposite to Aegina; but the city Salamis of Strabo's time was on the small Bay of Ambelákia, and near the peninsula which projects from the eastern part of the island to the shores of Attica, and terminates in Cape Cynosura. (Herod., viii. 76.) This cape was also called Sileniae and Tropaea. About midway between this peninsula and the Piraeus, but not exactly in the strait leading to the Bay of Eleusis, is the small island of Psyttaleia, now Lipsokutáli, which makes a conspicuous figure in the battle of Salamis. (Herod., viii. 95.) It is about a mile long, and from two to three hundred yards wide, low, rocky, and covered with shrubs. Between the Bay of Koluri and the strait at the western extremity of the island there is a mountainous peninsula called Budorus by Thucydides (ii. 93, 94) and Strabo. The western extremity of the peninsula is only three miles from Nisæa, the port of Megara.

The antient names of Salamis were Sciras and Cychreia, derived from antient heroes. It was also called Pityussa from the pines that grew in it. In Homer, the island is only called Salamis, a name said to be derived from Salamis, the mother of Asopus. Before the Trojan war, the island was possessed by the Aeacidae under Telamon from Aegina; and Ajax, the son of Telamon, accompanied the expedition to Troy with twelve Salaminian ships. About the time of Solon and Pisistratus, there was a dispute about the island between Megaris and Attica, which terminated in favour of Attica, and from that time the island became one of the Attic demi. In the contest between Cassander and the Athenians, the Salaminians surrendered their island to the Macedonians, for which they were punished by the Athenians, who destroyed their city. In the time of Pausanias it was in a ruined state, but he could trace the remains of the agora, and there was a temple of Ajax with a statue of ebony.

The great event in the history of Salamis is the naval battle fought B.C. 480, between the combined Grecian fleet and the Persian fleet under Xerxes. The battle took place chiefly in the eastern strait, which, being a contracted space, was very unfavourable to the enormous fleet of the Persians. According to Heredotus, the Greek fleet amounted to 367 triremes and five penteconters. The Persian fleet is stated by various antient authorities at 1200 ships, but it was probably somewhat less. The Persian king saw the battle from the Attic coast, where he had his seat at the foot of Mount Aegaleos, with his secretaries by his side to register the events of the action. (Herod., viii. 90.) The probable position of the Persian king, according to Leake, was near the shore, 'on the summit of a ridge which descends from the top of Mount Aegaleos, about a mile from the western side of Port Phoron, and opposite to the centre of the Persian fleet. The result was the complete defeat of the Persian armament. After making a feint to build a mole from the mainland to Salamis, as if he wished to shut up the Greek ships which had retired into the bay after the action, Xerxes suddenly ordered his fleet to retreat to the Hellespont.

(Herodotus, viii.; Aeschylus, *Persae;* Strabo, p. 393; Pausanias, i. 35; Leake, *On the Demi of Attica;* and the articles AESCHYLUS, ARISTIDES, THEMISTOCLES, and XERXES.)

SALAYER ISLANDS are a small group in the Indian Archipelago, situated between 5° 40′ and 6° 20′ S. lat., and between 120° and 121° E. long. The group consists of a larger and several smaller islands. The smaller islands are uninhabited, with the exception of two called Bonaratte and Calauwe. Salayer, or the principal island, is about 30 miles long, with an average width of eight miles; and it is divided from Cape Lassoa in Celebes by a strait about eight miles wide. In the strait there are three small rocky islands, called the Budjeroons, which are uninhabited.

A ridge of high hills traverses the island from north to south, and descends to the east and west with a rapid slope. These hills are entirely covered with wood, and abound in deer. Along the base of the hills there are tracts of low land, which are carefully cultivated. They produce several roots and grains common in the archipelago, but especially *botta*, a kind of millet, which constitutes the chief article of food of the inhabitants. Cotton is also grown to a great extent, and the inhabitants manufacture it into coarse cloth, striped blue and white, which is partly used in the island and partly exported. Among the trees there are several kinds of palms, and also the tallow-tree, the substance obtained from which is used for burning, as it is in China. The inhabitants, who are stated to amount to about 60,000, are Malays, and seem to be more industrious than the natives of other islands, as they apply themselves to agriculture, and, as already observed, manufacture cotton stuffs. The island is divided among several petty princes, who are dependent on the Dutch at Macassar, but it seems that they are not bound to any other duty than to resort every year to Fort Rotterdam to perform the customary ceremonies of vassalage. On the eastern side of the island the Dutch have a small fort, or rather a redoubt, called Fort Defence. (Stavorinus's *Voyages to the East Indies*.)

SALDANHA BAY is a spacious bay on the western shore of South Africa, about 70 miles north of Table Bay, between 33° 3′ and 33° 20′ S. lat. and near 18° E. long. This bay is about 15 miles in length from north-north-west to south-south-east, and it affords at all seasons excellent shelter and anchorage. It is divided from the Atlantic by a ridge of granite rocks of moderate elevation, in which there is an opening about three miles wide, which is the entrance to the bay. There are two small rocky islands in the entrance, and the channel for vessels lies between them. The bay contains several excellent anchorages, both towards the north and south, and also along the granite ridge which separates the bay from the sea. The country east of the bay is of moderate fertility; but being tolerably well inhabited and cultivated, all kinds of provisions are easily obtained. (Morell's *Narrative of Four Voyages to the South Sea*, &c.)

SALE is that transaction by which the ownership of property is transferred to the buyer, in consideration of a money payment by him, or on his behalf, to the seller. Such transfer of ownership may sometimes be made, although the property does not belong to the seller; as in the case of sales in open market, which are valid, though made by parties wholly without title to the property, or authority to sell it; and sales by factors and agents duly authorised. Under the present head it is proposed to treat only of the law relating to the simple act of sale, it being assumed that the parties to the sale are legally qualified to effect it. Persons in certain conditions are by law in some cases restrained and in others disabled from buying and selling, but these restrictions and disabilities form no part of the law of sale; they belong rather to those branches of the law, such as infancy, bankruptcy, insolvency, coverture, lunacy, alienage, &c., which reate and define them.

Generally, all things may be the subject of sale; but here are some exceptions,—such are a mere title to lands f which a party is not in possession, a presentation to a iving actually vacant, the pay of a naval or military officer, nd some other things.

Property is distributed under the two heads of real and ersonal property, which differ materially in many respects; nd the modes of effecting the sale of each of these kinds f property likewise materially differ. Some incidents however are common to a sale both of real and personal property.

No sale is valid so as to be capable of being enforced nless—

1st, The parties to it act with good faith;

2nd, Unless there is consent in each of them; and—

3rd, No sale is valid the subject of which is illegal, or hich involves an illegal transaction, or has for its object an llegal act.

With respect to the first principle, it is a maxim of the ommon law that fraud vitiates all contracts. The fraud nay be, with respect to the property, the subject of sale, either f a positive character, such as wilful misdescription of it in ome material particular by the seller, or negative, such as designed concealment of defects and incumbrances. In hese cases the contract of sale cannot be enforced, notwithstanding express stipulations that the property shall be aken with all its faults, or that mistatements shall not nvalidate the sale, but shall be provided for by compensation.

What is a material particular, will of course depend upon he subject-matter of the sale and the circumstances of the ase. A misdescription of the situation of an estate, a tatement that a public-house which was bound by covenant purchase beer of a particular brewer, was a free publicouse, that a long leasehold estate was freehold, have been eld to be material. Under this head may be adduced as n instance the employment of more persons than one to ake false biddings at an auction on behalf of the seller. uch persons are commonly called puffers. One such peron may lawfully be employed to protect the interests of the eller by merely buying in the property at a predetermined um. But the bidding of more than one has the effect of ducing an incorrect opinion as to the value of the estate, nd such bidding, being fraudulent, invalidates the sale. n like manner fraud on the part of the buyer will have e same effect; as where he prevents other persons om purchasing by fraudulently misrepresenting the ature of the property, or attempts to obtain possession f it with a design not to pay for it; or where, when egociating the sale, he knows himself to be insolvent, makes payment by cheques or bills which he knows will ot be honoured, &c. These are instances of fraud which is tended to operate only on one of the parties to the sale. But e same effect may be produced where the fraud is intended operate on other persons not parties to the sale; as where sale is attempted to be made by a seller for the purpose f defrauding his creditors. If in such case the buyer parcipate in the fraudulent intention, the sale will be invalid. n an action at law, the question whether fraud has existed to be determined by the jury.

2. There must be consent in each of the parties to the le. This rule involves the proposition that each must be free and intelligent agent: no sale therefore can be valid here either of the parties was under coercion by violence or nprisonment, or bodily fear, or was lunatic, or idiot, or utterly toxicated. Again, in order that a buyer may be a legally consenting party to a sale, he must be truly informed in all material particulars as to the property which is the subject of sale. This must be understood of such particulars as he cannot by reasonable care and observation inform himself upon, for a man has no legal protection against the consequences of his own carelessness and negligence. If however he has been deceived in any other particulars, even unintentionally, by the buyer, he cannot be said to consent to the bargain. The consent which he gives is to the purchase of such property as has been described to him, and the consent therefore cannot relate to the property which is the subject of the sale, if it differs in material points from what has been described. Thus in the common case of a horse warranted sound, the consent is to buy a sound horse, and the buyer cannot be considered to have consented to buy an unsound horse. If therefore the horse is manifestly unsound, a party cannot be compelled to carry into effect his contract to purchase it. The case is the same with an estate said to be tithe free, which in reality is not so, or with any other property the description of which, as stated, varies materially from the truth. Where indeed the variance from the description is obvious, and the buyer has had an opportunity of inspecting the property and afterwards chooses to complete the purchase, the contract will not be invalid. The reason of this rule is manifest, for the legal presumption is that ordinary diligence has been used, where it might and ought to have been used, and there is therefore no ground for supposing an absence of the buyer's consent.

In cases where there is no fraud, and a possibility of variance from the description is contemplated in the conditions of sale, the sale may still be valid notwithstanding the existence of such variance, for in this case both parties knowingly take the chance of the variance being either favourable or adverse to them. As when for instance it is stated that an estate consists of so many acres, &c., be the same more or less, &c. If the conditions of sale contain a provision that compensation shall be made for such variances when they are ascertained, then the party in whose favour they turn out to be, will be bound to make such compensation. If however from the circumstances of the case it should appear that such compensation cannot be made, the sale cannot be enforced against the purchaser, forasmuch as the terms to which the parties consented are impossible, and there is therefore nothing to which the consent is applicable.

A court of equity will in some cases compel a buyer to complete his bargain, on the condition of the seller making him compensation in respect of those matters in which there is a variance, even although there is no provision to that effect in the conditions of sale. The principle on which this is done is, that parties ought to carry into effect what was substantially their intention. This power of the court therefore is not exercised where the variance is material, or where the attainment of the particular matter in which a variance exists really was the main object of the purchase. The common terms of exaggerated praise in which persons speak of the property that they have to sell, is not such misdescription as will make a sale void. In cases where property is agreed to be sold by one contract, in one lot, a buyer cannot be compelled to take some part of it without the rest.

3. No sale is valid if the subject-matter of it is illegal or prohibited, or if an essential part of it is an illegal transaction or involves an illegal act. A sale of treasonable, blasphemous, or obscene publications is void, for the acts of treason, blasphemy, and obscenity are legally punishable. A sale of property known by the seller to be intended to be used for illegal purposes is void, such as drugs to be used for the adulteration of provisions, or a house to be occupied for the purposes of prostitution. Sales for the purpose of avoiding the forfeiture to the crown incident upon judgment after a conviction for felony, are void. Sales to an alien enemy are unlawful, although a power exists in the crown to grant licences legalizing such sales. Offices of public trust, such as those which are connected with the administration of justice or government, either in the United Kingdom or in the dependencies upon it, cannot lawfully be the subject of sale. The enactments affecting the sale of various articles are too numerous to be referred to here. It may however be laid down generally that where a thing is prohibited and made unlawful by statute, a contract for the sale of such thing is void,

although the statute does not enact that it shall be so, but only attaches a penalty to an infringement of its provisions. Sales of contraband articles are also void; and even in the case of a foreigner selling goods abroad, to be delivered in this country, the sale will be invalid, if he be cognizant of and aiding in an attempt to introduce them into this country in contravention of the revenue laws. A sale of property in the ordinary course of a party's trade is void if made on a Sunday, although the sale of the same article by another person whose ordinary dealings are not in such matters would be valid.

In the case of a sale of lands, it is assumed that the seller has a good title to them, and that he will deliver over the title-deeds to the buyer. In failure of either of these particulars the sale cannot be enforced. The right to receive a good title is one which is conferred upon the buyer by the law, independently of any agreement between the parties.

By the statute 29 Charles II., c. 3, s. 4, certain forms were required in order to give effect to a sale of 'lands, tenements, or hereditaments, or any interest in or concerning them.' Such forms are no part of the sale, which consists in the consent of parties who are competent to consent, but the statute merely declares that such consent shall, in certain cases, have no legal effect, unless the prescribed forms are observed. If an agreement for sale has been made without the requisite formalities, and has been carried into effect in some material part, a court of equity will enforce the performance of the whole contract, on the ground that the informal contract, having been partly completed, is not a case within the statute. In all other cases of contracts as to interests in land, 'the agreement, or some memorandum or note thereof, shall be in writing, and signed by the party to be charged therewith, or by some other person thereunto by him lawfully authorised.' The agreement binds the party who signs it, although it is not signed by the other party. No established form is requisite, and it is not necessary that the agreement should be contained in one instrument: it may be collected from a series of letters, or a written offer followed by a written acceptance, or from documents referred to by a letter. The signature may be attached to any part of it. An agent may be appointed verbally, and the same person may act as agent for both parties to the sale. An auctioneer is such agent, and his writing down the name of the highest bidder in his book is a sufficient signature.

The law which relates to the construction of agreements for sale falls under the ordinary rules as to the construction of agreements generally. The same observation applies as to the remedies which parties possess for the enforcement of them. When the contract for the sale of an estate is completed, the estate is, in equity, considered to be sold, and the buyer is viewed as the owner of the estate, and the seller as only a trustee for the buyer, while the buyer is considered as a trustee of the purchase money for the seller. If therefore a party has contracted for the sale of an estate of inheritance, and dies before payment of the purchase money, the money will be considered as part of his personal estate, and his executors will be entitled to it. On the other hand, if the party who has contracted to buy the estate die before it is conveyed to him, his heir or devisee will be entitled to the estate, and the executors must pay the purchase money out of the personal estate of the buyer, if they have sufficient assets. It is a consequence of this equitable doctrine, that the buyer must, as a general rule, bear any loss which happens to the estate after the completion of the contract of sale. A person who has obtained such an equitable ownership, may deal with the property in all respects as if it were his own; and such dealings, though not valid at law, are viewed as valid transactions in a court of equity.

With respect to sales of personal property, the common law required no formalities. The terms of sale might be agreed on either verbally or in writing; and they might be proved by any evidence legally applicable to the proof of other matters. Sales of goods made at one time, and not together exceeding in price 10*l*., still remain on this footing. By the same statute (29 Charles II., c. 3) which prescribed certain formalities in sales of land, it was enacted (s. 17) that 'no contract for the sale of any goods, wares, and merchandise for the price of 10*l*. sterling and upwards shall be allowed to be good except the buyer shall accept part of the goods so sold and actually receive the same, or give something in earnest to bind the bargain, or in part payment, or that some note or memorandum in writing of the said bargain be made and signed by the parties to be charged by such contract or their agents thereunto lawfully authorised.' By the 9 Geo. IV., c. 14, s. 7, the enactments of this act are extended to all contracts for the sale of goods of the value of 10*l*. sterling and upwards, notwithstanding the goods may be intended to be delivered at some future time, or may not at the time of the contract be actually made or fit for delivery. The statutory requisites are thus four in number:—

1. Delivery and receipt of part of the goods.
2. Payment of earnest.
3. Payment of part of the price.
4. A signature of a memorandum of the bargain by the party or his agent. By the performance of any one of these requisites the parties to the sale are bound.

If the goods themselves are delivered to the buyer himself and accepted by him, of course no question can arise as to the completion of the bargain. Where however the delivery is not to him personally, many cases of nicety occur as to whether or not a delivery has taken place, so as absolutely to vest the property of the goods in the buyer. A delivery which would be sufficient, if not afterwards interfered with by the seller, to accomplish the requisite of the statute, is complete as soon as the goods have been delivered to a carrier for the purpose of being conveyed to the buyer, even although the carrier has not been selected by the buyer. But during the course of actual transit to the place indicated by the buyer to the seller as the place of destination, the goods are subject under certain circumstances to a right of the seller to detain them. This is called the right of stoppage in transitu, and the time and place when it ceases are often a question of great nicety. [STOPPAGE IN TRANSITU.] Where no delivery of part of the goods themselves has been made by actual removal, a constructive delivery may effect the same purpose: a delivery of the key of the warehouse where the goods lie; the receipt of rent for their warehouse-room by the seller; the endorsement and delivery of a bill of lading or a dock warrant; an order to a wharfinger to deliver, &c., amount to a delivery. In all such cases however it must be understood that the delivery is not complete if anything yet remains to be done to the goods on the part of the seller, such as their separation by weighing or measurement from a larger bulk. Again, the exercise of ownership over the goods by the buyer, with permission of the seller, is an act legally equivalent to delivery: such as marking the goods, tasting wine, and cutting off the pegs from the cask, &c. But in these cases it must distinctly appear that the act which is done is an act of ownership; if done with any other view, as for the purpose merely of identifying the property, it will of course afford no ground from which a delivery may be inferred. Where a sample is taken out of the whole bulk sold, a delivery of the sample operates as a part delivery.

2. The earnest-money paid must be retained. In a case where a shilling had been paid to bind a bargain, and was returned, it was held that this was not a compliance with the requisite of the statute.

3. The part payment need not necessarily be made in cash; a payment by acceptance of a bill, or by a promissory note, will, while the instruments remain undishonoured, have the same effect as by actual money.

4. The general observations which have been made as to a note or memorandum in writing relative to sales of land, will apply equally to one relative to sales of goods.

(Sugden, *On the Law of Vendors and Purchasers*; Ross's *Treatise on the Law of Vendors and Purchasers of Personal Property*.)

SALE, GEORGE, a learned oriental scholar, was born in 1680. Very little is known of his private life, except that he was a lawyer. He was a contributor to the 'Universal History,' edited by Swinton, Dr. Campbell, and others, and he wrote for that work the cosmogony, besides several valuable fragments of oriental history, in which he was deeply versed. He was likewise one of the authors of the 'General Dictionary' (Lond., 1734, 10 vols. 4to.), which contains a translation of that of Bayle. But the work by which he is best known is a translation of the Korán into English, from the original Arabic, with explanatory notes and quotations from Zamashkhari Beydawi and the most approved commentators. [KORAN.] To this version, which in point of fidelity will bear a comparison with the excellent Latin translation by Marracci, published in 1698, Sale prefixed a preliminary discourse on the social and religious state of the Arabs, Jews, and Christians at the time of Mohammed's appearance [Mohammed]; on the doctrines inculcated in the Korán; on the principal sects among the Mohammedans; and on various other subjects connected with Islám (Lond., 1734, 4to.). This discourse was afterwards translated into French, and prefixed to the French version of the Korán by Duryer (Antw., 1770, 2 vols. 8vo.). Sir James Porter, in his 'Observations on the Religion, Law, Government, and Manners of the Turks' (Lond., 1768, p. 60), has accused Sale of making an apology for the Korán, rather than trying to point out the pernicious doctrines contained in that book. The charge however is wholly groundless, as every scholar acquainted with the writings of the Mohammedan divines will readily admit. Sale was one of the founders and a member of the first committee of a Society for the Encouragement of Learning, instituted in 1736. He died in the same year (14th Nov., 1736), leaving one son. Soon after his death a catalogue of his Oriental MSS. was published, containing many choice articles in Arabic, Persian, and Turkish literature. They are all now in the Radcliffe Library, Oxford, for which they were purchased.

SALEM, a sea-port town, the capital of Essex county, in the state of Massachusetts, North America, is situated on a tongue of land formed by two inlets of Massachusetts Bay, called North River and South River. A bridge 1500 feet long crosses North River, and connects Salem with the village of Beverley. Salem is in 42° 36′ N. lat., 71° 7′ W. long., 15 miles north-east from Boston. It is the oldest town in the state except Plymouth, having been founded in 1628, and for some time contended with Boston for commercial supremacy, but was soon compelled to yield to its powerful neighbour. The population was 12,731 in 1820, 13,886 in 1830, and 15,162 in 1840.

The town is well built, the old houses chiefly of wood, the modern ones of brick; and though the streets are rather narrow, there is an appearance of much neatness and comfort. There is a court-house, a market-house, a gaol, and an almshouse, all well built and spacious. The East India Marine Museum has an extensive and interesting collection of curiosities from all parts of the world. It belongs to the East India Marine Society, of which no one is eligible to be a member who has not sailed round Cape Horn or the Cape of Good Hope, and which was founded in 1801, for the purpose of affording relief to indigent members and their families, and also to promote the trade to the East Indies. The chief manufactures of Salem are leather and ropes, and there are yards for ship-building. In 1832 there were 8 banks, 5 insurance companies, and an institution for savings; 2 libraries, an Athenæum, and a mechanics' library; 3 semi-weekly newspapers and 2 weekly; and 15 places of worship. Education is much attended to; there are numerous schools, and no child in the town need remain uninstructed.

The harbour is in South River; the anchorage is good, but the depth of water at the wharfs is only 12 or 14 feet. The trade is chiefly with the East Indies, in which a large capital is employed. The number of vessels employed in this trade in 1818 was 53, carrying 14,272 tons.

Salem is the name of 18 small towns and villages in the United States of North America, including New Salem and West Salem.

SALEP, *Salap*, or *Saloop*, a nutritious article of diet, much valued in the East for its supposed general stimulant properties, but which is justly esteemed as bland and nutritious, and well suited to children and convalescents. Salep consists of the tubers of different species of Orchideæ, which have been known in medicine from very early times by the name Orchis. Dr. Royle has most recently treated of the plants yielding Salep, in his 'Illustr. of Himal. Botany,' and in the 'Proceedings of the Royal Asiatic Society.' He states that the accounts of Theophrastus and Dioscorides are repeated in the works of the Arabs, who describe Salep under the names of *khusyut-al-sálib* and *khasyut-al-kulb*, which names are literally translations of testiculus vulpis and testiculus canis; to the above they assign as Greek synonyms *orkhis*, *saturyoon*, and *turphyla*, evidently intended for the ὄρχις, Σατύριον, and τριφυλλον of Dioscorides. In India these tubers are known by the name *salip misree*, that is, salep from Misr, or Egypt, all which names appear to be derived from the Arabic *sulib*; whence, Dr. Royle states, it might be inferred that the knowledge of this substance was first derived from the East, but on examining the accounts in Arabian authors on 'Materia Medica,' we see the names and descriptions are mere translations of those of Dioscorides. If the Greeks were the first to use the tubers of some of the Orchideæ, either as articles of diet or in medicine, some European species would probably be the plants which yielded the original salep, and possibly some of those which have been found to afford it of good quality to experimenters in the present day. Sprengel considers Orchis papilionacea, Lin., to be the orchis (ὄρχις) of the antients, as it is called *salepe* (σαλεπι) by the modern Greeks; M. Beissinhirtz says that Orchis Morio, mascula, and militaris give the best salep in Europe; O. maculata and latifolia are rather inferior in quality. Dr. Cullen says, 'I have seen it prepared in this country from Orchis bifolia, as pure and as perfect as any that comes from Turkey.' But all the European saleps are far inferior to and considered only as indifferent substitutes for that brought by commerce from the latter country, though the place and plant yielding it are unknown.

Though the Arabs may have copied the descriptions of Greek authors, it is probable that the substance was known to eastern nations independent of all western intercourse. It is highly valued in India, and forms an article of commerce from Caubul and Cashmere to the north-western provinces of India, where it is sold, at the Hurdwar fair held in April, at a high price, sometimes as much as 40 rupees, or 4*l.* a pound. This is very similar in form and appearance to Turkey salep, though the tubers are twice as large as the best procurable in London.

The plant yielding the Cashmerian salep has not been yet fully described, but Dr. Royle obtained specimens of the tubers with the plant (not in flower) attached to them in 1836, from the vicinity of the hills near the Jhilum, on the road from Northern India to Cashmere. This plant he has named Eulophia vera. Another species, E. campestris, found in the jungly plains at the foot of the Himalayas, yields tubers which are collected by the natives and sold as a substitute for salep misree. Another plant, supposed to be E. herbacea, yields another variety of salep in the Himalayan Mountains; of the former, Dr. Royle states, that having obtained some of the tubers and prepared them as salep, that is, scalded them in boiling water and then carefully dried them, he found they had a considerable resemblance to the salep of commerce, and when prepared as arrow-root or gruel, afforded a very agreeable and nutritious article of diet, similar to that obtained from the commercial salep.

Salep consists of the dried tubers of several orchideous plants, chiefly of the genus Orchis, as O. moris, O. mascula, O. maculata, &c., and from some species of Eulophia. All these plants have two tubers, charged with nutritious matter, and while one is nourishing the flower-stem and seeds of the current year, by which it is robbed of its store, the other serves as a reservoir for the flower-stem of the succeeding year. This last alone is fit for use. Both are dug up together, but the solid one only is retained. It is dipped in warm water, after which the fine brown skin is easily removed by means of a coarse cloth or brush. 'The tubers, being thus cleaned and peeled, are to be arranged on a tin plate, and then placed within an oven heated to the same degree as is necessary for baking bread; here they are to remain for seven or ten minutes, in which time they will exchange their opaque and milky whiteness for a semi-transparent horn-like appearance, and a yellowish colour, retaining their original bulk. Being then withdrawn from the oven, they are exposed during some days to dry and harden in the air; or by the employment of a very gentle heat, they may be brought to the same state in the course of a few hours: all that is then required to adapt the salep for food is to boil it in water (or milk) to the required consistency.' (*Library of Entertaining Knowledge*, 'Vegetable Substances: Food of Man,' p. 159.) In Armenia the tubers, while yet soft, are strung together on threads, and suspended in the sun, which is sufficient to dry them without artificial heat. The chemical composition of salep varies according to the period of the growth when the tubers are taken up. Though salep is regarded as a variety of starch, there is very little pure starch present, the chief constituent being that form of gum termed *bassorine*. With cold water salep very slowly swells and forms a mucilage; but one part of salep-powder with forty-eight parts of water boiled or heated forms a thick mucilage, which has very peculiar qualities, inasmuch as with either calcined magnesia, bisulphate of quinia, or biborate of soda, it thickens into a solid glue-like substance. This may be of service in the arts. But the chief use of salep is as a mild and digestible article of food: and as the orchis abounds in our meadows, a large supply of nourishment might be obtained by digging up the tubers and drying them, as above stated, and as was recommended in the last century by Dr. Percival (*On the Preparation, Culture, and Use of the Orchis-root*, 1773). In that work it is stated that salep has the property of concealing the taste of salt-water (see also *Philos. Magazine*, vol. xviii., 161); 'a property,' observes Sir Whitelaw Ainslie, 'which might be turned to good account in long voyages; the mucilage is best to be used for this purpose' (*Materia Indica*).

Salep is composed chiefly of bassorine, some soluble gum, and a little starch; by some it is considered as containing the largest portion of nutritious matter in the smallest space.

SALERNITA'NA SCHOLA, or *School of Salerno*, the earliest school in Christian Europe where medicine was professed, taught, and practised. Salerno, from its connection with Constantinople and the Saracens, became the centre of the united learning of the Latins, the Greeks, and the Arabians; and hence it was one of the first cities in Europe where the sciences awoke from the slumber of barbarism. Amongst other arts, it was celebrated very early for the profession of medicine,[*] and its first fame was derived from the extraordinary cures said to have been performed by the relics of Saint Archelais. This lady, with two other holy virgins, Thecla and Susanna, suffered martyrdom in the persecution of Diocletian, about the year 293, and their remains were at length deposited in the church of the Benedictine nuns of Saint George at Salerno. (Anton. Mazza, *Histor. Epit. de Rebus Salern.*, Neap., 1681, 4to., cap. vi.) In an antient chronicle, quoted by Mazza, it is said that the first founders of the school of Salerno were Rabinus Elinus, a Jew; Pontus, a Greek; Adala, a Saracen; and Salernus, a Latin, who taught medicine in their respective languages, but at what æra is not mentioned. (Anton. Mazza, *Salern. Hist.*, cap. ix.) Though medical works had never been wanting in the dark ages, and the works of Hippocrates and Galen were translated into Latin as early as the sixth century,[†] yet this art was principally derived from the Arabians, who likewise learned it from the Greeks. After that warlike people had softened into habits of peace and luxury, by the encouragement of their khalifs, and particularly of Al-Mamoún, at the beginning of the ninth century, they applied themselves to learning. Many of the Greek writers were translated into Arabic; and the philosophy of Aristotle, and the art of medicine of Hippocrates and Galen, became their favourite studies. In their frequent visits to the port of Salerno, the knowledge which they freely communicated was eagerly received there and diligently cultivated. For many centuries the most able professors of medicine were the higher prelates and the superior monks.[‡]

Connected with the city of Salerno by its vicinity, and the similarity of its literary pursuits, was the monastery of Mount Casino. Here and at Salerno great progress in the sciences had been made, when the arrival of Constantinus Afer commenced a new æra of learning and fame. This celebrated man was born at Carthage. After thirty-nine years spent in study at Bagdad and in travel, he returned to his native country, master of all the learning then current in the world, and particularly of medicine. His talents excited the jealousy of his rivals, he was obliged to fly, and took refuge at Salerno in 1060. He was discovered by the brother of the khalif of Egypt, who happened to be in that city, and who recommended him to Robert Guiscard. By this prince he was patronised, and made his secretary. Having been converted to Christianity, he became a monk, and retired to the monastery of Mount Casino about the year 1075, where Desiderius was the abbot. He died in 1087, after having, by his wonderful cures, the multitude of books he wrote, and the number and fame of his scholars, raised the reputation of the School of Salerno to the greatest height. Some of his works have been printed (Basil., 1536, 1539, 2 vols. fol.), and others remain in manuscript.[*] The names of few of his disciples have been recorded. We find mention however of Atto, chaplain to the empress Agnes, who translated the works of his master from various languages into Latin. (Pet. Diac., *De Viris Illustr.*, cap. xxix.) Another of his pupils was John, the physician, an eloquent and learned man, who published a book of aphorisms, and died at Naples, where he deposited the books written by his master. Gariopontus seems likewise to have been a contemporary. (Moreau, *Prolegom.*, p. 11.) It may not be uninteresting to ascertain the other celebrated physicians of Salerno in the twelfth century, and soon after the time when the 'Regimen Sanitatis Salernitanum' was written. The earliest whose name occurs is Nicolaus, who, amongst other works, wrote a book, still extant, entitled 'Antidotarium,' upon medicines, which was thought to have been the summit of medical knowledge. [NICOLAUS PRÆPOSITUS.] It was commented upon by John Platearius, in the middle of the twelfth century, and many other writers. Musandinus wrote upon diet, Maurus upon urine and phlebotomy. The specific works of John Castalius, Matthew Solomon, and Ricardus Senior are not enumerated. There were other learned men who studied medicine at Salerno in that century, but removed to other places, such as Saint Bruno, bishop of Signia, afterwards abbot of Casino, and again bishop, who died in 1126: Romualdus the second, archbishop of Salerno from 1157 to 1181, who attended William, king of Sicily, as his physician, in 1127; Saladinus Asculanus, physician to the prince of Tarentum in 1163. (Aegidius Corbol.; Petrus Diac.; Mazza; &c.) Nor was the healing art confined to men only: there were many of the fair sex who were celebrated for their medical skill. The time when most of them lived is uncertain, but probably in the eleventh, twelfth, and thirteenth centuries. Ordericus Vitalis speaks of a woman unequalled in medicine in 1059: 'Rodulfus cognomento Mala-Corona, Physicæ scientiam tam copiose habuit, ut in urbe Psalernitanâ, ubi maximæ medicorum scholæ ab antiquo tempore habentur, neminem in medicinali arte, præter quandam sapientem matronam, sibi parem inveniret' (*Hist. Eccl.*, lib. iii., ad an. 1509, p. 477). Abella wrote a poem in two books, 'De Atrabile et de Naturâ Seminis Humani.' Mercurialis composed books 'De Crisibus,' 'De Febre Pestilenti,' 'De Curatione Vulnerum,' 'De Unguentis.' Rebecca, a work 'De Febribus, de Urinis, et de Embryone.' Trotta or Trottula's book 'De Mulierum Passionibus ante, in, et post Partum' is allowed to be a forgery.[†] Sentia Guerna lectured on medicine, and Constantia Calenda received the honour of the doctorate.

It would be tedious to mention all the learned men who studied physic at Salerno after the twelfth century, of whom Mazza has given a long catalogue. From these we may however except John de Procida, a nobleman and physician of Salerno, the friend and physician of Manfred, king of Sicily, and the adviser of the Sicilian Vespers.

When the 'Regimen Sanitatis' was written, the professors contented themselves with the humble title of the School of Salerno. By the privileges of subsequent sovereigns, it was gradually constituted a regular university. Ruggiero, king of Sicily, about the year 1137, enacted a law that all who designed to practise medicine should be examined and approved by his officials and judges, under the penalty of the confiscation of all their goods. By 'officials' it is supposed that the physicians of Salerno were understood, as he had recently given great privileges to that city. The emperor Frederic II., having established likewise a university at Naples, published edicts for its government, which were finally promulgated in 1231. The study of physic and lectures in that art were restrained to those two universities. Students were to apply themselves to logic for three years before they commenced the study of medicine, which they were to pursue for five years; nor were they then admitted till they had practised for one year under an expert physician. After a public examination, the university of Salerno had full power to grant a licence to practise: that of Naples could only certify the sufficiency of the candidate to the king or his chancellor, who granted the licence. The names of 'doctor' and master were not then known as specific titles of honour, but were used in their original significations for teachers or persons skilled in their art.

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[*] 'In urbe Psalernitanâ, ubi maximæ medicorum scholæ ab antiquo tempore habentur:' Orderic. Vitalis, 'Hist. Eccles.,' lib. iii., p. 477 (ed. Duchesne, Paris. 1619. fol.), ad an. 1059. 'Sin da' tempi di papa Giovanni VIII.' (pope, from 872 to 882): Giannone, 'Istoria di Napoli,' ed. Haia., 1753, vol. ii., p. 124.

[†] About the year 560, Cassiodorus recommended to his monks 'Legite Hippocratem et Galenum Latinâ linguâ conversos:' Muratori, 'Antiq. Ital.,' vol. iii., col. 930, ed. Mediol. 1740, fol.

[‡] Subsequently, by the councils of Lateran in 1139, of Tours in 1163, and the decree of Honorius III. in 1216, the clergy and monks were prohibited from exercising the professions of advocates and physicians, but they still continued the practice.

[*] His history appears originally in Leonis Ostiensis 'Chronicon Casinens., Neap., 4to. 1616, lib. iii., cap xxxv.: and Petrus Diaconus, 'De Viris Illustr. Casinens.,' cap. xxiii. (in 'Bibl. Max. Vet. Patr.,' tom. xxi., p. 362, fol. Lugd. 1677). From thence in Murat., 'Ant. Ital.,' vol. iii., diss. xliv., p. 934; Giann. vol ii., p. 123; Fabricii 'Biblioth. Græca,' vol. xiii., p. 123, ed. Vet.; 'Biblioth. Med. Latin.,' vol. i., p. 1199, &c.

[†] See a dissertation by C. G. Gruner, entitled 'Neque Eros, neque Trotula sed Salernitanus quidam Medicus, isque Christianus, auctor Libelli est qui De Morbis Mulierum inscribitur,' 4to., Jenæ, 1773.

The licensed practitioners took an oath to observe the regulations respecting medicines, to inform the court if apothecaries did not prepare their drugs properly, and to give advice to the poor gratis. Every physician was to visit his patient at least twice a day, and once in the night if necessary, and was not to receive for his attendance more than half a golden tarena[*] daily; or if called out of the city, three tarenæ and his expenses, or four tarenæ to provide himself. He was not to undertake to cure a disorder for a specific sum, or to keep an apothecary's shop, or to be in partnership with an apothecary. Surgeons were to study for one year, and to be perfect in anatomy before they were admitted to practise. Apothecaries were to take an oath to compound their medicines according to the forms prescribed, and for a fixed price, which for simple drugs was three tarenæ an ounce. Such were the regulations of the emperor Frederic.[†] The three professions appear to have been kept distinct as early as the time of Avenzoar, who was born at Seville in the eleventh century, and even in the time of Celsus. (Freind, *Historia Medicinæ*, ed. Paris, 1735, 4to., p. 253; Le Clerc, *Hist. de la Méd.*, p. 334.) These constitutions, and the privileges of the university of Salerno, were confirmed and extended by other princes, and were in force in modern times. They are the most antient medical statutes in Europe, and show the state of the medical professions in those early times. When fully established, the university consisted of ten doctors, of whom the eldest had the title of prior. Their common seal bore the image of St. Matthew, their patron saint, whose body had been given to them by Robert Guiscard, and the inscription of 'Civitas Hippocratis.' Students were admitted to the doctorate by the solemn form of having a book put into their hands, a ring on their fingers, a crown of laurel on their heads, and a kiss on their cheeks. (Mazza, cap. ix.; Freind, *Hist. Med.*) The medical science of the Arabians, thus introduced into Salerno, was in substance that of the Greeks, from whom it was derived. In the theory and cure of diseases they followed the opinions of Hippocrates and Galen; not indeed in their native simplicity, but often corrupted by their own vain and fanciful inventions, by the superstitions of astrology, and the follies of alchemy. (Freind, p. 479; Gian., vol. ii., p. 119, sec. 3.) Yet it is admitted that the modern science of medicine owes much to their improvements. They greatly extended the Materia Medica by the introduction of many efficacious remedies. They added to the list of medical plants. The first but very gradual introduction of chemistry into medicine is wholly theirs (as all the chemistry that is to be found in Greek writers relates to the fusion or transmutation of metals), and many of their formulæ of compound medicines still retain a place in modern dispensatories. In many points of practice they ventured to differ from their masters, as in less copious bleedings, in milder purgatives, in substituting sugar for honey in their syrups; and they first gratified the eyes and the taste of their patients by clothing their prescriptions in gold and silver leaf—a luxury which continued till within the last few years.

Under the title 'Regimen Sanitatis Salernitanum,' we possess a collection of dietetical precepts, written chiefly in Latin rhyming hexameters.[‡] The poem is dedicated, by the Medical School at Salerno, to Robert, son of William the Conqueror, who is styled king of England, and was probably composed by a physician of Salerno, at the beginning of the eleventh century. Johannes de Mediolano is generally supposed to be the author of it, which opinion was first started, in 1649, by Zacharias Sylvius, on account of some manuscripts (one of them as old as 1418) which had his name in the inscription; however, neither the earliest commentators and editors nor the oldest manuscripts make any mention of his name. The number of the verses varies much in different manuscripts, as the poem in the middle ages received by degrees many spurious additions. The oldest editions, with the commentary of Arnaldus de Villanova, have only three hundred and sixty-four verses, which may therefore be considered as the only genuine ones, since Arnaldus, who lived in the fourteenth century, and passed some time at Salerno, had certainly an opportunity of examining the most accurate copy of the poem. The whole work was much esteemed, not only in the middle ages, but also as late as the seventeenth century, and it is at the present time an important source of information respecting the state of medicine in that age. As it was not designed for physicians, but for an unlearned sovereign, and for general use, its object was rather the preservation of health than the cure of diseases. The means prescribed for this purpose consist in the due observation of the six non-naturals (strangely so called because they are *external*, and not parts of the *natural* body), air, food, exercise, sleep, the excretions, and the passions. To these heads may be reduced the various rules of living in a salubrious air and observing the changeful seasons; the minute detail of all kinds of meat and drink, and the qualities of herbs, which constitute the great bulk of the poem; frequent exercise and ablutions, avoiding sleep at improper times, not neglecting the calls of nature, and avoiding cares and all other violent agitations of the mind. The number of editions that have been published of this work is immense. A complete list of them is prefixed to Ackermann's edition, Stendal, 1790, 8vo.; Sir Alexander Croke's, Oxford, 1830, crown 8vo.; and in Choulant's *Handbuch der Bücherkunde für die Aeltere Medicin*, Leipz., 1828, 8vo. (from which two last works the preceding account has been principally abridged). The best commentary is that by Arnaldus de Villa Nova, which has been very frequently reprinted, and which has formed the basis of most of the editions since published. It was first published at Montpelier, 1480, 4to. Two of the most useful and valuable editions (though without the Commentary of Arnaldus) are Ackermann's and Croke's mentioned above. The work has also been translated into German, French, English, Italian, Dutch, &c.; and upon the whole no medical work appears ever to have enjoyed greater popularity.

SALE'RNO, THE PROVINCE OF, one of the administrative divisions of the kingdom of Naples, called also 'Principato Citra,' is bounded on the north by the province of Principato Ultra, west by the gulf of Salerno and by the province of Naples, south by the gulf of Policastro, and east by the province of Basilicata. The province of Salerno lies west of the central ridge of the Apennines, and between that and the coast of the Mediterranean, except a small portion which spreads along the eastern slope of the Apennines, about the sources of the river Agri. [BASILICATA.] The length of the province is about 80 miles from north-west to south-east, and its average breadth is about 30 miles. The central and larger part of the province consists of the basin of the Sele and its affluents. The Sele (Silarus) rises in the central Apennines near Conza, flows in a south-west direction, and is joined about half-way between its source and the sea by the Tanagro or Rio Negro, which comes from the south-east, and which has a longer course than the Sele itself, being joined, before its confluence with the Sele, by the Rio Bianco, which descends from the Apennines of Muro in Basilicata.

The valley of the Tanagro is bounded on the west by a detached ridge called Monte Alburno, which runs about twenty miles from north-west to south-east. West of the Alburno is the valley of the Pietra or Calore, which enters the Sele a few miles above its æstuary. The valley of the Calore is bounded to the south-west by another ridge, which rises east of Pæstum, and on which stands the town of Capaccio. South of this ridge is a fine region of hills and valleys sloping towards the coast, and extending to the south as far as the gulf of Policastro. This tract of country, which was known to the antients by the name of 'Pæstanæ valles,' is now called 'Il Cilento,' from the small river Alento which flows through it. [PÆSTUM.] The region of the Cilento is favourable to the growth of all sorts of fruit, and it contains good pasture: the inhabitants are noted for their industry and honesty. They have numerous coasting vessels, with which they trade with Salerno and Naples. This district contains many villages, and above 100,000 inhabitants. A road has been constructed of late years from Salerno to Vallo, which is the principal town of this secluded district.

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[*] A gold coin which weighed twenty grains, and would now be worth four shillings and two pence. 'Quâlibet unciâ computatâ pro quinque florenis, et quolibet floreno pro sex tarenis, et quâlibet tarenâ pro duobus Carolinis, et quolibet Carolino pro decem granis.' (Ducange.)

[†] Giannone, vol. ii., p. 387. The Constitutions are in many collections; the last is F. Pauli, 'Canciani Barbarorum Leges Antiqui,' 3 vols. fol., Venice, 1781, in vol. i., p. 367. See the 'Epistles of Peter de Vineis, Frederici cancellar.,' lib. iii., epist. 10, 11, 13. The Constitution is entitled 'De Probabili Experientiâ Medicorum.'

[‡] See Sir Alexander Croke's 'Essay on Rhyming Latin Verse,' Oxford, crown 8vo., 1828 and the Preface to his edition of the 'Regimen Sanitatis Salernitanum.'

The town of Policastro was formerly of some importance, but being sacked and half destroyed by the Turks in the sixteenth century, it has never recovered, and is now an insignificant place. Sapri, which is farther east in the innermost recess of the gulf of Policastro, is a place of some trade, and has a natural harbour.

The southern coast of the peninsula of Sorrento, as far as Cape Campanella, belongs also to the province of Salerno. The towns of Vietri, La Scala, Positano, Amalfi, and Majori are in this district, which is remarkably populous and healthy. The inhabitants are mostly engaged in maritime trade. [Amalfi.]

A long ridge, which is an offset of the central Apennines, runs in a westward direction, dividing the province of Salerno from that of Avellino or Principato Ultra, and then running along the whole length of the peninsula of Sorrento. This ridge forms a natural boundary between the plain of Campania and the basin of the Sele. The administrative province of Salerno however includes also a district north of this ridge, extending to the banks of the Sarno. The towns of Nocera and Sarno are in this district. [Nocera dei Pagani.]

Salerno (the Roman *Salernum*), the capital of the province, and an archbishop's see, is a walled town of 11,000 inhabitants, finely situated on the sea-coast, and surrounded by a beautiful tract of country at the foot of the mountains. An old Norman castle rises on a cliff above the top. The harbour of Salerno is only suited for small vessels. Salerno has a royal lyceum, a court of justice for the province, a theatre, and many churches and convents. The most remarkable building is the cathedral, built or restored in the eleventh century, by Robert Guiscard, the Norman conqueror, who adorned it with columns of porphyry, a mosaic pavement, and other remains of antiquity which he took from Pæstum. Among the modern buildings the palace of the intendente, or governor, is considered handsome. The quay along the sea-shore is a fine promenade. An annual fair of both native and foreign goods is held at Salerno in the month of September, which is the most considerable in the kingdom, and is resorted to by all the merchants from Naples.

The other towns of the province, besides those already mentioned, are: 1, La Cava, a town of 5000 inhabitants, and a bishop's see, delightfully situated in a valley of the Apennines, on the high road from Naples to Salerno. The population is chiefly employed in manufacturing linen, silk and cotton stuffs and pottery. The neighbouring Benedictine convent has a valuable library of MSS. and some good paintings. 2, Sarno, a considerable town in the plain of Campania, near the river of the same name, five miles north of Nocera, has several convents and churches, and about 10,000 inhabitants. 3, Eboli, in a plain south-east of Salerno, and on the high road to Calabria, where the road to Pæstum branches off to the south, is a poor town with about 5000 inhabitants. 4, Moliterno, a town in the Apennines, on the borders of Basilicata, and near the sources of the Agri, has 6000 inhabitants, and gives the title of prince to a Neapolitan family, the late representative of which figured in the revolutions of the country at the close of the last century.

The population of the province amounts to about 513,000 inhabitants, distributed among 161 communes. Of this population about 94,000 are owners of land or houses, 233,000 are agricultural labourers, 4700 are seafaring men, 2500 priests, 1080 monks, and 980 nuns. The number of vessels belonging to the province consists of about 275, including fishing-boats. (Serristori, *Statistica d'Italia;* Petroni, *Censimento de Reali Dominj.*)

SALFORD, one of the six hundreds into which the county of Lancaster is divided [Lancashire], contains seven market-towns—Manchester, Bolton, Bury, Ashton-under-Lyne, Oldham, Rochdale, and Salford; and consists of the following eleven parishes:—1, Bolton Division—Bolton, Bury, Dean, Radcliffe, Wigan; 2, Manchester Division—Beswick (extra parochial), Eccles, Manchester, Prestwich-cum-Oldham; 3, Middleton Division—Middleton, Prestwich-cum-Oldham, Rochdale. These parishes comprise one hundred townships. The district contains the following canals: the Duke of Bridgewater's, the Bolton, Bury, and Manchester, the Stockport, the Rochdale, the Worsley and Wigan, and the Leeds and Liverpool. From Manchester, which may be practically considered as its centre, railways now run in almost every direction—to Liverpool, Bolton, Leeds, Birmingham, London, Stockport, Preston. The principal rivers and rivulets are the Mersey, Irwell, Tame, Medlock, Irk, Roch, and Calder. The hundred is twenty-two miles in length from east to west, and nineteen in breadth from south to north.

At the original division of parishes Salford was thinly peopled, which accounts for there being so few in this now crowded district. Few of the great landed proprietors reside in their antient mansions, most of them having sought a retreat where land is less valuable and rural enjoyments are less encroached on by manufacturing occupations.

There is a great contrast between this hundred at the time of the Conquest and at the present day. At the former time it contained only the towns of Salford, Manchester, Radcliffe, and Rochdale. At present the whole region is covered with towns and villages; and instead of sending to the great council of the nation one baron, the hundred of Salford now sends ten members to Parliament, exclusive of the knights of the shire. In the time of the Confessor, the hundred of Salford, then held of the king, yielded only 37*l.* 4*s.* to the royal revenue; while in the year 1829 its parishes and townships were valued at 1,554,314*l.* per annum, and paid 3238*l.* to the county rate, upon an assessment of one halfpenny in the pound.

Within the last century the increase of population and of property in Salford hundred has been very great, owing chiefly to its being the great seat of the cotton-manufacture. In 1831 it had of families chiefly employed in agriculture 5130, and of families chiefly employed in trade and manufactures 96,172. In 1801 the population was 281,413, which in 1811 had risen to 356,734, and in 1831 had reached 612,414. This growth has been most decided in the vicinity of Manchester. The following table, exhibiting the rateable value in twenty different townships at three different periods, shows the great increase which has taken place in this manufacturing district:—

Assessment for County Rate in Twenty Townships.

Townships.	Yearly Value, 1815.	Yearly Value, 1829.	Yearly Value, 1840.
Manchester . .	£303,732	£371,749	£722,640
Salford . .	47,910	100,068	160,496
Chorlton-on-Medlock	19,484	66,645	137,651
Ardwick . .	11,097	13,004	39,316
Pendleton . .	16,425	26,835	48,363
Cheetham . .	8,524	24,090	38,983
Ashton-under-Lyne	33,548	71,837	143,813
Oldham . .	29,970	54,798	107,500
Bury . . .	16,546	34,954	52,882
Blackburn . .	37,624	52,073	83,700
Preston . .	34,936	80,984	129,766
Great Bolton .	27,861	63,865	93,915
Little Bolton .	11,755	23,680	47,110
Over Darwin .	6,629	10,207	16,966
Haslingden . .	8,472	11,469	17,260
Crumpsall . .	2,910	4,933	13,237
Failsworth . .	4,641	5,450	8,514
Stretford . .	7,060	12,357	21,676
Pilkington . .	12,193	26,611	32,675
Prestwich . .	5,699	9,361	11,565
	£647,416	£1,064,980	£1,928,038

The increase, great as it is in the yearly value of rateable property in the township of Manchester, which has more than doubled since 1815, is yet in a less ratio of increase than many other townships; and the aggregate amount of value of the twenty townships has nearly trebled within the twenty-five years. The aggregate value of rateable property in all the twenty townships (including Manchester) in 1815, viz. 647,416*l.*, is exceeded by the present value of property in the township of Manchester alone, viz. 722,640*l.*

For many years a house of correction at Hunt's Bank in Manchester, now occupied as the Castle Inn, had served for a common gaol, as well for the town of Manchester as for the hundred of Salford; but in the year 1782 an act of parliament was obtained for the erection of the *New Bailey Prison* on the right bank of the Irwell, and on the 22nd of May, 1787, the foundations of the gaol were laid. Part of the inscription on the foundation-stone runs thus: 'that there may remain to posterity a monument of the affection and gratitude of this county to that most excellent person who hath so fully proved the wisdom and humanity of separate and solitary confinement of offenders, this prison is inscribed with the name of JOHN HOWARD.' In April, 1790, 'this gaol and penitentiary house' was opened for the reception of prisoners.

It is one of the best conducted prisons in England. The officers are appointed by the magistrates of the hundred. The majority of male prisoners are employed in weaving, hat or shoe making, tailoring, or on the tread-mills, of which there are six. The female prisoners are occupied in weaving, sewing, washing, and heading pins. The proceeds from the prisoners' earning in 1835 amounted to 524*l.* In summer the prisoners rise and go to work at six in the morning, and continue their labour to the same hour in the evening, with the allowance of half an hour for breakfast, an hour for dinner, and an hour on quitting work. In winter their hours of labour are regulated by the extent of daylight. Prayers are read every morning, and divine service is performed twice on the Sunday. Bibles, prayer-books, and tracts are distributed among the prisoners by the chaplain. In the month of November, 1834, the silent system was introduced. The gross expenditure for the year 1837-8 was 8256*l.* The total number of persons confined in the prison in the course of the year ending October, 1836, was 6551, namely, 4783 males and 1868 females. It is capable of containing at one time 583 male and 214 female prisoners, in all 797. The average number is 700. The cost of a male prisoner is about 2*d.* a day; of a female, 1¾*d.* a-day. For the year 1837-8 there was expended in food for the prisoners the sum of 2534*l.*; namely, for bread, meal, peas, salt, and pepper, 1734*l.*; for butchers' meat, 505*l.*; for potatoes 295*l.* From Jan. 1794 to Jan. 1838, there were 94,340 persons committed. The sum paid in salaries for the year 1835 was 2231*l.* 14*s.* 6*d.* By a return of prisoners in the New Bailey, who are known to have been at large committing depredations for the time specified, it appears that 40 thieves had been plundering for a year, 50 for two years, 17 for three years, 10 for four years, 5 for five years 1 for six years, 3 for seven years, and 1 for nine years;—total 127 prisoners. The average duration of each prisoner's career of depredation before the imprisonment is two years and three months. Juvenile delinquency abounds in the district. The number of offenders of twenty years of age and under who annually pass through it is 1000, but the number brought before the magistrates in one year is 4000. The crime which these numbers indicate is however committed by a comparatively small number of persons, and by the same round of offenders. The following tables give valuable information on this important subject.

Ages, Sex, Offences, Degree of Education, and Result of Trial of the Prisoners of Twenty Years of Age and under, committed to the New Bailey Sessions, from the 17*th of October*, 1839, *to the* 24*th of February*, 1840, *being the result of Four Sessions held during that period.*

Ages.	Offences.																Degree of Education.				Event of Trial.												
																					Imprisonment.								Transportation.				
	Felony.		Shop-lifting.		Picking Pockets.		Burglary.		Highway Robbery.		Obtaining Money or Goods under False Pretences.		Receiving Stolen Property.		Total.		Neither Read nor Write.	Read or Write Imperfectly.	Superior Education.	Unknown.	1 month and under.	2 months.	3 months.	4 months.	6 months.	7 months.	10 months.	18 months.	7 years.	14 years.	15 years.	Life.	Acquitted.
	m	f.	m	f.	m	f.	m	f.	m	f.	m	f.	m	f.	m	f.																	
10 years and under							1								1		1							1									
11 ditto																																	
12 ditto	1						1								2		2				1		1										
13 ditto	9	1	1				1								11	1	10			2	2	2	4		1								3
14 ditto	4	2	1				1								6	2	[illegible]	2			2		3	1	1					1			
15 ditto	13	1	2			1	2					1			17	3	15	5			[illegible]	[illegible]	7		2								6
16 ditto	2	1			1		3								6	1	5	2			1		4			1	1						
17 ditto	9	3	2				2								13	3	6	9		1	1	2	3	1	3			1	1				4
18 ditto	6	4			3	1	1								10	5	6	9			1	1	3	1	3		1		1		1		3
19 ditto	14	2							4			4	1		19	[illegible]	10	8		7		5	9	4					1	1			4
20 ditto	7	1			1	1									8	2	4	6					5	1	2				1				1
Total	65	15	6		5	[illegible]	12		4			5	1		93	23	65	41		10	11	13	39	9	12	1	2	1	4	2	1		21

Number of Juvenile Delinquents committed to the New Bailey Sessions, from December, 1834, *to December*, 1839, *inclusive, being five years.*

Years.	SEX AND AGE.								Total Male and Female.	EVENT OF TRIAL.										
										Imprisonment.				Transportation.						
	Total Male.	Under 10 years of age.	10 and under 15.	15 and under 20.	Total Females.	Under 10 years of age.	10 and under 15.	15 and under 20.		Under 6 months.	6 months and under 12.	12 months and above.	Total Imprisoned.	7 years.	10 years.	14 years.	15 years.	For life.	Total transported.	Acquitted, [illegible] bills cut.
1835	277	1	56	220	46		3	43	323	171	38	4	213	48		24		4	76	34
1836	266	1	50	215	78		3	75	344	181	61	11	253	31		16		1	48	43
1837	309		45	264	71		[illegible]	65	380	230	42	10	282	49	5	3		[illegible]	63	35
1838	319	3	62	254	88		8	80	407	237	63	13	313	30	11	5			46	48
1839	276	4	49	223	59	1	11	47	335	179	43	25	247	36	7	[illegible]	1		46	42
Total	1447	9	262	1176	342	1	31	310	1789	998	247	63	1308	194	23	50	1	11	279	202

SALFORD, a market-town in the parish of Manchester and hundred of Salford, is divided from Manchester by the river Irwell, over which there are five bridges from one place to the other. Till the passing of the Reform Act it was considered as little more than a suburb of Manchester, with which it is still intimately connected by commercial, social, and domestic relations. It is now however a large, populous, and improving town, having its own municipal government, and returning a member to parliament. Salford may be viewed either as a township in the parish of Manchester, or as a borough comprising three other townships.

In 1773-4 an enumeration of the houses and inhabitants in the town and parish of Manchester was taken from an actual survey, and deposited by Dr. John Whittaker, April 27, in the college library. [MANCHESTER.]

	Houses.	Families.	Males.	Females.	Married.	Wives.	Widows.
Manchester	3402	5317	10,548	11,933	7724	432	1064
Salford	866	1099	2,248	2,517	1775	89	149

In 1801 the population of the township was 13,611, and in 1831 it had reached 40,786.

History.—According to Whittaker, Salford signifies the Sal or Hall at the Ford, that is, the passage across the Irwell near which the mansion of the thane was situated. It gave its name to the hundred, of which originally it was the head. On the general partition of the country, the hundred was retained by the crown, and for this reason the town of Salford has ever been independent of the Lord of Manchester, and continues to the present time annexed to the duchy of Lancaster. In lieu of the provisions which the township of Salford originally supplied to the officers of the crown, in the reign of the Confessor it contributed to the Exchequer the annual sum of 37*l.* 4*s.*, including the farmed profits of the hundred court, as well as the rents of the demesne lands. The town of Salford with the lands between the Ribble and the Mersey were purchased in the year 1227, from Roger de Maresey by Ranulph de Blundeville, earl of Chester, who in the 13th Henry III. received a confirmation of his purchase, and thereupon granted a charter creating Salford a free borough. In consequence of this grant, the boroughreeve, constables, and burgesses of Salford determined, at a general meeting held on the 16th June, 1830, to adopt and use as a common seal for the borough of Salford, the arms of Ranulph de Blundeville. This charter is substantially the same as the Manchester charter, granted by Thomas de Grelley nearly a century afterwards, the principal difference consisting in a provision 'that every burgess shall have one acre attached to his burgage, paying twelve pence for all rents belonging to that burgage.'

Salford is under the government of a boroughreeve and constables. Antiently the duty of the boroughreeve was to collect the rents and tolls of the land for the lord, as his bailiff, and to be the chief pledge for the preservation of the peace. At present the duties of the boroughreeve are to convene and preside at public meetings, to correspond with public bodies, and to distribute certain charitable bequests. These officers are elected by a jury, summoned by the deputy-steward of the hundred, at the king's Michaelmas Leet of Salford hundred. By an act of parliament obtained in the year 1829, the police of Salford was separated from that of Manchester, and placed under a body of men nominated 'the Commissioners for better cleansing, lighting, watching, and regulating the town of Salford,' under whose control the township still remains. The commissioners are the boroughreeve and constables for the time being, and 120 persons occupiers of one or more tenements assessed at 20*l.* a year clear, or persons rated below that amount but being owners of property producing 30*l.* a year clear, to be elected commissioners by all persons assessed to the relief of the poor. The commissioners nominate the surveyors of highways. In 1820 Messrs. Appleby, Clay, and Fisher erected gas-works in Clowes Street, from which Salford was supplied by contract until December, 1831. The present gas-works are in Lamb Lane, near the centre of the township, and are the property of the lay-payers. They were erected in 1835, under an act of parliament; the profits are appropriated to the improvement of the town, the extension of the works, and the liquidation of the debt. The quantity of gas made in 1838 was twenty-six millions of cubic feet; the price, 8*s.* per 1000 cubic feet. The works are managed by a Board of Directors chosen annually from the general body of commissioners. The expenditure of the commissioners of police, from June, 1839, to June, 1840, was 8711*l.* Within the same time 3810*l.* were expended by the 'Improvement Committee.'

Salford is rich in foundations for the relief of the poor, which materially diminish the poors' rate. Some of these charities would have been more productive, if they had been formerly as well managed as they are at present. In 1840 Salford came under the regulations of the New Poor Law. The following statements rest on the authority of one of the constables:—The average number of paupers for Salford (the township) for the quarter ending December, 1840,

Receiving out-door relief . . .	790
Receiving in-door relief . . .	316

Average relief per head about 1*s.* 0½*d.* a week.

Assessments in Salford for the Poors' Rate, 1840.

	Number.		Assessments.
10*l.* and upwards	3779	Net rental	£104,682 12
Under 10*l.* . .	7827	Do.	47,030 15

The assessment is taken on the gross rental, allowing 5 per cent. for repairs on property above 10*l.*, and 10 per cent. on all under 10*l.*, and this forms the net rental and the assessments as above.

The expenses for the relief of the poor and other charges, except those of county and parish highways, are as follows:—

	£	s.	d.			
1834-5 . . .	£4,974	11	4			
1834-5 . . .	4,399	17	2			
1835-6 . . .	4,061	1	8			
1836-7 . . .	4,367	5	2			
1837-8, the last year before the Union . .	8,543	14	0			
Total in 5 years .	£26,346	9	4			
Yearly average .	5,269	5	10			
Expenditure from 25th December, 1839, to 25th December, 1840 (being the first year under the Union) . .	6,592	17	9			
				£1,323	11	11
Paid for county and parish highway-rates for the 5 years previous to the Union .	7,520	9	4			
Yearly average . . .	1,504	1	10			
Paid last year . . .	2,094	1	1			
				589	19	3
Making together an annual increase of				£1,913	11	2

Salford Borough.—By the Act 'For amending the representation of England and Wales,' Salford was constituted a parliamentary borough, with the privilege of sending one member to the House of Commons. The borough includes the townships of Salford, in the parish of Manchester, population in 1831, 40,876; of Broughton, in the parish of Manchester, population 1589; of Pendleton, in the adjoining parish of Eccles, population 8435; and Pendlebury, in Eccles also, population 1556: making in the whole a population of 52,456. Since 1831 the population has increased very much, as may be inferred from the increase of the parliamentary constituency. The total number of persons whose names stood at the first election in 1832 on the revised list was 1498; in 1834 the number had risen to 2165; in 1835 to 2335; in 1836 to 2638. In 1839, in consequence of bad times, it had fallen to 2549, which number was diminished in 1840 to 2443, showing an increase of about a thousand voters to the constituency in eight years, three of which were years of great commercial difficulty. The first election was in 1832.

The rise in the value of property in Salford has been very great. In 1704 Thomas Dickinson gave for the use of the poor a house and land in Salford, which then produced 8*l.* 10*s.* a year, but in 1798, 40*l.* a year. In 1630 Humphrey Booth gave lands in Oldfield Lane and Gravel Lane for the repairs of Salford chapel and the surplus for the poor, value 44*l.* annual rent, which in 1798 produced 232*l.* 10*s.*, and in 1840 not less than 629*l.* Of the township of Broughton, consisting of 1004 statute acres, 870 are possessed by the Rev. John Clowes, an estate which, in the last five years, has more than doubled its rental, although little more than 200 acres have been sold in the whole.

Manufactures.—The following table shows the extent to which manufactures are carried in the borough:—

team and Water Power in the Borough of Salford, from a Report of the Manchester Statistical Society, June, 1837.

ewnships.	STEAM-POWER.														WATER-POWER.			
	Spinning and Weaving.	Bleaching, Dyeing, and Printing.	Foundry, and Machine making.	Silk.	Colliery.	Thread and Small Wares.	Flax.	Breweries.	Fustian-shearing.	Woollen.	Chemical.	Sundries.	Total Steam Power.	Cotton Manufactures.	Dyeing, Printing, and Bleaching.	Total Water-Power.	Total Steam and Water-Power.
alford.	710	399	228	54	..	36	..	56	34	22	11	46	1596	..	..	..	1596
endleton	51	48	..	..	100	..	30	6	..	..	..	..	238	80	10	90	328
roughton	..	136	..	50	..	..	40	..	..	..	..	..	226	..	..	..	226
otal of Horse-Power	764	583	228	104	100	36	70	62	34	22	11	46	2060	90	10	90	2150

The condition of the working classes was inquired into in the years 1834-5-6, by the Manchester Statistical Society, from whose published Report we take the following details:—In Salford the proportion which the population examined bore to the total population (estimated at 55,000) was 74 per cent.; 72 per cent. of the houses are reported as comfortable; 8 per cent. of the working population resided in cellars—generally two rooms, one for sleeping, the other for all other purposes; 1108 single rooms constituted each a dwelling; 9538 dwellings, at an average weekly rent of 2*s.* 10*d.* give an annual rental of 70,263*l.*; 3335 persons occupied cellars; 5991 children were receiving wages; 13,529 children were under 12 years of age; 6888 above; total 20,417 children: 10,220 children were stated by their parents to be in attendance at a Sunday or a day school; 21,853 persons could write or read. The members of the Established Church amounted to 53 per cent. of the whole. In many, perhaps in the majority of cases, there were only two beds to a family of five or six persons of both sexes.

Notwithstanding the pressure in the commercial world which prevailed from 1836 to 1840, the Committee of the Manchester and Salford Bank for Savings reported a very considerable increase in the business of the Bank during 1840, which however they partly attribute to the adoption of certain improvements.

			£	s.	d.
The amount deposited in the year ending Nov. 20, 1840, was			116,048	12	8
Amount withdrawn	„	„	92,461	11	0½
Amount remaining due to Depositors .	„	„	366,423	18	1½
Number of Accounts remaining open .	„	„	13,453		
Number of Deposits made		„	23,811*		

Education in Salford has of late years made rapid progress, but is still inadequate to the wants of the population. From the Parochial Returns made to the Select Committee of the House of Commons appointed to inquire into the education of the poor, Session 1818, it appears that then there were two 'national schools for 300 boys and as many girls; also three Sunday-schools, two of which are attached to the church, of about 400, and one of 200 or 300, conducted by Methodists; besides which there are three schools for adults.' The population is reported as 19,114. The Returns add, 'the minister of Salford supposes all may learn to read who desire.' This extraordinary statement is attested by the signature, 'Saml. Booth, minister.' In 1835 the Statistical Society of Manchester caused an inquiry to be made into the state of education in the borough of Salford, when it appeared that in a population of 50,810 (census 1831) the numbers attending the various schools in the borough were 12,885, of whom

3,131 or	5·7	per cent. of the population,			attended day and evening schools only.
3,410 or	6·2		„	„	attended both day and Sunday schools.
6,344 or	11·5		„	„	attended Sunday-schools only.
12,855 or	23·4	per cent. of the population.			

Of these about 2235 were found to be either under 5 or above 15 years of age, leaving about 10,650 children between the ages of 5 and 15 under instruction; the total number of children between these ages being computed at 13,750, thus leaving 3100 or 22½ per cent. of the whole without any education. Above one-quarter of the number receiving daily instruction were found in the dame-schools, very few of which possessed more than fragments of books; in many cases no books at all were to be seen, the mistress not having the means and the parents being without the ability or the inclination to procure them. Order and cleanliness were little regarded, and the children were for the most part crowded in close and dirty rooms, in which the whole business of the school was carried on, and where the family slept. Some of the teachers followed another occupation, such as shop-keeping, sewing, washing, and the generality of them were wholly incompetent to the task of instruction, and betrayed lamentable ignorance on the most common topics.

Charities and Educational Institutions.—The Salford Mechanics' Institution was founded at a general meeting held in the town-hall, Salford, on Monday, the 28th May 1838. 'The object of the institution is to instruct the operative in the principles of his trade or employment, and in other departments of really useful knowledge, that he may be enabled to understand those fundamental laws which are the key to the various branches of our arts and manufactures; so that whilst he acquires a greater degree of skill in the practice of his business, and consequently becomes more valuable to his employers, he may be better enabled to secure to himself and his family the means of comfort and rational enjoyment.' The principal means for carrying this desirable object into effect are classes, lectures, a library, and reading-room. The Salford Mechanics' Institution follows the general practice of similar establishments in excluding 'party politics and controversial theology,' subjects of the deepest and most pressing interest to the people, by which in reality they have given their minds most of the discipline they have received, and which the people ought to be taught to treat and discuss in a proper spirit.

The subscription to the institution is the payment of sixteen shillings annually in advance. The government is vested in a board of directors, consisting of a president, six vice-presidents, a treasurer, and twenty directors, to be chosen annually by the members out of their own body. Immediately on its establishment the institution began to fulfil the hopes of its friends. The reading-room was furnished with five weekly, ten monthly, and four quarterly periodicals; classes were formed, and began to study in arithmetic, algebra, geometry, grammar, writing, architectural drawing, ornamental drawing, perspective drawing, mechanical drawing, French, and elocution. A society was also formed for 'mutual improvement.' The foundation of a museum was laid. A library was commenced. Several courses of lectures, amounting in all to 50, were delivered. The Report for the year 1840 states the number of members as 310, and that the library contained 1159 volumes and 59 pamphlets, the average number of daily deliveries for the year being 32 volumes, and the total number of deliveries 9524 volumes.

In this year a new means of usefulness was devised, which deserves special notice, and may be advantageously imitated in other parts of the kingdom; namely, an *exhibition* of works of art, manufactures, models of machinery, curiosities, and antiquities, with a view to the general improvement of the people, and to aid the funds of the institution. Among other things, the visitor saw in actual operation the planing-machine, card-making machine, carding, roving, spinning of cotton, glass-engraving, &c., all at work by steam-power. Lectures were delivered on the polarization of light, chemistry, bleaching, and the chromatic fire-cloud. Ninety thousand persons passed through the exhibition.

The Salford Lyceum is one of a class of institutions pre-eminently fitted to benefit the working and the poorer classes. It was established in January, 1839, and has for its design 'to provide a system of juvenile and adult education for both sexes of the most numerous portion of the community, and to extend more widely the taste and means for moral and intellectual cultivation.' The Salford Lyceum embraces, in addition to the ordinary purposes of mechanics' institutions, the following fundamental objects:—female instruction—evening classes are held for instruction in branches of knowledge most suited for females in the manufacturing district; the newspaper press—a news-room is supplied with journals of all political opinions; useful recreation—there are classes for vocal and instrumental music, concerts and musical meetings, and social and festive parties; cheapness—the subscription is only two shillings a quarter. From the Report for 1840 it appears the number of 2017 subscriptions had been received from the 24th of January, 1839, to the 24th March, 1840, which are classed as follows:—

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* Of these, 9462 did not exceed £1 1s.; and 8656 were from £1 1s. to £5; the entire number of single deposits in 1840 was 23,811.

Merchants, manufacturers, and professional men	48
Bookkeepers, clerks, salesmen, and warehousemen	253
Mechanics, engineers, founders, and mill-hands	838
Engravers, pattern-designers, and calico-printers	285
Joiners, plumbers, carvers and gilders, masons, and painters	179
Butchers, bakers, and brewers	27
Shopkeepers, tailors, drapers, and shoemakers	113
Letter-press printers and bookbinders . .	53
Hairdressers	11
Boys and females undescribed	169
Undescribed males	41
Total	2017

The library consisted of about 1500 volumes; the number of deliveries averaged about 70 each evening, and there were generally above 400 volumes in circulation at one time. The following classes for males were in operation:—Reading, weekly average attendance 50 pupils; arithmetic and writing, 163 pupils; grammar and geography, 40 pupils; elocution, 20 pupils. Classes were also held for females in reading, writing, arithmetic, sewing, and embroidery; classes for vocal and instrumental music met every week. An essay and discussion society, of 30 members, held its meetings each alternate Thursday. The directors, ever aiming at affording rational amusement to the working classes, held several tea-parties, making for admission a small extra charge, which, though sufficiently moderate to occasion the assembling of considerable numbers, was found equal to defray the expenses incurred; the amusements consisted of glees, songs, recitations, musical promenades, accompanied by an instrumental band. During the year, 32 lectures were delivered on various subjects, as astronomy, oratory, comic literature and ballads, geology, natural theology, anatomy; 21 of these lectures were given gratuitously. The directors state that they have full confidence that 'the subscription, under judicious management, will to a very great extent meet the current expenditure, although to do this the union of large numbers is indispensably necessary.' The 'Financial Statement' for 1839-40 shows a small balance in favour of the institution, the total outlay being about 500*l*.

Previous to the year 1827 the working classes of Salford and the suburbs were dependent on the public institutions of Manchester for gratuitous medical relief. The rapidly increasing population rendering it absolutely necessary that some additional assistance should be provided, a public meeting was held on the 2nd of May, 1827, at which the immediate establishment of a public dispensary was resolved upon. A building was taken in a central situation; and on the 10th of September the dispensary was opened for the admission of patients. But the wants of the poor were soon found so pressing as to require a larger building. Measures were accordingly taken, and a new edifice, designated the Salford and Pendleton Royal Dispensary, was completed early in 1831, at an expense of 2546*l*.; and on the 25th of March, 1831, the business of the charity was removed to it. The government of the Institution is vested in a committee. It is supported by the voluntary subscriptions of the inhabitants.

The following table gives the relative number of patients admitted since the opening of the establishment, and the expenditure for each year. The out-patients are those capable of attending at the dispensary; and the home, those whose complaints require them to be visited at their own residence. Accidents constitute a large proportion of the whole number of cases, many of which are caused by the machinery in the numerous mills and manufactories in the vicinity of the Institution:—

Year.	Out-Patients.	Home-Patients.	Accidents.	Total.	Expenditure.
1828	1696	965	318	2979	
1829	..	..	648	3611	£735
1830	..	..	756	3667	£721
1831	2146	1316	803	4265	730
1832	2073	1268	900	4241	749
1833	2212	1210	944	4366	672
1834	1813	1069	926	3808	700
1835	1639	1653	1047	3739	659
1836	1915	1045	987	3947	699
1837	1863	1201	896	3960	678
1838	2113	1280	897	4290	698
1839	2519	1436	870	4825	721

The Public Buildings in Salford are not distinguished for architectural beauty. The oldest place of worship, Trinity chapel, was founded (1635) by Humphrey Booth, a prosperous merchant of Salford, and was rebuilt in 1752. The town-hall, situated in Chapel-street, is a neat building of stone, of modern date, after a design by Mr. Lane. The Salford police-office occupies one portion of the building; other parts are occupied by the officers of the guardians of the poor, the clerks of the police commissioners, &c. It contains a large room used for public meetings, concerts, lectures, &c. The Zoological Gardens in Higher Broughton were opened May 31st, 1838. They occupy nearly 16 acres of land, laid out in the best style of landscape gardening. They have a fine collection of animals, and are recommended by their locality, as well as by the taste and skill displayed in laying out the land and erecting the buildings.

Eminent Individuals.—Dr. Clarke, professor of history, geography, and experimental philosophy at the Royal Military College, Sandhurst, was born at Salford in 1743. John Byrom, of the ancient family of Byrom of Kersall, in the borough of Salford, inventor of a system of shorthand, and a respectable poet, was born at Kersall in 1691. William Crabtree [HORROCKS] was born at Broughton in the borough of Salford, in 1610; baptized in the Collegiate church, Manchester, July 29; educated at Cambridge; married September, 1633; and was buried in the Collegiate church, August 1, 1644. By observation made on Kersall Moor, he found that the planet Venus would pass the sun's disk, which phenomenon took place Nov. 24, 1639. The only persons who appear to have any knowledge of it were Crabtree and his friend Horrocks, to whom he had communicated the fact.

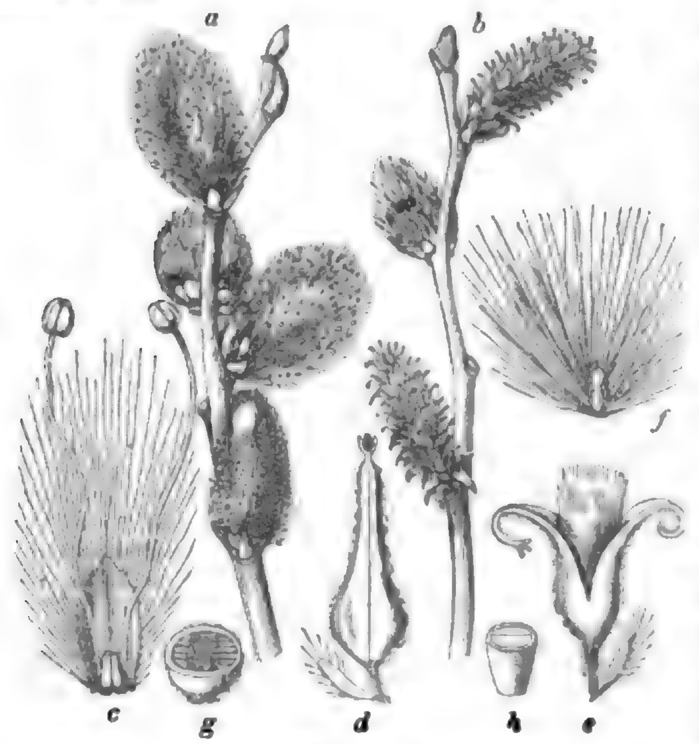
(Communication from Salford. For further information see Baines's *History of Lancashire; Manchester as it Is; Annals of Manchester; Reports*, &c.)

SALIAN. [KUR.]

SALIC LAW. [PHILIPPE V.; PHILIPPE VI.]

SALICA'CEÆ, or *Salicinicæ*, a natural order of apetalous Exogens possessing the following characters:—flowers with pistils or stamens alone, growing on the same or different plants, and arranged in the form of an amentum; stamens separate, or united together with two-celled anthers; a superior ovary, with one or two cells; numerous erect ovules; style single, with two stigmas, or absent; many-seeded, comose, 10-12-celled, coriaceous fruit; seeds comose, and either attached to the lower part of the axis of each valve or to the base of the cell; albumen absent; embryo erect; radicle inferior. They are trees or shrubs, with simple alternate leaves and deciduous or persistent stipules. Combined with Corylaceæ and Betulaceæ, they formed part of the natural order Amentaceæ of Jussieu, but they have been separated by Richard. They are distinguished from Corylaceæ by the absence of a calyx, and frequently by the venation of their leaves: from Betulaceæ they are known by their hairy seeds and polyspermous two-valved fruit. They are generally found inhabiting woods in the northern districts of Europe, Asia, and America. The most northern woody plant that is known, the *Salix arctica*, belongs to this order. There are only two genera in this order, Salix and Populus; but they are of great importance on account of their timber and various economical uses.

The genus *Populus* (from the Latin *populus*) is characterised by possessing diœcious, cylindrical, many-flowered catkins, wedge-shaped, single-flowered, jagged bracteæ or scales; turbinate calyx, tubular below, and dilated in the border. The barren flowers have eight or more capillary very short filaments, and large drooping quadrangular anthers. The fertile flowers have an ovate pointed ovary, no style, 4-8 awl-shaped stigmas; ovate capsule, with two concave valves and one cell; numerous small ovate seeds, each crowned with a tuft of fine hairs. All the species of this genus are deciduous trees, mostly of a large size, and growing in Europe, North America, Asia, and the north of Africa. The poplar has long been valued as an ornamental tree, and the various species have been extensively cultivated in Europe. As they are diœcious plants, much difficulty has arisen in determining the number of the introduced species; and it is probable that when the plants with male and female flowers shall have been carefully examined, a considerable reduction in the present number of acknowledged species will take place.



Salix caprea.

a, branch with staminiferous flowers; *b*. ditto, with pistilliferous flowers; *c*, staminiferous bract, with abortive pistil; *d*. pistilliferous bract, with closed ripened pistil; *e*. ditto, with valves open; *f*. seed with hair; *g*. section of fruit, showing seeds; *h*, section of seeds, showing cotyledons.

Populus alba, the white poplar, or Abele tree, has roundish, cordate, lobed, and toothed leaves, glabrous above, downy and very white beneath; fertile catkins, ovate; four stigmas; creeping roots; branches very white, downy when young. This tree is a native of Great Britain and most parts of Europe, in woods and thickets in a moist soil.

Populus canescens, the grey poplar, is by some writers considered only a variety of *P. alba*. It is known by its leaves being roundish, deeply waved, toothed, downy, and hoary beneath; fertile catkins cylindrical; stigmas eight. This tree is of slower growth than *P. alba*, and the wood is finer, and more adapted for the purposes to which timber is applied. Not fewer than eight distinct varieties are enumerated as cultivated in our nurseries, and probably many more might be added to the list by a careful examination of collections of these plants. The white and grey poplar both attain a height from 80 to 100 feet. All their varieties grow exceedingly fast, sometimes attaining a height of 30 feet in ten years. They are remarkable for the creeping nature of their roots, which send up suckers for a great distance round the trunk, and by these a perpetual succession of young trees may be kept up. The trees will endure for two centuries if allowed to remain; but if wanted for timber, they should be cut down before they are fifty years old, as after that period the heart-wood is liable to decay. The Abele, as well as the black poplar, was known to the Romans, and was recommended by Pliny as props for the vine. (*Hist. Nat.*, xvi. 23.) It is much planted in some parts of Holland, Flanders, France, and Germany. The principal use to which the Abele is put in England is that of making flooring boards, for which purpose it should be seasoned eighteen or twenty months previous to use. It is also employed by the cooper for making wooden dishes, casks, &c. The grey poplar possesses the whitest wood of any of the species, and is used in France and Germany for carving and the lighter kinds of architecture.

These poplars should be planted in a loamy soil near water, if it be desired that they should attain a great height or considerable size. They will however grow very well on dry sandy soils. In the nurseries near London they are usually propagated by layers, which ought to be transplanted into nursery lines for at least a year before removal, as they seldom ripen the points of their shoots or put forth many roots the first season. The Abele bears cutting or lopping worse than any other species of the genus.

Populus tremula, the trembling poplar, or aspen: leaves nearly orbicular, broadly toothed, glabrous on both sides; stalks compressed; stigmas four, erect, cased at the base. Ten or twelve varieties of this plant are found in the nurseries, and some writers refer several other species to this as varieties. The aspen, like all the genus, is a rapid-growing tree. It has horizontal branches, which become pendulous by age. It is a native of moist woods in Great Britain, and in Scotland is found at an elevation of 1500 feet above the level of the sea. It is also found in the whole of the south of Europe, in the Caucasus, in Lapland, and is very abundant in Russia. The wood of this tree is used for much the same purposes as the last. Sheep and goats are said to be very fond of the leaves and bark. In common with *P. alba* and *P. nigra*, the bark of this species is used in tanning. It has even a greater tendency to send up suckers than the other species, and on this account requires attention, as it would otherwise cover the whole district in which it is planted. In cultivation this tree ought to have a rich and loamy soil, but it does not require a soil of any great depth. It may be propagated by cuttings or by seeds.

The trembling leaves of the aspen have always excited attention, and have frequently been the subject of superstitious belief and poetical allusion. Among other superstitions of former times, this tree was believed to have supplied the wood of which the cross of Christ was made, and its trembling leaves were thought to bear testimony to the fact.

Populus trepida, the American aspen, is by some looked upon as a variety of *P. tremula*; the leaf is suborbiculate, with an abruptly acuminate point, toothed, with two glands at the base on its upper surface; silky whilst young, glabrous afterwards. It is found in North America in extensive swamps from Canada to the Carolinas, and from Hudson's Bay to the northward of the Great Slave Lake as far as lat. 64°. It attains a height of from 20 to 30 feet. *P. grandidentata*, the large American aspen, is nearly allied to the above, and is probably only a variety of *P. tremula*. It attains a height of 40 or 50 feet, and is found in the same situations, but much less frequently than the foregoing. *P. græca*, the Grecian poplar, seems also to be a variety of the aspen.

Populus nigra, the black poplar: leaves twice the length of their footstalks, deltoid or unequally quadrangular, serrated, with glandular teeth, glabrous; the base more entire, the under side palest; catkins cylindrical, pale, lax. It is a native of Great Britain, and has a geographical range nearly the same as that of *P. alba*. It attains a height of from 70 to 80 feet, and, on account of its rapid growth, has been much cultivated. The wood is used for the same purpose as that of *P. tremula*; it is however softer, and more easy to work, and splits more easily than any other of the species. The cotton from the seeds has been used in France and Germany as wadding, and has been also manufactured into cloth-hats and paper; but the expense of cultivating the tree for this purpose was too great, and consequently the manufacture has been given up. It is best cultivated in a good soil near water. It may be propagated by cuttings or truncheons. It is subject to the attacks of an aphis, the *A. populi*, which penetrates the tissue of the leaf and petiole, and produces little protuberances of various shapes and sizes, similar to those produced in the leaves of the oak by the cynips.

Populus canadensis, the Canadian poplar, is an American species: it has angular branches, a compressed petiole; leaves roundish ovate, deltoid, acuminate, subcordate at the base, where there are glands serrated with unequal teeth, glabrous. It attains a height of 70 or 80 feet, and is found wild in the rocky districts of North America between Canada and Virginia. In America it is considered the best of all poplars for planting. The young shoots are used as food for horses. The poplar avenues in the garden at Versailles are formed of this tree.

Populus monilifera, the black Italian poplar: shoots more or less angular; branches round; petiole slender, compressed in the upper part; disk deltoid, glands at the base, subacute, serrate, glabrous; bracteæ glabrous; stamens 16; stigmas 4. It is doubtful of what country this tree is a native. It appears to have been introduced into England by Messrs. Dickson, nurserymen, from North America. In America however it is called Italian poplar, and in France *Peuplier Suisse*. It is probably a variety of an European species that has been introduced into America. It is the most rapid-growing of all the poplars, and in this country the timber is considered equal if not superior to that of any other species. In the neighbourhood of London, it has been known to grow 30 or 40 feet in height in seven years. In America it attains a height of only about 70 or 80 feet, but in England it reaches 100 or 120 feet and upwards. There are two varieties cultivated in the Horticultural Society's garden, London, *P. m. Lindleyana*, with wavy leaves, and *P. m. foliis variegatis*, with variegated leaves. In the middle of May it sheds its seeds, which are covered with a cottony down, and when lying on the ground look like snow. These seeds adhere to everything in their vicinity, and become in consequence a great nuisance when planted near houses. For this reason, male plants alone should be planted near habitations. It requires a fertile soil near water, and grows very freely from cuttings.

Populus fastigiata, the Lombardy poplar: leaf deltoid, wider than long, crenulated, glabrous, in the bud involutely folded, petiole compressed. This tree is readily distinguished among the species by its peculiar conical cypress-like form, and the total absence of horizontal branches. It grows to the height of 100 and 120 feet, and sometimes 150 feet. It is a native of Italy on the banks of the Po, and also of Persia and the Himalaya. It was introduced from Italy into Britain about the year 1758, and is now very generally diffused, some parts of the country exhibiting magnificent specimens. The wood of the Lombardy is inferior to that of the black poplar and the black Italian poplar. It is used for making packing-cases, rafters, small beams, studs, boards, &c. But the great use of the tree in this country is in ornamental planting, and for this purpose its spiry straight form adapts it exceedingly well as a contrast to the round-headed trees that are so numerous. It is well adapted for growing in villages, towns, and near houses, as the branches, not being horizontal like most other trees, will not interfere with the walls nor obstruct the entrance of light through windows. In ornamental planting, it may be placed near bridges, viaducts, rows of houses, and long buildings, as the perpendicular lines formed by the tree relieve the horizontal lines of the building. It requires a good soil, but will not even then grow well unless near water.

Populus balsamifera, balsam-bearing poplar, or Tacamahac tree: leaves ovate-oblong, quite smooth, with fine glandular serratures, deep green above, almost white but smooth underneath. Sometimes 2 glands at the apex of the petiole. Buds covered, in the spring, with an abundance of fragrant, viscid, balsamic juice. It is a native of North America, Da-uria, and the Altai, and attains a height of 80 feet. It is remarkable for its balsamic secretion, which was formerly collected in Canada in shells, and, under the name of *baume focot*, was sent in considerable quantities to various parts of North America. In Siberia a tincture is prepared from the buds, which is said to be antiscorbutic. But in Europe the principal use of the Tacamahac and its varieties, of which there are several from various districts, is in ornamental planting, for which it may be used instead of the Lombardy poplar.

P. betulifolia, *heterophylla*, *angulata*, and *candicans*, American species, have also been cultivated in this country, and deserve a place in all collections of these plants.

SALICIN, a neutral principle obtained from several species of salix: it is white, crystallizes in scales, inodorous, very bitter, fusible below 212°, and does not lose water at 392°. It is much more soluble in hot water than in cold; it is dissolved by alcohol, but is insoluble in æther and volatile oils.

According to Piria, anhydrous salicin is composed of—

Hydrogen	5·79	or 24	equivalents.
Carbon	60·25	„ 42	„
Oxygen	33·96	„ 9	„
	100·		

In its crystalline state it contains two equivalents of water. When treated with very dilute and hot hydrochloric or sulphuric acid, a resinous substance is formed, to which Piria has given the name of *salicetin;* it rises to the surface of the liquid as it forms, and is of a white or yellowish colour: it differs in properties and composition from salicin.

By the action of oxidizing agents salicin is converted into *salicyle*, which has not been obtained in a separate state, but is capable of combining, like a simple substance, with different bodies. When hydrate of salicyle is heated with potash, an acid is formed, which is separable from the alkali by means of stronger acids, and being but slightly soluble in water, it is precipitated in crystals resembling benzoic acid in appearance. Salicin possesses tonic properties analogous to those of disulphate of quina, and it is stated to be less liable to irritate the stomach.

SALICI'NIÆ. [SALICACEÆ.]

SALICOQUES. [SHRIMPS.]

SALICO'RNIA (from *sal*, salt, and *cornu*, a horn, in reference to the taste and form of the plant), the systematic name of the Glassworts, a genus of plants belonging to the natural order Chenopodiaceæ. They are characterised by a single, turbinate, fleshy, obscurely-lobed perianth; 10-12 stamens; short style; bi-trifid stigmas; fruit a utricle with a single seed. They are mostly weeds inhabiting moist salt districts on the coasts of the North of Europe, Africa, and America. *S. herbacea*, jointed glasswort, is a common plant in the salt marshes and on the banks of salt rivers in Great Britain. It is known by its herbaceous stem, compressed and notched articulations somewhat thickened upwards, and cylindrical spikes slightly tapering at the extremities. This, and many other species belonging to the genus, and to the other genera of the same natural family, yield a great quantity of soda, for the purpose of obtaining which they are collected on the coasts of the South of Europe and the North of Africa. This species is often eaten as a salad or pickle under the name of samphire, but is a different plant from the true samphire (*Crithmum maritimum*), which is found on the cliffs at Dover, and has been immortalised by Shakspere. The only other British species is *S. radicans*, which by some botanists is considered a variety of the last with a creeping stem. *S. fruticosa*, shrubby jointed glasswort, is a doubtful native of Great Britain, but grows largely in the South of Europe and in North America, and is used for the same purposes as the above. The species of this genus are rather numerous, but most of them possess properties in common with the foregoing.

Some of the species are very common on the Coromandel coast, whence Dr. Roxburgh, in his 'Flora Indica,' recommends the manufacture of alkali, which, from the cheapness of labour, he conceives might be made there at so low a rate as to admit of its being profitably sent to Europe. [SALSOLA.]

SALIENT, a term applied to an angle which presents its point to the outside of the figure, as opposed to re-entering or re-entrant, which is applied to an angle presenting its point to the inside of the figure. These terms are frequently used in fortification, and seldom in geometry.

SALIE'RI, ANTONIO, a composer of great eminence in his day, was born at Legnano, in the Venetian territory, in 1750. When only fifteen years of age he lost his father, a respectable merchant, and then immediately determined to make music, which he had studied only as an accomplishment, his profession. His first master was Giovanni Pescetti, and his next Leopold Gasmann. The latter took his pupil to Vienna, where he made the acquaintance of Gluck, who, at that time declining in health, entrusted Salieri with the charge of composing *Les Danaïdes*, which the great German master had engaged to produce for the *Académie Royale de Musique*. It was performed with the most brilliant success in Paris, and not only made the reputation of the author, but added nearly 20,000 francs to his fortune. He afterwards brought out, at different theatres, many operas, among which his *Tarare*, or *Axur Roi d'Ormus*, and *La Grotta di Trofonio*, were the most popular, and are now best known. He died at Vienna, in 1823. Salieri was a kind of rival of Mozart, and, strange to relate, his music was much preferred by the court and fashionable circles of Vienna to that of the greatest dramatic composer that then or has ever since lived.

SALIES. [PYRENEES, BASSES.]

SALIFEROUS SYSTEM. In geology, the series of calcareous, argillaceous, and sandy strata, locally and frequently productive of rock salt or brine springs, and of gypsum is thus designated. The equivalent terms are, New Red System, from the prevalence of a particular colour in the sandstones and clays; and Poicilitic System, from the various colours of the rocks. The term saliferous is formed on the same model as carboniferous, oolitic, &c., salt being the characteristic portion of its component masses. Salt is abundantly but not exclusively found in this system of deposits. Springs more or less salt are indeed met with in a great proportion of the whole series of strata; in England they are rather prevalent in rocks of the carboniferous system (as at Harrogate, Ashby de la Zouch, and near Newcastle), but we have no knowledge of real beds of salt except in the midst of red marls and sandstones. On the continent of Europe this is not the case, for though salt occurs in the Poicilitic marls and beds associated therewith (especially the Muschelkalk) in Germany and France abundantly, it is also found in the tertiaries of Poland, the greensand series of Spain, and the oolitic system of the Salzburg Alps.

Viewed on the great scale, the Saliferous System of rocks is one of the most varied and interesting we are acquainted with. There are peculiarities in its limestones, sandstones, and clays, as well as in its gypseous and salt deposits; the occurrence and nature of its organic contents, and the relation which it bears altogether to earlier and later classes of rocks, are worthy of careful study. Some of the peculiarities of its limestones have been noticed under the head of **Magnesian Limestone**, and for the changing qualities of its sandstones and clays see **Red Sandstone** and **Red Marl**. We shall here add a few reflections on he salt and gypseous masses, and on the organic contents of the Saliferous System.

Sulphate of lime is found perhaps as frequently and under almost as many curious circumstances in the stratified rocks, as carbonate of lime, in mealy aggregations, acicular prisms, broadly foliated crystals (selenite), fibrous masses and beds, and marmoroid or alabastrine rocks. It lies in strata of almost every age, and is not absent from diluvial, alluvial, and recent deposits. The mode of its occurrence is in a considerable degree characteristic of each particular mineral ype. While long prismatic crystals appear in cavities of hells and in recent excavations (as in the gallery of Felling Colliery, Newcastle), the solitary broad flaky crystals of elenite abound in blue clays of the tertiary and secondary eries (which receive their colour from protoxide of iron), and the fibrous gypsum marks, spots, and irregular lines n the red clays (coloured by peroxide) of the Saliferous System, the fibres being (in agreement with a general aw of structures) arranged so as to lie at right angles to he broader surfaces which bound the mass. The marmoroid exture is most commonly found in real however irregular beds, as at Montmartre, and in some points near Fairburn in Yorkshire, on the line of the York and North Midland ailway. At these places fibrous, marmoroid, and flaky ulphate of lime may be obtained in association.

From what is known to take place at the present day, and rom appearances in the distribution of the gypsum and elenite in masses of clay and cavities of shells, &c., it appears that in a great proportion of cases these crystallized masses owe their origin to the processes of segregation since he deposition of the earthy masses in which they appear. n no other way is it at all conceivable or even possible that he irregular masses of gypsum which appear in red marl at xmouth, Aust Passage, and the Trent's mouth could be ormed. The marls in which they here lie were deposited s fine mud, and if we suppose merely a slow extrication f the liquid, so that its contained salts might remain, he arrangement of these salts in such irregular masses uring crystallization presents no particular difficulty.

Salt shows itself in the Cheshire mines as either granuar, broadly laminated, or fibrous; in great beds or minutely mixed with marls, nearly as gypsum is, and probably in regard to its origin, similar suppositions will apply, he solid beds (of limited extent however and irregular rea) being due to a great evaporation of liquid over the reviously deposited marls. That such water, in the case f rock-salt generally, was derived from the sea, is almost ertain, from the occurrence of iodine and bromine in the rine springs connected with them. (Daubeny's Memoir, n *Phil. Trans.*) But it does not follow that the area in hich the salt was found was, at the time of its formation, r for some time previously or subsequently, connected ith the sea. Lagoons may have been the theatre of he evaporation supposed, and earthy sediments, such as ccur in Cheshire and Poland, may have been drifted in y fresh-waters or the sea, according to circumstances, nd it is not difficult to imagine a repetition of the processes uch as might produce the two great beds of rock-salt in Cheshire. It is not known that organic remains of any kind accompany the salt of Cheshire, but this is almost true of the whole range of the red marls, in which these deposits lie

We find, then, associated together, abundance of red oxide of iron, salt, and gypsum, but no organic remains. The prevalence of red oxide of iron in any of the strata is accompanied by a paucity or total absence of organic remains. In the Saliferous System these red strata extend through several hundred feet of thickness, and it is found, in general terms, that the types of organic life above and below are widely different. Similarly the thick series of old red-sandstone contains few organic fossils, and separates two distinct groups of these productions. Some great physical changes then must be supposed to have occurred previous to and during the saliferous period, and to have influenced both chemical and vital phenomena.

M. Adolphe Brongniart (*Prodrome d'une Histoire des Végétaux Fossiles*, 1829), viewing the series of fossil plants, gives four great periods of antient vegetation.—the first extending from the earliest strata to the red-sandstone (saliferous) strata; the second including these strata; the third including the oolites and chalk; the fourth, the tertiary strata. Of these the flora of the second period (chiefly terrestrial) is very limited, and may be looked upon as a transition group of plants connecting the earlier and later periods. Similarly the series of marine invertebrata which lie in the Saliferous system have characters intermediate between the early (palæozoic) and later races of preadamitic life. We find the same results by considering the vertebrated animals; but on a careful scrutiny, this 'transition' character of life is resolvable into two parts; we discover in the Saliferous period *two periods*, marked in geology by the *two formations* in which the Saliferous strata are ranked.

The lower of these, the **Magnesian Limestone** formation, contains corals, brachiopoda, and fishes, so extremely similar in detail or analogous in their general history to the corresponding forms of the mountain-limestone, that it is impossible in any fair classification to sever this group of fossils from the Palæozoic series; while, on the other hand, the upper of the two formations, the Red Sandstone and Keuper series, presents almost no resemblance to the older, but a decided analogy to the newer, or, as we wish to call it, Mesozoic series of the Oolites. And this is confirmed by a similar review of the nature and distribution of the fossil plants. In the Upper Red Sandstone and Keuper we have Pterophylla and Cycadeous plants allied to those of the Oolites; in the Lower Red Sandstones (Rothliegende), Calamites and Lepidodendra of the coal series.

It appears then that the rocks of this great and varied Saliferous System may be best placed in relation to the other systems of strata by help of a further analysis, as in the scheme subjoined, in which we have added all the other groups of strata to illustrate our general view:—

Proposed titles depending on the series of organic affinities.		Ordinary titles.
Cainozoic strata	upper	Pleiocene Tertiaries.
	middle	Meiocene Tertiaries.
	lower	Eocene Tertiaries.
Mesozoic strata	upper	Cretaceous System.
	middle	Oolitic System.
	lower	New Red Formation.
Palæozoic strata	upper	Magn. Limestone Formation Carboniferous System.
	middle	Eifel and South Devon.
	lower	Transition strata. Primary strata.

The determination of two of the types of the Palæozoic strata is yet imperfect, because the series of forms intermediate between the transition and carboniferous periods is not fully investigated. It is probable that the Eifel and South Devon fossils make the middle Palæozoic type.

SALIH-BEN BAHLEH (called by Abulfaraj. *Hist. Dynast.*, p. 154, Salih Ben *Nahleh*), an eminent Indian physician, who came to Irak and practised at Bagdad in the time of Haroún al Rashîd, who reigned from A.H. 170 to 193 (A.D. 786 to 808). 'He was distinguished,' says Ibn Abi Osaibiah. Oioún Al-Amba fi Tabacát Al-Atebba (*Fontes Relationum de Classibus Medicorum*, cap. xii., sec. 7),[*] 'amongst the learned men of India, well skilled in their methods of medical treatment, and had power and influence in the promotion of science.' He acquired great reputation by discovering that Ibrahim Ben Salih, the cousin of the khalif, whom Jabril Ben Bachtishua had pronounced to be dead, was only apparently so,[*] of which event the same author gives a curious and circumstantial account. It appears that he first went alone into the room where Ibrahim lay, and immediately there was 'heard a sound as of one striking the body with the palm of the hand.' Then the khalif and some others were admitted, and in order to prove that Ibrahim was alive, 'Salih took out a needle that he had with him, and thrust it in between the nail and the flesh of the thumb of his left hand, when he immediately plucked away his hand and drew it towards his body.' He then ordered that his burial clothes should be taken off him, and that he should be washed till the scent of the hanút[†] was removed; after which he called for some *kundus*, and blew some of it up his nose. In about ten minutes his body began to move; then he sneezed, and sat up in his bed, supposing that he had been asleep, and complaining only that he had been bitten by a dog in the thumb, and that he still felt the pain, at the same time showing the thumb into which Salih had thrust the needle. Ibrahim lived a long time after this circumstance, and married the Princess Alabbasah, daughter of Almahadi, and obtained the government of Egypt and Palestine, and died in Egypt.

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[*] See an extract from this work (chap. xii.), translated by the Rev. W. Cureton, with remarks by Professor H. H. Wilson, in the 'Asiatic Journal.'

With respect to the kundus, we are told in the 'Kamus' that 'it is the root of a plant which is yellow inside and black out. It operates as an emetic and a purging medicine, and clears away the ringworm. When it is reduced to powder and blown up the nose, it causes sneezing and enlightens the weary eyes, and stops blindness.' See Avicenna (*Canon*, lib. ii., tract 2, cap. 137, p. 280, ed. Venet. 1564), where a description of its medical properties is given. Sprengel (*Comment. in Dioscor. de Mater. Med.*, lib. ii., cap. 192) supposes it to be the same as the Greek *στρόυθιον*, on which there is a chapter in Dioscorides (*loco cit.*), and which he identifies with the 'Saponaria officinalis,' or soapwort.

SA'LII were twelve priests of Mars Gradivus, who formed an ecclesiastical collegium or corporation at Rome. They were chosen from the patricians, and established by Numa to take care of the twelve ancilia, or sacred shields of Mars. The original ancile was said to have been found in the palace of Numa, and was supposed to have fallen from heaven. To secure its preservation, Numa commanded the armourer Mamurius Veturius to make eleven other shields exactly like it; and the twelve were deposited in the temple of Mars on the Palatine hill, and committed to the care of the Salii. (Liv., i. 20; Dionys., ii. 70, 71; Cic., *Rep.*, ii. 14; Ovid, *Fast.*, iii. 387; Festus, s. v. *Mam. Vet.*)

On the calends of March, and on several successive days, the feast of Mars was celebrated by the Salii, on which occasion they carried the shields through the city dressed in their official garments, which consisted of an embroidered tunic with a brazen belt, the trabea, and the apex, or conical cap, with a sword by their side, and a spear or staff in their right hand. They at the same time performed a dance, and sung hymns or songs called Axamenta (Festus, *s. v.*) in honour of Mamurius Veturius, and all the celestial deities, with the exception of Venus. (Macrob., *Sat.*, i. 12; Virg., *Æn.*, viii. 286; Varro, *De Ling. Lat.*, vii. 26, ed. Müller.) These songs were in later times scarcely understood even by the priests themselves. (Quint., i. 6, p. 54, Bipont.; Hor., *Ep.*, ii. 1, 86.) At this festival the Salii were accustomed to partake of an entertainment in the temple of Mars, which was proverbial for its magnificence and excellence. (Suet., *Claud.*, 33; Cic. *ad. Att.*, v. 9; Hor., *Carm.*, i. 37.) There was a magister at the head of the collegium.

Another corporation of Salii, also consisting of twelve members chosen from the patricians, was established by Tullus Hostilius in fulfilment of a vow which he made in a war with the Sabines. These Salii were also called Collini or Agonenses, to distinguish them from the Salii established by Numa, who were surnamed Palatini. (Dionys., ii. 70; iii. 32; Varro, *De Ling. Lat.*, vi. 14; Göttling, *Geschichte der Römischen Staatsverfassung*, p. 192; Ambrosch, *Studien und Andeutungen im Gebiet des altrömischen Bodens*, p. 143, &c.; *Dictionary of Greek and Roman Antiquities*, article *Ancile*.)

SALI'NAS, FRANCISCUS, a profoundly learned musical theorist, was born in 1613, at Burgos, the capital of Old Castile, of which city his father was quæstor or treasurer. Blind from his birth, he had recourse to the study of music, an art to which his deprivation naturally led him. In this his progress was, as is usual in such cases, rapid, and he became a superior organist. While yet a boy he was instructed in Latin by a young woman famous for her knowledge of that language, his success in which led to his being entered at the university of Salamanca, where he applied most assiduously to the Greek language, as well as to philosophy, and then commenced reading the Greek authors on the science of music, with whose writings he made himself thoroughly acquainted, commenting on them in an equally learned and ingenious manner, and correcting errors not before detected, but seen and admitted on his pointing them out in his great work, 'De Musica,' &c., a treatise in seven books, published at Salamanca in 1677. The first book of this is on musical ratios; the second, on musical intervals; the third is a clear description of the various antient *genera*; and the fourth is on the diapason and octave, and on the doctrines of Pythagoras, Aristoxenus, Ptolemy, &c. The remaining three books chiefly relate to rhythm and the feet of the Greek and Roman versification.

Salinas died, according to Thuanus, in 1590. He was highly esteemed by pope Paul IV., who created him abbot of St. Pancratio, in the kingdom of Naples. A full and clear analysis of his work is given by Sir John Hawkins (*History of Music*, iii. 123); to which Dr. Burney has made some interesting additions in the third volume (page 290) of his History.

SALINS. [Jura, Department.]

SALISBURY, or NEW SARUM, a city in Wiltshire, locally in the hundred of Underditch, but having separate jurisdiction, 85 miles from the General Post-office, London, by railroad to Basingstoke, and from thence by Overton and Andover.

This city had its origin in the thirteenth century. The bishop and canons of the cathedral, which was then within the fortifications of Old Sarum [Sarum], being exposed to injury from the captains of that fortress, with whom they were at feud, determined to remove their church to another site; and Herbert Pauper or Poore, who held the see, having obtained an indulgence from the pope, determined on commencing a new church on the lands belonging to the see on the site of the present cathedral (A.D. 1220). The inhabitants of Old Sarum being attached to their bishops and clergy, determined on removing also, and thus the city of New Sarum or Salisbury rose into existence. A charter granted by Henry III., making it 'a free city,' and giving to the inhabitants a fair and a market, contributed to its prosperity, and in the succeeding reigns several parliaments were held here. It was fortified by a wall and ditch; and the erection of a bridge over the Avon at Harnham brought the great western road (which had previously passed through Old Sarum) through this town. Salisbury was the place of rendezvous for Richard III.'s army on occasion of the duke of Buckingham's rebellion; and that nobleman was brought here and beheaded in the market-place, A.D. 1483. During the protectorate of Cromwell (A.D. 1655), Salisbury was occupied by a band of 200 royalist insurgents under Sir Joseph Wagstaffe, who had come over from the Continent, Penruddock, Grove, Jones, and other gentlemen of Wiltshire, who seized the sheriff and judges then holding the assizes, and proclaimed Charles II. king. The rising was speedily put down; and the leaders, except Wagstaffe, who escaped, were executed.

The city, before the late alteration in its boundaries, occupied part of a peninsula formed by the river Avon on the west and south, and by the river Bourne on the east. The village of Fisherton Anger, now included in the municipal and parliamentary limits, is on the west side of the Avon at the junction with that river of the united stream of the Wily and the Nadder, which meet at Bemerton, two miles west of their junction with the Avon. The principal part of the city lies immediately to the north of the extensive cathedral close, and comprehends the three parishes of St. Edmund, St. Thomas, and St. Martin: it consists of several streets regularly laid out at right angles to each other. Most of the houses are of brick, of comparatively modern erection, and several of them of handsome appearance. The paving and lighting of the town have been much improved of late years; and the principal streets have a stream of water from the rivers conducted through them by canals lined with brick. Fisherton Anger is on the road to Bath. South of the Avon is the suburban village of Harnham on the Dorchester and Exeter road. The area and population of Salisbury, in 1831, were as follows:—

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[*] For similar instances, see the note on Rhazes, p. 445.

[†] 'Hanút is the name of every kind of scent that is mixed for dead bodies.' Kamus.)

		Inhab. Houses.	Building.	Uninhab.	Total.	Families.	Persons.
Parish of St. Edmund	Acres 480.	907	1	44	952	1078	4612
" St. Martin		457	5	21	483	566	2362
" St. Thomas		421	0	18	439	501	2364
Cathedral Close		86	0	6	92	119	538
Old City of Salisbury		1871	6	89	1966	2264	9876
Fisherton parish (part of) conjectured					290		1396
Milford tything (ditto) ditto					80		400
New City as determined by Boundary Act					2336		11,672

The cathedral is considered one of the most beautiful in England. The close is entered by several antient gates. The freedom of the cathedral from the encumbrance of contiguous buildings adds much to the imposing beauty of its appearance. The church consists of a nave and choir with two side aisles, a space on the east of the choir, and a Lady-chapel at the east end; a large transept with an aisle on its east side; a smaller transept east of the former, with an aisle on its east side; a central tower and spire; a north porch, a muniment-room or vestry at the south end of the eastern transept; cloisters, and a chapter-house. The principal dimensions are as follows:—Extreme length of the church without, 474 feet; within, 450 feet, thus divided: nave, from the western door to the organ-screen, 229 feet; choir and adjacent space from thence to the Lady-chapel, 151·5 feet; Lady-chapel, 69·5 feet: width of west front, 112 feet; breadth of nave and choir, 34 feet, or, with the aisles, 78 feet; great transept, length without, 230 feet, within, 206 feet; width, with aisle, 57 feet; smaller transept, length within, 145 feet; breadth, with aisle, 44 feet: Lady-chapel, width, 37·25 feet: height within of the vaulting of the nave, choir, and transepts, 81 feet; of the aisles and Lady-chapel, 40 feet; height without to the top of the side aisles, 44 feet; to the parapet of the church, 87 feet; to the ridge of the roof, 115 feet; to the parapet of the tower, 207 feet; to the summit of the spire, 404 feet. The cloisters form a square of 181·75 feet within the walls, and have a width of 18 feet between the side walls and windows; the height of the vaulting is 18 feet. The chapter-house is an octagon of 58 feet diameter internally, and 52 feet in height to the vaulting. (Britton's *Salisbury Cathedral.*)

'This edifice has the advantage of being built in one style, the Early English, and from a uniform and well arranged plan. The tower and spire are of later date, but admirably accommodated to the style of the building. . . . Modern alterations have taken away the altar-screen and thrown the Lady-chapel open to the choir: the organ-screen is also modern. In various parts of the church are several antient monuments, some of which are very fine. On the whole this cathedral presents an object for study hardly equalled by any in the kingdom; the purity of its style, and the various modes of adapting that style to the purposes required, deserve the most attentive consideration.' (Rickman.) The eastern end of the cathedral is of remarkable beauty; but the west front is less pleasing, from its formal square outline. The spire is remarkable not only for its elevation, but for the curious and ingenious contrivance of its timber framework, and for the skill and boldness with which it was raised on a tower not designed originally to support such a burden. The episcopal palace is a large building of various dates and styles, with an extensive and tastefully laid out garden. There is in the cathedral close a college or almshouse for ten clergymen's widows. The close is under the civil jurisdiction of the bishop, recorder, and canons residentiary, who are justices. The three parish churches of the old city are large; St. Edmund's and St. Thomas's are fine buildings of perpendicular date.

The other public buildings are the council-house, erected in 1795, and devoted to the use of the corporation and the business of the county; the spacious county gaol and bridewell, erected A.D. 1818; the infirmary, a plain and commodious building; the Salisbury and Wiltshire library and newsroom, with a small museum annexed to it; a small theatre; and several dissenting meeting-houses and almshouses.

The woollen manufacture, once extensively carried on here, has now much declined; the manufacture of fine cutlery has also declined; but the silk manufacture has been introduced with some success; it employed, when the Municipal Corporation Commissioners made their report, 120 persons. There are markets, on Tuesday for corn, and every fortnight for cattle, and on Saturday for cheese and provisions: there are four yearly fairs, but they are falling into disuse.

Salisbury returned members to parliament from 23rd Edward I. The boundaries of the city were considerably enlarged by the Boundary Act, and the suffrage, previously much restricted, extended by the Parliamentary Reform Act. The number of electors on the register in 1834-5 was 650; in 1835-6, 689. By the Municipal Reform Act, the extended parliamentary boundaries were adopted for municipal purposes; the city divided into three wards. The corporate body consists of six aldermen and eighteen councillors, having a commission of the peace. The summer assizes and the Easter sessions for the county are held here, also the city sessions and a court leet and court of record belonging to the bishop. Salisbury is the place of election and a polling-station for the southern division of Wiltshire.

There were, in 1833, in the four parishes just enumerated, two infant-schools, with 164 children, partly supported by subscription or endowment; a classical grammar-school, founded by Queen Elizabeth for 8 boys; four other endowed day-schools, with 10 boys and 28 girls, with the choristers of the cathedral; two 'national' schools, with 210 boys and 150 girls; seventeen private boarding or day schools, with a number of children not ascertained; and nine Sunday-schools, with about 1400 children.

SALISBU'RIA, a genus of the natural family of Taxaceæ, named in honor of R. A. Salisbury, a modern botanist of distinction. The tree, which is the only one of the genus, has long been known by the Japanese name Gingko. The genus is characterised by having monœcious flowers. The male flowers disposed in a filiform naked catkin, without calyx or corol; stamens numerous; the anthers composed of two cells, which are pendulous and united only at the apex. Female flowers are solitary and terminal. Calyx 4-fid, or rather, a cup-shaped disk, from the thickened apex of the peduncle, surrounds the base of the solitary ovule. Fruit forming a drupe, which has its base supported by a fleshy cup, with a juicy white pulp. Seed nut-like, with an osseous shell, kernel white. Embryo axillary, dicotyledonous, radicle above.

The Gingko grows naturally in Japan, is much cultivated in China, and is found in many gardens in Europe; fine old specimens may be seen at Kew and in the Apothecaries' Garden at Chelsea. In congenial climates it attains the size of the walnut. It is remarkable for the form of its leaves, which are wedge- or fan-shaped, deeply cut in the centre or bilobed, and finely striated with veins, having some resemblance to the leaves of some species of Adiantum, whence it is commonly called Maiden-hair Tree in this country. The pulp of the fruit is austere-tasted, but the kernel is sweet, with some degree of bitterness when raw, but agreeable as a dessert when roasted like chesnuts. They are much eaten in China. Dr. Abel says he saw the fruit exposed in the markets in China, but could not find out to what purpose it was applied.

The Salisburia is best planted on a deep sandy loam, with a dry subsoil, as it will not grow with a wet bottom. The situation should be sheltered, but it may be more exposed than many exotic plants. It is frequently planted against a wall in order to afford protection, but this does not appear to be necessary in the south of England. Salisburia can be grafted with much facility, and thus male and female flowers may be easily produced on the same tree.

SALI'VA, SALIVARY GLANDS. The principal glands by which the saliva is secreted are six in number, three being situated on each side of the face, viz. the parotid, the submaxillary, and the sublingual glands. Of these the parotid is considerably the largest, and has been already described. [PAROTID GLAND.] The submaxillary gland, which is the next in size, has its principal mass situated immediately behind and beneath the middle of the base of the lower jaw, below the mylohyoïdeus muscle, round the posterior edge of which a portion of it is continued, and leads to the submaxillary or Whartonian duct. The latter passes forwards and inwards, and opens on the surface of the mucous membrane of the mouth, just by the side of the frænum of the tongue. The sublingual gland is the smallest of the chief salivary glands; it is situated close by the duct of the submaxillary, into which several of its ducts open; others have their orifices on the surface of the mucous membrane of the mouth, by the side of the frænum linguæ, and further outwards. Besides these larger glands there are a vast number more which secrete saliva, and which are situated in the substance of the lips and cheeks immediately beneath their mucous membrane, on whose surface their ducts open. Indeed the whole interior of the lips and cheeks is lined by a congeries of small glands, which in structure closely resemble the salivary, and probably do not differ from them in function.

The saliva which is secreted by these glands, according to the general laws of secretion [GLAND; SECRETION], is, when not mixed with air, a transparent, rather viscid fluid, which is usually weakly alkaline, but during the mastication of food is often slightly acid. It is composed of a great proportion of water, mixed with portions of the epithelium of the mucous membrane lining the mouth, and holding in solution about seven parts in one thousand of albumen, salivine (a principle almost peculiar to itself), and other animal matters, together with the saline substances found in the blood, and a very minute quantity of sulpho-cyanide of potassium.

The purpose served by the saliva seems to be the softening of the food, with which it is intimately mixed in mastication. Whether it is of any further use in digestion than thus to fit solid food to pass along the œsophagus without pain, is at present uncertain. But for this purpose it is absolutely necessary; and glands for its formation exist in all classes of animals from the insects upwards (with the exception of fish), and even in many that are lower in the animal kingdom than the insects. In all these it appears to serve the same purpose; the peculiar properties ascribed to the saliva of some animals being for the most part drawn from erroneous observations. The poison of venomous snakes, for example, is secreted by glands quite distinct from those which form their saliva; the saliva of the toad is perfectly harmless; and that of rabid animals is probably not more poisonous than the other fluids of their bodies; only under ordinary circumstances it alone is inserted into the wounded part.

The quantity of saliva secreted when the mouth is at rest is only sufficient to keep its internal membrane moist and slippery. When, however, the jaws are actively moved, and especially during feeding, or even at the thought of a meal or of certain kinds of palatable food, the quantity is greatly increased. During the twenty-four hours it is probable that from sixty to ninety grains of saliva are secreted by one parotid gland (Mitscherlich), and the quantity produced by all the salivary glands of an adult man together may therefore be estimated at from four to five hundred grains.

With the exception of the parotid, which is often the seat of inflammation [MUMPS], abcess, and malignant disease [PAROTID GLAND], the salivary glands are remarkably little obnoxious to disorder. The most common affection is an accidental closure of their ducts by calculous matter or otherwise, when small cysts similar to those called Ranulæ [RANULA] form. These are often met with about the lips; they rarely need surgical treatment, but when they do, that adapted to ranula may be employed. The only other affection worth noticing is treated of in the following article.

SALIVATION, or PTYALISM, is a superabundant secretion of saliva. This sometimes occurs as an idiopathic disease, originating without any evident cause. Dr. Christison (*Treatise on Poisons*) has collected several such cases, in some of which the quantity of saliva discharged amounted to three or more pints daily. Irritation of the salivary glands, accompanied with profuse secretion, is also an occasional attendant on common inflammations of the throat and mouth, and on those that accompany eruptive diseases, especially small-pox. But far more frequently salivation is the effect of medicines or poisons. Some preparations of gold, copper, antimony, and iodine, croton oil, digitalis, and even opium, are apt to produce it; and it is almost a constant effect of the long-continued or copious administration of mercury.

The quantity of mercury required to produce salivation varies greatly in different persons. In some, two or three grains of calomel are sufficient; but by other persons such large quantities may be taken with impunity, that they appear insusceptible of its action. No general rule therefore respecting the quantity of mercury that may be safely given to any one can be made; but in no case can there be safety without caution and careful watching of the effects produced by it.

Salivation from the use of mercury is distinguished from that which arises from other causes, by its being preceded by a peculiar brassy taste in the mouth, fœtor of the breath, and tenderness, redness, and sponginess of the gums. These are soon followed by the increased flow of saliva, and if mercury be still taken, or if the quantity already taken was very large, they increase; the whole mouth, tongue, face, and throat become swollen and tender, and ulcers and sloughs quickly form on the mucous membrane. In extreme cases the mouth and cheeks and throat become extensively gangrenous, the teeth fall out, the gums swell up as they do in scurvy, the jaws are affected with necrosis, and by the spreading of the disease to important parts it may prove fatal; or the patient may die exhausted by the profuse discharge of saliva, or by the peculiar nervous and other constitutional disturbances that often accompany the poisonous influence of mercury. [MERCURY.]

The best treatment of mercurial salivation is exposure to cool pure air, a nutritious diet, and mild purgatives. Gargles of chloride of soda are useful in correcting the fœtor of the breath; and honey, or the *Mel Boracis*, may be applied to the smaller ulcers in the mouth. The more extensive ulcerations and the gangrene can be treated only by maintaining the patient's strength by tonics and stimulants, and by the usual local applications to such diseases. The idiopathic kinds of salivation usually require only cool air and gently reducing measures.

SALIX (Latin, *salix*, a willow), the name of a genus of plants, which, in conjunction with Populus [SALICACEÆ], constitutes the natural order Salicaceæ. In many respects this is one of the most important genera of plants: the rapidity of their growth, the toughness and lightness of their wood, and their uses in medicine and the arts, have caused them to be extensively cultivated. But although largely cultivated and well known in most parts of the world, the botanical arrangement of these plants presents considerable difficulties, and few genera have had more time and labour spent upon them than Salix; and up to the present time the most able botanists differ as to the real nature of many species or varieties.

The genus Salix is known by possessing diœcious flowers; catkins many-flowered, imbricated, composed of a single-flowered flexible bract. The barren flowers have a small lateral abrupt gland, sometimes double; filaments 1, 2, 3, 5, or more, longer than the bract, and in some partly combined; 2 lobed anthers, opening longitudinally. The fertile flowers with a nectariferous gland; ovate, 1-celled, many-seeded ovary; permanent terminal style, with 2 stigmas which are notched and obtuse or cloven acute, and spreading; ovate capsule composed of 2 revolute concave valves and one cell; numerous minute oval seeds, tufted with soft, simple, upright hairs. The willows are chiefly natives of the colder parts of the temperate regions of the northern hemisphere. *S. herbacea* and *S. arctica* are found nearer the pole than any other woody plants. *S. Babylonica* is a native of China, Japan, Armenia, and the north of Africa. Of all the species enumerated, only 17 are extra European.

The willow was known to the Greeks and Romans; in fact little has been added to our knowledge of the properties and uses of these plants since their time. On account of the flexible nature of their shoots and the toughness of their woody fibre, they have always been used as materials for making baskets, hoops, crates, &c., and for these purposes great quantities are cultivated in this and other countries. The bark is made use of in the north of Europe for the purpose of forming mats in the same manner as the bark of the common linden-tree. In Tartary the woody fibre is macerated and separated, and then spun into threads, from which cloth is woven. Willows are much used in the manufacture of charcoal; and it has been proved that willow charcoal is superior to that procured from the wood of most other trees for the preparation of gunpowder. The bark of all the willows contains the tanning principle, and, according to Sir H. Davy, some of the species, especially *S. Russelliana*, *S. alba*, and *S. purpurea*, contain as much as the oak itself. From the bark of some is obtained a vegetable principle called *salicin*, which acts upon the system in the same manner as quinine, and is used for the same purposes. The willow is considered as the emblem of despairing love. It is often associated with the yew and the cypress in the churchyard.

Willows are extensively cultivated in this country as timber-trees, coppice-wood, and for the purpose of making hoops and basket-work. In the culture of willows, one of the first points to be attended to is the determination whether the plant is male or female. The female is generally the more vigorous growing plant; and in consequence, where timber or coppice-wood, hoops, or rods for coarse basket-work are required, the female should be grown. On the other hand, when tough and delicate rods for basket-making are required, the male plant ought to be selected. All willows that are intended for basket-rods, hoops, poles, or timber-trees should annually ripen their shoots. Hence the colder the climate, the drier should be the soil in which they are planted, on account of the necessity of ripening their wood. The willow grows naturally in a moist soil, and wherever planted, it should be within reach of water. Low moist bottoms, high banks of rivers, brooks, or ditches, are the best situations for planting them. But wherever they are placed, care must be taken that the soil be drained, for although they require much moisture, they will not grow in a saturated soil.

In the culture of the willow as osiers and for hoops, great care is required in order to produce them in perfection. All willows may be propagated by cuttings. There are however many species that will grow from seeds; and probably, were it tried, they might be grafted as easily as other plants.

All the willows are liable to the attacks of various insects, and on that account afford a valuable field for entomological research. The larvæ of cossus ligniperda, cerambyx moschatus, and nitidula grisea are found in the wood of most willows, on which they feed, and in general they are so numerous as to destroy the tree in a few years. Cryptorhynchus lapathi is an insect that frequently commits great havoc in osier-grounds. The larva of the lunar hornet sphinx (*Trochilium crabriforme*) bores the trunk of *S. caprea*, and feeds upon the living wood, and thus destroys the tree. The following insects are also recorded as attacking and living on willows: nematus capreæ, chrysomela vulgatissima, the larvæ of brepha Parthenias, notodonta ziczac, leiocampa dictæa, ptilodontes palpina, gastropacha quercifolia, galeruca capreæ, the larva of pyrochroa rubens, melasoma populi and tremula, balaninus salicivorus, tachyerges salicis, aphis salicis, coccus capreæ, and c. salicis.

In order that the species of this genus may be studied successfully, a number of points require consideration, and it is only lately that an approach has been made to accuracy in their investigation. The flowers of the salix are subject to many anomalies which have been productive of not a little difficulty, and have sometimes led to the supposition that this genus was an exception to the ordinary laws of vegetable development. The principal anomalies that are found are: 1, male and female flowers occurring in the same catkin; 2, stamens apparently changed into pistils; 3, stamens accompanied by an imperfect pistil; 4, entire union of the filaments of the stamen. In the study and description of the species, it is of importance that the tendency to these anomalies should not be overlooked. Another difficulty in the way of the study of this genus is the occurrence of hybrids. This has been denied by Sir J. E. Smith, in his article 'Salix,' in Rees's *Cyclopædia*: he says, 'We can also contradict another common opinion taken up by botanists, who found a difficulty in discriminating the species, that they frequently generate mule varieties. In a garden where for twenty years almost every British willow, and many foreigners, have been cultivated together under our inspection, and where abundance of seedling plants have come up every season; though many of these have been purposely preserved for examination, no mule plant nor even any variety has occurred. The greatest difference of aspect indeed, and the strangest diversities of shape and size in the foliage and stipules, are seen, according to the treatment of each individual with respect to pruning, watering, starving, felling, and allowing young shoots to grow from an old root.' On the contrary, Koch, a German botanist, who has published a commentary on this genus, and who has certainly studied it more profoundly and philosophically than any other writer, says, 'The variation of the different parts is not the only difficulty with which the botanical student in this genus has to contend. The great number of hybrids, the existence of which in the genus Salix no one can doubt, is another obstacle. No one will accuse me of arrogance in assuming to know S. rubra and S. viminalis; and yet on the banks of the Rednitz near Erlangen there are many thousand trees of these two species, and, at the same time, many intermediate forms which I can refer to neither species. The catkins of these afford no distinguishing marks; for what seem at one time to belong to the former species, at another time appear more clearly allied to the latter.' A few well-conducted experiments would soon set this question at rest.

In arranging and distributing the species, Koch has not followed the suggestions of Linnæus, or the arrangement of Sir J. E. Smith. He observes, 'that if the usual arrangement of the species be adopted, in which the sections are characterised by having the ovaries naked or pubescent, the leaves glabrous or downy, serrated or entire (as in Smith's 'English Flora,' &c.), then species widely separated by nature and habit must necessarily be grouped together, not to mention that these characters are in themselves liable to great changes.' With regard to the parts of most importance in the determination of species, Koch says, 'a character taken from the catkins appearing earlier than, at the same time with, or later than, the leaves, is of great importance; but one taken from the situation and insertion of the leaves is still more so. The capsule offers important characters; its length relatively to the gland, which is never wanting, is a very constant character, varying only in a few species. The colour of the young shoots varies greatly, often so much as to cause the varieties to appear distinct species. The form of the leaves in the same species, and even in the same plant, can never be depended upon. In some species they are serrated or entire, green or hoary on the under surface, and glabrous or hairy on the same plant. The same variation is common on the exterior of the ovaries. The bracteas are sometimes obovate, and only half the length of the ovary; and sometimes in the same species lanceolate, and reaching as far as the style. The style and stigma likewise vary in length, and are occasionally more or less cleft. Stigmas of a rose colour, and of a yellow colour, have been found in the same species. The stipules vary in size, but never in form; hence they afford the very best characteristics for distinguishing species.' (Koch, *De Salicibus Europæis Commentatio.*)

There are at present described about 220 species of Salix; of all which we shall not here give a description, but refer the reader to works that give a full account of the species, with their arrangement. (Koch, *De Salicibus Europæis Commentatio*; Hooker's *British Flora*; Loudon's *Arboretum et Fruticetum Britannicum.*) In this last work all the information that could possibly be collected with regard to this genus is to be found. We shall arrange here the more common species, under the heads Sallows, Osiers, and Willows. These terms are often applied to any of the species, but some have more frequently one of the designations than the other.

SALLOWS.

These are trees or low shrubs belonging mostly to Borrer's group Cinereæ, and are characterised by downy branches, and mostly obovate, grey, hoary, toothed, more or less wrinkled, and stipuled leaves, very veiny beneath Ovaries sericeo-tomentose.

Salix cinerea, grey sallow: stem erect; lower leaves entire, upper serrated obovate-lanceolate; glaucous downy and reticulated with veins beneath; stipules half-heart shaped, serrated; ovary silky, style short, stigmas mostly entire. It attains a height of 20 or 30 feet, and is abundant in England on banks of rivers and in moist woods.

Salix aquatica, water sallow: stem and branches erect; leaves slightly serrated obovate-elliptical, minutely downy, and rather glaucous beneath; stipules rounded, toothed; ovary silky, stalked, stigmas nearly sessile. This is also a British species and one which Koch has made a variety of *S. cinerea*. The olive-leaved sallow (*S. oleifolia*) is also referred by Koch to *S. cinerea*.

Salix aurita, round-eared sallow: branches trailing; leaves obovate, somewhat serrate, convex, obtuse with a small hooked point, hairy, and reticulated with veins on both sides; stipules roundish, convex, toothed; ovary silky, stalked, stigmas nearly sessile.

Salix caprea, goat willow: stem erect; leaves roundish-ovate, pointed, serrated, waved, pale, and downy beneath; stipules somewhat crescent-shaped; catkins oval; ovary stalked, ovate, silky; stigmas nearly sessile, undivided; capsules swelling. It is a native of Britain, and is distinguished early in the spring by putting forth its handsome yellow blossoms before other trees have assumed their foliage. The bark is much used for tanning, and the wood is used for making implements of husbandry. It is also grown for hoop-making, and in medicine the bark is sometimes used as a substitute for cinchona.

Osiers.

The species of Salix called mostly by this name belong to Borrer's group Viminales, which are described as trees of a more or less considerable size with long pliant branches and lanceolate leaves; ovaries nearly sessile, hairy or silky; their styles elongated; their stigmas linear, mostly entire. Any willow however that has long pliant twiggy branches and is grown on this account is called an Osier.

Salix viminalis, common osier: leaves linear-lanceolate, obscurely crenate, white, and silky beneath; stipules very small, sublanceolate, branches straight and twiggy; ovary upon very short stalks, lanceolate; style elongated; stigmas long, linear, mostly entire. This is the species that is used for the various kinds of basket-work, bands, &c., and for this purpose is largely cultivated in this country.

Salix stipularis, auricled osier: leaves lanceolate, pointed, slightly wavy, obscurely crenate, soft and nearly naked above, white and downy beneath; stipules half heart shaped, stalked, very large; gland cylindrical; ovary ovate, nearly sessile, stigmas linear, undivided. It is a native of England, and may be employed for the same purposes as *S. viminalis*, but is inferior to that species.

Salix incana, hoary osier: leaves linear-lanceolate, denticulated, covered on the under surface with a hoary tomentum; catkins arched, slender, almost sessile, subtended at the base with small leaves; capsule ovate-lanceolate, glabrous, stalked; the stalk twice the length of the gland; style elongated; stigmas bifid; bracteas sub-glabrous, ciliate, with short hairs. This species is found wild in the lower Alpine valleys, on the Pyrenees, Cevennes, Alps of Dauphiny, Switzerland, Tyrol, Austria, and Carpathia. Its distinct character renders it an interesting species to the botanist.

Willows.

Amongst these we shall include a few species useful in the arts and medicine, belonging to the various groups into which Koch and Borrer have distributed the species of Salix.

Salix Russelliana, Russell or Bedford willow: leaves lanceolate, tapering at each end, serrated throughout, very glabrous; foot-stalks glandular or leafy; ovary tapering, stalked, longer than the bracteæ; style as long as the stigmas. A native of Britain, growing in marshy woods, osier-grounds, &c. This tree was first brought into notice by the late Duke of Bedford, and has on that account received its present name. The best history of it is to be found in the introduction to the Duke of Bedford's splendid work on willows, the *Salictum Woburnense*. It was a tree of this species that was a favourite with Dr. Johnson at Lichfield, and hence called Johnson's willow. It was lately destroyed by a hurricane, having attained a height of 60 feet and a girth of 13 feet. The growth of this species is very rapid, and as it may be extensively used for poles, &c., it is a profitable tree for growing in plantations. Its bark is said to contain as much tannin as the oak. The medical properties attributed to the bark of *S. fragilis* belong properly to this species. It acts as an astringent and tonic.

Salix alba, common white willow: leaves elliptical-lanceolate, pointed, serrated, silky on both sides; lower serratures glandular; stamens hairy; ovary smooth, almost sessile; stigmas deeply cloven; scales notched. It is a native of most countries of Europe, and is more extensively planted as a timber-tree than any other species. It grows rapidly, attaining a height of 30 feet in 10 or 12 years. Hundreds of miles of road between Moscow and the Austrian frontier are planted with this tree. The bark is used in the north of Europe both for tanning and dyeing. The wood is very useful, and is employed for making the handles of all sorts of instruments, in turnery, millwork, coopery, weather-boarding, &c. Willow hats and bonnets are made from the shavings of this willow. The bark may be used in medicine instead of *S. Russelliana*, but it is not so valuable. It is frequently called the 'Huntingdon Willow,' and under that name is recommended by Gilpin and others as an ornamental tree.

Salix Babylonica, the weeping willow: leaves lanceolate acuminate, finely serrated, glabrous, glaucous beneath; catkins protruded at the same time with the leaves; ovary ovate, sessile, glabrous. This, the most favourite species of the genus, is a native of Asia, on the banks of the Euphrates near Babylon, whence its name; also of China, of Egypt, and other parts of North Africa. It is said that this willow was introduced into England by the poet Pope, who, being with Lady Suffolk when she received a parcel from Spain bound with withes, which appeared alive, took one, and planted it in his garden, which grew up, and afterwards became so well known as Pope's willow at Twickenham. It is however more probable that it was introduced by the botanist Tournefort into Europe. This tree is increasingly cultivated in this country and on the Continent. It is one of the greatest favourites in China, as might be inferred from its constant introduction into Chinese pictures. Growing on the banks of its native Euphrates, it was the willow on which the weeping daughters of Zion 'hanged their harps.' (*Psalms*, cxxxvii.)

Salix pentandra, sweet bay-leaved willow: stamens 5; leaves elliptico-lanceolate, acuminate, serrated with glands, glabrous, with several glands at the base; ovary lanceolate, glabrous, nearly sessile; style small; stigmas bifid. It is one of the latest flowering willows, not expanding its flowers till the beginning of June. The flowers are very fragrant, especially when bruised, resembling in some measure the sweet bay (Laurus nobilis), hence its name. It is one of the most desirable species for planting in shrubberies, on account of its late flowers, its deep green almost evergreen leaves, its powerful fragrance, and compact growth. It may be used for basket-work. Nees von Esenbeck prefers its bark as a medicine to that of any other species, on account of its aroma.

Salix purpurea, purple willow: branches trailing, decumbent; leaves partly opposite, obovate lanceolate, serrated, very smooth, narrow at the base; stamen 1; stigmas very short, ovate, nearly sessile. It is a native of Britain, and is a shrub 2 or 3 feet high. It is characterised by the elegant slenderness of its twigs and the redness of its catkins, which makes it desirable for the shrubbery. Of all the willows it possesses the largest amount of bitter principle in its bark, and on this account has been recommended for medicinal use.

Salix vitellina, the yellow willow: leaves lanceolate with glandular serratures, acuminate, more or less silky beneath often so above; ovaries lanceolate, sessile, glabrous; style short; stigmas bipartile; scales lanceolate. It is a native of Great Britain in hedges, osier-grounds, and other places. As an ornamental tree, it is very striking, both among evergreen and deciduous shrubs, on account of its bark possessing conspicuous colours.

Among these we have not referred to the following British species, which will be found fit for timber growth, as they attain a height of 30 or 40 feet in 20 years:—*S. triandra*, long-leaved triandrous willow; *S. Meyeriana*, Meyer's willow; *S. Amygdulina*, almond-leaved willow; and *S. acuminata*, long-leaved willow.

SALIX, Medical Properties of. The barks of several species of willow have been long celebrated for their astringent and antifebrile qualities; but from the great difficulty of determining the species, it is not ascertained which kind is entitled to the preference. The Salix Russelliana appears to possess the greatest quantity of *tannin*; but the peculiar principle termed *salicin* seems to exist in the largest proportion in the S. Helix, or Rose Willow; while the S. pentandra, L. (seu Laureæ, s. Laureolæ, the sweet or bay-leaved willow) possesses, both in its bark and leaves, the largest amount of bitterness and resin, and a most balsamic odour. The barks of S. alba, S. fragilis, and S. caprea are also gathered, often indiscriminately. Whichever species is selected, the bark should be stripped in spring from branches not less than three years or more than six years old, and from trees growing in moist rather than swampy places. It should be carefully dried in the shade. The fresh bark has a faint odour somewhat resembling bitter almonds; the dried bark is devoid of odour. The taste is at first mucilaginous, afterwards bitter and astringent. The degree of astringency may be easily tested by adding to a decoction of the bark a solution of gelatine. Tincture of nut-galls does not affect it. (Davy's *Agricult. Chemistry*, p. 83, fourth edit.) According to the analysis of Pelletier and Caventou, the bark of S. alba contains a green fatty matter similar to that of Cinchona, a yellow slightly bitter colouring-matter, tannin, resinous extract, gum, wax, woody fibre, and an acid, which with magnesia forms a salt easily soluble in water and alcohol. Since these analyses, salicin has been found.

Willow bark possesses astringent, tonic, and febrifuge qualities, which render it a valuable substitute for Cinchona, and as it often suits the stomach better, it is well calculated for the treatment of agues among the poor. In debility of the stomach and relaxation of the mucous membranes, it is often very serviceable. In the latter cases, an infusion, made with cold water, of the powdered bark of Salix pentandra, is preferable; but any of the others may be made equal to it by the addition of bruised cinnamon bark.

The nature of Salicine is not ascertained. It has neither basic nor acid properties. According to Herberger, it is a saline compound of a vegetable alkali (*Salicina*) and a volatile odorous acid. That it has febrifuge properties seems incontestible, but they are much weaker than those of Quinia; it must therefore be given in considerably larger doses. It may be given in substance or solution, and also in conjunction with many other salts, without undergoing decomposition or entering into combination.

SALLEE, or **SALE′**. [Marocco.]

SALLOWS. [Salix.]

SALLU′STIUS, or **SALU′STIUS**, with his full name **CAIUS SALLUSTIUS CRISPUS**, was born B.C. 86, in the seventh consulship of Marius, at Amiternum, a town in the country of the Sabines, near the sources of the Aternus. He was of a plebeian family; his parents seem to have been in affluent circumstances. He received instruction from the grammarian Atteius Philologus, who is said to have supplied him with an epitome of Roman history, from which he might choose subjects for his own composition. (Suet., *De Ill. Gramm.*, c. 10.) The year in which he obtained the quæstorship is not known, but he was tribune of the plebs, B.C. 52, in which year Clodius was killed by Milo.

Sallust was a strong opponent of the aristocratical party, and accordingly in his tribuneship took an active part in the proceedings instituted against Milo. (Asconius, *in Ciceron. Milon.*, p. 38, 45, 49, 50, 51, ed. Orelli.) In B.C. 50, he was expelled from the senate by the censors Appius Claudius and Piso (Dion, xl. 63), in consequence, it is said, of his immoral life; but there is no good authority for this statement of the grounds of his expulsion, while we know that Appius Claudius belonged to the Pompeian party, and that Sallust only shared the general fate of all Cæsar's friends. After his expulsion from the senate, Sallust seems to have repaired to Cæsar's camp in Gaul, and to have accompanied him in his invasion of Italy. According to some accounts he was made quæstor again after the battle of Pharsalia, B.C. 48; but we know for certain that he was prætor in the following year (B.C. 47), and was present at the mutiny of Cæsar's troops in Campania, on which occasion he narrowly escaped with his life. (Dion, xlii. 52.) He accompanied Cæsar the same year into Africa, where he was actively employed in the war (Hirt., *De Bell. Afric.*, c. 8, 34), and when Cæsar quitted Africa in the following year (B.C. 46), he left Sallust governor of the province (Hirt., *Ibid.*, c. 97), where, according to Dion Cassius (xliii. 9), he acquired immense wealth by the plunder of the country. On his return home, Sallust built the famous palace at Rome, which was afterwards used by the emperors, and was not destroyed till the time of Alaric. About this time he is said to have married Terentia, the divorced wife of Cicero. He died, B.C. 34, four years before the battle of Actium.

The moral character of Sallust has been drawn in the darkest colours by many writers. He has been accused of the most unbounded profligacy, which has been represented as the more inexcusable on account of the praises he has bestowed in his works upon virtue and temperance. These accusations however do not rest upon any sufficient authority, unless we except the tale told by Varro, that Sallust was detected in adultery with Milo's wife, and severely punished by the husband (Aul. Gell., xvii. 18), to which circumstance the words of Horace (*Sat.*, i. 2, 41), 'ille flagellis ad mortem cæsis,' refer, according to one of the antient scholiasts.

Sallust was a strong party-man. He thoroughly despised and hated the aristocratical party, and took no pains to conceal his opinion. He had designated Pompey, the leader of the aristocracy, as a man 'oris improbi, animo inverecundo,' and accordingly it was only to be expected that his own character should be attacked and traduced in every possible manner. Lenæus, the freedman of Pompey, wrote a work expressly against Sallust (Suet., *De Ill. Gramm.*, 15); and a rhetorician under the early emperors, when it had become the fashion to praise the old Pompeian party, wrote a declamation against the character of Sallust, which is still extant, and falsely ascribed to Cicero. That Sallust was not better than his contemporaries may easily be believed, and there seems no reason for doubting the statement of Dion Cassius, that he followed the example of his contemporaries in plundering the province of which he was governor.

Sallust wrote a history of Catiline's conspiracy, and of the war with Jugurtha, and also a general history of Roman affairs from the death of Sulla, B.C. 78, to the appointment of Pompey to the command of the Mithridatic war, B.C. 67. The two first works have come down to us entire; but of the latter we have only fragments; and its loss is the more to be regretted as it contained an account of one of the most important periods of Roman history, respecting which our information is very meagre and unsatisfactory. It was written in five or six books, addressed to Lucullus, and appears to have contained an introduction, in which an acount was given of the civil wars between Sulla and Marius. It connected his histories of the Jugurthine war and the Catilinarian conspiracy. The only fragments of it of any length are four orations and two letters, which are characterised by Sallust's usual style.

The merits of Sallust, both as an historian and a philosopher, have been rated very low by many modern critics. The objections which have been made to the moral reflections and dissertations in Sallust's writings as unsuitable to the nature of historical compositions, have arisen from a want of due attention to the object which the historian had in view. This does not appear to have been so much the narration of the particular events which he chose as the subjects of his history, as the elucidation of certain great political facts. In his 'Jugurtha' his object was to show the venality and total want of principle in the aristocratical party, and how both their private and public profligacy at length deprived them of the power which they had possessed since the time of the Gracchi. In his 'Catiline' he had the same object to a certain extent in view, though here it was not to show how the vices of the aristocratical party occasioned their loss of power, but rather to describe the consequences to which those vices had at length led, for it must be remembered that Catiline and his associates had been brought up in the school of Sulla, and belonged to the aristocracy.

In estimating the value of Sallust's writings, it should also be borne in mind that the Romans possessed no works worthy of the name of histories before his time. Preceding writers merely narrated events according to the order of the years in which they happened, without any attempt to trace the causes and results of the events which they recorded. Sallust studiously avoided the annalistic style of his predecessors, and appears to have made Thucydides his model, to whom he is sometimes compared by the antients themselves. The fastidious critics of the Augustan age objected to the use of the antiquated words and expressions which Sallust sometimes employed (Suet., *De Ill. Gramm.*, 10), but it is no small proof of the excellence of Sallust's style that Tacitus closely imitated it.

Besides the works already mentioned, two epistles have come down to us under the name of Sallust, addressed to Julius Cæsar, on the management of the state ('De Republica Ordinanda'); but these are evidently not the work of Sallust, and are supposed by Niebuhr to have been written, at the latest, in the second century of the Christian æra. (*Römische Geschichte*, vol. iii., p. 401.) There is also extant a declamation against Cicero, falsely ascribed to Sallust.

The first edition of Sallust was published at Venice, in 1470. The edition of Cortius, which was published at Leipzig, in 1724, 4to., with a valuable commentary, has formed the basis of most of the subsequent editions. The best modern editions are those of Kritz, 2 vols. 8vo., Leipzig, 1828, 1834, which does not however contain the fragments, and of Gerlach, Basel, 1823-1831, 3 vols. 4to. An accurate edition of the text, with the principal various readings, but without explanatory notes, has been published by Orellius, Zürich, 1840, 12mo. The principal translations of Sallust into the European languages are, in English, by Gordon, Lond., 1769, 4to.; by Rose, 1757, 8vo.; and by Sir Henry Stewart, 2 vols. 4to.; in French, by De Brosses; in Spanish, by Gabriel de Bourbon, the son of the king of Spain, Madrid, 1772, 4to; in Italian, by Alfieri; and in German, by Gerlach, Prenzlau, 1827.

SALLUSTIUS, a Platonic philosopher, who lived in the fourth century of the Christian æra. He wrote a work in Greek, 'On the Gods and the World,' which was originally published by Leo Allatius, Rome, 1638, 12mo. The best edition of this work is by Orelli, Zürich, 1821, 8vo. It has been translated into French by Formey, Berl., 1748, 8vo., and into German, by Schulthess, Zürich, 1779, 8vo.

SALM. As far back as the tenth century, there have been in Germany two counties bearing the name of Salm: the county of Ober-Salm (with the rank of a principality) in the Vosges mountains, between Alsace and Lorraine, in the circle of the Upper Rhine; and the county of Nieder-Salm, in the Ardennes, between the duchy of Luxemburg and the bishopric of Liège, which subsequently made part of the circle of Burgundy. It would be equally tedious and useless to trace the division of the family of the counts of Salm into different branches, and the various changes of territory during a period of eight centuries. The two principal lines, subdivided into several branches, subsisted till the French revolution, during which their territories were annexed to France, and in the sequel other possessions were assigned them from the secularizations on the east of the Rhine. At present, the elder line is divided into three branches:—1, Salm-Salm, which possesses revenues from estates in Brabant and Holland, to the amount of 600,000 florins. 2, Salm-Kyrberg, whose revenues may amount to 180.000 or 200,000 florins. 3, Salm-Horstmar, which, after various changes during the French revolution, was placed, with the rank of a principality, under Prussia, from which it receives a perpetual annuity of 20,000 dollars, as an indemnity for the cession of the judicial and civil administration. The second line is that of Salm-Reifferscheid, divided into the four branches of 1, Salm-Reifferscheid-Kramtheim; 2. Salm-Reifferscheid-Raitz; 3, Salm-Reifferscheid-Hamspach; and 4, Salm-Reifferscheid-Dyk. Some of these are called princes, and others counts; they are all mediatised, that is, they have lost the exercise of their right as sovereigns, which is transferred to the members of the German confederation in whose dominions their possessions are.

SALMA'SIUS, CLAU'DIUS, the Latinized form of his real name **CLAUDE DE SAUMAISE**, was born near Sémur in Auxois, in the year 1588 or 1596, more probably the latter. His father, who was a member of the parliament of Burgundy, was a person of considerable learning; he translated the work of Dionysius of Alexandria into French verse, Paris, 1597, 12mo. Young Salmasius was educated at home by his father, and is said to have made such astonishing progress in his studies as to be able to read Pindar at ten years of age, and to write Greek and Latin verses with fluency and correctness. At the age of sixteen he was sent to Paris to prosecute his studies, where he became acquainted with Casaubon, by whose influence he was induced, contrary to the wish of his father, to embrace the Reformed faith. From Paris he went to Heidelberg, where he made a formal renunciation of the Roman Catholic religion, in which he had been educated. At Heidelberg he obtained the friendship of the jurist Denys Godefroy and of Gruter, who appreciated his talents, and recommended him to the notice of all the great literary men in Germany. During his stay in this city, he prosecuted his studies with the greatest perseverance, and perused not only the Greek and Latin writers which were then published, but also numerous others, which existed in manuscript in the university library. He devoted the whole of every third night entirely to study, till at length his excessive application occasioned a long and serious attack of illness. About this time (1608) his first publication appeared, which was an edition of a treatise in Greek by Nilus, archbishop of Thessalonica, on the primacy of the pope, and also of another work on the same subject, by a monk of the name of Barlaam, both of which were accompanied with a Latin version and a few notes. He published soon afterwards an edition of Florus, Par., 1609, 8vo., which he dedicated to Gruter. After spending three years in Germany, he returned to France, and shortly after his return published a short treatise 'De Suburbicariis Regionibus et Ecclesiis,' in opposition to Sirmondus. In 1620 he published his edition of the 'Historiæ Augustæ Scriptores Sex,' fol., which Casaubon, shortly before his death, had intended to edit as a sequel to his edition of Suetonius. The commentary of Salmasius on these writers is full of valuable information, and may still be consulted with profit. In 1622 Salmasius published his edition of Tertullian's work 'De Pallio,' with a commentary, in which he treats at great length of the different garments worn by the antients.

In the following year (1623) Salmasius married the daughter of Mercier, who was a person of elevated rank, and is frequently mentioned by his son-in-law in terms of the highest praise both for his learning and talents. From the time of his marriage Salmasius resided for many years in the neighbourhood of Paris, chiefly engaged in the preparation of his great work, which was published at Paris in 1629, 2 vols. fol., under the title of 'Plinianæ Exercitationes in Caii Julii Solini Polyhistora,' and reprinted at Leyden in 1689, with an appendix entitled 'De Homonymis Hyles Iatricæ Exercitationes, necnon de Manna et Saccharo.' The treatise of Solinus [Solinus] was evidently selected by Salmasius on account of its treating of so many various subjects in antiquity, and thus enabling him to discuss without the trouble of systematic arrangement almost any subject which he chose. It is a work of astonishing erudition; not only does it embrace questions connected with Greek and Roman history, geography, and archæology, but it also treats at great length of the plants, herbs, and minerals known to the antients. In order to qualify himself more completely for the work, Salmasius studied the Hebrew, Persian, and Arabic languages, with which he shows an extensive acquaintance. The work is however written in a very confused manner, and embraces too many subjects to be thoroughly treated of by one man. In this, as well as in most of his other writings, Salmasius frequently shows great carelessness in the statement of facts, combined with much arrogance and pretension.

Upon the publication of this work the reputation of Salmasius reached its greatest height. He was solicited by various princes and states to settle in their dominions. He was invited by the Venetians, by the university of Oxford, and even by the pope; but he declined all these invitations, and at length settled at Leyden in 1632, where he received a public salary, but did not discharge any duties as professor.

Upon the death of his father in 1640, Salmasius returned to France to settle his father's affairs; and while there Richelieu pressed him to remain in his native country, and also offered him a very large pension if he would write his Life. After the death of Richelieu, Mazarin renewed the offers of Richelieu, but Salmasius resisted all their solicitations, and returned to Leyden, where he remained till 1650, when he went to Sweden to pay a visit to Queen Christina, who had written him the most pressing invitation, and had said she could not live happy without him. The climate of Sweden however did not agree with him, and he accordingly returned in the following year.

After the death of Charles I. of England, Salmasius was employed by Charles II., who was then in Holland, to write a defence of his father and of monarchy, and which he accordingly did, and published under the title of 'Defensio Regia pro Carolo I.,' 1649; to which Milton replied in his 'Defensio pro Populo Anglicano.' [Milton.] Salmasius prepared a reply to Milton, but did not live to finish it. He died in September, 1653.

In addition to the works which have been mentioned in the course of this article, Salmasius also wrote and edited the following works: 'De Usuris,' Leyd., 1638, 8vo; 'De Modo Usurarum,' Leyd., 1639, 8vo.; 'Dissertatio de Fœnere Trapezitico, in tres libros divisa,' Leyd., 1640; 'Notæ in Pervigilium Veneris,' Leyd., 1638, 12mo.; Commentarius in Simplicii Enchiridion Epicteti,' Leyd., 1640, 4to.; 'Interpretatio Hippocratei Aphorismi de Calculo,' Leyd., 1640, 8vo.; 'De Hellenistica Commentarius Controversiam de Lingua Hellenistica decidens, et plenissime pertractans Origines et Dialectos Græcæ Linguæ,' Leyd., 1645, 8vo.; 'Observationes in Jus Atticum et Romanum,' Leyd., 1645, 8vo. A collection of Salmasius's Letters was published by Antony Clement after his death, to which his Life is prefixed, Leyd., 1656.

SALMON, NATHANIEL, the son of the Rev. Thomas Salmon, was admitted of Corpus Christi College, Cambridge, in 1690. He entered into holy orders, and obtained a curacy in Hertfordshire, but abandoned the clerical profession for that of medicine, in the practice of which, and in the study of antiquities, he passed the remainder of his life. He died on the 2nd of April, 1742.

His principal works are: 'A Survey of the Roman Stations in Britain according to the Roman Itinerary,' 1721, 8vo.; 'A Survey of the Roman Stations in the Midland

Counties in England,' 1726, 8vo.; 'History of Hertfordshire,' Lond., 1728, fol.; 'Antiquities of Surrey,' Lond., 1736, 8vo.; 'History and Antiquities of Essex, from the Collections of Mr. Strangeman,' Lond., 1740, fol.

SALMON. [Salmonidæ.]

SALMON FISHERY. [Fisheries.]

SALMO'NIDÆ (Salmon tribe), a family of fishes belonging to the Malacopterygii Abdominales. These fishes have the body covered with scales, the first dorsal fin has soft rays only, and the second dorsal is small and destitute of rays, and of a soft fleshy nature; they are furnished with an air-bladder, and have numerous cæca. The more typical species appear to be confined to the northern hemisphere.

The genus *Salmo*, as at present restricted, contains those species, such as the salmon and trout, in which the upper boundary of the mouth is formed chiefly by the superior maxillary bones, the intermaxillaries being small, confined to the fore-part, and situated between the maxillaries; usually these latter bones descend in front of the superior maxillaries, and form the upper boundary of the mouth. The maxillary bones, intermaxillaries, palatines, vomer, and even the tongue, are furnished with teeth; the branchiostegous rays are about ten in number; the natatory bladder, or air-bladder, extends the whole length of the abdomen.

Numerous species of this genus are found in the seas of the northern hemisphere, one of the largest of which is the common salmon (*Salmo salar*, Lin.), a fish too well known both in flavour and appearance to require any particular description. This fish, Cuvier states, is found in all the Arctic Seas, whence it enters the rivers in the spring. Mr. Yarrell observes that fishes ascend the rivers in some situations much earlier than others, depending on the time of their arrival into breeding condition. 'Rivers issuing from large lakes afford early salmon, the waters having been purified by deposition in the lakes; on the other hand, rivers swollen by melting snows in the spring months are later in their season of producing fish, and yield their supply when the lake rivers are beginning to fail. "The causes influencing this," says Sir William Jardine, "seem yet undecided; and where the time varies much in the neighbouring rivers of the same district, they are of less easy solution. The northern rivers, with little exception, are however the earliest, a fact well known in the London markets; and going still farther north, the range of the season and of spawning may be influenced by the latitude."' Artedi says, in Sweden the salmon spawn in the middle of summer. From some further observations in Mr. Yarrell's excellent work, it appears that the temperature of the water has considerable influence.

The number of fishes procured for food increases as the summer advances; 'during the early part of the season the salmon appear to ascend only as far as the river is influenced by the tide, advancing with the flood, and generally retiring with the ebb, if their progress be not stopped by the various means employed to catch them. It is observed that the female fishes ascend before the males; and the young fish of the year, called grilse till they have spawned once, ascend earlier than those of more adult age. As the season advances, the salmon ascend higher up the river, beyond the influence of the tide; they are observed to be getting full of roe, and more or less out of condition, according to their forward state as breeding fish. Their progress forwards is not easily stopped; they shoot up rapids with the velocity of arrows, and make wonderful efforts to surmount cascades and other impediments by leaping, frequently clearing an elevation of eight or ten feet, and, gaining the water above, pursue their course. If they fail in their attempt and fall back into the stream, it is only to remain a short time quiescent, and thus recruit their strength to enable them to make new efforts.

'The fish having at length gained the upper and shallow pools of the river, preparatory to the important operation of depositing the spawn in the gravelly beds, its colour will be found to have undergone considerable alteration during the residence in fresh water. The male becomes marked in the cheeks with orange-coloured stripes, which give it the appearance of the cheek of a *Labrus*; the lower jaw elongates, and a cartilaginous projection turns upwards from the point, which, when the jaws are closed, occupies a deep cavity between the intermaxillary bones of the upper jaw; the body partakes of the golden orange tinge, and the salmon in this state is called a red-fish. The females are dark in colour, and are as commonly called black fish; and by these terms both are designated in those local and precautionary regulations intended for the protection and preservation of the breeding fish.'

The process of spawning is thus described in Ellis's 'Memoir on the Natural History of the Salmon:'—'A pair of fish are seen to make a furrow, by working up the gravel with their noses, rather against the stream, as a salmon cannot work with his head down stream, for the water, then going into his gills the wrong way, drowns him. When the furrow is made, the male and female retire to a little distance, one to the one side and the other to the other side of the furrow; they then throw themselves on their sides, again come together, and, rubbing against each other, both shed their spawn into the furrow at the same time. This process is not completed at once; it requires from eight to twelve days for them to lay all their spawn, and when they have done they betake themselves to the pools to recruit themselves. Three pairs have been seen on the spawning-bed at the same time, and even closely watched while making the furrow and laying the spawn.

'The adult fish having spawned, being out of condition and unfit for food, are considered as unclean fish. They are usually called kelts; the male fish is also called a kipper, the female a baggit. With the floods of the end of winter and the commencement of spring they descend the river from pool to pool, and ultimately gain the sea, where they quickly recover their condition, to ascend again in autumn for the same purpose as before, but always remaining for a time in the brackish water of the tideway before making either decided change, obtaining, it has been said, a release from certain parasitic animals, either external or internal, by each seasonal change, those of the salt water being destroyed by contact with the fresh, and *vice versâ*.' It is moreover probable that the constitution of the fish is such as to require a gradual change; that the salmon is considerably affected in passing from the salt water into the fresh, is evident from the change of colour which accompanies the difference of the state of the element.

To Mr. John Shaw of Drumlanrig, Dumfriesshire, naturalists are indebted for numerous important and interesting experiments instituted by him to determine certain doubtful points connected with the natural history of the salmon, and more especially to determine the developments and growth of the salmon-fry. Mr. Shaw's first paper, entitled 'An Account of some Experiments and Observations on the Parr, and on the Ova of the Salmon, proving the Parr to be the Young of the Salmon,' will be found in the 'Edinburgh New Philosophical Journal' for July, 1836, vol xxi. His second paper, in which he gives an account of 'Experiments on the Development and Growth of the Fry of the Salmon, from the Exclusion of the Ovum to the Age of Six Months,' is published in the same work, vol. xxiv., p. 165; and lastly in the 'Transactions of the Royal Society of Edinburgh,' vol. xiv., p. 547, the author gives a summary of the preceding papers, and adds the result of further investigations.

The author, who has lived the whole of his life, with the exception of a few seasons, on the banks of streams where salmon are in the habit of depositing their spawn, had long been of opinion that the fish commonly called the *parr*, and supposed to be a distinct species from the salmon, was the natural produce of the salmon; and in order to satisfy himself of the development of this fish, he caught seven specimens of the parr on the 11th of July, 1833, and placed them in a pond supplied by a stream of wholesome water. There they continued to thrive remarkably well, and were seen catching flies and other insects, or sporting on the surface in perfect health. In the month of April following (1834), they began to assume a different aspect from that which they exhibited when first placed in the pond, and upon catching some of them in May, they were found to have assumed the usual appearance of what are called salmon smolts or fry, being of a fine deep blue on the back, with a delicate silvery appearance on the sides of the body, and having the abdomen white. 'A circumstance occurred about the first week of May,' observes the author, 'which it may be proper to mention as illustrating in a manner what may be deemed the migratory instinct of these fishes. They seemed to me at this time to be decreasing in numbers, and I found, on examination, that some had leapt altogether out of the pond, and were lying dead at a short distance from the edge.' 'In March 1835, I again took twelve parrs from the river, of larger size, that is, about six inches long; they then bore the perpendicular bars, and other usual characters of that fish. These I also transferred to a pond prepared for the purpose, and by the end of April they too assumed the characters of the salmon-fry; the bars becoming overlaid by the new silvery scales, which parrs of two years old invariably assume before departing towards the sea. From these experiments I had no doubt that the larger parrs observable in rivers in autumn, winter, and early spring, were in reality the actual salmon-fry advancing to *the conclusion of their second year*, and that the smaller summer parrs (called, in Dumfriesshire, May parrs) were the same species, but younger as individuals, and *only entering upon* their second year. This then I conceived to be the detection of the main error of preceding observers, who had uniformly alleged that salmon-fry attain a size of six or eight inches in as many weeks, and after the lapse of this brief period take their departure to the sea. It is the rapidity with which the two-year-old parr assumes the aspect of the salmon-fry that has led to this false conclusion; and superficial or hasty observers, taking cognizance, 1st, of the hatching of the ova in early spring, and 2ndly, of the seaward emigration of smolts soon afterwards, have imagined these two facts to take place in immediate or speedy succession.' The author next proceeds with the history of the young salmon during its early stages up to the time of its becoming what is termed the May or summer parr, and then gives the results of his various experiments on the ova of the salmon, undertaken with a view to prove the identity of these two fish. Having procured the eggs of the salmon, he placed them in a pond made for the purpose, and succeeded in rearing them. 'On its first exclusion the little fish has a very singular appearance. The head is large in proportion to the body, which is exceedingly small, about five-eighths of an inch in length, of a pale blue or peach-blossom colour. But the most singular part of the fish is the conical bag-like appendage which adheres by its base to the abdomen. This bag is about two-eighths of an inch in length, of a beautiful transparent red, very much resembling a light-red currant; and in consequence of its colour, may be seen at the bottom of the water when the fish itself can with difficulty be perceived. 'The body also presents another singular appearance, namely, a fin or fringe, resembling that of the tail of the tadpole, which runs from the dorsal and anal fins to the termination of the tail, and is slightly indented. This little fish does not leave the gravel immediately after its exclusion from the egg, but remains for several weeks beneath it with the bag attached, and containing a supply of nourishment, on the same principle, no doubt, as the umbilical vessel is known to nourish other embryo animals. By the end of fifty days, or the 30th of May, the bag contracted and disappeared. The fin or tadpole-like fringe also disappeared by dividing itself into the dorsal, adipose, and anal fins, all of which then became perfectly developed. The little transverse bars, which for a period of two years (as I have already shown) characterize it as the parr, also made their appearance. Thus from the 10th of January to the end of May, a period of upwards of 140 days was required to perfect this little fish, which even then measured little more than one inch in length, and corresponded in all respects with those on which I had formerly experimented, as well as with such as existed at that same time in great numbers in the natural streams.' More experiments were afterwards made, with still greater precaution, by Mr. Shaw, and the same conclusions were arrived at.

The salmon has been known to attain upwards of eighty pounds weight, but a salmon of half that size is considered a fine fish: 'the largest known, as far as I am aware,' observes Mr. Yarrell, 'came into the possession of Mr. Groves, the fishmonger of Bond Street, about the season 1821. This salmon, a female, weighed eighty-three pounds; was a short fish for the weight, but of very unusual thickness and depth. When cut up, the flesh was fine in colour, and proved of excellent quality.'

Salmon have been kept in fresh-water lakes and other pieces of water having no outlet to the sea; these fish however, though of tolerable good colour and flavour, did not obtain the size of those which visited the sea annually. They are caught by nets of various kinds, which are described in Mr. Yarrell's 'History of British Fishes,' where there will also be found an account of the various other British species of *Salmo*. The following are the principal genera of the *Salmonidæ*:—

Genus *Osmerus*.—Of this genus the common smelt (*Osmerus eperlanus*) affords a familiar example. The smelts differ from the species of Salmo in having two ranges of teeth in each palatine bone, but there are only a few in front of the vomer: they have eight branchiostegous rays; the ventral fin is on a line with the anterior dorsal. They are taken in the sea, and at the mouths of great rivers. Mr. Yarrell, in the supplement to his volumes on British fishes, describes a new species of the present genus, which he names the Hebridal Smelt (*Osmerus Hebridicus*), a name suggested by the locality in which the specimen was found.

Genus *Mallotus*, Cuvier.—This genus is founded on a single species, the *Salmo Grœnlandicus* of Bloch, a small fish employed as a bait in the cod fisheries: its teeth are dense, like the pile on velvet, in both jaws, as well as the palate and tongue; the branchiostegous rays are eight in number; the body is elongated and covered with small scales; the anterior dorsal and ventrals are situated rather behind the middle of the body; the pectorals are large and rounded, and almost meet beneath.

Genus *Thymallus*, Cuvier.—Of this genus the Grayling (*Thymallus vulgaris*) is the type. This fish is common in some of our streams, but is a local species; it differs chiefly from the trouts or salmons in having the mouth less deeply cleft, the orifice square, the anterior dorsal very high, and the scales larger.

Genus *Coregonus*, Cuvier.—Here the teeth are very small, and the species are often edentate; the scales are very large, and the first dorsal is not so long as it is high in front. Numerous species of this genus are found in Europe. The Gwyniad (*Coregonus fera*, Yarrell) and the Vendace (*C. Willughbii*, Jardine) afford British examples of the genus. 'The Gwyniad of Wales,' says Mr. Yarrell, 'was formerly very numerous in Llyn Tegid (Fair Lake) at Bala, until the year 1803, when pike were put into the lake, which have very much reduced their numbers.' It is very numerous in Ulswater and other large lakes in Cumberland.

The Vendace was originally described by Sir William Jardine, in the third volume of the 'Edinburgh Journal of Natural and Geographical Science.' This author considered the fish in question as very closely allied to the *Salmo albula* of Linnæus, but the difficulty of determining this point has induced him to apply to it the name of our distinguished naturalist. It is only known to inhabit the lochs in the neighbourhood of Lochmaben in Dumfriesshire.

Genus *Argentina*, Linnæus.—But one species (*Argentina sphyræna*, Linn.) of this genus is known, an inhabitant of the Mediterranean. This fish has the mouth horizontally depressed; the tongue is armed, as in the trouts and smelts, with strong curved teeth; in front of the vomer is a transverse range of little teeth; the branchiostegous rays are six in number; the air-bladder is very thick, and loaded with that silvery substance which is used in colouring artificial pearls.

Genus *Crumata*, Cuvier.—These are *Salmonidæ* with the same general form and small mouth, as observed in the Graylings, but differ in the number of the branchiostegous rays.

Genus *Anastomus* of Cuvier differs chiefly from the last in having the lower jaw turned up in front of the upper one, and gibbous, so that the little mouth appears like a vertical slit at the end of the muzzle. The species inhabit the rivers of South America.

The genus *Gasteroplectus* of Bloch also has the opening of the mouth directed upwards, but the abdomen is compressed and prominent; the ventrals are very small and far back; the first dorsal fin is situated over the anal, which is long; in the upper jaw are conical teeth, and in the lower the teeth are sharp and denticulated.

The species of the next genus, *Serasalmo*, are remarkable for the short, high, and compressed form of the body, which is furnished with small scales; their teeth are sharp, of a triangular form, and denticulated; there is often an adpressed spine in front of the dorsal fin. They inhabit the rivers of South America. To these may be added the genera *Tetragonopterus* of Artedi, *Chalceus*, *Myletes*, *Hydrocyon*, *Citharinus*, *Saurus*, *Scopelus*, and *Aulopus* of Cuvier, and *Sternopteryx* of Herman.

SALOMON, JOHANN-PETER, a composer of merit, a violinist of the very highest rank, and a most active, enterprising promoter of music, was born at Bonn, in the year 1745, and educated for the profession of the civil law; but, like many others, having been led away from so dry a pursuit by at least one of the Muses, he was allowed to indulge his favourite inclination, and soon became celebrated not only for his performance on the violin, but for his knowledge of the harmonic art in all its branches.

When young he entered the service of Prince Henry of Prussia, at Berlin, who soon became much attached to his youthful musician. For this accomplished and amiable prince he composed several French operas. He afterwards accepted an invitation to Paris, in 1781, where he met with an abundance of empty praise, but speedily sought the English shores, in hope of obtaining more solid reward, and was not disappointed. Arriving in London, he was immediately introduced to all the amateurs, among whom were many of the nobility, and his cheerful disposition, superior manners, and good sense soon obtained for him the friendship of those who at first patronised him on account of his professional talents. In 1790 he formed the project of giving a series of subscription-concerts, and carried it into effect, in the most spirited manner, the following year. These constitute an epoch in musical history, for they led to the production of those twelve grand symphonies by Haydn, known everywhere as 'composed for Salomon's Concerts'—works of an imperishable nature, because founded on immutable principles, and embodying all that is beautiful in the class of art to which they belong. A further account of these, and of the concerts, will be found in our biographical sketch of HAYDN.

In 1798 the oratorio of *The Creation* was produced at the Opera concert-room, at the risk and under the direction of Mr. Salomon. In 1801 he, in conjunction with Dr. Arnold and Madame Mara, opened the Haymarket theatre, during Lent, with oratorios; and in the same year gave five subscription-concerts. As a professional man he now retired from public life, and chiefly occupied his time in attending at Carlton House, in composing two sets of canzonets, some songs, glees, &c., and in publishing these, together with six violin solos and two grand violin concertos, arranged for the piano-forte. But at the formation of the Philharmonic Society, in 1813, he nobly contributed his services as a dilettante, and led the first concert 'with a zeal and ability that age had in no degree impaired.' He died in 1815, and his remains were deposited in the great cloister of Westminster Abbey, followed by a long train of friends, by whom he was most highly and deservedly esteemed; for his education had been liberal, his acquirements were numerous, including a perfect knowledge of four living languages, and his habits were those of a gentleman, in the best sense of the word.

SALON, a town in the department of Bouches du Rhône in France, on a cross-road from Arles to Aix. A Roman town appears to have existed on the site, and an inscription which has been dug up shows that there was a temple erected in honour of Tiberius Cæsar; but the present town appears to have risen under the first Counts of Provence. Salon stands in a plain on one of the branches of the canal of Carponne, which is used for irrigation. The central part, called Vieille or Old Salon, was surrounded with walls, of which only one tower with battlements and some other ruins remain. This old town is irregularly laid out; and has old houses, and a church built in the thirteenth century by the Templars. The outer part, called Nouvelle or New Salon, is separated from the old town by a boulevard planted with trees and adorned with fountains, and consists of streets well laid out, and lined, especially the boulevard, with tolerably good houses. There are a church, a large market-place, and a castle, now used as a prison, situated on a rock overlooking the Crau, an immense stony plain south-west of the town. The population of Salon in 1831 was 4187 for the town, or 5987 for the whole commune. Hats, soap, and candles are manufactured; and there are oil-mills and silk-throwing-mills. The townsmen carry on trade in these articles, and in wool, cattle, olive oil, and almonds. There are five fairs in the year. Michael Nostradamus died at Salon, where his son Michael Nostradamus the historian was born.

SALO'NA, Bay of. [PHOCIS.]

SALONI'KI. [THESSALONICA.]

SALOON (from the Italian *sala* and its augmentative *salone*) signifies, in its stricter architectural meaning, a room answering in some respect to the idea of a *hall*, that is, not only the principal room as to spaciousness, but loftiness also, *height* belonging to the character of a saloon in like manner as *length* does to that of a gallery. Thus if the plan be square, the proportions may vary from those of a cube to a cube and a half, or even more in height, but should never be much less than the first-mentioned. Like all others however, this rule admits of exceptions, because a room may be both lofty in itself and in comparison with the others in a building, although its proportions may not be strikingly so. It is further usual for a room of this description to be either a perfect square in plan or of some shape that can be inscribed within such figure, that is, circular, octagonal, or some other regular polygon. At present however the term is not understood in so strictly technical a sense, but the name of saloon is indiscriminately or ostentatiously bestowed on any unusually large room, be its proportions and character what they may, even though it would answer better to that of gallery. Except that it is not used for banquets, the saloon may be considered, in modern residences, what the hall was in the mansions of 'olden times.' Its destination differs from that of drawing rooms and other apartments of that kind, as serving rather as an approach to and communication between them, and as a room of general rendezvous for the visitors at a house. Blenheim, Castle Howard, and other mansions erected by Vanbrugh, have lofty and stately saloons; but one of the most splendid examples of the kind would have been that designed by Adam, and published in his works, for Sion House, the inner court of which he proposed to convert into a magnificent rotunda [ROTUNDA] enclosed within a circular or ring-shaped gallery, with openings from one to the other between columns, and with niches in the intermediate piers.

SALPA. [SALPACEA.]

SALPA'CEA. Lamarck places the genus *Salpa* in his third section of *Tunicata* (*Tuniciers libres ou Ascidiens*), with the following definition: 'Animals disunited, either isolated or assembled in groups, without internal communication, and not forming essentially a common mass.' These form his second order of *Tunicata*, with the title above given, and consist of the genera *Salpa*, *Ascidia*, *Bipapillaria*, and *Mammaria*. *Pyrosoma* is arranged under his second section: 'Animals floating with their common mass in the bosom of the waters,' in his first order (*Tuniciers Réunis ou Botryllaires*).

M. de Blainville (*Malacologie*) makes the *Salpacea* the second family of his fourth order *Heterobranchiata*, with the following character:—

Body free, or not adherent, more or less cylindrical, with a thick external envelope, which is subcartilaginous, transparent, pierced with two apertures, which are ordinarily very large and distant, nearly terminal, one incrementitial, the other excrementitial. The branchiæ, in the form of a narrow band, traverse obliquely the respiratory cavity of the incrementitial orifice to the aperture of the mouth.

M. de Blainville remarks that one may easily perceive the relationship of this family to the other *Acephalophora*, by supposing an *Ascidia* slit between the two tubes which terminate it and then extended lengthwise. It is then, he observes, easy to determine the analogy of the apertures, of which neither the one nor the other are any more the mouth and the anus than in the *Ascidiæ*; but one (the widest, the greatest, and the most distant from the mouth) is the entrance of the incretory or respiratory tube, and the other is that of the excretory tube. He adds that the species of this family are, like those of the preceding, susceptible of living solitary or aggregated in a fixed manner, which would seem to make them composite animals, though they are not such; and he divides it into two tribes—1st, the simple Salpaceans (*Salpa*); 2, the aggregate Salpaceans (*Pyrosoma*). (1825.)

Chamisso, in his Memoir on *Salpa*, had previously (1819) taken, like Lamarck, the bilabiated aperture for that which corresponds to the mouth; but Cuvier, in his last edition of the 'Règne Animal' (1830), persists in his opinion as to the organization of these animals, which, according to him, move by making the water enter at the posterior extremity, and ejecting it by the anterior extremity, consequently going backwards; and all swim with the back downwards.

The following is Cuvier's description of *Salpa;* but we should premise that he places this genus in the first family of his *Acéphales sans coquilles* (the second order of his acephalous mollusks), and *Pyrosoma* in the second family (*Les Aggrégés*).

The *Biphores* (*Thalia*, Brown: *Salpa* et *Dagysa*, Gm.) have, says Cuvier, the mantle and its cartilaginous envelope oval or cylindrical, and open at both ends. On the side of the anus the aperture is transverse, wide, and furnished with a valvule, which permits the entrance but not the departure of the water; on the side of the mouth it is simply tubular. Muscular bands embrace the mantle and contract the body. The animal moves in making the water enter at the posterior aperture, which has the valvule, and in forcing it to go out by that on the side of the mouth, so that it is always pushed backwards, which caused many naturalists, Chamisso and others, to take the posterior aperture for the true mouth; but it is evident that it is no reason for changing the denominations of these parts because an animal swims on its back (which the *Biphores* generally do) with the head behind. Thus it was that the organization of the *Pterotracheæ* (which always swim with the back downwards, as is the case with an infinity of Gastropods with and without shells) was mistaken. The branchiæ form a single tube or riband furnished with regular vessels, placed scarfwise in the middle of the tubular cavity of the mantle, so that the water strikes it incessantly in traversing the cavity.* The heart, the viscera, and the liver are knotted into a nucleus (*pelotonnés*) near the mouth and on the side of the back; but the position of the ovary varies. The mantle and its envelope sparkle in the sun with iridescent colours, and are so transparent that one sees through them the anatomy of the animal; in many species they are provided with perforated tubercles. The animal has been sometimes seen to go out of its envelope without appearing to suffer. But one of the most curious phenomena attending the *Biphores* is that during a long time they remain united together, as if they were in the ovary, and thus swim in long chains, where the individuals are disposed in different orders, but always in the same order in each particular species. M. de Chamisso declares that he has proved a fact still more singular, namely that individuals which have thus come forth from a multiple ovary have not a similar one, but produce only isolated individuals differing in form, which in their turn yield ovaries similar to that from which their mother came forth, so that there is alternately a less numerous generation of isolated individuals, and a numerous generation of aggregated individuals. These alternate generations do not resemble each other. It is certain, continues Cuvier, that one observes in some species small individuals adhering in the interior of great ones by a sort of peculiar sucker, and of a different form from those which contain them. He adds that these animals are found abundantly in the Mediterranean and the warm parts of the ocean, and that they are often endowed with phosphorescence. (*Règne Animal.*)

M. Rang (1829) adopts the arrangement of M. de Blainville, but as provisional only, remarking that there is the greatest want of information with regard to the *Heterobranchiata*, and that it is most difficult to procure. He states that M. de Blainville is right when he says that neither the one nor the other aperture is the mouth or the anus, for, as Cuvier had demonstrated in his anatomical memoir on the *Biphores*, the mouth and the anus are very small apertures, hidden in the bottom of a vast canal which forms the envelope of the animal; for the rest M. Rang is of opinion that the term *anterior* should be applied to the extremity where the nucleus is found, and *posterior* to its opposite; he had remarked that the animal, which generally receives the water by the posterior aperture, can also take it in by the anterior opening. He admits the division proposed by M. de Blainville, because, although it is very true that the *Biphores* unite either in a linear or radiating direction, he has satisfied himself, after numerous observations, that this disposition only takes place when the animals are young. But it is not the same with *Pyrosoma;* the animals which that form comprises are probably aggregated throughout life. M. Rang arranges the following genera under this family:—

Simple Salpaceans.

Genera, *Salpa*, Cuv.; *Timoriensis*, Quoy et Gaim.; *Monophorus*, Quoy et Gaim.; *Phyllirōe*, Péron et Lesu.

Aggregated Salpaceans.

Genus, *Pyrosoma*, Péron.

The circulation of the *Biphores* formerly observed by Kuhl and Van Hasselt, and since by MM. Quoy and Gaimard, appears to be very singular. The current is stated to change its direction periodically; and, according to the researches of M. Milne Edwards, referred to as inedited in the last edition of Lamarck (1840), the case is the same with all the *Tunicata.*

Salpa.

M. de Blainville divides the genus into the following sections and subdivisions:—

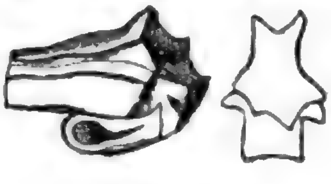
*

Species as it were truncated, without any prolongation going beyond the apertures.

A.

Recurved species; the two terminal orifices very much approximated: aggregation?

Example, *Salpa polymorpha*, Quoy et Gaim.



Salpa polymorpha.

B.

Straight species; the orifices distant and terminal; the cartilaginous envelope consisting of three pieces; aggregation linear, oblique, two and two.

Example, *Salpa vaginata.* Length two inches.

Locality.—Straits of Sunda.

C.

Straight species: the orifices distant; the envelope of a single piece; aggregation circular.

Example, *Salpa pinnata.* The body is marked with two dorsal lines, one yellow, the other white, and on each side of the belly is a violet line. There is also a variety with interrupted lateral lines.

Locality.—The Mediterranean Sea.

**

Body pointed at one or both extremities, arising from a prolongation reaching more or less beyond the apertures.

D.

A prolongation at the anal extremity only; the aperture of the side very small; aggregation? (Genus *Monophorus*, Quoy et Gaim.)

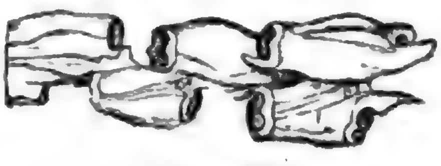
Example, *Salpa conica*, Quoy et Gaim. (*Voyage de l'Uranie*).

E.

A prolongation nearly of the same size at each extremity; mode of aggregation linear, oblique, two and two or three and three.

1. Prolongation to the left.

Example, *Salpa fusiformis.*

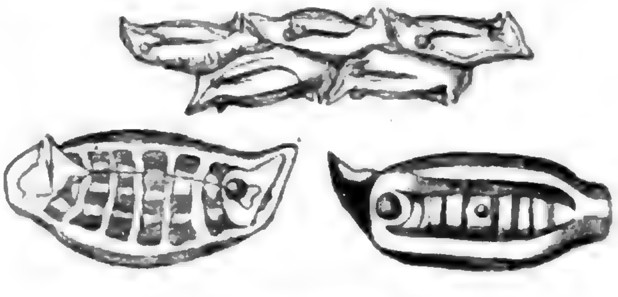


Salpa fusiformis.

2. Prolongation to the right.

Example, *Salpa Zonaria.* Sheath flesh-colour; zones yellow.

Locality.—The ocean near Antigua.



Salpa Zonaria.

F.

A prolongation at each extremity; the anterior much the longest and caudiform; aggregation? (Genus *Timoriensis*, Quoy et Gaim.)

Example, *Salpa firoloidea.*

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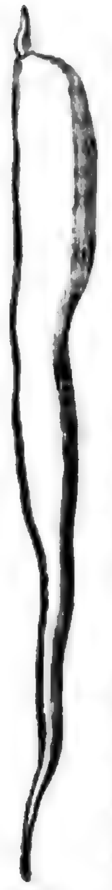
* Cuvier, in a note, says, 'Some authors state that this tube is pierced at the two ends, and that the water traverses it; a fact of which I have in vain sought to assure myself.'



Salpa firoloides.

G.

Two prolongations, in the form of horns, at the posterior extremity only; aggregation?

Example, *Salpa bicornis*.

Locality.—Straits of Sunda.

H.

Three prolongations at the posterior extremity; aggregation?

Example, *Salpa tricuspidata*.

M. de Blainville adds, that though he has referred, almost without any doubt, *Salpæ conica* and *firoloïdea* to this group of animals, he ought not to conceal that MM. Quoy and Gaimard, to whom he owed the knowledge of them, think, even after his observations, that they ought to form two distinct genera, of which one will approximate the *Firolæ*, and that those zoologists had the advantage of direct observation; but he adds that unfortunately they did not bring home the animals themselves, and that it is only on figures and notes, incomplete perhaps, that these two genera are established.

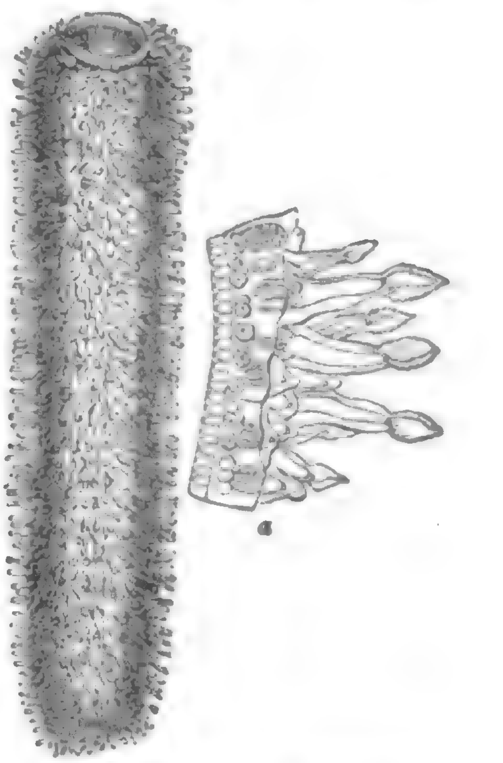
Pyrosoma.

Generic Character.—Animals elongated, fusiform, terminating in a point on one side and obtuse on the other, furnished with two apertures, one external, not terminal, the other internal and terminal, united among themselves towards their base by means of their external envelope, so as to compose numerous and regular rings, which concur to form a long free cylinder, rough with points externally, hollow and mammillated internally, and open at one extremity only. (Rang.)

Cuvier states that this great cylinder swims in the sea, by means of the combined contractions and dilatations of all the individual animals which compose it. The branchial orifices are pierced near the points, and the anus opens into the interior cavity of the tube. Thus, says Cuvier, one may compare a Pyrosoma to a great number of stars of *Botrylli* [BOTRYLLUS] strung one after the other, but the whole of which would be moveable.

Mr. George Bennett, in his interesting 'Wanderings in New South Wales,' after some valuable remarks on the luminosity of the ocean, proceeds as follows:—'On the 8th of June, being then in latitude 30′ south, and longitude 27° 5′ west, having fine weather and a fresh south-easterly trade-wind, and the range of the thermometer being from 78° to 84°, late at night the mate of the watch came and called me to witness a very unusual appearance in the water, which he, on first seeing, considered to be breakers. On arriving upon the deck, this was found to be a very broad and extensive sheet of phosphorescence, extending in a direction from east to west as far as the eye could reach; the luminosity was confined to the range of animals in this shoal, for there was no similar light in any other direction. I immediately cast the towing-net over the stern of the ship as we approached nearer the luminous streak, to ascertain the cause of this extraordinary and so limited a phenomenon. The ship soon cleaved through the brilliant mass, from which, by the disturbance, strong flashes of light were emitted; and the shoal (judging from the time the vessel took in passing through the mass) may have been a mile in breadth: the passage of the vessel through them increased the light around to a far stronger degree, illuminating the ship. On taking in the towing-net, it was found half filled with *Pyrosoma* (Atlanticum?), which shone with a beautiful pale greenish light, and there were also a few small fish in the net at the same time; after the mass had been passed through, the light was still seen astern until it became invisible in the distance, and the whole of the ocean then became hidden in darkness as before this took place. The scene was as novel as it was beautiful and interesting, more so from having ascertained, by capturing the luminous animals, the cause of the phenomenon.

'The second was not exactly similar to the preceding; but though also limited, was curious, as occurring in a high latitude during the winter season. It was on the 19th of August,* the weather dark and gloomy, with light breezes from north-north-east, in latitude 40° 30′ south, and longitude 138° 3′ east, being then distant about three hundred and sixty-eight miles from King's Island (at the western entrance of Bass's Straits). It was about 8 o'clock P.M. when the ship's wake was perceived to be luminous, and scintillations of the same light were also abundant around. As this was unusual, and had not been seen before, and it occasionally also appeared in larger or smaller detached masses giving out a high degree of brilliancy, to ascertain the cause, so unusual in high latitudes during the winter season, I threw the towing-net overboard, and in twenty minutes succeeding in capturing several *Pyrosoma* (pyrosomata), giving out their usual pale-green light; and it was, no doubt, detached groups of these animals that were the occasion of the light in question. The beautiful light given out by these molluscous animals soon subsided (being seen emitted from every part of their bodies), but by moving them about, it could be reproduced for some length of time after. As long as the luminosity of the ocean was visible (which continued most part of the night), a number of *Pyrosoma Atlanticum*, two species of *Phyllosoma*, an animal apparently allied to *Leptocephalus*, as well as several crustaceous animals, all of which I had before considered as intertropical species, were caught and preserved. At half-past ten P.M. the temperature of the atmosphere on deck was 52°, and that of the water 51½°. The luminosity of the water gradually decreased during the night, and towards morning was no longer seen, nor on any subsequent night. Vol. i.



Pyrosoma giganteum; a, a portion magnified.

In the museum of the Royal College of Surgeons in London (*Preparations of Nat. Hist. in spirit*) the following species will be found preserved:—

Lucidæ, MacLeay: compound and floating, having their branchial cavity open at the two extremities.

No. 119, C. *Pyrosoma Atlanticum*. This is well described in the catalogue as remarkable for the beauty and variety of the colours that are reflected when the animal is irritated.

Biphoridæ, MacLeay. Aggregated, in their young state, and floating.

Specimens of *Salpæ* are well shown from No. 119 D, to No. 128, both inclusive. Of these 119 D, *Salpa Confederata?* Forskahl; *Dagyza*, Banks; the Chain Dagyza; is thus described:—'In March, 1801, these Dagysæ were observed in the sea near Cape Finisterra; they were very near the surface, and formed chains several yards in length. From being subject to the undulations of the waves, they sometimes appeared to have a serpentine motion. When raised up out of the water, they readily separated. The bodies composing them were exactly similar, and lay parallel to each other; they exhibited a remarkable synchronous contractile movement, repeated about fifteen times in a minute; the action of contraction being rapid, that of re laxation slow and gradual. Their substance was a clear transparent jelly, enclosed in a very fine capsule: at one extremity was an opaque central spot or globule, of a dull red colour, from which lines appeared to radiate towards the circumference of the body.' (MS. note by John Howship, Esq.)

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* 'My journal,' says Mr. Bennett in a note, 'remarks the atmosphere to have been very chilly during the day, but much milder in the evening; the range of the thermometer during the day being from 49° to 56°

No. 124 presents a fine specimen of *Salpa Tilesii.* The cartilaginous protuberance covers the stomach and liver. Upon the protuberance are many cartilaginous spines; others may be observed scattered over different parts of the outer sac.

In 127, *Salpa maxima*, the outer tunic is laid open, and a bristle passed into the stomach.

In 128 (*Salpa maxima* also) the specimen is laid open, and the stomach, oblique intestine, and transverse muscular bands are more completely exposed. (*Cat.*, part iv., fasc. i.)

M. de Blainville is of opinion that *Pyura Molinæ* forms the passage between the simple and the aggregated Ascidians.

SALSETTE, an island in the Indian Ocean, close to the west coast of Hindustan, and included in the British presidency of Bombay and the province of Aurungabad. It is a little to the north of the island of Bombay, with which it is united by a causeway which was constructed in 1805. This causeway is very useful to the natives of Salsette, who bring vegetables and other produce by it to the Bombay market, but it is so narrow and inconvenient as to be rarely used by carriages. Salsette extends from 19° 4′ to 19° 17′ N. lat., and from 72° 50′ to 73° 2′ E. long., with an average length of about 16 miles and an average breadth of about 10; its area is therefore about 160 square miles.

The island consists for the most part of rocky hills, in some parts of considerable elevation, but covered with underwood to their tops; the jungle in many parts being very thick, while in the valleys there are groves of mangoes and palms, and some fine timber-trees. The tara-palm and cocoa-nut grow almost spontaneously among the jungle, but some care is bestowed on their cultivation, though little on anything else. There are tigers in the jungle, and great numbers of monkeys and jungle-fowl. The island is said to be fertile, and capable of much improvement, but little has been done for it by the British government, with the exception of an excellent road which has been made round it. Tannah and Gorabunder are the only towns. The latter is little better than a poor village, but Tannah is a neat and flourishing town on the eastern coast of the island, chiefly inhabited by descendants of Portuguese and by Hindus. The Portuguese are Roman Catholics, and have converted a great number of the Hindus, at the same time that they themselves have adopted most of the habits of the Hindus, and have become almost as dark-coloured. There is a small but regular fortress, and a considerable cantonment of British troops at Tannah. A wild race of people inhabit the hills, who are charcoal burners. They have no intercourse with the Hindus, who inhabit the lower grounds, but bring down their charcoal to particular spots, whence it is carried away by the Hindus, who deposit in its place a settled payment of rice, clothing, iron tools, or other necessaries.

The chief objects of curiosity in Salsette are the temple caves of Kennery, which resemble those of Elora, Elephanta, and Carlee. [ELORA; ELEPHANTA; POONAH.] They are numerous, but for the most part small, cut in two of the sides of a hill, at different heights, and of various forms. Some of the smaller ones seem as if they had been the residences of monks or hermits. The largest cave is a Buddhist temple, a rectangle about 50 feet long by 20 wide, terminated by a semicircle. The entrance is formed by a lofty portico, over which, but detached and a little to the left-hand, there is a high octagonal column, with three lions sculptured on the top, seated back to back. A colossal statue of Buddha, with his hands raised in supplication, is on the east side of the portico. A number of male and female figures, which seem to represent dancers, nearly naked, but not indecent, are carved above the screen which separates the vestibule from the temple. The temple is entered by a large door, above which are three windows contained in a semicircular arch. A colonnade of octagonal pillars surrounds the temple on every side except the entrance. In the centre of the semicircle a mass of rock has been left, cut in the form of a dome, with a sort of spreading ornament on the top like the capital of a column. The ceiling of the cave is a semicircular arch, curiously ornamented with slender ribs of teak-wood, of the same curve as the ceiling, which they seem to support; this however is not the case.

Salsette is supposed to contain about 50,000 inhabitants, who are chiefly occupied in fishing, of whom about 10,000 are of Portuguese origin. The Portuguese obtained possession of the island in the 16th century; but it was taken from them by the Mahrattas in 1750, and conquered from the Mahrattas by the British in 1774.

(Heber's *Narrative of a Journey through the Upper Provinces of India in* 1824-5.)

SA'LSOLA, a genus of plants of the natural family of Chenopodiaceæ, so named from *salsus*, 'salt,' in consequence of many of the species yielding kelp and barilla. The species are chiefly found on the sea-shore in temperate parts of the world, and also in hot parts of the world where the soil is saline or there is salt water in the vicinity. The genus is characterised by having perfect flowers; the perianth five-cleft, persistent, enveloping the fruit with its base, and crowning it with its enlarged scariose limb; stamens five; styles two; embryo spiral; herbs or small shrubs, smooth or pubescent; leaves alternate or opposite, roundish, seldom flat; flowers axillary and sessile.

S. kali, so named from yielding barilla or kali, that is, alkali, is found on the coasts of Europe, and of many parts of the world, and is one of the species which is burnt for the purpose of yielding kelp and barilla. S. sativa is a species found on the southern coast of Spain, where some pains are taken to extend both it and the following species by cultivation, for the purpose of yielding barilla when burnt:—The crop is cut in September, and laid in small heaps to dry. These heaps are collected and burned, forty or fifty of them, in a hole in the ground.

S. soda is found on the southern coast of Europe, and in the north of Africa.

Merat and Delens conceive that the species which yields the soda of Alicant is a new species, and not yet described, which they propose calling S. beril. Other species are described by Forsköl as yielding soda on the coasts of the Red Sea.

S. nudiflora Dr. Roxburgh describes as a native of salt barren lands near the sea, where it is gathered for fuel only; but as the taste is strongly saline, it would no doubt yield good fossil alkali, and he gave it as his opinion that this plant, with two Indian species of Salicornia, might be made to yield barilla sufficient to make soap and glass for the whole world.

S. indica is another Indian species, growing in similar localities. The green leaves are eaten by the natives.

SALT. [SODA; SODIUM; MANURE.]

SALT TRADE. The principal part of the salt of England is made in the valley of the Weaver in Cheshire. [CHESHIRE, vii., 43.] When the salt duty was repealed in 1824, there were seventy-five works where salt was raised in a fossil state: thirty-four were at Northwich, twenty-six at Winsford, three at Middlewich, and two at Nantwich, all in Cheshire; two were at Shirley Wich in Staffordshire; six at Droitwich in Gloucestershire; and two in Durham. There were at the same time thirty-five works at which salt was made by evaporation from sea-water, twenty-nine of which were in Hampshire and the Isle of Wight. In Scotland, at the same time, there were fifteen salt-works, and in all of them salt was made from sea-water. The rock-salt is used to strengthen the brine from salt-springs, from which the salt used for domestic purposes in England, and also a large portion of what is exported, is produced by evaporation. The Cheshire brine-springs are from twenty to forty yards in depth, and are very productive. [CHESHIRE.] The process of solar evaporation is now entirely disused. Nearly the whole of the salt exported is made in Cheshire, and is sent down the river Weaver, which communicates with the Mersey, to Liverpool. In the years 1832-3-4-5 the quantity of salt sent by the Weaver averaged 434,5 tons for each year. Mr. Porter states (*Progress of the Nation*, i. 346) that by adding 100,000 tons for the produce of other counties, and for that part of the Cheshire salt which is not sent to Liverpool, 'it is probable that the total produce of this mineral in England will be very nearly ascertained.' It may not therefore be far from the truth to estimate the annual production of salt in England at 500,000 tons. The sources of supply are said to be inexhaustible; and latterly the salt-manufacturers have so far extended their works, that the opening of new markets would be of the greatest advantage to them. The Staffordshire rock-salt is chiefly exported from Hull, and that of Gloucestershire from the port of Gloucester. The capital employed in the salt-manufacture is said to be about 1,000,000*l.*, and the population engaged in it from 10,000 to 12,000.

A duty of 10*s.* per bushel was laid on salt in 1798, which in 1805 was increased to 15*s.* In 1823 this duty was reduced to 2*s.*; and on the 5th January, 1825, was wholly repealed. The charge of collecting a gross revenue of 1,496,387*l.* on salt, in 1821, was 33,879*l.*, or the moderate per centage of 2*l.* 5*s.* 3*d.* Salt used in the fisheries was duty-free, and in 1821 the quantity so used was 2,406,602 bushels; and about 150,000 bushels, required by bleachers, was also exempt from the duty. A duty of only 5*s.*, which was afterwards reduced to 2*s.* 6*d.*, was charged on salt used for agricultural purposes. In the years 1820-1-2, the net amount of revenue which the duty on salt produced averaged 1,524,510*l.* annually. In the eight years from 1801 to 1808, the average annual consumption of salt was 1,928,739 bushels; from 1810 to 1817 the consumption averaged 2,060,495 bushels; and from 1827 to 1834 it is computed by Mr. Porter, in the work already quoted (p. 349), at 10,307,752 bushels. The annual consumption of an adult is said to be 16 lbs. During the existence of the duty, the retail price was 4½*d.* per lb.: it is now ½*d.* The consumption is at present five or six times greater than it was at the beginning of the century. Salt is now used more largely by the poor, and is employed in manufactures and in agriculture to an extent which is only compatible with cheapness. From 1827 to 1830 inclusive, the annual exports of rock and white salt (the former for the use of salt-refiners, and the latter ready for immediate use) averaged 9,385,719 bushels; from 1831 to 1834 the exports averaged 10,814,545 bushels each year. The number of bushels exported in 1839 was 11,837,594, equivalent to 295,939 tons (declared value 218,907*l.*). The United States of America took 3,519,990 bushels; British North America, 1,668,839; Russia, 1,513,792; Belgium, 1,154,145; Prussia, 1,143,520; Holland, 799,166; Denmark, 693,960; western coast of Africa, 389,574; Germany, 283,242; and to various other parts smaller quantities were exported, including 180,884 bushels to the Isle of Man and the Channel Islands, and 137,254 to our Australian settlements.

The British government in India monopolises both the manufacture and sale of salt, and the exportation of British salt to India is prohibited. Attempts have been made by the salt-manufacturers and ship-owners to obtain admission for British salt into the ports of India at a moderate duty; and the latter especially complain of the disadvantage of not being allowed to take so convenient an article of merchandize to this part of our empire. The cost of production of the finest Cheshire salt is about 3½*d.* or 4*d.* per bushel; and after paying all charges and freight to Calcutta, at the rate of 20*s.* per ton, they state that the best salt could be laid down there at 1*s.* per bushel; and not unfrequently it would be taken out as ballast. The salt monopoly had existed in India long before the sway of the Company commenced; and its modification and abolition are considered only as questions of time. In the years 1830-1-2-3-4, the gross salt revenue of the three presidencies averaged 2,184,415*l.* annually, and the net revenue 1,578,623*l.* It is believed that a moderate duty on British salt would yield as large a revenue in the course of a few years, if the monopoly were abolished, while commerce would be benefited by the interchange of East India sugar and other native commodities for British salt; smuggling in salt, which is extensively carried on, would cease; and in place of arbitrary and harsh restrictions, the consumer would obtain a better article at a cheaper rate. (*Report from Select Committee of the Commons on Salt, British India*, 1836.)

SALTA. [Plata, La.]

SALTASH. [Cornwall.]

SALTCOATS, a town in Ayrshire, on the coast of the Frith of Clyde, 32 miles from Glasgow, partly in Ardrossan, and partly in Stevenston parish. It was erected into a burgh of barony by James V. in 1528, but it appears to have fallen into such decay that in 1661 there were only four houses in the town. Early in the 18th century it began to revive through the exertions of Sir R. Cunningham, to whom the town belonged, who opened coal-works in the neighbourhood, erected large salt-pans, and made a harbour capable of admitting vessels of above 200 tons. The parish church of Ardrossan is in Saltcoats: it is a tolerably large building, erected nearly seventy years since; there are also the Gaelic chapel, a neat building, of Gothic architecture; the town-hall, a moderate-sized building, of two stories, with handsome spire, clock, and bell; and the banking-house of the Ayrshire Banking Company. The population is estimated at about 4000, a considerable number of whom are sailors, colliers, and weavers. There were, in July, 1837, above 450 looms in the Ardrossan side of the town, chiefly kept in work by the Glasgow and Paisley manufacturers: they produced gauzes, shawls, trimmings, silks, &c. Many women were employed in sewing and flowering muslin. The salt-pans have been injured by the importation of English salt from Liverpool: magnesia is manufactured from the 'bittern or mother-water' of the pans. Some ship-building is carried on. The vessels that trade from the harbour amounted, in November 1837, to about thirty, of from 20 to 250 tons each: the aggregate tonnage was about 3000 tons, and the number of seamen employed about 180. The exports are coal, freestone, herrings, and earthenware, chiefly to Ireland; and the imports, chiefly from Ireland, are oats, butter, and limestone. Some salmon and other fishing is carried on near the town, and several boats are yearly sent out to the herring fishery. There is a good market, and a yearly fair on the last Thursday in May. There is a post-office, and communication is kept up by coach with Glasgow and Kilmarnock, and by steam-boats, either from Saltcoats or the adjacent harbour of Ardrossan, with Glasgow, Ayr, and Stranraer. The canal from Glasgow to Johnstone in Renfrewshire, and the connected rail-road from Ardrossan to Johnstone, at present incomplete, contribute materially to benefit Saltcoats.

Besides the parish church of Ardrossan and the Gaelic chapel, there are three dissenting meeting-houses. The parochial school of Ardrossan parish is in the town, and there were, in 1837, a free-school for girls of both parishes, superintended by a committee of ladies, and about seven private schools. There are a subscription library and a Sabbath-school library; a public reading-room in the town-house; a parochial society for both parishes, for various purposes of religious benevolence; a 'benevolent society,' and a 'female benevolent society;' a female bible and missionary society, a savings' bank, and several benefit, or, as they are termed in Scotland, friendly societies.

(*New Statistical Account of Scotland.*)

SALTFLEET. [Lincolnshire.]

SALTILLO. [Mexican States.]

SALTPETRE. [Potassium.]

SALTS. The term salt, originally restricted in its application to common salt, which it still means when used merely by itself, is now applied to a vast number of substances which have in many cases few properties in common.

Common salt is the principal of a class composed of a metal and such bodies as chlorine, iodine, bromine, and fluorine, and the radicals of the hydracids, and which are included by Berzelius in his class of *haloid-salts* (from ἅλς, sea-salt, and εἶδος, form), because in constitution they are analogous to sea-salt. The whole series of the metallic chlorides, iodides, bromides, and fluorides, such as chloride of sodium, iodide of potassium, and fluor-spar, are, as well as the cyanides, sulphocyanides, and ferrocyanides (though the three last are very differently constituted from the former), included by Berzelius in his list of haloid-salts.

It was for many years admitted as an unquestionable fact that common salt was a compound of muriatic acid and of soda; and hence it was very commonly called muriate of soda. But it has been shown by Davy, that the acid and alkali during their action on each other suffer mutual decomposition; and that while water is formed by the union of the hydrogen of the acid with the oxygen of the alkali, the chlorine of the former and the sodium of the latter unite to form chloride of sodium. It has since been proved that this occurs with all what are called *hydracids*, when they act upon metallic oxides: thus while hydrochloric acid and soda give chloride of sodium and water, hydriodic acid and soda yield iodide of sodium and water, and hydrocyanic acid, cyanide of sodium and water, &c.

While then the hydracids, by the decomposition which they suffer, do not yield *hydro-salts* with the metallic oxides, yet hydro-salts may be formed by saturating these acids with the vegetable alkalis; for example, hydrochloric and hydriodic acids yield respectively hydrochlorate and hydriodate of quina, when made to act upon this base. With ammonia hydrochloric acid forms the salt called sal-ammoniac; but it is questioned whether this is not analogous to the chlorides, chloride of ammonium being formed by the conversion of the ammonia into ammonium, by the transference of the hydrogen of the hydrochloric acid to the ammonia, which is theoretically supposed to consist of one equivalent of azote and four equivalents of hydrogen, instead of one equivalent of azote and three equivalents of hydrogen, which exist in ammonia.

The *Oxy-salts* form another numerous and important class of compounds: these are formed when an oxacid is made to combine with an oxidized base; as, for example, when sulphuric acid unites with soda, the result being sulphate of soda. The sulphates of potash, lime, magnesia, &c. are similarly constituted; but a question has lately arisen whether these salts are not also analogous to the chlorides, in containing a metal rather than an oxide; thus, instead of supposing that sulphuric acid, composed of one equivalent of sulphur, and three equivalents of oxygen, is combined with soda formed of one equivalent each of sodium and oxygen, it has been, and with some plausibility, supposed that the oxygen is transferred to the sulphuric acid, forming a compound which has never yet been isolated, consisting of one equivalent of sulphur and four equivalents of oxygen, and that this is combined with sodium. Professor Daniell has proposed the name of *oxysulphion* of sodium for such compound, while Professor Graham denominates it a *sulphat-oxide* composed of *sulphat-oxygen* and sodium.

Another class of bodies has been described by Berzelius as coming within the description of salts; namely, the sulphur-salts. In this country however they generally are classed together as double sulphurets; thus, according to Berzelius, the well-known copper pyrites, or double sulphuret of iron and copper, is a sulphur-salt. Electro-positive sulphurets, termed *sulphur-bases*, are usually the protosulphurets of electro-positive metals, and therefore correspond to the alkaline bases of those metals; and the electro-negative sulphurets, *sulphur-acids*, are the sulphurets of the electro-negative metals, and are proportional in composition to the acids which the same metals form with oxygen. Hence, if the sulphur of a sulphur-salt were replaced by an equivalent quantity of oxygen, an oxy-salt would result.

In general properties the various classes of salts, and indeed the individuals of the same class, differ as widely as possible; some are crystallizable, others uncrystallizable; they are colourless, and of various colours; sapid and insipid; soluble and insoluble in water, alcohol, and other menstrua; volatile and fixed in the fire; decomposable or undecomposable by the same reagent. Such salts as decompose each other when brought into contact are called incompatible salts.

Salts have been conveniently, though not quite correctly, divided into alkaline, earthy, and metallic salts; for strictly speaking most of the two former belong to the latter, and to these classes must be added the ammoniacal salts and the salts of the vegetable alkalis. Again, salts constituted of the same elements may contain one or other in excess; thus soda and various other bases combine with three different portions of carbonic acid. The first is the neutral carbonate, containing one equivalent each of acid and of base; the second contains one-half more carbonic acid, and is called the sesqui-carbonate; and the third contains twice as much carbonic acid as the first, and is the bi-carbonate.

Super-salts are such as contain an excess of chlorine or of acids, and sub-salts such as contain excess of base. Dr. Thomson has proposed, and it is very conveniently adopted in practice, to describe the degree of excess of acid in the super-salt by Latin terms, and that of the excess of base by Greek: thus while a compound of two equivalents of chlorine and one of a base, or of an acid and base, is called a bi-chloride or bi-sulphate, as the case may be; a compound containing one equivalent of chlorine or acid to two of base, is termed a *di-chloride*, &c.

SALUZZO, a province of the Sardinian states, is bounded on the north by the provinces of Pignerol and Turin, east by the provinces of Alba and Mondovi, south by the province of Cuneo, and west by the chain of the Cottian and Maritime Alps, which divides it from France. The western part of the province stretches along the eastern slope of the Alps, forming several transverse valleys, through which flow the Po, the Vraita, the Maira, and some minor streams, all of which at first run eastwards, but after emerging from the highlands, turn to the north and flow through a wide and fertile plain which opens between the lower offsets of the Alps and the hills of Monferrato, where they all join the Po above the town of Carignano. [Po, BASIN OF.] This plain, which belongs partly to the province of Saluzzo and partly to those of Alba and Turin, abounds in corn, wine, pulse, fruit, hemp, and rich pasture, being irrigated by canals. The rearing of silkworms is also a considerable branch of industry. The mountains are covered with chesnut trees, which supply food to a great part of the peasantry. The population of the province of Saluzzo amounts to about 136,000, distributed in 52 communes.

The principal towns are,—1, SALUZZO, a bishop's see and a considerable town, built on the slope of a hill which is one of the lowest projections of the group of Mount Viso: it has an old castle, once the residence of the marquises of Saluzzo, a sovereign house of the middle ages; a handsome cathedral, several other fine churches, a royal college, an hospital, and about 10,000 inhabitants, who carry on a considerable trade in the products of the soil, and have also manufactures of silk, leather, hats, linen, and iron. 2, Savigliano, a town of 15,000 inhabitants, 10 miles east of Saluzzo, on the banks of the Maira, on the road from Turin to Nizza, and in the middle of the fine plain above mentioned. It has some good streets, a fine market-place, a collegiate church, several other churches adorned with paintings by Mulinari, a native of the place, two hospitals, and manufactories of silk, cloth, and linen. Many of the provincial nobility and landed proprietors have their residence at Savigliano. 3, Racconigi, six miles north of Savigliano, a town of about 10,000 inhabitants, situated in a very fruitful country, the garden of Piedmont, is just above the confluence of the Grana and the Maira; it has a handsome country residence of the princes of Carignano. 4, Dronero, in the valley of the Maira, a busy town on the mountain-road leading across the Alps to Barcellonette in France. 5, Revello, a small town which gives the title of count to a distinguished family of Piedmont. 6, Barga, in the upper valley of the Po, a town with 7000 inhabitants.

(Serristori; Neigebaur; Denina, *Tableau Géographique et Statistique de la Haute Italie*.)

SALVADO'R, SAN, the capital of the state of Salvador, and until lately the seat of the federal government of the United States of Central America, is situated in 13° 45′ N. lat. and 89° 10′ W. long. The town is built on undulating ground, in a kind of valley, surrounded by high hills covered with wood, among which, in a north-eastern direction, and at a distance of about nine or ten miles, is the volcano of S. Salvador, which at different periods has caused great devastation by its eruptions. The Rio de Aselhuate, a small river, rises about seven miles south of the town, passes to the south of it, and falls into the river Lempa. It is supposed that the site of the town is more than 2000 feet above the level of the sea. Accordingly it enjoys a very temperate climate, which however is warm enough for the cultivation of sugar, the plantations of which alternate in the vicinity of the town with extensive orchards. The town itself is laid out with considerable regularity, the streets crossing each other at right angles, except in the suburbs, where this plan has not been strictly adhered to. The pavement is very bad. The houses are low, consisting mostly of a ground-floor. In the centre of the city is a plaza, or square, three sides of which are lined with shops, with porticos before them, supported by a colonnade. On the fourth side is the cathedral, an edifice which has no great claims to architectural beauty. The population is about 16,000. There are some manufactures of iron, especially of cutlery, and the articles made here are highly prized all over Central America. Many coarse cotton-stuffs are also made here. The number of white families is not great, and the mestizoes, or ladinos, as they are called here, constitute the bulk of the population. The commerce is not great. Some sugar and indigo are sent to Acajutla and to Puerto de la Libertad, which are respectively 50 and 30 miles distant from the town. In its vicinity there are some warm and some cold rivulets, which afterwards unite, and thus afford to the inhabitants the advantage of having natural baths of every degree of temperature.

(Juarros, *History of the Kingdom of Guatemala*; Haefkens, *Reize naar Guatemala*; Haefkens' *Central America*; and Montgomery's *Narrative of a Journey to Guatemala*.)

SALVADOR, SAN, DE BAYA'MO, is a town in the island of Cuba, in the eastern Intendencia, in 20° 40′ N. lat. and 76° 55′ W. long. It is built in a hilly country, which supplies excellent pasture for cattle, and contains some plantations of sugar and coffee. The population amounts to 7500, among whom there are about 1500 slaves and 320 free people of colour. The produce of the country is brought to this town from a considerable distance, and hence sent to the harbour of Manzanillo, where it is shipped.

(Humboldt's *Voyage aux Régions Equinoxiales du Nouveau Continent*.)

SALVADOR, SAN, DE BAHI'A, commonly called *Bahia*, a city of Brazil, the most commercial town in South America, and also the largest and most populous, next to Rio de Janeiro, is situated in 13° S. lat. and 38° 40′ W. long. It is built on the eastern shores of the strait which leads from the Atlantic to the Bahia de Todos os Santos, or All Saints' Bay, and this strait constitutes its harbour.

The Bahia de Todos os Santos extends, from south to north, about 33 miles, from Cape S. Antonio to the mouth of the river Sergipe, and is about 28 miles across in the widest part. Its opening is to the south, and in this opening there is an island, called Itaparica, which is about 23 miles long and 6 miles broad. Of the two entrances formed by this island, the western, called Barra Falsa, which is only two miles wide at the narrowest part, has some shoals, especially at its southern extremity, which prevent even vessels of moderate size from entering the bay. Large vessels pass through the eastern entrance, which is hardly more than four miles wide, and has only sufficient depth for men-of-war along the eastern shores, as there are some rocky shoals in the middle of the entrance, and at the distance of half a mile from the island of Itaparica there is a reef which is covered with water. In the interior of the bay other shoals are met with, especially between the northern point of the island of Itaparica and the Ilha dos Frades, which lies north of it, and between the last-mentioned island and the mouth of the rivers Sergipe and Paraguassú, the two largest rivers which fall into the bay. By these shoals the greatest part of the bay is rendered unfit for receiving large vessels, but there is water enough on them for the country vessels which bring the produce of Reconcavo [BAHIA] to the town of S. Salvador. The common anchorage begins at the distance of from three to four miles from Cape S. Antonio, the most southern point of the peninsula which separates the bay from the Atlantic. Where the anchorage begins, and opposite to the southern extremity of the town, is the Forte de S. Marcello, commonly called Fortim do Mar, on a small rocky islet. Larger vessels generally anchor west of this fortress, but those which require less depth anchor farther north, between the Fortim do Mar and the Forte de S. Felipe, which is built on a projecting point, the Punta de Monserrate, about four miles farther north. These two fortresses protect the anchorage. North of the Punta de Monserrate the land retires and forms a small bay called Tagagipe, the entrance of which is protected by the Forte de S. Bartholomeo, and which serves as a dock-yard for the construction of merchant vessels.

Opposite the anchorage lies the city, which consists of two towns, the Citade Baixa, or Praya, and the Citade Alta. The Praya (beach) is a strip of low land, so narrow as to admit only of a single street, except in the middle, where five short streets branch off eastward. It is the seat of commercial activity, where the large warehouses, called *trapiches*, are situated, in which both imported goods and those which are destined for exportation are deposited. Here also are the numerous workshops of the jewellers, who work in gold and silver, and set the precious stones that are brought from the Minas Novas. This is almost the only branch of manufacturing industry in Bahia. The town is meanly built and dirty. Among the buildings the Exchange and the church of Nossa Senhora da Conceição are distinguished by their architecture. The church is a fine edifice, with a front of European stone, and is richly decorated within. At the southern extremity of the Praya is the royal dock-yard and the arsenal, but the dock-yard is not spacious, and only a few vessels can be built at the same time. At the back of the Praya rises a hill with a steep ascent. Some parts of the declivity are covered with buildings, but the steeper parts are planted with bananas and orange-trees. The streets which lead across this ascent to the Citade Alta are paved with bricks, and are almost impassable for carriages. People who can afford it are taken to the Citade Alta in sedan-chairs carried by two negroes.

On the top of the hill stands the Citade Alta, on an undulating and in some parts hilly surface, from 100 to 300 feet above the sea-level. Most of the streets are wide and straight; and the houses, being built of stone, and from two to five stories high, exhibit in their exterior a certain degree of taste, but are destitute of comfort within. The centre of the town lies in a depression, and contains the best streets, and several squares, among which is Praca da Parada, where the palace of the governor, the town-hall, the mint, and the edifice of the supreme court (Relação) are situated. The most remarkable building in this part of Bahia, and indeed in all Brazil, is the College of the Jesuits, with the contiguous church, which is now used as the cathedral. Europe and the East Indies have contributed to ornament this church. Some fine pictures, the brass ornaments embellishing the choir, the gildings of the altar, and an excellent organ, were sent from Europe; and the beautiful and splendid wainscoting of the vestry, made of choice pieces of tortoise-shell, was brought from the East Indies. The college contains a public library, which consists of a small portion of that collected by the Jesuits, but has been increased by a considerable number of modern books. It contains more than 12,000 volumes. The greater part of the building is however appropriated to a military hospital. The other churches, more than thirty in number, are not remarkable, except that of the Italian Capuzins, which has lately been erected, and has a fine cupola. Other remarkable public buildings are the city hospital (Caza de Misericordia), the school of surgery, the house for white orphans, and the palace of the archbishop. Within the circuit of the town there is a considerable number of extensive gardens and orchards, whose plantations of orange-trees greatly contribute to render this place a pleasant residence. At the south-eastern extremity of the Citade Alta is the *Passeio Publico*, or public walk, on one of the most elevated eminences of the town, from the pavilion of which the whole bay, with its green island, and the Atlantic Ocean, can be seen. The alleys are planted with rows of trees introduced from Europe and the East Indies, and the intermediate places are embellished with flowers transplanted there from various parts of Brazil, Southern Europe, and Southern Asia. Contiguous to the Passeio Publico is the Forte de Santo Pedro, the most important fortification of the town, which protects it against attacks on the land side. It existed before the town was taken by the Dutch (1624), but was much enlarged and improved by them; and they intended to make a wide moat from the fortress to the sea, but this plan has only been executed in part. The Dique, as this moat is called, is built of bricks, and extends through a considerable space along the eastern extremity of the suburb Barril, between gentle eminences and pleasant bushes and woods. Caimans are frequently seen in the moat. At the north-eastern extremity of the town is the Forte Barbalho, which defends the great road that leads from the town northward to the interior of the province.

The population of Bahia is stated to exceed 180,000, and is fast increasing. The negroes probably form nearly two-thirds of it, and about nine-tenths of the negroes are slaves. The number of inhabitants belonging to the mixed races is also considerable. It is not easy to determine the number of whites, as many of the inhabitants claim a place among them, though their complexion and features do not support their claim. The great disproportion between the negroes and the other population is the principal cause of the outbreaks by which in recent times the peace of the inhabitants has been disturbed.

Bahia contains a college, in which Greek, Latin, mathematics, logic, metaphysics, and rhetoric are taught by eight professors. There are also other schools in which some branches of knowledge are taught by persons who have not taken orders; but they are under the superintendence of the clergy. Persons destined for the church receive the requisite instruction in a seminary under the direction of the archbishop. Those who wish to study the law generally go to Coimbra in Portugal, and the students of medicine to Paris or other parts of Europe.

Bahia has great advantages over Rio de Janeiro in a commercial point of view. Rio de Janeiro is separated from the interior provinces by three ranges of high mountains, each consisting of several ridges, all of which have such steep declivities that it is hardly possible to make roads over them on which carriages can be used. The expenses of transport for heavy goods are therefore very great, and most of them cannot reach a market. But from Bahia the country towards the interior does not rise by steep ranges, but by long slopes and wide terraces, and in these parts there are no obstacles to making roads. The state of the country and the population have not been such that their want is yet felt, but these advantages are so obvious, that the cotton of Minas Geraes and of Goyaz is already brought to Bahia, even from places which are nearer to Rio Janeiro than to Bahia. Three roads lead from Bahia to the interior. The most northern goes to the Sertão de Pernambuco and the province of Piauhy, traversing Cachoeira, Jacobina, or Villa Nova da Rainha, and Joazeiro; the last-mentioned town stands on the banks of the Rio de Santo Francisco. The central road goes to Goyaz and Matto Grosso, beginning at Cachoeira, and passing through the towns of Cincora and Villa do Rio de Contas and Caytete to Carynhanha on the banks of the Rio de Santo Francisco, whence it passes into the southern districts of Goyaz. The most southern road begins at Jaguaripe, opposite the island of Itaparica, and passes thence in a south-western direction to Conquista and Rio Pardo, whence it traverses the Serra do Gram Mogul, and enters that portion of Minas Geraes which is called Minas Novas, where the cultivation of cotton is rapidly increasing. By these roads the foreign goods which are consumed in the interior of Brazil reach the places of consumption, and the produce of the country is brought to market. But only a very small portion of the goods exported from Bahia is brought to the place of embarkation from the interior. By far the larger part is collected in the Reconcavo [Bahia, vol. iii., 279]; but considerable additions are also made to the exports from the countries north of Cape Santo Antonio, as far as the mouth of the Rio de Santo Francisco, and even the town of Maceyo in Alagoas. The provinces of Sergipe and Alagoas, having no harbours which admit large vessels, send their sugar and cotton to Bahia. The coast south of Bahia, as far as Porto Seguro, has also no harbours for large vessels, with the exception of that of Camamú, which however is not used on account of its vicinity to Bahia. Thus the countries adjacent to this coast must likewise send their produce to Bahia; but it is not of such a description as to add much to the exports of Bahia, as it consists chiefly of provisions that are consumed in the town. The rice exported from Bahia is brought from these parts.

The goods collected for exportation from all these countries consist of sugar, cotton, tobacco, hides, rice, and coffee; also of rum, molasses, train-oil, tallow, hides, horns, fustic, braziletto, and small quantities of ipecacuanha, cacao, ginger, indigo, and isinglass. The largest articles are sugar and cotton. The production of sugar has rapidly increased. In 1817 it amounted to 27,300 cases, and in the following year to 29,575. About eight years ago it was estimated at 50,000 cases, and last year (1840) the exportation of this article alone was between 60,000 and 70,000 cases. Each case weighs about 1200 lbs. Thus the present exportation of sugar is between 72 and 84 millions of pounds. The largest quantity, about 36,000 cases, goes to Germany, 22,000 cases through Hamburg, and 14,000 cases through Trieste, and between 12,000 and 15,000 cases go to Lisbon and Oporto. Smaller quantities are taken to France, Italy, and other countries of Europe. The most important article next to sugar is cotton, of which more than 50,000 bags are exported, nearly the whole of which goes to Liverpool; a small quantity goes to Bordeaux. The tobacco, amounting to between 300,000 and 400,000 arobas, goes mostly to Portugal, the Mediterranean, Hamburg, and Africa. The hides, between 80,000 and 100,000 pieces, are sent to Portugal, Amsterdam, Antwerp, the Mediterranean, and the United States of North America. Rice, about 100,000 arobas, is only exported to Portugal. Coffee, amounting to 20,000 arobas, is mostly sent to Hamburg. Bahia carries on an active commerce with the province of Rio Grande do Sul, and with Monte Video and Buenos Ayres: it receives from these places chiefly jerked beef, which is the common food of the slaves, and sends in return sugar, coffee, tobacco, and cacao. Tobacco is also sent to Rio Janeiro. The exports are said to amount in value to 2,000,000*l*.

The imports amount nearly to the same sum. Those brought from England consist of different kinds of cotton fabrics, woollen stuffs and cloth, linen, brass and copper ware, china and earthenware, iron and steel, wrought and unwrought, hardware and cutlery, tin, hats, ropes, arms and ammunition, butter and cheese, porter, soap and candles. Many cargoes of cod are sent to Bahia from the British fisheries in North America. France sends from Nantes and Bordeaux some articles of fashion, furniture, hats, dry fruits, wine, and brandy. From Holland and Belgium are brought beer, glassware, linen, geneva, and paper; from Germany, glass, linen, iron and brass utensils; from Russia and Sweden, iron and copper utensils, sail-cloth, cords, ropes, and tar; from Portugal, wine, brandy, fruits, hats, and European manufactures; from the United States, wheat, flour, biscuits, leather, boards, pitch, potashes, and some articles of rough furniture, and coarse cotton-cloth. From the Cape Verde Islands are imported sulphur, gum-arabic, and salt.

The number of vessels annually entering the harbour of Bahia with cargoes, amounted, in 1803, only to about fifty, but now they exceed two hundred, and probably two hundred and fifty. Many vessels bound to the East Indies resort to this place to get water and fresh provisions.

The bay was discovered in 1503 by Christovam Jacques, and received from him the name of Bahia de Todos os Santos. The town was built in 1549 by Thomé de Souza. It was taken by the Dutch in 1624, but in the following year was retaken by the Portuguese. In 1638, the Dutch, under the command of Prince Maurice of Nassau, laid siege to it, but were not able to take it. When the independence of Brazil was declared in 1822, the Portuguese general Madeira refused to surrender Bahia, and it was taken by the Brazilian troops, after a long siege, on the 2nd of July, 1823. Since that time the peace has frequently been disturbed by insurrections among the slaves, which have led to much bloodshed and even to civil war.

(Lindley's *Narrative of a Voyage to Brazil;* Henderson's *History of Brazil;* Spix and Martius, *Reise in Brazilien.*)

SALVADO'RA, a genus of plants which has been placed in different families, but usually in Chenopodeæ. Endlicher attaches it to Plumbagineæ, but under the name of Salvadoraceæ. The species are few in number, and found only in warm and dry parts of the world, as in India, Persia, Arabia, and on the coasts of the Mediterranean, whence they extend along the north of Africa, from the Nile to Senegambia. The genus is characterised by having a small four-leaved calyx; corol united into a single piece, quadripartite, membranaceous; stamens four, perigynous, connecting the lobes of the corol; anthers subglobular, two-celled, opening inwards and vertically; ovary free, one-celled; ovule single, erect from the base, anatropous; stigma sessile, undivided; berry single-seeded, seed erect; cotyledons fleshy; plano-convex peltate, including the inferior radicle; the shrubs are smooth, and have a hoary and glaucous appearance. The stem is jointed, the leaves opposite, stalked, very entire, leathery, obscurely veined; flowers minute, loosely panicled. The small branches of S. indica, being cut and then bruised, are used by the natives of India for cleaning the teeth. The leaves of this species, being purgative, are called *ra-suna*. The bark of S. persica is acrid, and raises blisters; a decoction is considered tonic, and the berries are said to be edible.

SALVADORA'CEÆ, a natural order of monopetalous Exogens, comprising only one genus, Salvadora. It is characterised by possessing a superior ovary, regular flowers, single carpel, single style with a simple stigma, and a one-celled fruit with a single seed. The position of the genus Salvadora has always been doubtful: by one author it has been referred to Chenopodiaceæ, although it has a monopetalous corolla; by others it is referred to Myrsinaceæ, from which it differs in the position of its stamens and the structure of the ovary and seeds. It is most nearly allied to Plumbaginaceæ and Plantaginaceæ; with the former it agrees in habit, and with the latter in the number of the parts of the flower, its membranous corolla, and simple style. They are Indian and North African plants, with eatable fruit.

SALVAGE. [Shipping.]

SALVA'TOR. [Sauvegarde.]

SALVATOR ROSA. [Rosa, Salvator.]

SA'LVIA (perhaps from *salvus*, healthy), a genus of plants belonging to the natural order Lamiaceæ or Labiatæ. It belongs to the Monopetalous division of Exogenous plants, and is known by its 2-lipped tubular or campanulate calyx; bilabiate corolla, with the upper lip usually arched; 2 stamens with halved anthers, having a flat dilated connective, which is placed vertically with the anther on the upper end. The species of this genus are well known both as ornamental shrubs and on account of their uses in domestic economy. The best known and that which is used most frequently in this country is the *Salvia officinalis*, the garden sage. It is a native of various parts of the south of Europe. It is a low straggling shrub, with erect branches, hoary with down, leafy at the base; entire, stalked, oblong, narrowed at the base or rounded leaves; nearly simple racemes; many-flowered distinct whorls; campanulate, coloured, membranous calyx; corolla two or three times as long as the calyx, with a large projecting tube ringed inside, the lips erect, the upper lip straight, the lateral lobes of the lower one reflexed. This plant is much used in cookery, and is supposed to assist the stomach in digesting fat and luscious foods. Sage-tea is also commended as a stomachic and slight stimulant. It is said that the Chinese prefer an infusion of sage-leaves to that of their own tea, and that the Dutch once carried on a profitable traffic by carrying sage-leaves to China, and bringing back four times the weight of tea-leaves.

Salvia pomifera, apple-bearing sage: leaves crenate, hoary, articulated with veins, lanceolate; heart-shaped at the base; calyx 3-lobed, bluntish. It is a native of rough open hills in Crete and various parts of the Levant. It is remarkable for being liable to the attacks of an insect of the Cynips genus, which produces upon their branches little protuberances similar to galls upon the oak, but much larger. These morbid growths contain an acid aromatic juice, and on this account are valued by the inhabitants of Crete as an article of diet.

Salvia sclarea, common clary: leaves oblong heart-shaped, rugged, villous, doubly crenate; bracteæ coloured, concave, longer than the calyx. This plant is a native of Italy, Syria, and Bithynia, and is one of the longest known of the exotic herbs found in British gardens. It is sometimes used for making wine, which has a taste resembling that of Frontignac, and is remarkable for its narcotic qualities.

S. splendens, *Indica*, *formosa*, and *fulgens* are all handsome ornamental flowers, and as such are much cultivated. All the plants of this genus are raised without much difficulty, and the most tender will live through the winter against a wall, and flower beautifully all summer. *S. chamædryoides* is a dwarf species, which is frequently found in gardens with flowers of an intensely brilliant blue.

S. pratensis, meadow clary, and *S. verbenacea*, wild English clary, are natives of Great Britain.

SALVIA'TI, IL, FRANCESCO ROSSI, so called from having been patronised and protected by the Cardinal Salviati, was the son of Michel Angiolo Rossi, and was born at Florence in the year 1510. He studied painting first under Andrea del Sarto, and afterwards under Baccio Bandinelli, and was fellow-student with Giorgio Vasari, between whom and himself there existed a strict intimacy. They studied together at Rome, and although the superior genius of Salviati prompted him to a higher class of design than that to which Vasari attained, the latter, with a remarkable freedom from jealousy, always in his writings celebrated the eminence of his friend. Indeed in his 'Le Vite di più eccellenti Pittori,' he speaks of the work of his fellow-pupil and countryman in the Palazzo Grimaldi at Venice, representing the history of Psyche, as the finest work in Venice. Whilst at Rome Salviati painted the Annunciation and Christ appearing to St. Peter in the Church of La Pace, and he embellished the vault of the chapel of his patron the cardinal with a series of frescoes representing the life of St. John the Baptist; he painted for the Prince Farnese a set of cartoons for the tapestry of his palace, displaying the principal events of the history of Alexander the Great, and, in conjunction with Vasari, he ornamented the Cancellaria with several fresco works.

From Rome he went to Venice, and from thence to Mantua and Florence, and in the latter city was employed by the grand-duke to decorate one of the saloons of the Palazzo Vecchio, where he painted the Victory and Triumph of Furius Camillus. He did not long remain at Florence, but, upon the invitation of the Cardinal de Lorraine, visited France, where he painted for Francis I. some part of the château of Fontainebleau. In Paris he executed a fine work for the church of the Celestines, representing the Taking down from the Cross; but not feeling satisfied with his situation in the dominions of Francis, he returned to Rome, where he died, in the year 1563.

The violence and turbulence of Salviati's disposition caused him to be frequently embroiled in quarrels, and his envious and illiberal disposition towards the merits of his brother artists provoked from them a comparison of his works with those of others, as uncalled for as unjust. Though received in France by Primaticcio, the superintendent of the works at Fontainebleau, with distinguished respect and much personal kindness, he acted towards that person with ingratitude; and when he returned to Rome, he fell into virulent disputes with Daniello di Volterra, Pietro Legorio, and others; and carried his violence to such excess that it is said to have brought on a fever, which proved fatal to him.

In invention Salviati was rich and fertile; in composition, original and copious; and though his colouring is not so highly esteemed as his strict correctness of design, his carnations are delicate and tender. He showed great skill in the management of his draperies, which are broad and simple, and yet do not conceal the beauty of his forms, whilst in the representation of architectural accessories he possessed a magnificent conception and a masterly style of handling, and was scrupulously exact in the delineation of the antient Roman costume. His pencil appears to possess more the spirit of Bandinelli than of Del Sarto, with the exception of the Descent from the Cross, in the Celestines in Paris, which strongly partakes of the style of the latter artist. (Pilkington's and Bryan's *Dictionaries*.)

SALVINIA'CEÆ, a small natural order of Acrogenous or flowerless plants. They possess rooting and floating stems; leaves sessile, entire, somewhat ovate, imbricated; receptacles globose, on the same individual of two forms, attached to the stem near the base of the leaves and the roots, closed, valveless, some filled with angular capsules confusedly enclosed, and by some taken for anthers; others one-celled, comprehending numerous small-staked many-spored bags inserted on a central column or on a tubercle of the base. This order comprises only two genera, Salvinia and Azolla. They are related in structure both to the Ferns and Mosses, and their nearest affinities are with Marsileaceæ and Polypodiaceæ; from the latter however they differ in having their conceptacles of two kinds, and from the latter by their being indehiscent. Azolla is a New Holland plant; Salvinia is common in the south of Europe.

SALZBURG, formerly the duchy of Salzburg, is now the circle of Salzburg, or of Salzach, in Upper Austria. It is bounded on the north and north-east by the circle of the Inn, on the east by the circles of the Hausrück and Traun, on the south-east by Styria (Steyermark), on the south by Illyria, and on the west by Tyrol and Bavaria. The area is not above 2800 square miles, since the cession of part of the country to Bavaria, and the population is about 145,000. It is an Alpine country, like Switzerland and North Tyrol, and it is covered by the Noric Alps, which on its southern frontier branch out from the Rhætian Alps. It may be considered as consisting of one great valley, the valley of the Salza, from its source to the point where it leaves the mountains, and of numerous lateral valleys, which open into it, most of which are traversed by rapid torrents. 'The principal valley, one of the most lovely,' says Hassel, 'that has been formed by nature, and adorned by the industry and magnificence of man, begins in the western corner of the country, runs first to the east, then to the north, and, especially on the right side, along the southern frontier, is enclosed by lofty mountains, the continuation of the central Alpine chain, which passing through Tyrol, to the eastern frontier of Salzburg, forms an almost uninterrupted chain of glaciers, here called Kees, presenting all the varieties of Swiss scenery, defiles, avalanches, cascades, lakes, &c.' Some of these mountains are covered with eternal snow. The chain of calcareous rocks which accompanies the central Alps to the north forms the frontier on the other sides, and its highest points are 8382 feet above the level of the sea. The country is open to the north only where the Salza issues from the mountains, and forms a fruitful plain, which however is marshy in some parts. The principal rivers are the Salza, the Saale, the Ens, and the Mur. The lakes are numerous; that called the Zellersee is ten miles long and above two broad. Of the many mineral waters, the hot springs of Gastein are the most celebrated. The cascade of the Krimonler Ache (which is the name of mountain-torrents in the language of the country) is the most striking in Austria; the torrent falls in five breaks from the height of above two thousand feet, forming at last a magnificent arch. There are other very fine cascades. The climate is much more severe than we should expect in a country situated between 46° 50′ and 48° N. lat. Even in the neighbourhood of Salzburg the hills, which are much lower than those of the south, are covered with snow by the end of September, though it does not lie permanently till November. In the south the winter lasts, with little intermission, from the beginning of November till April, and storms and frosts do not cease till the end of June. The heat in the summer is very great in the valleys, and vegetation is rapidly brought forward. Most of the valleys are very fruitful, and produce corn, flax, and fruit, which thrives even at the foot of the mountains. The middle mountain-region is covered with forests, and the upper with fine Alpine pastures, which afford subsistence to numerous herds of cattle, and to a breed of remarkably strong and large horses. Wild animals become more and more scarce, but there are still chamois goats, marmots, bustards, and heath-cocks. The corn produced is in general of excellent quality, but not sufficient for the home consumption. The products of the mineral kingdom are gold, silver, copper, iron, lead, cobalt, arsenic, rock crystal, marble, saltpetre, salt, sulphur, asbestos, and serpentine. The once celebrated mines of gold and silver now yield little; those of copper, iron, lead, and arsenic are very productive, and the salt-works and marble-quarries are very important. There are properly speaking no manufactures; the country people make their own clothing. The inhabitants are a robust race; they are characterised by superstitious prejudices, but also by natural good sense, honesty, and industry, and are much attached to their antient festivals and sports.

Salzburg was formerly governed by archbishops, who possessed very great privileges. In 1802 it was secularised, and, together with Berchtesgaden, Eichstädt, and the greater part of Passau, assigned to Ferdinand, grand-duke of Tuscany, as an indemnity for that country, which was taken from him by the treaty of Luneville, in 1801, and erected into the kingdom of Etruria. Ferdinand was an elector of the German empire. By the treaty of Presburg, in 1805, Salzburg was allotted to Austria, and Eichstadt and Passau to Bavaria. Ferdinand, in exchange, received the principality of Würzburg, which had been secularised and given to Bavaria in 1802. By the treaty of Vienna, 1809, Austria ceded Salzburg to Napoleon, who gave it to Bavaria in 1810. After the peace of Paris, in 1814, Salzburg was restored to Austria, and Würzburg to Bavaria, and Ferdinand was reinstated in his Italian dominions. The religion of the majority is the Roman Catholic; formerly the Protestants were numerous, but Count Firmian, prince archbishop of Salzburg (who presided over the diocese from 1729 to 1733), oppressed and persecuted them in so cruel a manner, that above 30,000 emigrated to other countries in Germany, especially Prussia, to England, Holland, Russia, Sweden, and North America, where their industry and skill proved highly beneficial.

In antient times we find Salzburg inhabited by the Celts, who, as dwellers on the Tauern (which is the name they still give in their language to the mountains), were called by the Romans Taurisci. Under the Romans Salzburg belonged to the province of Noricum, and Juvavia was built by Hadrian on the place where Salzburg now stands. The decline of the Roman power led to the ruin of Juvavia, which was plundered and destroyed by the German tribes. The country was nearly a desert when the pious Scotchman, Hrodbert (Ruprecht or Rupert), arrived there towards the end of the seventh century, under the reign of Theodo II., of the family of the Agilolsfingers. He built a chapel on an island in the Waller lake, and preached the doctrines of Christianity to the ignorant inhabitants, who were gradually attracted in considerable numbers. Theodo had a monastery and church built for him, which was dedicated to St. Peter, and was richly endowed. Arno, the seventh successor of Rupert, was raised in 798, by Pope Leo III., to the archiepiscopal dignity by the consent of the emperor Charlemagne.

SALZBURG, the capital of the province, is situated in 47° 13′ N. lat. and 13° E. long., on the banks of the Salza, over which there is a bridge 370 feet long and 40 wide. The situation is one of the most picturesque in Germany. The city is surrounded with an amphitheatre of lofty Alps, which form a noble background to the view. The river runs between two isolated mountains, the Mönchsberg on the left and the Capucinerberg on the right, leaving in many places only a narrow space on the banks on which the city is built. The streets are narrow and crooked, and the squares small, but regular. The houses are built of red marble from the neighbouring quarries, with flat roofs. The magnificence of the archbishops adorned the city with so many splendid buildings, chiefly in the Italian style, that Salzburg was called Little Rome. It is surrounded with walls and bastions, and has eight gates, one of which, called the new gate, is a passage cut through the Mönchsberg, 300 feet long, 30 feet high, and 24 broad. Salzburg is still the see of an archbishop and chapter. The university, founded in 1620, was abolished in 1800, and a lyceum or academy established in its stead, which has a library of 30,000 volumes, a botanical garden, and a geological museum. The monastery of St. Peter has a library of 40,000 volumes. The city has a theatre, four hospitals, a lunatic asylum, and many other charitable and useful public institutions. The cathedral was built in the seventeenth century (1614-1668) by Santino Solari of Como, in the Roman style, with a façade of white marble. It is adorned with many statues of white marble, and good paintings by Sandrart, Remsi, and others. St. Peter's church contains the tombs of Haydn and St. Rupert. The fine church of the antient university was built in 1696-1707, in a mixed Greek and Roman style. St. Margaret's, a handsome edifice, was built in 1485. The church of the Benedictine nuns has some beautiful painted-glass windows executed in 1480. The palace called the Winter Residence is a very extensive building ornamented with columns, but destitute of symmetry: it is now used for public offices. The square in front of it is adorned with the finest fountain in Germany, 45 feet high, made entirely of white marble. On the opposite side of the square is a magnificent palace called the Neubau. The town-house and the palace of Count Kerenburg are also splendid buildings. The stables for 130 horses are accounted the handsomest in Europe. A stream called the Alberbach flows through them; the racks are of white marble. Two fine riding-schools, one for the summer, and one for the winter, are attached to the stables. There are many other buildings, for instance some of the 26 churches, that deserve notice. In 1818 Salzburg was visited by a dreadful conflagration, which destroyed the beautiful church of the Holy Trinity, the two palaces of Count Ledron, the lunatic asylum, the splendid palace of Mirabell, which was the summer residence of the archbishops, and the church of St. Sebastian, with the tomb of Paracelsus, and many other public buildings, with 100 houses. The damage was estimated at above five millions of florins. The palace of Mirabell and the church of St. Sebastian have been rebuilt. Salzburg is rich in Roman antiquities. One of the most remarkable is a Roman bath, now in the court-yard of St. John's Hospital. A very fine mosaic pavement has been removed to Vienna, and the important collection of antiquities, unrivalled in Germany, made by Mr. Rosenberger on his estate near Salzburg, is now at Munich. The fortress of Hohensalza, commanding the town, from which there is a most interesting prospect, is now used as a prison. There are in the town one military and three civil hospitals, an hospital for incurable patients, several schools, and many other useful and charitable institutions. The inhabitants, about 13,000, manufacture calicos, leather, and hardware, and derive considerable benefit from two well attended fairs, and from an important transit trade between the eastern Austrian provinces and Bavaria, and between the latter and Italy. The environs of Salzburg are in many respects highly interesting; the prospects from some points are most extensive, embracing a great variety of grand and picturesque scenery.

(Jenny, *Handbuch für Reisende in dem Oesterreichischen Kaiserstaate; Oesterreichische National Encyclopädie;* Blumenbach, *Gemälde der Oesterreichischen Monarchie; Conversations Lexicon*, 8th edition; Masselin, *Dictionnaire de Géographie.*)

SALZWEDEL is the chief town of a circle of the same name, in the government of Magdeburg and province of Saxony, in Prussia, which is 470 square miles in extent and contains 40,000 inhabitants. The town is situated on the river Jeetze, at its confluence with the Demme, after which junction it becomes navigable. It is surrounded with walls and moats, and has six gates. It is divided by the Jeetze into the old and the new town, and has two suburbs

Bockhorn and Perwez. There are six churches, most of them venerable for their antiquity, two hospitals, a gymnasium, a poorhouse, and numerous public offices. The population amounts to 7225. The principal manufactures are of woollens, linen, cotton, gloves, shoes, tobacco-pipes, and needles. There are likewise tanneries, breweries, and distilleries. The inhabitants carry on a considerable trade in cattle, corn, and hops, and export large quantities of their own manufactures, especially woollen cloths and linen. The whole surrounding country is supplied with shoes from this town.

SAMADE'RA, a genus of plants of the natural family of Simarubaceæ, which was named by Gærtner, though the origin of the name is unknown. The genus, though containing but few species, includes Vittmannia of Vahl and Niota of Lamarck. The genus is characterised by having bisexual flowers. Calyx 4-5 partite. Petals 4-5, much longer than the calyx. Stamens 8-10. Ovaries 5-seeded, on a short stalk-like gynophore. Styles as many. Fruit of one or more carpels, usually drupaceous. The genus is composed of trees or shrubs, with simple alternate and reticulately-veined leaves. Peduncles are axillary or terminal, pendulous when in fruit, and divided at the apex into a 5- to 12-flowered umbel. S. tetrapetala is a shrub, ten feet in height, a native of Madagascar. S. lucida (Niota lucida) is another shrub, figured by Dr. Wallich, *Pl. As. Rar.*, t. 168, from Amherst, on the coast of Martaban. S. indica (pentapetala of authors) is a large tree, a native of Southern India, especially on the Malabar coast, of which the fruit and bark are intensely bitter, like that of the other plants of the Quassia family.

SAMANIANS, a Persian dynasty under the khalifs, of which the founder, Ismael, was the first who had the title of Padishah (king). As the Mohammedan possessions increased in extent, the governors of the provinces gradually usurped a more extended and less dependent power, sometimes refusing to their spiritual and temporal superior the nominal allegiance which at others they were content to pay. Amru Laith, a governor of this class, ruled Khorasan, Fars, and Irak, and his extent of dominion raised the jealousy of the khalif Motadhedh, who stirred up against him Ismael Samani, a chief who had been for some time rising into a power, of which the first foundation had been laid by his grandfather Saman. Ismael passed the Oxus into the states of his rival, and prepared to dispute his possessions by arms; but the contest was decided in a more unusual manner. The horse of Amru took the bit in his teeth and carried his rider into the camp of the enemy. His soldiers, left without a commander, fled, and thus a large portion of Persia was added to the dominions of the fortunate conqueror. It is said that Ismael sent an officer to console and comfort his prisoner, a kindness which Amru returned by sending to his captor a list of the places where he had stored his treasures. Ismael however refused even to look at this; treating the offer as an attempt to throw upon him the guilt incurred in the unjust accumulation of these treasures. The ultimate cause of their discovery, say the historians of this dynasty, was as singular as any part of this extraordinary correspondence. The ruby necklace of one of the wives of Ismael was carried off by a bird of prey, who took it for a piece of flesh. Pursued by soldiers with shouts and clashing of arms, he dropped the splendid booty into a well, and in this well were found, after a diligent search, the treasure in question. Ismael was recognised as king by Motadhedh in 287 of the Hejira (A.D. 900), and reigned seven years. His descendants who held this kingdom from father to son, except in the last two instances, in which it passed from one brother to another, were, Ahmed, Nasser, Noah, Abdalmelek, Mansor I., Noah II., Mansor II., and Abdalmelek II. The dynasty was superseded by Mahmoud of Ghizni, who incorporated their dominions with his own empire, after they had held the greater part of Persia for more than 100 years.

SAMAR. [PHILIPPINES, p. 86.]

SAMARANG. [JAVA, p. 98.]

SAMARCAND is a town in Asia, in the khanat of Bokhara, and situated near 40° N. lat. and 66° 40′ E. long. It is built not far from the banks of the river Zer-afshan, nearly in the centre of the fertile valley which extends on both sides of the river and is called El Sogd. The country about the town is traversed by a great number of canals which are used for the irrigation of the fields. The town is mentioned in the history of Alexander the Great, under the name of Maracanda, the capital of the Persian province of Margiana, and seems to have been a flourishing town. (Arrian, *Anab.*, iv. 3.) In the times of the caliphs it acquired some fame as a seat of learning, but it attained its greatest glory in the fourteenth century, as the usual residence of the famous conqueror Timur. Ulugh-Begh, the successor of the great warrior, being of a different disposition, raised the fame of the town (in the fifteenth century) as a seat of learning, by his love of science, especially of astronomy. He ordered those astronomical tables to be made which go under his name. At that period it was a large and splendid town. But the family of Timur was driven from the throne and country by an irruption of the Uzbeks towards the end of the fifteenth century, and as their chief removed the royal residence to the town of Bokhara, Samarcand began to decline. We have no account of the present state of the town from an eye-witness. Meyendorff states that it still contains 50,000 inhabitants, that the mesids (lower schools) and medresses (high schools or colleges) are numerous, and built of white marble, which is got from quarries in the neighbourhood; and that the fronts are of varnished bricks, as in Bokhara. The tomb of Timur still exists: it is made of jasper. There are no traces of the observatory of Ulugh-Begh. Burnes says that the population is not more than 8000, or at most 10,000, and that gardens and fields occupy the sites where mosques and streets formerly stood. Yet there are still some buildings which attest its former splendour. Three of the colleges are perfect, and one of these, which formed the observatory of Ulugh-Begh, is very handsome; another college, Sheredah, is also of beautiful architecture. The tomb of Timur remains, and is under a lofty dome, the walls of which are beautifully ornamented with agate. Both travellers were prevented from going to Samarcand by the jealous policy of the government of Bokhara. There were formerly manufactures of silk-paper in this town, and it has been supposed that this article was first made there, but probably the invention passed from China to Samarcand.

(Meyendorff's *Voyage d'Orenbourg à Boukhara*; Burnes's *Travels into Bokhara, &c.*)

SAMARIA. [PALESTINE.]

SAMARITAN CHARACTERS, are the old Hebrew characters, which were disused by the Jews during the Babylonish captivity, but retained by the Samaritans, from which circumstance, and especially from their being used in the extant copies of the Samaritan Pentateuch, they have obtained their present name. They are nearly the same as the Phœnician characters. [ALPHABET, p. 382; HEBREW.]

SAMARITANS. After Shalmanezer, king of Assyria, had taken Samaria and carried the ten tribes of Israel into captivity (721 B.C.), he re-peopled the city of Samaria and the surrounding district, which formed the central part of Palestine [PALESTINE], from Babylon, Cuth, Ava, Hamath, and Sepharvaim; and these people, joined with the remnant of the Israelites, were from this period called Samaritans, and sometimes Cuthites. Being plagued with lions as a punishment for their idolatry, immediately after their establishment in the land, they asked aid of the king of Assyria, who sent them one of the captive priests of Israel to instruct them in the worship of Jehovah. The result was that they served Jehovah without renouncing the worship of their own gods. (2 *Kings*, xvii. 24-41.) When the Jews, returned from the Babylonish captivity, began to rebuild the temple at Jerusalem, the Samaritans requested that they might share in the work, pleading that they had worshipped the God of the Jews ever since their settlement in the land. Upon the refusal of this request, they did all they could to hinder the work, and at last succeeded in causing it to be discontinued till the second year of Darius Hystaspes, B.C. 520 (*Ezra*, iv.), and they afterwards offered similar opposition to the rebuilding of the walls of Jerusalem by Nehemiah. (*Nehem.* iv.) From this cause chiefly sprung the inveterate enmity which ever after existed between the Jews and the Samaritans. In the reign of Alexander the Great, according to Josephus, Manasseh, a brother of the high-priest Jaddua, having been expelled from Jerusalem for marrying the daughter of Sanballat, a Samaritan and governor of Samaria, fled to his father-in-law, who obtained Alexander's permission to build a temple to Jehovah on Mount Gerizim, and appointed Manasseh its priest. (Joseph., *Antiq.*, xi. 8.) Prideaux and Jahn think that Josephus has made a confusion between Darius Nothus and Darius Codomannus, and thus placed Sanballat in the reign of the latter; whereas he actually lived in the reign of the former, and was the great opponent of Nehemiah, by whom he is mentioned as having a son-in-law, who was a son of the high-priest Joiada, and was expelled from Jerusalem on account of his marriage with Sanballat's daughter. (*Nehem.*, xiii. 28; comp. Prideaux's *Connections*, i., p. 591; Jahn's *Biblische Archäologie*, ii. 1, p. 278; Winer's *Biblisches Realwörterbuch*, art. 'Nehemias.') The building of the temple on Gerizim seems to have put a final stop to the remains of idolatry among the Samaritans, but it widened the breach between them and the Jews, and from this period Samaria became an asylum for offenders against the Jewish laws. The Samaritans readily submitted to Alexander, and aided him in the siege of Tyre with seven thousand men. When Alexander marched into Palestine (B.C. 332), the inhabitants of Sichem, one of the chief cities of Samaria, requested exemption from tribute in the Sabbatical year, asserting that they were of Hebrew extraction; but when, in answer to the question 'whether they were Jews,' they replied that they were not, Alexander promised to consider of their request after his return from Egypt. Thither he took with him the Samaritans who had joined him before Tyre, and gave them lands in the Thebais. The next year, while Alexander was in Egypt, some Samaritans put to death Andromachus, the Macedonian governor of Samaria. The other Samaritans gave up the culprits to Alexander, who, not content with punishing them, drove out the inhabitants of Samaria, and planted in it a Macedonian colony. From this period Shechem, or Sichem, was the metropolis of the Samaritans. During the persecution of Antiochus Epiphanes, the Samaritans disclaimed all kindred with the Jews, and dedicated their temple on Gerizim to Jupiter Hellenius (167 B.C.). John Hyrcanus made war upon them, conquered Sichem, and destroyed the temple on Gerizim, after it had stood about two hundred years (about 129 B.C.); but the Samaritans still continued their worship on that mountain. (*John*, iv. 20.) Samaria formed a province of the kingdom of Herod the Great, who rebuilt the city of Samaria, and gave it the name of Sebaste. After Herod's death, it was subject to Archelaus, and was afterwards united to the Roman province of Syria. Samaritans are still found in their old country, especially at Nablous, near Sichem, and also in Egypt; and they have at various times corresponded with learned Europeans.

The religion of the Samaritans, at least after the building of the temple on Gerizim, differed but little from that of the Jews. They received however no part of the Hebrew scriptures except the Pentateuch [PENTATEUCH, SAMARITAN], but they expected a Messiah, and it is remarkable that their notions of his office were more correct than those of the Jews. (*John*, iv.; Horsley's *Sermons*, 24-26.) They have been accused by Christian writers of Sadducean tenets. (Josephus, *Antiq.*, xi., xii.; Prideaux's *Connections*; Jahn's *Biblische Archäol.*; Winer's *Biblisches Realwörterbuch*; Calmet's *Dictionary*; Kitto's *History of Palestine*.)

SAMBAWA. [SUMBAWA.]

SAMBOR, one of the nineteen circles of Austrian Galicia, has an area of 2124 square miles, with 300,000 inhabitants, of whom above 16,000 are Jews. It is bounded on the north-west by the circle of Przemysl, on the north-east by Lemberg and Brzezani, on the south-west by Stry, on the west by Sanok, and on the south by the kingdom of Hungary. The southern half of the circle is mountainous, with large forests; the soil in many parts is stony. The northern half is a plain and very fertile. The Dniester and the Stry are the two principal rivers, both of which rise in the Carpathian Mountains. The circle produces corn, pulse, and timber. Iron is found in the mountains, which supplies some smelting-houses. The salt-springs are of more importance. The breed of cattle is indifferent. The manufactures are inconsiderable; there are some of linen, hempen-cloth, thread, and wooden utensils.

SAMBOR, the capital of the circle, is situated in 49° 31′ N. lat. and 23° 14′ E. long., in a beautiful and fertile plain on the banks of the Dniester, 46 miles south-west of Lemberg. It is tolerably well built, and with the suburbs, which are much more considerable than the town itself, has 9000 inhabitants. There are here the civil tribunal for the circle, a criminal court, a district court for miners, a gymnasium, a high school, and other public institutions. The inhabitants manufacture and bleach linen, especially very fine damask. The making of salt likewise employs numerous hands. There is a government magazine for salt and tobacco; and in the environs there are extensive plantations of rhubarb. The town of Drohobiez, to which Schlieben, in 1833, gives only 3116 inhabitants (viz. 478 Christians and 2638 Jews), is stated by Stein in 1818 to have 7140 inhabitants; by Hassel, 1819, 7200; by Hörschelmann, 1834, 11,300; and by Cannabich, 1836, 11,290 inhabitants: we cannot account for this strange diversity.

SAMBRE. [FRANCE.]

SAMBU'CUS (from *σαμβύκη*, a musical instrument), the name of a genus of plants belonging to the natural order Caprifoliaceæ. It is known by possessing a five-cleft calyx; rotate, urceolate, five-cleft corolla; five stamens; three sessile stigmas; a roundish pulpy one-celled berry, hardly crowned by the remains of the calyx, with three or four seeds. The species are low deciduous trees inhabiting Europe and North America. The best known of the species is the common or black elder, *Sambucus nigra*. It is a small tree or large bush; the stem is irregularly, but always oppositely, branched; the young branches are clothed with a smooth grey bark, and filled with a light spongy pith; the leaflets are deep green and smooth, usually with an odd one; the inflorescence is a cyme composed of numerous cream-coloured flowers, with a sweetish but faint and heavy smell; fruit a globular purplish-black berry, with reddish stalks. This plant is a native of Europe, the north of Africa, and the colder parts of Asia. It is very common in most parts of Great Britain, and is generally found near human habitations. Considerable medicinal value has at all times been popularly attributed to this plant, and it is only recently that it has fallen into comparative disuse amongst medical practitioners. The berries, flowers, and leaves have been all used in medicine, and expectorant and diaphoretic properties have been attributed to them. In the rural districts of England a wine is made from the berries, which is in great repute, and when drunk hot, is an agreeable stimulant. The flowers are employed for making a distilled water, which is frequently used as a refrigerant, and on account of its agreeable odour is introduced into many articles of confectionery. The first year's branches, when deprived of their abundant pith, are in great demand amongst schoolboys for making pop-guns, miniature muskets, &c. They have also been very generally employed for making flutes and rustic pipes. The pith, on account of its solidity and great lightness, is used for making small figures and balls for electrical experiments. The undeveloped buds, when pickled, form a good substitute for capers. In planting, it is recommended as a good nurse for plantations near the sea-shore, but it does not bear fruit in such situations. In the county of Kent, it is grown in orchards and gardens for the purpose of obtaining the fruit. The elder requires a good soil in a moist situation, and, for the production of its fruit in perfection, should be freely exposed to light and air. It will grow readily from cuttings and truncheons.

S. Ebulus, dwarf elder or danewort, is distinguished by its cymes with three principal branches, lanceolate leaves, foliaceous stipules, and herbaceous stem. It is not an uncommon plant in England and Scotland in way-sides and waste places. It has a very fetid smell, and the roots are violently purgative.

S. Canadensis, Canadian elder: cymes with five principal branches: leaflets, four pairs and an odd one, oblong, oval, acuminated more or less, pubescent beneath. The flowers are nearly scentless. It is a native of North America throughout Canada to the Carolinas.

S. racemosa, red-berried elder: leaflets five, membranous, oblong, acuminated, serrated, unequal at the base; petioles glabrous; flowers of a whitish-green colour. It is a native of the south of Europe and Siberia. It is a showy plant, and has a splendid appearance when covered with its fine large scarlet fruit. Many other species of this genus are worth cultivation on account of their flowers, fruit, and foliage. Amongst these, *S. laciniata*, the parsley-leaved elder, and *S. pubens*, the downy elder, may be mentioned.

SAMIELI is the Turkish name of a wind which the Arabs call *samoom* or *simoom*, which in Egypt is called *khamsin*, and in Senegambia and Guinea *harmattan*. It occurs in most countries which are situated at no great distance from sandy deserts, and it blows always from that quarter in which the desert is situated. Thus in Senegambia and Guinea it blows from the north-east, in the Delta of the Nile from the south-south-west and south-west, on the eastern shores of the gulf of Suez from the north, east, in Syria from the south-east, at Mecca from the east, at Bagdad from the west, at Basra from the north-west, and at Surat from the north. These winds are extremely hot, and a considerable quantity of fine sand is generally suspended in the air, which has been collected by the winds in rushing over the desert. They affect the human body very powerfully, producing great feebleness, and sometimes even death. They usually consist of a quick succession of hot and cold puffs of wind; and the difference of the temperature between these puffs, which is stated to amount to more than twenty degrees of Fahrenheit's thermometer, is probably one of the reasons of their effect on animal bodies being so great. It is also thought that the hot puffs bring a pestilential air, as a putrid and sulphureous smell is perceived when they blow. Formerly it was asserted that the hurtful effects of the wind could be avoided by a person throwing himself on the ground with the mouth downward; but modern writers say that the Arabs disapprove of such a proceeding, and perhaps justly, if it is true that the hot air is heavier than the atmosphere. To diminish the effects of the wind, the Arabs cover their faces with the *kefieh*, a handkerchief which they wear on their heads.

SAMNITES, an antient nation or confederacy of nations in Central Italy, known in history for its bravery and long struggle against Rome. The Samnites occupied an extensive tract of country on both sides of the central ridge of the Apennines, including the valleys of the Vulturnus, Tamarus, and Calor, towards the Tyrrhenian Sea, and those of the Sarus, Tifernus, Trinius, and Frento, towards the Adriatic, and corresponding to the present provinces of Sannio and Principato Ultra, and parts of Terra di Lavoro, and of Abruzzo Citra, in the kingdom of Naples. The territory of the Samnites was bounded on the north by the Peligni and Marrucini, and by the Adriatic, for the Frentani, who extended along the coast of that sea, formed part of the Samnite confederation, and were also of Sabine origin. On the east the Samnites were bounded by Apulia and Lucania, on the south by the Campanians, being divided from the latter by the ridges of Tifata and Taburnus, and on the west by Latium Novum and the country of the Marsi. The Samnites were originally a colony of the Sabini, which migrated in remote times, probably before the building of Rome, to the banks of the Vulturnus and the Tamarus, and thence spread on one side as far as the plains of Apulia, and on the other to those of Campania. They were an agricultural and pastoral people, and as their numbers increased beyond the means of subsistence, they followed the custom of their Sabine ancestors, and sent forth colonies, which were the origin of the Lucanians, who gradually extended as far as the southern extremity of the peninsula. The Samnites were divided into several nations or tribes, known by the names of Pentri, Caudini, Caraceni, Hirpini, and Frentani, the three first of which inhabited the country designated by the name of Sabinium Proper, having the Frentani on the north, and the Hirpini to the south-east. Their principal towns were: 1, Bovianum, the head town of the Pentri, now Boiano, at the foot of the lofty Mount Matese, near the sources of the Tifernus; it was, according to Livy (ix. 31), an opulent and important town; part of the walls, formed of irregular polygonal stones, still remains. 2, Æsernia, now Isernia, on the opposite or western side of the Matese ridge. 3, Allifæ, now Alifi, south of Æternia, in the valley of the Vulturnus. 4, Maluentum, afterwards called Beneventum. [Benevento.] 5, Caudium, long since destroyed, stood near the modern village of Arpaia, on the road from Benevento to Naples. 6, Æclanum, in the country of the Hirpini; its remains are at Mirabella, near Frigento, not far from the sulphureous lake of Ampsanctus in the group of mountains which rises between Basilicata, Apulia, and the two Principati. Virgil (*Æn.*, vii. 563) gives a fine though poetically coloured description of the phenomena of this lake, now called Mefiti by the natives, which throws up its fetid water in jets to the height of about four feet in some places, accompanied by a slight noise. 7, Telesia, now Telese, near the banks of the river Calore. 8, Aufidena, or Alfidena, the chief town of the Caraceni, in the valley of the Sarus or Sangro, where a village still bears the name of Alfidena. 9, Acudunnia, in the country of the Hirpini, on the site of the modern Lacedogna, on the borders of Apulia. 10, Taurasium, on the river Calore, where there are considerable remains, and several sepulchral inscriptions near the modern village of Taurasi. Pyrrhus was here defeated by Curius Dentatus. 11, Compsa, now Conza, in a strong position near one of the sources of the Aufidus or Ofanto. 12, Sæpinum, in the mountains east of Bovianum. 13, Abellinum, now Avellino. 14, Larinum, in the country of the Frentani, near the site of the modern Larino. 15, Histonium, near the site of the present town of Vasto. 16, Anxanum, the remains of which are on a hill near the town of Lanciano; and farther north, 17, Ortona, which has retained its name, and was the chief fortified town of the Frentani. The whole country of the Samnites was very populous, and full of towns or large villages, the names of many of which alone remain, without a trace of their site.

The Samnites brought at various times as many as eighty thousand armed men into the field. Their chief strength consisted in their infantry. Their government appears to have been a kind of aristocracy, in which the priests exercised a great influence. Livy (x. 38) portrays in a vivid manner the awful religious ceremonies with which they prepared for battle, and the fearful imprecations denounced against those who should turn their backs on the enemy. In another place (ix. 40) he describes the army of the Samnites as splendidly accoutred, with shields embossed with gold and silver, and shining white and party-coloured tunics; and (x. 46) he speaks of two millions of pounds weight of coined copper taken from them by the younger Papirius: all which shows that the Samnites were no longer a rustic people, but were acquainted with the arts of luxury, which they had probably acquired from their intercourse with their Greek neighbours of Tarentum and of the coast of Campania. But they never became effeminate and corrupt like the Campanians, and they retained to the last their character for hardiness, perseverance, and devotedness to their country. Each of the nations of Samnite race had its own independent government, its magistrates, and its comitia. The chief magistrate of each nation was styled Meddix Tuticus, an Oscan denomination, as the Samnites appear to have spoken a dialect of the Oscan, and to have used Oscan characters. [Osci.] It was only in cases of urgent necessity, such as resistance to a common invader, that the various Samnite states acted in concert, and then only for a time. This looseness and uncertainty of the federal union of the Samnites, if such it may be styled, was one main cause of the ultimate triumph of Rome over them, as well as over the Etruscans and other Italian nations, who were likewise divided into small independent states.

Between the years 330 and 333 of Rome, the Samnites attacked the Etruscans, who had settled in the plains of the Osci or Opici about half a century before, and who had founded or colonised Vulturnum, to which town the Samnites afterwards gave the name of Capua. (Livy, iv. 37.) According to Livy, the Etruscans, being weary of war, admitted a Samnite colony to share with them their houses and fields; but on the occasion of a great festival, when the old inhabitants were overcome by sleep after banqueting, they were murdered by the Samnite colonists, who formed the new state of Capua, or Campania Proper, which figured so much in the subsequent history of the wars of Rome. [Campania.]

About 340 B.C., the first war broke out between the Samnites and the Romans. The Campanians of Capua, who were originally a mixture of Samnite colonists and Osci, were by this time an independent people, distinct from the Samnites proper of Samnium, and they had become corrupt and effeminate, like their Etruscan predecessors. The Sidicini, a small nation that inhabited the left bank of the Liris, being attacked by their Samnite neighbours from the mountains, requested the assistance of the Campanians. The latter came into the field, but were twice defeated by the Samnites, who, descending from Mount Tifata, overran the Campanus Ager, and laid siege to Capua. The Campanians then sent ambassadors to the Roman senate to ask for aid against their formidable enemies, to which the senate objected, that there existed a previous fœdus or alliance between the Samnites and Rome. The Campanian ambassadors in depair made a solemn surrender, in the name of their countrymen, of their towns and fields, the altars of their gods, and all they were possessed of, to the Roman people. Upon this the senate sent messengers to the Samnites to request them to abstain from molesting the Campanians, who were now subjects of Rome. The supreme council of the Samnites resolutely refused compliance, and some of their magistrates came out of the curia or council-hall, and in presence of the Roman messengers ordered the prefects of the cohorts to proceed without delay to devastate the Campanian territory. Upon hearing this, the senate sent the feciales to declare war against the Samnites. Two armies were ordered out, one, under the consul M. Valerius Corvus, into Campania, and the other, under A. Cornelius Cossus, into Samnium. Valerius, after an obstinate fight, routed the Samnites, who abandoned their camp in the night. The Romans acknowledged that they never before met such stubborn enemies. The other consul having entered the confines of Samnium by the valley of Saticula, at the foot of Mount Tifata, found himself surrounded by the Samnites, who were posted on the heights. A legionary tribune named Decius Mus, by his intrepidity and quickness in marching up to a height yet unoccupied by the enemy, was the means of extricating the Roman army, which attacked and defeated the Samnites. A third battle took place near Suessola, in the plain of Campania, in which the Samnites were again defeated. The two consuls re-entered Rome in triumph. In the following year a formidable mutiny, which broke out in the Roman army, and which was with difficulty quelled by the dictator Valerius Corvus, prevented any active operations in the field. In the subsequent year, the consul L. Aemilius Mamertinus, entered the country of the Samnites, who sued for peace, and obtained it. This was followed by a war between the Samnites on one side, and the Sidicini, Latini, and Campanians on the other, which led to the final war between the Latins themselves and the Romans, and the total subjection of the former. [LATINI.] In this last war the Samnites appeared as auxiliaries of Rome.

In the year 323 B.C. a new war broke out with the Samnites, on the occasion of the Romans besieging the Greek town of Palæopolis, which was garrisoned by a party of Samnites, but which the Romans took by a secret understanding with the inhabitants. The Samnites were joined by the Lucanians. L. Papirius Cursor being appointed dictator to carry on the war, his master of the horse, Q. Fabius Maximus Rullianus, attacked the Samnites in his absence and against his orders, and defeated them, but for this breach of discipline he was condemned to death by the dictator, and only saved by the interference of the soldiers and of the people of Rome. [PAPIRII.] Papirius himself defeated the Samnites, who asked for and obtained one year's truce. But before the expiration of the truce, the Samnites having again attacked the Roman territory, the dictator, A. Cornelius Arvina, with M. Fabius Ambustus, his master of the horse, was sent against them. The Roman army, being surprised by the enemy in an unfavourable position, after five hours' desperate fighting was in danger of being totally defeated, when the Samnite cavalry, seeing the baggage of the Romans moving away in the rear without protection, rushed forward in disorder for the sake of plunder. The dictator, who expected this, allowed them to begin plundering, and then ordered his own cavalry, which he had kept in reserve, to fall upon the enemy's horse, which were cut to pieces. The Roman cavalry then returning, attacked the Samnite infantry in the rear, while the Roman legions pressed them in front with renewed ardour. At last the Samnites gave way, and the defeat was complete. Their general was among the killed. This disaster disheartened the Samnites, who exclaimed that this was a consequence of their having broken the truce, so that the wrath of the gods ought to be appeased. Accordingly the magistrates decreed that Brutulus Papius, one of the chief men in the country, who had instigated the renewal of the war, should be given up to the Romans, together with his property, as well as the Roman prisoners who were in the hands of the Samnites. But Brutulus killed himself, and his body was sent to Rome, together with the prisoners. The Roman senate declined taking the property of Brutulus, and also refused to grant peace to the Samnites. (Livy, viii. 23, 39.)

In the following year, 321 B.C. the Samnites having made great preparations for war, gave the command of their forces to Caius Pontius, son of Herennius, an experienced officer, who had already served against the Romans. He placed his troops in ambuscade in a defile between Mount Taburnus and an offset of the Tifata ridge, through which flows the small river Isclerus, an affluent of the Vulturnus. This was the direct road for the Roman army, which was posted at Calatia, north of the Vulturnus, to proceed by to Maluentum. [BENEVENTO.] Pontius sent emissaries, disguised as shepherds, towards the Roman outposts, who, being seized and questioned said that the Samnite forces were then engaged in besieging Luceria, a town of Apulia, which was in alliance with Rome. The consuls T. Veturius Calvinus and Sp. Posthumius, after some consultation, resolved to march to the assistance of Luceria by the most direct way, which was across the Vulturnus, at the confluence of the Isclerus, and then through the defile towards Maluentum. Advancing through a narrow gorge, they came to a little valley between the mountains, and farther on to another narrow defile, which they found barricaded with trunks of trees and pieces of rock, and looking up they saw the Samnites posted on the hills. The Romans thought of retracing their steps, and recrossing the little valley, but they found the other narrow pass, leading to the banks of the Vulturnus, also barricaded and defended. The consuls then ordered the army to encamp in the plain and to fortify themselves. The Romans spent the night in a state of discouragement, whilst the Samnites held council concerning what was to be done with the Roman soldiers when they surrendered. They sent to consult Herennius, the father of their general, an old man, retired from active life, who had a great reputation for wisdom. His answer was, to open a passage for the Romans and let them retire without molestation. This appeared absurd to the Samnite officers, who sent a second message to Herennius, who then said that they should put to death the whole Roman army. Puzzled at these contradictory opinions, the Samnites sent for Herennius himself, who was brought in a cart to the camp, and appearing in the military council, explained his meaning:—'If you follow my first advice,' said he, 'your generosity will win you the affection and friendship of a powerful nation; if you refuse that, then you must destroy the Roman army, by which means you will render Rome unable to annoy you for a long time to come.' 'But,' said his son, and others with him, 'supposing we take a middle course, and dismiss the Romans after imposing upon them those conditions which befit a conquered army?' 'By this means you neither make friends nor get rid of enemies; you spare those who will never forgive you for their own humiliation, and who will take the first opportunity of revenging themselves.' The advice of Herennius however was rejected. The Romans, after attempting to break through the surrounding enemy, and feeling the want of provisions, sent messengers to ask for honourable conditions. Pontius told them that they must consider themselves his prisoners, and as such give up their arms and file off, under a yoke or gallows, in presence of the whole Samnite army, after which they would be allowed to return home; that at the same time peace should be concluded between the two nations on fair conditions; that the Romans should evacuate the Samnite territory and withdraw the colonies which they had placed on the border, and a treaty of mutual alliance be entered into. The consuls, after much hesitation, replied that they could not conclude an alliance without the consent of the Roman people, but they and all the officers, submitting to necessity, subscribed to the conditions of peace dictated by Pontius, they and the legionary tribunes becoming personally guarantee for their fulfilment, besides leaving six hundred hostages in the hands of the Samnites. Then came the ceremony of passing under a yoke one by one, the consuls first, despoiled of their consular robes and other insignia of their rank, then the officers in like manner, and lastly the common soldiers amidst the taunts and threats of the surrounding Samnites, who struck and even killed those of the Romans who showed any resentment for the insult. The spot on which this transaction occurred became known by the name of the 'Caudine Forks,' from its being in the neighbourhood of Caudium.

When the news of this mishap reached Rome, it produced universal consternation. The conditions of the peace being discussed in the senate, the consul Posthumius proposed to annul the treaty, offering to surrender himself, and the tribunes who had signed it, to the Samnites. Two of the tribunes of the people contended that this was not sufficient to annul the solemn engagement made with the Samnites, but they were overruled, and Posthumius and the legionary tribunes, escorted by a fecialis, were led back to the Samnite camp, with their hands bound and given up to Pontius, the fecialis saying that they were guilty of concluding a treaty without authority. Posthumius, pretending to be offended, struck the fecialis, and then drawing back, cried out, that as he was now a Samnite, and as such had struck an envoy of Rome, he had thereby afforded a sufficient reason to Rome for renewing the war. Pontius bitterly reproached Posthumius for this despicable subterfuge, and said to the fecialis that if the Romans did not approve of the treaty, they ought to send back the whole army to the same position which they had occupied previous to their surrender. He ordered his lictors to release the prisoners, and gave them permission to go where they pleased. The war was continued, and the Samnites took Fregellæ, a Roman colony, and killed all the inhabitants. One of the new consuls, Papirius Cursor, marched against Luceria, which was in possession of the Samnites, and in which the six hundred Roman hostages were detained. After defeating the Samnite army which came to relieve it, Papirius took the town and obliged the garrison to pass under the yoke. The war was carried on for several years, generally to the disadvantage of the Samnites, if we are to believe Livy's account, until 308 B.C., when the consul C. Marcius Rutilius was defeated and wounded, in consequence of which Papirius Cursor was named dictator, and he defeated the Samnites. But notwithstanding these repeated defeats, and the evidently exaggerated numbers of the Samnites, who, according to Livy, fell or were taken prisoners every year, and by which the whole country of the Samnites must have become depopulated, we still read of large Samnite armies appearing again in the field every succeeding year, and not only defending their country, but overrunning Campania, invading the borders of Latium, and fighting conjointly with the Etruscans, the Umbri and the Marsi, Peligni and Hernici. Wars were carried on in those times in a very different manner from what they were afterwards, in the latter ages of the republic and under the empire. Every year a certain number of citizens, mustered under the new consuls, went into the field, fought a battle, and if successful, made an inroad into the enemy's territory, and after a few months, perhaps weeks, returned home with their plunder and captives. But the walled towns stood out against these inroads, and the country-people retired either within them or among the recesses of the mountains until the invaders were gone, and thus the country remained unsubdued. This was especially the case in a mountainous country like Samnium. In such a state of things, it would not have been practicable to send out colonies, as in a conquered country, and in fact we find that even the colonies which the Romans had placed in the countries of the Volsci, Ausones, Campanians, and Hernici, near the borders of Samnium, such as Sora, Fregellæ, Satricum, &c., either were taken by the Samnites or revolted against Rome, the original inhabitants rising against the Roman colonists and joining the Samnites. [COLONY.] But at last the strongholds of the Samnites began to fall. Bovianum, Luceria, Saticula, Allifæ, were taken one after the other, and the Samnite army, being defeated in the field by the consuls Postumius Megillus, after an obstinate combat, in which his colleague Minucius Augurinus was killed, and the Samnite general, Statius Gallius, was taken prisoner, the Samnites sued for peace, in the year 303 B.C. The senate sent the consul Sempronius Sophus with troops into Samnium to examine the real disposition of the people, and the Samnites having received the Roman soldiers in a friendly manner and supplied them with all necessaries, the senate granted them peace. (Livy, ix. 45.)

In the year 298 B.C. the Lucanians complained to the Roman senate that the Samnites had urged them to join in a new war against Rome, and upon their refusal were ravaging their borders. The Picentes also sent information that the Samnites had made to them proposals of alliance against Rome. The senate sent a message to the Samnites to abstain from annoying the Lucanians, which message being disregarded, a new war ensued. The Etruscans having joined the Samnites with a large force, in which were also auxiliaries from Cisalpine Gaul, the Romans chose for their new consul Q. Fabius Maximus, notwithstanding his great age, and P. Decius Mus (297 B.C.). In the mean time the Etruscan cities nearer to Rome having proposed peace, both consuls were at liberty to march against Samnium, Fabius by way of Sora, and Decius through Campania. After ravaging a large tract of country, Fabius met the Samnite army on the banks of the Tifernus, and for a long time the Romans could make no impression on the enemy's ranks; but at last Fabius having sent the hastati of the first legion round a mountain to attack the Samnites in the rear, the latter, thinking that the other consul with his army had arrived, made a precipitate retreat, leaving 3040 killed on the field and 330 prisoners; a small number, observes Livy, for such a victory. Decius having defeated near Maluentum some Apulian auxiliaries of the Samnites, the two consular armies spread throughout Samnium which they ravaged for five months, during which time Decius removed his camp to forty-five different stations, and Fabius to no less than eighty-six, leaving everywhere traces of the devastation effected by their soldiers. Fabius took the town of Cimetra, after which he returned to Rome, and Decius remained to complete the ruin of Samnium. At last those Samnites who were still in arms, being unable any longer to defend their country, migrated in a body under their leader Gellius Egnatius into Etruria, where they prevailed upon the chief men of the various states of that country to effect a general rising against Rome, being joined also by the Umbri and some Gallic mercenaries. Decius attacked and took by storm the remaining towns of Samnium, Murgantia, Romulea, and Ferentinum. The destruction of that unfortunate country appeared now to be complete, and yet we find in the following year not only the Samnites who had joined the Etruscans giving full employment to the consuls Volumnius and Appius, but also a new host of Samnites descending from their mountains, and overrunning the Falernus Ager in Campania. The consul Volumnius hastened by forced marches, and surprised the Samnites encumbered with prisoners and booty on the banks of the Vulturnus, and easily routed them. The Romans sent Roman colonies to Minturnæ and Sinuessa to secure the Falernus Ager. (Livy, x. 14, 21.) For several years afterwards we find the Romans fighting in Samnium and on the borders of Samnium, until Livy himself, after relating the usual tale of battles and victories, of thousands killed or sold as captives, observes that both the writer and his readers must feel weary of these never-ending Samnite wars which however did not seem to weary out those hardy soldiers who fought them (x. 31).

The Samnite host which had migrated into Etruria fought bravely in conjunction with the Etruscans and Gauls; and on one occasion, near Sentinum, the Gallo-Samnites spread disorder into the Roman ranks, when the consul P. Decius, perceiving the critical moment, devoted himself to the infernal gods, and rushing into the thickest of the enemy, fell covered with wounds. This act restored confidence to the Romans, and they finally routed the enemy after a severe loss on both sides.

At last, in the year 293 B.C., the consul L. Papirius, son of the former conqueror of the Samnites, marched into Samnium, and having ravaged the country in its length, laid siege to Aquilonia, one of the last remaining strongholds of the Samnites, near the Apulian borders, whilst his colleague Carvilius besieged Cominium. An army of 40,000 Samnites, 16,000 of whom were picked men and bound by solemn oaths to fight to the last, moved to the relief of Aquilonia. Papirius, having attacked them, met with a desperate resistance, but on a sudden a great cloud of dust arose, which was produced by the baggage mules which Papirius had sent round unobserved, and which dragging after them a quantity of branches of trees raised the dust, the appearance of which imparted fresh courage to the Romans, whilst it dispirited the Samnites, already wearied by their previous resistance. The Samnites were routed, and after losing a vast number of men, which Livy with probable exaggeration states at 30,000, the remainder of the Samnite infantry took refuge within Aquilonia, whilst the cavalry rode off towards Bovianum. Both Aquilonia and Cominium were taken by the Romans and burnt. Papirius next besieged Sepinum, which he entered after a brave resistance, and his colleague Carvilius took Volano, Palumbinum, and Herculaneum. The snow, which fell deep in the mountains, obliged the Romans to evacuate Samnium.

In the following year, 292 B.C., one of the new consuls, Fabius Gurges, son of Fabius Maximus, marched against the Samnites, and was defeated by them with a severe loss. The senate proposed to deprive him of his command; but his veteran father, deprecating this humiliation, offered to serve under his son as his legatus. A new battle was fought, in which the Samnites were finally routed. Pontius, the conqueror at the Caudine Furcæ, was taken prisoner. After taking Venusia, to which the Romans sent a colony, the two Fabii, father and son, returned to Rome, and the senate granted to Fabius Gurges the honour of a triumph, in which

Pontius appeared with his hands tied behind his back: after the ceremony, he was beheaded.

In the year 290 B.C. the Samnites, worn out by their repeated defeats, sued for peace, which the Romans, likewise exhausted by their dearly-bought victories, felt disposed to grant. The consul M. Curius Dentatus, being charged with the negociation, concluded a peace, the conditions of which are not known. (Livy, *Epitome*, xi.) 'Thus,' says Eutropius (ii. 9), 'ended the Samnite war, which had lasted forty-nine years, against the most persevering enemy that the Romans had to encounter within the boundaries of Italy.' The result of this war, or succession of wars, was that the Romans extended their power over South Italy, Campania, and Apulia, and thus became neighbours, and soon after enemies, of the Tarentines. The Tarentine war brought on the expedition of Pyrrhus into Italy, and the first war of the Romans with an enemy from beyond the limits of Italy. In the war of Pyrrhus, the Samnites joined that prince, after whose second retreat from Italy and subsequent death they found themselves attacked by two Roman armies, under their old antagonists L. Papirius Cursor the younger and S. Carvilius, who utterly defeated them (272 B.C.). It was then that Samnium became a conquered country, and the Romans sent colonies to Maluentum and other places. Florus says that Samnium ceased to exist, meaning as an independent state; and those who reckon this as the end of the Samnite war, give it a duration of seventy years, in which however there were considerable interruptions.

In the war of Hannibal the Hirpini joined the Carthaginians after the battle of Cannæ, but the Pentri did not. At last, in the Social War, the Samnites having joined the Marsi, Vestini, Peligni, and others in the common league against Rome, remained last in the field, and were defeated and slaughtered without mercy by Sulla, who exclaimed that Rome could enjoy no repose as long as a number of Samnites could collect together. The devastation of Samnium by Sulla was most effectual; the towns were burnt and razed to the ground; Beneventum alone was spared. The last time the Samnites appear in history is during the war of Sulla against the younger Marius, when Pontius Telesinus, who had joined the latter at the head of 40,000 Samnites and Lucanians, stole a march upon Sulla, who was besieging Præneste, and advanced within ten stadia of Rome, which was without any adequate defence. Telesinus told his own Samnites that he was the enemy of both Marius and Sulla, and that his object was to destroy Rome and restore freedom to Italy. Sulla however came in time to save the city. A desperate battle ensued; the Samnites defeated the left wing of the Romans, commanded by Sulla himself; but Crassus, who commanded the right wing, having defeated Carina, a Roman officer of the party of Marius, who was opposed to him, fell upon the flank of the Samnites, who were obliged to retire to Antemnæ, where Telesinus was killed. Between seven and eight thousand Samnites surrendered to Sulla, who marched them to Rome; and having shut them up in the Circus Maximus, had them all butchered in cold blood, while he was haranguing the senate in the neighbouring temple of Bellona. The remainder of the Samnites were slaughtered in the same manner at the taking of Præneste.

SAMOGITIA, now only an historical name, is an extensive tract of the antient duchy of Lithuania, bounded on the north by Courland and the Baltic, on the west by the Baltic and Prussia, and on the south and east by Lithuania Proper. It produces abundance of corn, honey, wax, timber, horses, and game. It now forms part of the Russian government of Wilna. The inhabitants have retained in greater purity than any others the peculiar customs and language of the Lithuanians. The places deserving of notice are, Kieydani, a colony founded by Prince Radzewill for some Scotch emigrants, where they long flourished; and Polangen, the harbour of which, once of considerable importance, was filled up with earth by the Swedes at the instigation of the merchants of Riga.

SAMOS, an island in the Grecian Archipelago, called by the Turks *Susam Adasi*, lying between 37° 35′ and 37° 48′ N. lat., and extending from 26° 36′ to 27° 8′ E. long., situated on the coast of Asia Minor, at the distance of about a mile from the promontory of Trogilium, or Cape Santa Maria, which lies between the gulf of Scala Nova and that of Balat.

The word Samos, as we are told by Strabo (viii. 503), means a mountainous height, and therefore may be considered as characterizing the physical features of the island, while the names Dryusa, Anthemura, Melamphyllus, and Cyparissia, given to it by the Greeks, are descriptive of its fertility and varied produce. Its early history is mixed with fable. We find mention of Ancæus ruling here over the Carians and Leleges, and of a subsequent establishment, after the return of the Heraclidæ, of Lesbians led by Cydrolaus, and Ionians expelled from Epidaurus under Tembrio, the Carians consenting to incorporate the new comers into their city. The date of this settlement is probably about 988 B.C.

Very soon after the year 776 B.C., the Samians became remarkable for maritime enterprise and commerce. They were the first to avail themselves of the improvements in ship-building, originating, as Thucydides tells us, at Corinth (Thucyd., i. 13), B.C. 704. We find them trading with Egypt under the protection of Psammetichus, who gave them a settlement there: about B.C. 630, a Samian merchant, Colæus, made a successful voyage to Tartessus in the extreme west of the Antient World, and brought back, as Herodotus tells us, the largest private fortune he had ever known made by trade (iv. 152). During this period they founded several colonies, Samothrace, Anoea, Perinthus, Bisanthe, Amorgus, and joined the confederacy on the Asiatic continent, called the Panionium, consisting of twelve cities. Scattered notices of their early kings and petty wars with Ephesus, Priene, &c. occur in the antient historians, and have been well collected by Panofka, in his work, 'Res Samiorum.'

In the time of Cyrus and Pisistratus, the government of the island was in the hands of Polycrates, the most remarkable of the tyrants of his day. Having obtained the government of the island by stratagem, he established himself there as a tyrant, and became very powerful: he extended his sway over the neighbouring states, Lesbos, Miletus, &c., and had a larger navy than any other Grecian prince or state of his time; he was also strengthened by his alliance with Amasis, king of Egypt. Shortly after the invasion of Egypt by Cambyses, Polycrates became engaged in a war with Lacedæmon, in which the Spartans were finally repulsed from the island. His increasing power at length provoked the jealousy of the Persian monarch Darius, whose satrap Oroetes, allured him by treacherous promises to trust himself in his power, and then murdered him. Herodotus (iii. 125) says of Polycrates that he perished in a manner unworthy of himself and his high designs, and that none of the Greek tyrants, with the exception of those of Syracuse, were to be compared with him in greatness of character. This praise is consistent with all we read of Polycrates. He seems to have designed to make Samos the mistress of the Archipelago, and to have neglected nothing that could enhance her greatness, either by the skilful conduct of wars and foreign policy, or the cultivation of the arts of civilization. He surrounded himself with all the princely luxuries which the wealth of that time could procure. Democedes the physician and Anacreon the poet were in his court. He is said to have transported superior breeds of animals from other countries. (Athenæus, lib. xii., p. 540, Cas.) His seal was made by Theodorus, a celebrated artist. Other curious anecdotes of him may be found in the passage of Athenæus just quoted. The mole in the harbour of Samos, of which Herodotus speaks, was probably executed under his directions.

During his reign, Samos, enriched by her trade with Egypt and the Mediterranean, and strengthened by the decline of the states on the Asiatic continent, extended her sovereignty over the Archipelago in such a manner as to provoke the jealousy of the Persian government. After the treacherously-contrived death of Polycrates, the island, deprived of his guidance, and a prey to civil war, fell into the hands of Darius, who appointed Syloson, the brother of Polycrates, as governor. The resistance of the inhabitants to this measure led Otanes, the Persian general in command, to order a general massacre, and Samos was delivered up to Syloson almost unpeopled.

Shortly after this, we find the Samians joining in the revolt of Ionia, and expelling their tyrant, Aeaces, brother of Syloson. They contributed a large force at the battle of Lade, but treacherously withdrew from the engagement to obtain favour with Darius, to whose empire they were again made subject, but were released from it after the battle of Mycale.

The maritime strength of Samos was broken, and their government made democratical by Pericles, B.C. 440, who took the opportunity afforded by a quarrel between this island and Miletus to crush a power which might otherwise have been a dangerous subject, if not a formidable rival, of Athens. After the expedition of the Athenians to Sicily, during the Peloponnesian war, Samos, like Athens, became agitated by a struggle between the oligarchical and democratical parties, terminating in the triumph of the latter. After the battle of Aegospotami, the Samians, alone remaining firm in their alliance with Athens, sustained a siege from Lysander, and were compelled to submit to Spartan principles of government. After this time the island fell into various hands. The Athenians, Lacedæmonians, and Persians became successively possessed of it, and it was finally restored to its early masters by Timotheus, and was protected by Athens as her ally during the Social War (B.C. 360). Little mention of Samos is made in the history of the Macedonian period. Its valuable situation as a naval station made it the prey of the great monarchs then contending against each other, and after forming part of the Egyptian, Macedonian, and Syrian empires, it was finally made subject to Rome, B.C. 84. Samos was afterwards the residence of Marcus Antonius and Cleopatra, B.C. 32, and of Augustus, who gave its inhabitants a titular freedom. It was reduced by Vespasian to the form of a province, though the memory of its antient glory was preserved as late as the time of the emperor Decius by the inscription *Σαμίων πρώτων Ἰωνίας* on its coins.

The antient history of Samos exhibits very strikingly the vices and virtues of the Ionic race. In love of liberty, in commercial and naval activity, in fondness for art, not less than in luxury and fickleness of character, they very much resembled their Athenian masters, while no Greek state at so early a period as the time of Polycrates perhaps equalled them in the variety of their mercantile relations and enterprise in navigation. We find them in close alliance with Amasis, king of Egypt, who granted them a separate temple at the establishment for Greek merchants at Naucratis, and their trade with Africa must have been carried on not only by the assistance of the Cyrenæans, but by their settlement at an oasis in the desert, seven days' journey from Thebes, an outpost of Greek civilization discovered by the army of Cambyses on their invasion of that continent. (Herod., iii. 26.) Closely connected with their trade with Egypt is the history of the early art of Samos. A school of sculptors, beginning with Rhœcus and his sons Theodorus and Telecles, at a period (according to Pliny, xxxv. 43) long before the expulsion of the Bacchiadæ from Corinth, continued till the time of Polycrates. (Müller's *Archæologie der Kunst*, 60, 71.) Theodorus is said to have invented the art of casting in bronze, and of him and his brother the well-known and remarkable anecdote is told, that after their stay in Egypt, they formed a statue, one-half being made at Epheaus by Theodorus, the other at Samos by Telecles, and that the two halves tallied exactly. Without entering into the question of the general origin of Greek art, it seems probable from this, that the intercourse between Egypt and Samos had led these two artists to imitate the prescribed forms and unchanging proportions of the art of the elder country. The stiffness of the early style was much improved upon by another Theodorus, son of Telecles, in the time of Polycrates, and the skill of the Samians in working metal had been already shown in the execution of the brazen caldron dedicated by Colœus to the temple of Juno at Argos, and ornamented with colossal figures and heads in high relief.

In the sister arts of architecture and painting the Samians were also eminent. Rhœcus, who has been already mentioned, built the Heræum, or temple of Juno, the largest which Herodotus had ever seen (iii. 60). In this temple was a statue of the goddess by Smilis (an artist said by Pausanias to be a contemporary of Dædalus), of a very archaic form, as we may see from its representation on the coins of the island.

Mandrocles, a Samian, built the bridge over the Bosporus for Darius Hystaspes, and also caused a painting to be made of his work and of the monarch passing over it with his army.

Notices of Calyphon, Timanthes, and other Samian painters, are collected from Pausanias and other sources by Panofka, 'Res Samiorum,' 55, who also quotes passages to show that the natural genius for design in the islanders showed itself in the improvements introduced by them in ship-building. The coins of Samos are very numerous and worthy of attention. The earliest autonomous coins bear the head of a lion or of a bull; a winged wild boar or a prow of a ship are common reverses. Juno, with her attributes, and Neptune, Vulcan, and Minerva, are deities represented upon the imperial coins, the series of which extends as far as Saloninus junior; the usual reverse is the archaic figure of Juno, which resembles very much that of Diana on the coins of Ephesus; for a more particular description of which see Mionnet, *Description des Médailles Antiques*. This statue was still standing in the temple in the time of Pausanias.

Pythagoras, who was a native of Samos, is also represented in a sitting attitude on the imperial coins, touching a globe placed on a column with his hand, with the inscription, ΠΥΘΑΓΟΡΗC CΑΜΙΩΝ. Other types are Meleager attacking the boar, the river Parthenius personified, Nemesis, &c.

After being made a province by Vespasian, Samos was constituted the head of a theme under the Byzantine emperors. It was plundered and taken by the Arabs in the eighth century, and recovered by Leo in the thirteenth. A Turkish chief, Tzachas, seized it for a short time, but was soon deprived of it by Johannes Ducas. It was in the hands of the Venetians, and afterwards of the Genoese; and upon the taking of Constantinople (1453), was ravaged by Mahomet II. Selim granted permission to one of his subjects, Kilitsch Ali Bassa, to colonize the island, as the population had been much reduced by frequent piratical invasions. It has continued ever since under the dominion of the Turks: the inhabitants made an unsuccessful attempt to free themselves during the late Greek revolution, in which the archbishop and clergy did not join.

The form of the island of Samos is irregular and indented; the greatest length is from west to east, and the circumference is about eighty miles. It is separated from the continent of Asia by a narrow strait or boccage about six miles in length, and nowhere more than three in breadth, full of small islands. Through the island in a direction from east to west runs a high mountain called Ampelus by Strabo, a continuation of the promontory of Trogilium, and terminating at its western extremity with the height of Kerkis, the Mons Cercetius of the antients, the loftiest point in the island.

Immediately opposite to Cape Santa Maria, between the rivers Metelenous and Imbrasius, is the port of Tigani, the antient harbour of the city of Samos, which has an artificial mole built across it from north to south. Herodotus speaks of an immense mole in this harbour, which he considers one of the three works most worthy of mention in the island. A little inland at the distance of about five miles from Cape Santa Maria is the site of the antient town of Samos. From the existing ruins Pococke (*Travels in the East*) gives a ground-plan of it, from which it appears that it was situated to the west of the port, partly on flat ground, and partly occupying the south side of Mount Ampelus; the walls, of which there are still remains, are cased with white marble, and have square towers. At about sixty paces interval they enclose a quadrangular space; within them are the ruins of a theatre with the seats, built on the side of a hill. To the west of the city, towards the Imbrasius, are the remains of an aqueduct, which does not seem to be the one mentioned by Herodotus (iii. 60), which was carried through a mountain, and was one of the three works which he considered most worthy of admiration at Samos. Of the great temple of Juno hardly anything remains except a capital and base, engraved in Tournefort. (*Voyage du Levant.*) Its dimensions were ascertained by Mr. Bedford, an architect who accompanied Sir William Gell in the second Asiatic mission of the Dilettanti, to be—length 346 feet; breadth 189. It was a decastylus dipterus; had ten columns in front, twenty-one on the sides, a triple row in the pronaos, and a double row of four columns between the antæ at the entrance of the cella in front. The columns were about seven feet in diameter at the bottom of the shaft, and about sixty feet high. The intercolumniation in the two fronts was fourteen feet, in the flank only ten feet and a half, and in the flank of the pronaos something still less. There was no appearance of fluting in the columns. The material was the white and bluish-grey marble of the island. (Leake's *Asia Minor*, 348.) Opposite to the old city, about a mile to the west of it, is the modern town of Cora, or Μεγαλη χωρα, the largest in the island, containing, in Pococke's time, about twelve small churches and two hundred and fifty houses. On the south side of the city is a large plain called Megalocampus, which has become a stagnant marsh. To the west of Cora is the river Imbrasius, on which is the small village of Mily. At the mouth of this river the land juts out to the south, terminating in Cape Colonna, opposite to the small island of Samopoula. To the west of this promontory is the village of Marathrocampos, about forty miles distant from Patmos. Three miles from this village, opposite to the island of Nicaria, and distant from it about twelve miles, is a hermitage called St. George's, with a grotto near it, on the top of Mount Kerkis, called Panagia Phaneromena. The summit of this mountain is covered with snow all the year round, and has a lake at the top.

Five miles from Marathrocampos towards the north is the village of Castany. Proceeding along the coast in a north-east direction we come to Carlovassi, the most considerable town in the island after Cora. The port is a bad one, being much exposed to the north wind. Three miles to the east of this town is Farni, a village, ten miles from which, in a deep bay, is Vathi, a town with a good harbour cacapable of holding a large fleet. There is a small harbour four miles to the north-east, the mouth of which is well protected by little islands. On the east side of the island is another port, which Tournefort (*Voyage du Levant*) calls the Port des Galères. These are the principal geographical points in the island. The soil of Samos is very fertile, and produces very good wine, though this was not the case formerly, according to the testimony of the antients. The muscat grape is much cultivated. There is good timber on the hills, which have quarries of white marble in abundance.

Samos was formerly celebrated for its pottery, which was made from a particular kind of clay found in the island.

Travellers speak of the abundance of game and wild animals in the island.

The inhabitants, about 15,000 in number, living in eighteen villages, are nearly all Greeks; they are described by Michaud and Poujoulat (*Correspondance d'Orient*, 1833) as being wretched in their condition and habits, and of a savage appearance. They are governed by a waiwode and cadi; the former has the care of the revenue, and the latter administers justice. There is also a Christian governor, called an aga, chosen by the people. From Pococke's *Travels in the East* we get the following statement of the amount of the revenue yearly accruing from Samos in his time:—land-tax, 22 purses; harach or poll-tax, 20 purses; avancos, or fines on deaths and for crimes, 10 purses. Samos is the see of an archbishop, who is also bishop of Icaria. His lands, with those belonging to the papas or priests, and caloyers or monks, are more than half of the whole island. A minute account of the state of the Greek church in Samos may be found in a rare work translated into English, under the following title: 'A Description of the Present State of Samos, Nicaria, Patmos, and Mount Athos, by Joseph Georgirenes, archbishop of Samos,' London, 1677; which may be also referred to generally for an account of the condition of the island during the seventeenth century.

For further information see Dapper's *History of the Archipelago*; Panofka, *Res Samiorum*; Tournefort, *Voyage du Levant*; and Beauvau, *Voyage du Levant*, Nancy, 1619; in which work a bird's-eye view of the island is given.

SAMOTHRA'CE (Σαμοθρᾳκη), a small island opposite the mouth of the Hebrus in Thrace, from which it was 38 miles distant according to Pliny (iv. 23). It was chiefly celebrated for the worship of the Cabiri, which was said to have originated in this island. [CABIRI.] According to Herodotus (ii. 51), Samothrace was originally inhabited by the Pelasgians, from whom the inhabitants learnt the religious mysteries which they solemnized.

In Homer the island is usually called Samos (*Il.*, xxiv. 78, 753), or the Thracian Samos (*Il.*, xiii. 12), and was said, according to some accounts, to have derived its name from a colony from the island of Samos on the coast of Asia Minor, who settled there (Paus., vii. 4, s. 3; Strabo, x., p. 457); but Strabo, who did not believe this account, derived its name from *samos*, which meant a height, or from the Saii, whom he supposed to be the antient inhabitants of the country. Other accounts state that it was originally called Dardania, and that Dardanus, the founder of Troy, passed over from this island to Asia Minor. (Strabo., vii., p. 331.)

The Samothracians joined the army of Xerxes when he invaded Greece, and one of their ships distinguished itself at the battle of Salamis. (Herod., viii. 90.) In the time of Pliny it was a free state.

Samothrace, according to Pliny, was 32 miles in circumference. It contains a very high mountain, called Saoce by Pliny, from which Homer says that Troy could be seen. (*Il.*, xiii. 12.)

SAMOYEDES, one of the most widely spread nomadic nations of Northern Asia. The tribes of the Samoyedes inhabit two large tracts, one of which extends along the shores of the Polar Sea, and the other on both sides of the Altai Mountains. Thus there are northern and southern Samoyedes.

The Northern Samoyedes wander about in the country which occupies the western portion of the coast of Siberia. The most eastern point at which they are found is the Gulf of Taïmooras, which lies west of the peninsula that terminates in the North-east Cape, the most northern point of Asia. From this gulf westward they occupy the whole coast to the Ural Mountains, and they are even found west of that range, on both sides of the river Pechora, as far as the banks of the river Mezen. Thus they inhabit the coast of the Polar Sea between 45° and 100° E. long. They are of short stature, seldom attaining five feet, and resemble the Tungooses in the conformation of their body. They have round, broad, and flat faces, thick lips, a broad and open nose, very little beard, and very coarse black hair. They are stout, and have muscular limbs. They have herds of rein-deer, but they use this animal only for drawing their sledges. They do not milk them, nor do they eat their flesh. They live chiefly on the produce of the chase, of which the principal object is the wild rein-deer, with which their country abounds, and which supplies all their wants. They take also several kinds of fur-bearing animals, especially foxes. The sea supplies them with white bears and some other animals, and dead whales are occasionally carried to their shores. From time to time they occupy themselves with fishing in the rivers and lakes, but the chase is their principal employment. They are heathens, and profess the religion called Shamanism. It is stated that the numerous tribes which belong to the Northern Samoyedes contain 70,000 individuals.

The Northern Samoyedes are divided from their southern kinsmen by an immense tract of country, occupied by the Ostiaks, and several tribes that belong to the Tongooses, especially the Tchapogires.

The Southern Samoyedes inhabit that part of the Altai Mountains which extends from the sources of the river Tshulyshman, one of the principal branches of the river Obi (near 88° E. long.), to the south-western extremity of Lake Baïkal, or to 105° E. long., where they approach the banks of the river Selenga. The principal seat of the Samoyedes in this part is the valley between the two chains, called Erghik Targak Taiga, on the north, and the Tangnu Oöla, on the south [ALTAI MOUNTAINS, vol. i., p. 398], in which the two principal branches of the Yeneseï river, the Ta-Kimu and the Kemtshyk, have their origin. This country is included within the territories of the Chinese empire; and these Samoyedes, called Soyotes, are tributary to the emperor of China, and obliged to do military service along the frontier. Some small tribes of Samoyedes inhabit the northern declivity of the Erghik Targak Taiga range, where they are subject to Russia, and pay a tribute of furs. They extend northward along the banks of the Yeneseï to Abakansk, and along the Uda, a tributary of the Upper Tunguska, to Nishnei Udinsk. Some of these tribes live entirely on the produce of the chase, such as elks and different kinds of deer, especially a large species called marali. They also take sables and squirrels, with the furs of which they pay their tribute. Other tribes have herds of rein-deer, their country being the most southern region in which that animal is met with in Asia. They use the males as hunting animals, and the females supply them with milk. A few have adopted agriculture, but they eat also the roots and stems of some wild-growing plants. The Soyotes, or Chinese Samoyedes, however, inhabit a rich pasture country, and live on the produce of their herds, consisting of horses, black cattle, and camels. These Southern Samoyedes exactly resemble their northern kinsmen in the formation of their bodies, except that they have a tolerably thick beard. The different tribes of the Samoyedes speak different dialects of one language, which varies greatly from the languages of all the neighbouring nations, though it contains a considerable number of roots which occur in the languages of some nations of Central Asia.

(Pallas, *Reisen durch verschiedene Provinzen des Russischen Reichs;* Klaproth, *Asia Polyglotta;* Ritter, *Erdkunde von Asien*, vol. i.).

SAMPHIRE, an herb in much request in some parts of the country as a salad and pickle. The true Samphire is the *Crithmum maritimum*, a plant belonging to the natural order Umbelliferæ. It is a very succulent plant, with pale-green leaves, and flowers arranged in umbels. It grows on rocks by the sea-side. The species of Salicornia [SALICORNIA] are often called Samphire, and are used in the same manner, but they are very much inferior to the Crithmum as an article of diet.

SAMPOO, river. [BRAHMAPOOTRA.]

SAMSOE, OLE JOHAN, was born on the 2nd of March, 1759, at Nestved, where his father was a person in easy circumstances. At first he was educated at home by a private tutor, but was afterwards sent to the school at Colding, of which Justitsraad Thorlacius was then the rector. He proceeded thence to the university of Copenhagen, where he distinguished himself by his superior abilities and attainments, and where he formed some literary friendships. One of his most intimate associates was Rahbek, with whom he set out on a tour through Germany in the summer of 1782. The two friends visited Paris on their return in the autumn of 1784. It was now necessary that he should form some decisive plans for the future, for though his father had left him what was at the time a considerable property, it was vested in Indian stock, which had fallen very greatly in the interim, while the expenses of travelling, of which he seems to have borne the greater share, had made some inroad into his finances. At the advice therefore of a friend, he applied for the post of teacher to the royal pages, but did not hold it longer than about five years. His salary however was continued to him as a pension.

In 1793 he was made one of the masters of the Latin school, but resigned that situation in the following spring, his motive for accepting it having been chiefly to make such addition to his income as would enable him to marry a lady to whom he was attached: yet though all preparations had been made, and the day itself fixed, the marriage was broken off by mutual consent, and without breach of good understanding between the parties. Thus released from the duty of providing for a family, Samsöe gave up his other engagements, and applied himself entirely to literary studies. Besides his Scandinavian tales, the first of which, 'Frithiof,' had been composed by him while at the university, he commenced a translation of Cicero's 'Offices,' and another of Garve's work on morals. His proficiency in Greek literature, and his admiration of Plutarch, suggested to him the idea of writing a work on antient history, thrown chiefly into the form of biographies of the most conspicuous personages, connected by succinct narratives of intermediate events. Unfortunately he did not execute or even begin it, for nothing of the kind was discovered among his manuscripts. He now tried his talent in a different walk of literature, where success brings with it more sudden and more brilliant popularity. The enthusiasm with which his tragedy of 'Dyvecke' (founded on the history of the beautiful mistress of Christian II. and her ambitious mother) was received, would doubtless have led him at once to prosecute that career, and indeed the plans of two other dramas on national subjects were found among his papers. But he did not live even to be assured of his triumph, as he died January 24th, 1796, just a week before the first representation of his piece, which took place on the day of his funeral. 'Dyvecke' makes an epoch in the annals of the Danish stage: written in prose, and divested of those pompous conventionalities which often serve merely to disguise feebleness, this drama captivates by the intrinsic interest of dialogue and situations, and by its forcible pathos. It is true that criticism has alleged many defects against it; yet if not perfect, it furnished a model which did not previously exist in the language; and both on that account, and as being the only dramatic attempt of the author, it deserves to be estimated by its beauties and its merits. This tragedy and his Tales form the two volumes of his posthumous pieces, edited by his friend Rahbek.

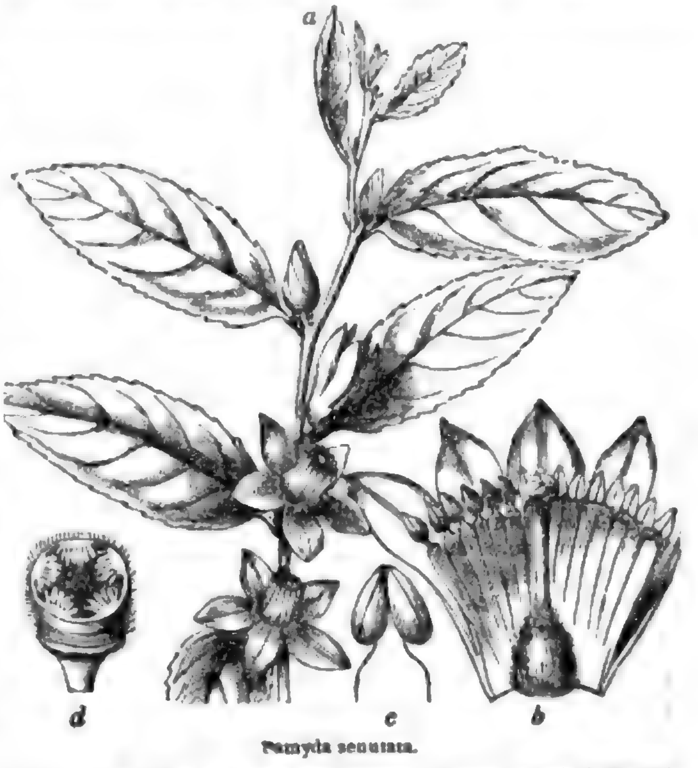
SAMUEL, BOOKS OF, two canonical books of the Old Testament, the first of which contains the history of Israel from the birth of the Prophet Samuel to the death of Saul (B.C. 1171-1055); and the second the history of David's reign for about forty years (B.C. 1055-1017). At this point the history is taken up in the First Book of Kings. The Jews and most Christian writers ascribe a portion of these books to Samuel (who, from the nature of their contents, could not have written the whole), and the remainder to the prophets Gad and Nathan, chiefly on the ground of the following passage in 1 *Chron.*, xxix. 29:—'Now the acts of David the king, first and last, behold, they are written in the book of Samuel the seer, and in the book of Nathan the prophet, and in the book of Gad the seer.' The first twenty-four chapters of the first book of Samuel, from Samuel's birth nearly to his death, are ascribed to Samuel himself. As to the remainder, it cannot be exactly determined what part was written by Gad, and what part by Nathan; but it is conjectured that Gad, who was very probably a pupil of Samuel, and a companion of David in his wanderings during the life of Saul (1 *Sam.*, xxii. 5), wrote the history of David, from the death of Samuel to his being made king in Hebron (1 Sam., xxv.; 2 *Sam.*, v.); and that the remaining part of the second book was written by Nathan. These three portions then were collected by Ezra when he formed the canon into one book; for in the Jewish canon the two books of Samuel form only one. Jahn, on the contrary, ascribes the books of Samuel and of Kings to the same author, and places their publication about the forty-fourth year of the Babylonish captivity.

In the Septuagint these books are called the first and second books of Kings, or of the Kingdoms. [KINGS; CHRONICLES.]

(The *Introductions* of Jahn, Eichhorn, Bertholdt, De Wette, and Horne.)

SAMY'DA, a genus of plants of the natural family of Samydeæ. The genus having all the characters of the family to which it belongs, is distinguished by possessing 10-12 stamens, all of which bear anthers; while the stigma is globose. The species consist of small trees or shrubs, found in the hot parts of America, such as the West Indies, Mexico, and Brazil, with a few doubtful species in the East Indies. The branches are sometimes thorny; the leaves alternate, entire, or serrate, with pellucid dots and twin stipules; flower-stalks axillary, single-flowered, solitary or fascicled with white but sometimes purple flowers.

SAMYDA'CEÆ, a natural order of apetalous plants, of uncertain station, and placed by De Candolle amongst polypetalous Exogens. They have three, five, or seven se-



Samyda serrulata.

a, branch with stipulate leaves and flowers; b, flower opened, showing the monadelphous stamens and the pistil; c, anther with its double cell; d, transverse section of ovary showing seeds attached to five parietal placentæ.

pals more or less cohering at the base; stamens perigynous, two, three, or four times as numerous as the sepals, with monadelphous filaments; superior one-celled ovary; indefinite ovules attached to parietal placentæ; capsules with from three to five valves; numerous seeds fixed to the valves; fleshy albumen and a radicle pointing away from the hilum. The leaves are alternate with stipules, marked with round and linear pellucid dots. The apetalous flowers and fruit of this order approximate it to Bixaceæ, and its perigynous stamens and alternate stipulate leaves ally it to Rosaceæ. It is an entirely tropical order, composed of small trees or shrubs. The bark and leaves are slightly astringent. One of the species, Casearia ulmifolia, is used in Brazil as a remedy against the bite of snakes, for which purpose the leaves are applied to the wound, and an infusion of them is taken internally.

SAN BLAS, a town on the western coast of Mexico, in the state of Xalisco, formerly the province of Guadalaxara, is situated on an island formed by two mouths of the Rio Grande de Santiago as it enters the Pacific. It is the seaport of Tepic, and the chief maritime station in Xalisco. It stands about three-quarters of a mile from the shore, on a very remarkable isolated rock, rising abruptly out of a low, swampy, wooded plain or savannah, to the height of 150 feet, inaccessible on three sides, and with a surface of about 500 yards each way; within which limits the town is of course confined. From the plain, which is always more or less under water, rise exhalations and miasmata, which render the town very unhealthy by causing a low fever, besides giving birth to myriads of mosquitoes and sand-flies. During the rainy season, from June to November, the place is perfectly uninhabitable from the torrents of rain, which destroy the houses, and perfectly insulate the rock. At this season, all the inhabitants who can afford it, remove not only themselves but most of their property to Tepic, and the population is in a few days reduced from 3000 to 150.

At the shore is a village called La Playa, inhabited principally by fishermen and those connected with the arsenal, which, though now in a dilapidated state, was once of great importance. A good ropewalk still remains. A small æstuary, the northern branch of the Rio Grande, affords a safe boat-harbour and landing-place, but the anchorage in the roads, which is commanded by two batteries, is much exposed to westerly winds. San Blas affords good supplies of meat, fruit, and vegetables, but the climate is very hot in the summer. 21° 32′ N. lat., 105° 18′ W. long. High-water, full and change, at 9h. 40m.; rise between 6 and 7 feet.

(Captain Hall's *South America;* Captain Beechey's *Voyage to the Pacific; Sailing Directions*, &c.)

SAN FRANCISCO, a port in the Mexican dominions, in the province of New California, on the shores of the North Pacific. It is only on account of its size, and the perfect security which it offers to vessels of any burden, that it has at present any claim to notice, though there can be little doubt that it will ultimately arrive at greater importance from the fertility of its soil and delightful climate. The entrance is narrow, lying between land of considerable elevation, on the southern point of which stands a fort to guard the passage. After running in a westerly direction about six miles, it divides into two branches, one extending 30 miles to the south-east between two ridges of hills with low land at the base reaching to the shores and terminating in small winding creeks; the other taking a northern direction, after about four miles opens out into a capacious basin 10 miles in diameter, and after converging to a second strait, again expands, and is connected with three large rivers, called Jesu Maria, Sacramento, and San Joachim. The greater part of the south-east arm is very shallow, leaving only a narrow channel up the centre, and the landing is bad. There are several islands and some dangerous rocks and shoals, but the anchorages are safe and well sheltered. A bar of sand lies eight miles off the entrance, with only 25 to 30 feet water; and with a high wind a heavy sea breaks over it.

It is not however devoid of interest in other respects, being one of the earliest settlements of the Old Spaniards for the charitable purpose of converting the Indians to Christianity. Their fort or stronghold, called the Presidio, was fixed near the entrance, on the southern shore, about half a mile inland. It is a square enclosure, the sides of which are about 300 yards in length, and were formerly surrounded by a mud wall about 15 feet high, pierced for musketry. Against the inner sides of these walls are the dwellings of the settlers, the centre being left clear for exercise and military evolutions. These walls are now in ruins.

From this primary settlement emanated the five following missions, which were established in various parts of the adjacent country under the protection of the Presidio:—

San Francisco, founded in 1776; Santa Clara, 1777; San José, 1797; San Francisco Solano, 1823; San Rafael, 1827.

As they are nearly similar in appearance and in their political organization, they may all come under the following brief description. The most conspicuous object is the church, around which are congregated the dwellings of the padres, and of the soldiers and attendants of the establishment, which are built with some pretensions to order and comfort; and at a little distance stand the mud huts of the Indians, placed in squares with great regularity. It is the business of the Indians, who are under the absolute control of the padres, to cultivate the soil, and take care of the herds of sheep and cattle in which consists the wealth of the missions; the hides and tallow sent to Monterey for shipment form their chief source of revenue. Some of the missions possess as many as 10,000 head of cattle.

San Francisco is situated about three miles to the south-east of the Presidio, in the midst of a beautiful and fertile plain. Santa Clara is in an extensive plain not far from the head of the southern arm of the port. San José is at the foot of the hills to the south-east; and the two more modern missions are near the shores of the northern arm. Supplies of meat and vegetables are plentiful, and the country abounds with game and wild-fowl.

The Presidio is in 37° 48′ N. lat. and 122° 26′ W. long. High-water at full and change, 10h. 50m.; the rise is eight feet.

(Captain Beechey's *Voyage to the Pacific.*)

SAN MARI'NO, REPUBLIC OF, is a small territory, consisting chiefly of a steep mountain with its offsets and valleys, covering an area of about 27 square miles. It is situated within the papal province of Urbino, and about ten miles from the coast of the Adriatic. The whole population amounts to about 7000. The town of San Marino stands on the upper part of the mountain, the summit of which is crowned by an old castle with three towers, on which the standard of the republic waves. The town is ill built and ill paved; the streets are steep, and only practicable for mules and donkeys. The square before the town-house is large, and commands a fine view of the neighbouring Apennines. The church of the Capuchins contains a fine painting representing the Descent from the Cross. Outside of the town is il Borgo, or suburb; and at the foot of the mountain are three or four villages, Serravalle, Acquariva, Feglio, &c. The inhabitants have cultivated every slip of ground that can be made productive; they make some very good wine, some oil, and rear silk-worms, the produce of which constitutes an article of trade. They have also some good cattle. They import corn from the neighbouring Papal State.

The origin of the republic of San Marino is lost in the obscurity of the dark ages. Marinus, a holy hermit from Dalmatia, is said to have retired to this mountain in the fourth century of our æra, and after his death a church was raised to his memory, and a village grew up round the spot. In the tenth century it became a walled town by the name of 'Plebs Santi Marini cum Castello.' It seems to have governed itself as an independent municipality; and we find in the twelfth century that the commune of San Marino purchased some lands from the neighbouring counts of Montefeltro, lords of Urbino. During the wars of the Guelphs and Guibelins, the people of San Marino took the part of the latter, together with their neighbours of Montefeltro, and as such were excommunicated by Innocent IV. Towards the end of the fourteenth century, the popes, in consequence of the cession made by Rudolph of Habsburg [PAPAL STATE], began to send rectors to the Romagna, to enforce the suzerainship of the papal see over the towns and lords of the country. One of these vicars, Hildebrandinus, bishop of Arezzo, about the year 1291, complained that, with the exception of the town of Cesena, no other place in Romagna would obey his injunctions. This rector appointed a certain Theodoric, canon of St

Leo, as his vicar for the district of Montefeltre, in which San Marino was included. The commune of San Marino being summoned, like the rest, by the vicar, to pay certain dues and fees, refused; and the matter being referred to a learned judge of Rimini, called Palamede, he decided that the community and men of San Marino were exempt from payment, having been of old independent of all foreign dominion, a decision which was confirmed by the vicar Theodoric in a charter quoted by Delfico in his 'Storia di San Marino.' From that time San Marino has been acknowledged as an independent state by the popes, although some popes, or rather their legates in the Romagna, have attempted at times to enforce their authority over that little state, but the attempt has not been persevered in. [ALBERONI.]

When Bonaparte overthrew the papal government, he respected the independence of San Marino; and in 1814, when the pope was reinstated in his dominions, the freedom of the republic was confirmed. The legislative power is in the hands of a great council of 300 anziani, or elders, and the executive consists of a senate of twelve, with a gonfaloniere, who is changed every three months.

SAN REMO, a province of the Sardinian States, forming part of the duchy of Genoa, is bounded on the north by the Maritime Alps, which divide it from Piedmont, east by the province of Oneglia, west by the county of Nizza and the principality of Monaco, and south by the Mediterranean Sea. The country partakes of the general nature of the Riviera, being occupied by offsets from the Alps, which advance to the sea-shore, and contain between them narrow valleys through which flow several torrents that are generally dry in summer. The lower hills and valleys and the strips of level ground along the coast produce oil, oranges, lemons, and wine. The climate is very temperate and genial, the thermometer seldom falling below the freezing-point. Even date-trees bear fruit in some favourable spots. (Bertolotti, *Viaggio nella Liguria*.) The population of the province consists of 56,500 inhabitants, distributed among 28 communes.

SAN REMO, the chief town, is built on the slope of a steep hill which rises from the sea-coast; the mountains forming a semicircle around and sheltering it from the north winds. The lower hills around the town are planted with olive, orange, lemon, fig, almond, and pomegranate trees, which constitute the principal wealth of the inhabitants.

The population of the town amounts to 11,000, many of whom are employed as seamen, and enjoy a good reputation for honesty and mildness of character. Murders, which are not uncommon in other districts of this coast, are unknown among the natives of San Remo. Before 1797 San Remo had eighty large merchant vessels, most of which, being pressed by the French into the service for their expedition to Egypt, were lost. The town has now hardly any other but coasting craft, with which it trades with Marseille and Genoa.

San Remo has a communal college with about 400 students, and several churches and palaces. The church Dell' Assunta, or Della Costa, is a fine structure ornamented with several columns of alabaster and crowned by a handsome dome. The Palace Borea has a gallery of good paintings. The town being formerly deficient in good water, has been of late years abundantly supplied with it by an aqueduct through the care of its intendente, the Avvocato Nota, well known for his dramatic works.

San Remo dates its origin from the ninth century, having been built below a castle on the hill called Castrum S. Romuli, from the name of a bishop of Genoa who was buried there, and which had been destroyed by the Saracens. In the twelfth century San Remo was an independent community under a nominal allegiance to the German emperors, and in 1170 it made an alliance with Genoa and Nizza for the mutual protection of their respective shipping against the Pisans. In 1199 however San Remo placed itself under the allegiance of Genoa, with a reservation of its municipal franchises and immunity from arbitrary taxation. This state of things, which was common to most towns of the Riviera, lasted till 1728, when the Genoese having laid certain duties upon the latter, the people of San Remo took up arms and dismissed the magistrates sent by Genoa. But through the mediation of the Prince of Monaco, the former relations between the metropolis and its dependencies were re-established. In 1753 however, in consequence of fresh dissensions, the Genoese sent an armed force to San Remo, built a castle to overawe the town, and deprived the citizens of most of their privileges. Some time after an anonymous writer published 'Mémoires touchant la Superiorité Impériale sur les villes de Gênes et de San Remo,' Ratisbon, 1768, in which, referring to the old suzerainty of the emperors over the whole of the towns of this coast, he said that San Remo could not be bound by allegiance to Genoa, but was merely connected by a convention. The Genoese on their side attempted to prove 'their old high dominion over the whole of Liguria independently of the Empire.' (Accinelli, *Compendio delle Storie di Genova*, vol. ii.)

San Remo has produced some learned men, among others Michel Angelo da San Remo, an Orientalist, who lived in the seventeenth century, and Francesco Maria Gaudio, professor of mathematics in the university of Rome, and the author of several valuable works, especially on hydraulics, who died in 1793.

The only other place of any importance in the province is Ventimiglia, the antient Albium Intemelium, a well-built town of 5700 inhabitants, on the sea-coast at the mouth of the Roia, and a bishop's see. The cathedral, a structure of the middle ages, is said to be built on the remains of a temple of Juno raised by the consul M. Æmilius, after his last victory over the Ligurians, B.C. 187. (Liv., 39, c. 2.) The church of St. Michael is partly built with the remains of a temple dedicated to Castor and Pollux. The town contains several Roman inscriptions. Father Angelico Aprosio, a native of Ventimiglia, and a great philologist and bibliographer of the seventeenth century, bequeathed a considerable library to the Augustine convent in the town, which was plundered of its best works, by the revolutionists of Genoa, it is said, during the French invasion in 1797.

In the eleventh century Ventimiglia had its counts, who afterwards became feudatories of the city of Genoa. This relation was confirmed by the diploma of the emperor Frederic I., dated 1162, which granted to the republic of Genoa the whole Riviera from Monaco to La Spezia, as an imperial fief, saving the rights of the respective counts and marquises. In the thirteenth century Ventimiglia was a subject of dispute between Genoa and the Anjou counts of Provence. In April, 1794, the French, who had already taken possession of Nizza and Monaco, appeared before Ventimiglia. The Genoese governor, not having the means of resistance, could only protest against this violation of a neutral territory. The French then spread along the Riviera, from whence, two years after, they penetrated into the plains of Lombardy.

Between Ventimiglia and San Remo, on a hill above the road, is the village of Perinaldo, the birth-place of the astronomer Domenico Cassini, and his nephew Maraldi, likewise an astronomer, who died at Paris in 1729.

The province of San Remo was for a long time the extreme boundary of the Genoese territory. It has been also considered, geographically speaking, as the western boundary of Italy on this side, the offsets of the Maritime Alps from the group of the Col di Tenda coming close to the sea near Monaco, and closing the passage, whilst the river Roia, which descends from Tenda, flows along their eastern or Italian base. [MONACO.] The country of Nizza, which lies to the west of the mountains, is open on the side of Provence, the Var being rather a conventional than a geographical boundary. In the Antonine Itinerary the boundary between Italy and Gaul is placed at the mountain summit, now called Colle della Turbia, on the road between Villafranca and Monaco, upon which a splendid trophy was raised by the senate to Augustus, in commemoration of his having finally subjected all the Alpine tribes, of which an inscription, given by Pliny (iii. 20), recorded the names. A fragment of the inscription, with the words 'Gentes Alpinæ devictæ,' is seen upon a gate leading to the square of S. Giovanni in the village of Turbia, as well as fragments of columns and other remains. The neighbouring church was built with stones taken from the monument, the massive round tower or body of which, that bore the colossal statue of Augustus, still remained in the seventeenth century, and was used as a castle to defend the pass; but Marshal Villars, in the wars of Louis XIV., blew up the greater part of it. The remaining part is called by the natives 'Il trofeo di Augusto.'

SAN SEBASTIAN. [SEBASTIAN, SAN.]

SANA. [ARABIA.]

SANADON, NOEL-ETIENNE, was born at Rouen, February 16, 1676. Having entered early into the order of Jesuits, he became professor of rhetoric first at Caen, and afterwards at Paris. On the death of Père Ducerceau, he was appointed tutor to the Prince de Conti, through whose influence he became, in 1728, librarian of the Collège de Louis le Grand, which situation he held till his death, October 22, 1733.

The Père Sanadon was possessed of considerable erudition, and was on terms of intimacy with Huet and most of the other learned men of his time. He is the author of a prose translation of Horace, 'Les Poésies d'Horace, disposées suivant l'Ordre chronologique, et traduites en Français, avec des Remarques et des Dissertations critiques,' Paris and Amsterdam, 1728, 2 vols. 4to. There is a subsequent edition in 8 vols. 12mo., 1759. This translation is better than that of Dacier, and has smoothed the way for following translators, but it possesses few of the beauties of Horace. Sanadon is the author of a Latin heroic poem, 'Nicanor Moriens,' which contains some pleasing imitations of Theocritus, Anacreon, and other Greek poets. He wrote also some Latin lyric poems, 'Carminum Libri Quatuor,' Paris, 1715, 12mo., and translated the 'Pervigilium Veneris,' Paris, 1728, 12mo. Many of his Latin verses and Latin discourses have been published separately, of which a detail is given in Moreri's 'Dictionnaire Historique,' edition of 1759.

SANCERRE. [Cher.]

SANCHEZ, FRANCISCO, commonly called 'El Brocense,' an eminent classical scholar of the sixteenth century, was born at Las Broças, in the province of Estremadura in Spain, in 1523. He commenced his studies at the university of Valladolid, where he took his degree of bachelor of arts in 1551. From thence he went to Salamanca, where, having been incorporated in the university, he obtained, in 1554, the chair of rhetoric, and also taught Greek and Latin with the highest reputation. Justus Lipsius, Scioppius, and other learned scholars of his time speak in the highest terms of him. The former bestows on him the epithets 'divine' and 'admirable,' and in one of his letters (*Ad Italos et Hispanos*, p. 89) calls him 'Mercurius atque Apollo Hispaniæ.' In 1574 Sanchez took the doctor's degree. He had already edited Persius, Pomponius Mela, the 'Ibis' of Ovidius, Virgil's 'Bucolics,' and Horace's 'Art of Poetry.' He now devoted all his leisure to the composition of the work which gained him most reputation, namely, his 'Minerva; seu de Causis Linguæ Latinæ Commentarius,' which appeared for the first time at Salamanca in 1587, 8vo., and was often reprinted during the sixteenth century, and in more modern times at Amsterdam, 1754, 1761, 8vo., with remarks by Scioppius and numerous annotations by James Voorbroek. [Perizonius.] Another edition was published at Utrecht, 1795, with the additions of Everard Scheid. The 'Minerva' is a work in which the rules of Latin syntax are explained by means of quotations from the classic authors. It gained its author great reputation among the learned of his time. In 1593 Sanchez resigned the chair of rhetoric in favour of his son-in-law Bartholomé de Cespedes, and reserved for himself those of Latin and Greek grammar, which he filled till the time of his death. Sanchez died on the 17th January, 1601, at the age of 77, and was buried in the church of the convent of San Francisco. Besides the above-mentioned he wrote the following works:—'Veræ brevisque Grammatices Latinæ Institutiones' (Salamanca, 1587, 8vo.), which he subsequently published in Spanish under the title 'Arte para saber Latin' (Sal., 1595, 8vo.); 'Grammaticæ Græcæ Compendium' (Salam., 1592, Antw., 1581, 8vo.); 'De Arte Dicendi,' Salam., 1556; 'De Interpretandis Auctoribus, sive de Exercitatione,' Antw., 1582 and 1592; 'Paradoxa,' Antw., 1582, 8vo.; 'Organum Dialecticum et Rhetoricum,' Salam., 1588, 8vo.; 'De Nonnullis Porphyrii aliorumque in Dialectica Erroribus Scholæ Dialecticæ,' Salam., 1588 and 1597. He also published a very learned Commentary on the 'Emblems' of Andrea Alciati, Leyden, 1563; on the 'Sylvæ' of Angelo Politiano, Salam., 1554; on the Poems of Juan de Mena [Mena]; on the works of Garcilaso de la Vega, Salam., 1574. All his minor works, with the exception of the 'Minerva,' were collected and published at Geneva in 1766, 4 vols. 8vo.; prefixed to the first volume is the life of the author by Gregorio Mayans.

Sanchez, Francisco, an eminent physician, who lived at the same time as the subject of the preceding article, has often been mistaken for him. He was born of Jewish parents, but embraced the Christian religion. He died in 1632. His works, among which is a valuable Commentary on the Physics of Aristotle, were published after his death, Toulouse, 1636, 4to.

SANCHEZ, THOMAS, a learned theologian, was born at Cordova in 1550, of noble parents. At the age of sixteen he entered the Society of the Jesuits, and in course of time became director of the noviciate at Granada. His reputation for sanctity and theological learning was such that he was consulted on difficult cases of conscience by persons from all parts of Spain and Italy. This induced him to write his 'Disputationes de Sancto Matrimonii Sacramento,' which he intended as a sort of manual for confessors. This work, in which the author displayed great learning, has been the subject of much animadversion (Bayle's *Dict.*, vol. ix., p. 45), owing to the free manner in which the subject is treated. It was first printed at Geneva, 1602, folio, and has subsequently gone through fifteen different editions. He also wrote 'Opus Morale in Præcepta Decalogi,' Mad., 1613; and 'Consilia, seu Opuscula Moralia,' Lyon, 1634-5. Sanchez died 19th May, 1610, at Granada, where he was interred with great pomp.

SANCHEZ DE ARE'VALO, RODRI'GO, generally known as Rodericus Sanctius, a Spanish prelate, much admired for his writings on ecclesiastical history and other subjects, was born at Santa Maria de Nieva, in the diocese of Segovia, in 1404. After receiving his classical education at the university of Salamanca, and obtaining the degree of doctor, he entered the church, and was made successively archdeacon of Treviño in the diocese of Burgos, dean of Leon, and dean of Seville. About 1440, John II., king of Castile, wishing to send an ambassador to Frederic III., chose Sanchez for that purpose. Sanchez succeeded so well in the object of his mission, that when Calixtus III. became pope, he was sent by Henry IV. of Castile to congratulate his holiness on his accession. In all his embassies Sanchez made Latin harangues to the different princes to whom he was sent. These harangues are still preserved in manuscript in the Vatican library. On the accession of Paul II., Sanchez, who had been prevailed upon by his predecessor to settle at Rome, was appointed by that pope governor of the castle of St. Angelo, and keeper of the jewels and treasures of the Roman church; and in course of time promoted to the bishoprics of Zamora, Calaborra, and Palencia, which he however governed without quitting Rome. He employed all the time he could spare from his official duties in composing several works, most of which have never been printed. He died at Rome, Oct. 4th, 1470, and was interred in the church of Santiago dei Spagnuoli. He wrote the following works:—'Speculum Vitæ Humanæ, &c.,' being a treatise on morals, divided into two books, in which very heavy censure is passed on the clergy, Rome, 1468, folio; 'Epistola de Expugnatione Nigropontis,' folio, without date, but probably before the author's death. 'Compendiosa Historia Hispanica' (Rome, 1470, 4to.), dedicated to Henry IV. of Castile; this was subsequently reprinted in the collection entitled 'Hispania Illustrata,' by Andrea Schott, vol. i. (Frankfort, 1603). 'Liber de Origine ac Differentia Principatus, &c.,' being a treatise wherein the author labours to prove the supremacy of the pope over all other sovereigns, Rome, 1521. He also wrote many more works on different subjects, which are still in manuscript in the Vatican library, and the catalogue of which may be seen in Nicolas Antonio, 'Bib.,' vol. i., p. 297.

SANCHUNIATHON, a Phœnician writer, whose æra is not certain: some make him a contemporary of queen Semiramis (Euseb., *Præp. Evang.*, i., p. 31; x., p. 485); and others say that he lived about the time of the Trojan war. (Porphyr. ap. Euseb., l. c.; Suidas, s. v. Σαγχωνιάθων.) His birthplace, according to the general opinion, was Berytus, though Athenæus (iii., p. 126, where however the common reading is Σουνιαίθων) and Suidas call him a Tyrian. He was the contemporary of Adonilibnas, a king of Byblus, to whom he was engaged as secretary; and it was at the request of this king that he wrote his principal work. Suidas mentions the titles of two works of Sanchuniathon, one called *περὶ τῆς Ἑρμοῦ φυσιολογίας*; another *Αἰγυπτιακὴ θεολογία*. Athenæus speaks of Φοινικικά of Sanchuniathon, i.e. 'A History of Phœnicia,' which by other antient writers is called *Φοινικικὴ ἱστορία*, or *Φοινίκων θεολογία*. (Porphyr., *De Abstin. ab Anim.*, ii., p. 94: Theodoret, p. 34.) But these three titles probably refer to different portions of the same work, namely, to the 'History of Phœnicia' in which he escribed the religious as well as the profane history of his wn country, and also the theology of Egypt. He is said to ave derived most of his information from the books of aaut (Hermes), or from Hierombal, a priest of the god ευώ (perhaps Jehovah); and if the latter be the same as erobaal (Gideon) in the book of *Judges*, Sanchuniathon ust have lived in the fourteenth century before the hristian æra. But little confidence can be placed in these nd similar conjectures; and some critics have gone so far s to deny the existence of Sanchuniathon.

The original works of Sanchuniathon, which were written n the Phœnician language, are now lost, and even the ntients who speak of them do not appear to have been cquainted with them in the original language, but they peak of a Greek translation made by Philo of Byblus, a rammarian who lived during the latter half of the first cenury of our æra. The original work of Sanchuniathon is aid to have consisted of eight books (Porphyr., *De Abstient.*, ii., p. 94), but the translation of Philo was divided into ine books. (Euseb., *Præp. Evang.*, i., p. 31.) The work f Eusebius just referred to contains a considerable fragent of the history of Sanchuniathon, which gives an account of the gods of the Phœnicians and Egyptians, and till ithin the last few years this and a few other fragments, as ranslated by Philo, were the only parts of the work of Sanhuniathon which were known. A very useful edition of hese fragments was published at Leipzig, in 1826, by J. C. relli, under the title 'Sanchoniathonis Berytii Fragmenta e Cosmogonia et Theologia Phœnicium, Gr. et Lat. recogn. mend. not. sel. Scaligeri, Bocharti, G. J. Vossii, Cumberandi aliorumque permult. suisque animdv., illustr. J. C. relli.' But in the year 1835 a MS. containing the whole f the nine books of Philo's translation of Sanchuniathon as discovered in the convent of Santa Maria de Merinhao, n the province of Entre Douro e Minho in Portugal, by olonel Pereiro; or according to others, by a German sureon. The discovery of so important a work created a great ensation throughout Europe, but the opinions of scholars ere divided; some declared the work to be a forgery of hilo, while others, and especially Grotefend, exerted their tmost to prove that the work was the real translation of anchuniathon made by Philo. The controversy was at the ime carried on with great zeal in Germany, and the result as, that at last almost all scholars agreed that the work s spurious. In 1836 Wagenfeld published a German translaion of it, with an introductory discourse by Grotefend, under he title 'Sanchuniathon's Urgeschichte der Phœnizier, in inem Auszuge aus der wieder aufgefundenen Handschrift on Philo's vollständ. Uebersetzung nebst Bemerkungen on Fr. Wagenfeld mit einem Vorworte von G. F. Grotefend, it einem Facsimile,' Hanover, 1836. The year following here appeared 'Sanchuniathonis Historiarum Phœniciæ bros novem, Græce versos à Philone Byblio, edidit Latiaque versione donavit F. Wagenfeld,' Bremæ, 1837, 8vo.; nd another German translation, 'Sanchuniathon's Phœnische Geschichte: nach der Griechischen Bearbeitung des hilo von Byblos ins Deutsche übersetzt, mit einer Vorrede,' übeck, 1837, 8vo. Compare, on Sanchuniathon in general, A. Fabricius, 'Biblioth. Græc.,' vol. i., p. 222, &c.: and especting the controversy on the new discovery, C. L. Groteend, 'Die Sanchuniathonische Streitfrage nach ungedrucken Briefen gewürdigt,' Hanover, 1836, 8vo.; Schmidt, 'Der euentdeckte Sanchuniathon, ein Briefwechsel,' Altona, 838, 8vo.: and Movers, 'Die Phönizier,' p. 116, &c.

SANCROFT, WILLIAM, born 1616, died 1693, an minent and learned prelate of the English church, was orn at Fresingfield in Suffolk, and being remarked while t school for his piety and extraordinary powers and attainnents, was early destined for the church, and sent to study n Emmanuel College, Cambridge. He was living in the University in 1642, but he soon after lost his fellowship at Emmanuel in consequence of his refusal to take the Solemn League and Covenant.

While in the University, he was a most diligent student. We are not informed what he did from the time when he ost his fellowship to the return of the king, but it was uring this period that he produced his work entitled 'Modern Policies and Practices,' a work containing statements f general principles in politics, but intended plainly to bear n the prevalent doctrines and principles of the day. Some part of the time was spent abroad. A little before the king's return, he was in England, and chosen one of the University preachers; in the same year he was collated to the rectory of Houghton-le-Spring, and made a prebendary of the church of Durham. His rise was now rapid: in 1662 he was made master of Emmanuel; in 1663, dean of York; in 1664, dean of St. Paul's; in 1668, archdeacon of Canterbury; and in 1678, archbishop of Canterbury.

While in this high dignity, he performed many useful works. But a change was at hand. King James II. found no countenance from the archbishop in his designs to introduce popery, nor passive acquiescence; and when he had issued his declaration for liberty of conscience, and required the clergy to publish it, Sancroft refused, and, accompanied by six other bishops, presented a petition to the king against the declaration. This petition was treated as a libel, and the seven prelates were committed to the Tower, but on their trial were acquitted. In the same year he was much employed in endeavouring to effect a comprehension of the dissenters and the church. He concurred in the declaration for a free parliament when King James had withdrawn himself, but when the Prince and Princess of Orange were declared king and queen, he, together with several other of the prelates and many of the inferior clergy, refused to acknowledge them as such, and he was in consequence deprived of his dignity.

Tillotson was nominated his successor; and as to Sancroft himself, he did not long survive. Retiring to Fresingfield, the place of his birth, he lived there in a state of great seclusion till his death, which occurred on November 24, 1693. He was buried in the churchyard of that place, under a tomb, the inscription on which, written by himself, is characteristic and remarkable:—'William Sancroft, born in this parish; afterwards, by the providence of God, archbishop of Canterbury; at last, deprived of all which he could not keep with a good conscience, returned hither to end his life, and professeth here, at the foot of his tomb, that as naked he came forth, so naked he must return, the Lord gave, and the Lord hath taken away (as the Lord pleases, so things come to pass), blessed be the name of the Lord.' There is more of it, but this is the most striking part.

SANCTIFICATION, a term in Theology, denoting the highest Christian attainment; the state of those who are perfectly pure and holy, having lost the inclination to vice, and are wholly devoted to virtue and godliness. It is understood to be produced by the special operation of the Holy Ghost, and to ensue upon justification.

SA'NCTIUS. [SANCHEZ.]

SANCTO'RIUS, the Latinized form of the name of an eminent Italian physician, who was called in his own language Santorio. He was born in 1561, at Capo d' Istria, studied medicine and took his degree at Padua, and then settled at Venice as a practitioner, where he had considerable success. In 1611 he was recalled to Padua, and appointed professor of the theory of medicine in that university. He there commenced a series of observations on insensible perspiration, which have made his name known throughout Europe, even among those who do not belong to the medical profession. 'For the better carrying on these experiments,' says Addison, in the *Spectator*, No. 25, 'he contrived a certain mathematical chair, which was so artificially hung upon springs that it would weigh anything as well as a pair of scales. By this means he discovered how many ounces of his food passed by perspiration, what quantity of it was turned into nourishment, and how much went away by the other channels and distributions of nature.' He continued to lecture at Padua to numerous audiences for thirteen years, until his reputation occasioning his being frequently sent for to Venice by the people of distinction in that city, he resigned his chair, in order to dedicate all his time to medical practice. His resignation was accepted, but the salary continued; and with this testimony of the public esteem he removed and settled finally at Venice, where he died in 1636, aged seventy-five. A marble statue was erected to his honour in the cloister of the Servites, where he was interred; and the College of Physicians at Venice, in return for a legacy which he bequeathed them, annually commemorate him in a laudatory harangue. He was the author of the following works: 1, 'Methodus vitandorum Errorum omnium qui in Arte Medicâ contingunt Libri XV.,' Venet., 1602, fol., and several times reprinted. Haller gives a short analysis of its contents (*Biblioth. Medic. Pract.*, tom. ii., p. 351), says that there is much useful matter in it, and calls it 'magni moment opus, etsi raro citatur.' 2, 'Commentarius in Artem Medicinalem Galeni,' Venet., 1612, fol. 'Fusissimum opus, says Haller, 'ut tædium lectionis vix feras.' 3, 'Ars de Staticâ Medicina Sectionibus Aphorismorum Septem comprehensa,' Venet., 1614, 12mo. This is the work by which his name is best known, of which there were numerous editions, and which was translated into several modern languages. The latest edition that the writer has seen quoted is that with a Commentary by A. C. Lorry, Paris, 1770, 12mo. There is a French translation by Le Breton, Paris, 1722, 8vo., and by Pierre Noguez, 1725, 12mo., 2 vols.; an Italian one be F. Chiori, Venice, 1743; a German one, Bremen, 1736, 8vo.; and an English one, Lond., 1676, 12mo., and another by Dr. Quincy, third edit., Lond., 1723, 8vo. It contains the results of a long series of observations made upon the weight of his own body, and the external causes which influenced its increase or diminution. He treats especially of insensible perspiration, on the due amount of which he makes health and disease depend. There is much curious and valuable matter in the work, though the advances of modern science have thrown some doubt upon the infallibility of some of his aphorisms. He unquestionably conferred a benefit on medical science by directing the observations of medical men to the functions of the skin; but unfortunately the doctrines were extended much too far; and coinciding with the mechanical principles which were coming into vogue after the discovery of the circulation of the blood, as well as with the chemical notions which were not yet exploded, they contributed to complete the establishment of the *humoral pathology*, under the shackles of which the practice of medicine continued almost to our own times. 4, 'Commentarius in Primum Fen Primi Libri Canonis Avicennæ,' Venet., 1626, fol. 'Memorabile opus,' says Haller, 'plenumque propriorum inventorum et cogitationum apud auctorem primum natarum.' In it he describes an instrument that he had invented for measuring the force of the pulse, and several new instruments of surgery. He was also the first physician who attempted to measure by the thermometer (then newly invented) the heat of the skin in different diseases, and at different periods of the same disease. 5, 'Commentarius in Primam Sectionem Aphorismorum Hippocratis,' Venet., 1629, 8vo. A work not of much value. 6, 'Liber de Remediorum Inventione,' Venet., 1629, 8vo., contains nothing remarkable except the account of some post mortem examinations. A letter by Sanctorius, 'De Calculo,' is inserted in Jo. van Beverwyck's 'De Calculo Renum et Vesicæ Liber Singularis, cum Epistolis et Consultationibus Magnorum Virorum,' Lugd. Bat., 1638, 12mo. All his works were collected and published in four volumes, 4to., Venet., 1660.

SANCTUARY, in English law, a consecrated place which gives protection to a criminal taking refuge there. The word also signifies the privilege of sanctuary, which was granted by the king for the protection of the life of an offender. Among the Saxons the privilege of sanctuary was regulated by law, and all persons were prohibited from violating it by taking away or molesting the offender, who had a right to remain in sanctuary thirty days, after which he was to be delivered safe to his relations. The institution was probably beneficial in those times. It took away from parties the opportunity of avenging their wrongs upon the offender, and gave him time to collect the mulct, which was then the legal penalty for many crimes. The same custom prevailed after the Conquest; but under the dominion of the Normans there appear early to have existed two kinds of sanctuary, one general, which belonged to every church, and another peculiar, which commenced and had its force in a grant by charter from the king. This peculiar sanctuary could not be claimed by prescription only, and it was also necessary that it should be supported by usage within legal memory, and allowance before the justices in eyre. These two kinds differed from each other with respect to some of their privileges. The general sanctuary afforded a refuge to those only who had been guilty of capital felonies. On reaching it, the felon was bound to declare that he had committed felony, and came to save his life. If he neglected to do this, he might immediately be dragged from the place. After this declaration, he had the option, within forty days, either of surrendering himself to justice, or of stating before the coroner the particular circumstances of his offence, and taking the oath of abjuration, by which he swore forthwith to leave England, and never to return without the king's permission. The consequence of abjuration was the attainder of his blood, and the consequent forfeiture of all his goods and chattels. After taking the oath, a port was assigned him by which to quit the kingdom, and a certain time was allowed for this purpose. It seems however that if he refused to leave the sanctuary, the lay officers had no authority to remove him; and in case the spiritual authorities declined to act, there were no means of removing him except by starving him out. If during the forty days, or after the oath of abjuration, and during his journey for the purpose of quitting the realm, he was legally proceeded against, he might plead his privilege of sanctuary to an appeal or indictment. A peculiar sanctuary might, if such privilege was granted by the charter, afford a place of refuge even for those who had committed high or petty treason; and a party escaping thither might, if he chose, remain undisturbed for life. He still however had the option to take the oath of abjuration and quit the realm. Sanctuary seems in neither case to have been allowed as a protection to those who escaped from the sheriff after being delivered to him for the purpose of execution. It appears also that it was not allowed in cases of sacrilege. During the latter part of the reign of Henry VIII., at the time when the religious houses were dissolved, several statutes were passed (26 Henry VIII., c. 13; 27 Henry VIII., c. 19; 32 Henry VIII., c. 12), which regulated, limited, and partially abolished the privilege of sanctuary, both as regarded the number and classes of criminals entitled to it, and also the places possessing the privilege. Finally, by 21 James I., c. 28, s. 7, it was enacted that no sanctuary or privilege of sanctuary should thereafter be admitted or allowed in any case. [Asylum.]

(Reeves's *History of the English Law*; Comyn's *Digest*, tit. 'Abjuration;' 4 Bl., *Com.*)

SAND. A mass of any comminuted minerals is in popular language called sand; but the most abundant ingredient in the extensive sands of the deserts, sea-shores, river-banks, and soil, is granular quartz or flint.

Little attention has been paid by geologists to this abundant covering of the earth's surface. Most of the sands which we observe are the ruins of disintegrated rocks; red, white, grey, black, according to the rocks from which they were derived. On examining these rocks themselves, we find them composed of grains of such sand, not crystallized grains, but worn and rounded on their surfaces like small pebbles. The parts of these solid rocks then have once existed as mere loose sand, and we seem to return in a circle to the point of departure. The *origin* of sand is however seen in volcanic dust and ashes—in the disintegration of granitic, porphyritic, and other pyrogenous rocks; the aggregation of them is easily understood by examining millstone grit, new red-sandstone, or the grès-de-Fontainbleau; and the disintegration of sandstones is too common a phenomenon in English Gothic buildings.

Soil often contains sand, though the subjacent strata be wholly calcareous or finely argillaceous. This is a phenomenon of the same order as the accumulation of detritus (boulders, gravel, clay, &c.) in situations far from the native place of such materials. It proves that the surface has been traversed by currents of water; and there can be little doubt in the mind of an observing agriculturist, that these washings of the earth's surface, by mixing materials of different qualities, have been in many cases the cause of the fertility of soils.

Some sands impregnated with oxide of iron (and thus often blackened or rendered ochraceous) and others which are nearly white, are very sterile; others of a grey or green brown, or redder hue, are often fertile. The latter almost always contain argillaceous ingredients (often a proportion of felspar), and probably it is in a great degree to the presence of potash in the felspar or the clay that their superiority is owing. [Manure.]

SAND GROUSE. [Tetraonidæ.]

SAND MARTIN. [Swallows.]

SANDAL-WOOD. [Santalaceæ; Santalum.]

SANDAL-WOOD, RED, or Red Saunders Wood of Commerce. [Pterocarpus.]

SANDARAC (incorrectly called a *gum*, being altogether destitute of that principle, and consisting of a mixture of two different kinds of resin and a little volatile oil) is a secretion from the Callitris quadrivalvis (Thuya articulata, Desf.), a tree of enormous size, native of the upper part of the province of Temme in the kingdom of Marocco, and there called Arar. (Jackson, *Travels in Marocco*, p. 78.) It exudes spontaneously from the bark, and corcretes on the surface. It occurs in small, irregular, but rather elongated, seldom perfectly round tears, or in masses run together, which are rarely of any considerable size, of a light yellow colour, sometimes verging to brownish, of a dull hue externally, generally covered with powder, but when this is removed, semitransparent. It breaks easily with a conchoidal fracture and vitreous lustre. The powder is white, and forms the substance called *pounce*. By chewing it forms a fine powder, which does not agglutinate, and has a faint balsamic taste. At ordinary temperatures it is without odour, but by the application of heat it easily melts and diffuses a strong though not unpleasant odour, resembling that of juniper or mastic, but not so agreeable as the latter. It is easily ignited. It is soluble to the extent of four-fifths in cold alcohol, and the insoluble residuum is easily soluble in æther, or, slowly and with difficulty, in boiling turpentine. The portion insoluble in alcohol is termed *Sandaracin*.

Sandarac is used for the preparation of varnishes, also occasionally for incense or pastilles, plasters, and ointments. The powder is rubbed on parchment to render it fit to be written on. Sandarac is sometimes used to adulterate mastic; and on the other hand, a resin obtained from the Juniperus communis, and another from J. Oxycedrus, are employed as a substitute for the genuine sandarac. In Sweden, lumps of resin which are found under ants' nests below the juniper bushes are called Sandarac. The resin of the Pinus Dammara (Agathis loranthifolia, Salisb.) is called French Sandarac in commerce. Sandarac must not be confounded with Orpiment.

SANDBACH. [CHESHIRE.]

SANDBY, PAUL, an English artist of very great merit and deserved reputation, was born at Nottingham in the year 1732. At the early age of fourteen he came to London, and obtained an introduction to the drawing-room at the Tower, where he had studied about two years, when the duke of Cumberland, wishing to have a survey of the north and west parts of the Highlands of Scotland, Sandby was employed as draughtsman under Mr. David Watson. Though his proper occupation was the drawing of plans, he devoted his leisure hours to making numerous sketches of the fine scenery of that romantic country. From these sketches he made some small etchings, which were published by Ryland and Bryce. About 1752, after his return from the Highlands, he passed some time at Windsor, where he made drawings of the beautiful scenery of Windsor and Eton. These drawings were much admired, and were purchased by Sir Joseph Banks, who soon afterwards invited him to accompany him on a tour in Wales. Here he was employed by Sir Watkin Williams Wynne to take views of the picturesque scenery of the principality. These he afterwards engraved in aqua-tinta, in imitation of drawings, with a degree of perfection to which that style of engraving had never before attained.

On the institution of the Royal Academy in 1768, Mr. Sandby was chosen one of the original members, and in the same year received the appointment of head drawing-master to the Royal Military Academy at Woolwich; an office which he held with credit to himself and great advantage to the academy till his death.

His industry was as remarkable as his genius, and the number of his drawings which are contained in the cabinets of amateurs is immense. It appears that he sometimes painted in oil, but none of his performances of that kind are known to the public.

SANDEC (pronounced Sandetz), one of the circles of Austrian Galicia, is 1400 square miles in extent, and has 220,000 inhabitants. It is bounded on the north by the circle of Bochnia, on the east by that of Yaslo, on the north-west by that of Wadowice, and on the south and south-west by Hungary. The southern part is entirely covered by the Carpathian Mountains. There are many sandy tracts. The soil in some parts is stony, and only a few spots are fertile. The Dunajetz rises in the south-west corner of the circle, but is not navigable till it has been joined above Old Sandec by the Poprad, a more considerable stream, which comes from Hungary, traverses the whole circle, and receives all the smaller streams. The inhabitants are industrious, and cultivate the soil with great care and industry. They have also a pretty numerous breed of cattle. The abundance of wood enables them to maintain many glasshouses, and they manufacture great quantities of yarn and linen.

NEW SANDEC, the chief town of the circle, is situated on an eminence on the right bank of the rapid Dunajetz, in a wide and fertile plain bounded by mountains rising like an amphitheatre behind each other. It has a gymnasium, founded in 1818, a district school, and the public offices of the circle. The number of inhabitants is nearly 5000, of whom one-third are Jews. OLD SANDEC, about 6 miles to the north, consisting chiefly of wooden houses, has 3000 Christian inhabitants, a convent of nuns of the order of St. Clarissa, a female school for the higher classes, and a gymnasium. It is also the residence of a vicar-general for the three western circles, who has a chapter and a consistory, and exercises episcopal functions since the suppression of the bishopric of Tarnow.

SANDEMANIANS, one of the minor sects, consisting of persons who profess to be followers of Robert Sandeman, a native of Perth, born in 1718. They are however really an offset from the Glasites of Scotland, a body of religionists followers of Mr. John Glas, a minister in the Presbyterian church, who was removed from his office, on account of certain peculiarities of religious opinion, in the year 1728. Mr. Sandeman married Catherine Glas, daughter, we believe, to John Glas, and entered into all his peculiarities. In 1757 he published his Letters on the 'Theron and Aspasia' of Mr. James Hervey, in which the peculiarities of the Glasite system are exhibited in a popular manner. In 1758 he began a correspondence with Mr. Samuel Pike, an Independent minister of note in London, who adopted his views, and in 1760 he removed to London, where he preached in various places, and attracted much notice. He did not however remain long in London, for in 1764 he removed to the American Colonies, where he continued till his death.

The leading doctrine of the sect is thus expressed in the epitaph on Mr. Sandeman's tomb at Danbury in New England:—'Here lies, until the resurrection, the body of Robert Sandeman, who, in the face of continual opposition from all sorts of men, long and boldly contended for the antient faith, that the bare death of Jesus Christ, without a deed or thought on the part of man, is sufficient to present the chief of sinners spotless before God.'

The Sandemanians in London met first for public worship at the hall of the Glovers' Company, afterwards at an old meeting-house of the Quakers in Bull and Mouth Street, and from 1778 at a chapel in Paul's Alley, Barbican.

The best account which has been given of this sect is to be found in 'The History and Antiquities of the Dissenting Churches in London,' by Walter Wilson, in four volumes 8vo. (vol. iii., p. 261-276). After giving a more detailed account of the faith of this body of persons, he proceeds 'to unfold some of those practices by which they are distinguished from other Christians: these are, their weekly administration of the Lord's supper; their love-feasts, of which every member is not only allowed but required to partake, and which consist in dining either in the vestry of their meeting-house or at each other's houses in the interval between the morning and afternoon services; their kiss of charity at the admission of a new member, and at other times when they deem it necessary and proper; their weekly collections before the Lord's supper, for the support of the poor and defraying other expenses; mutual exhortation; abstinence from blood and things strangled; washing each other's feet, when, as a deed of mercy, it might be an expression of love; community of goods, by which any one is to consider the whole of his property liable to the calls of the poor and of the church; and the unlawfulness of laying up treasures upon earth, by setting them apart for any distant, future, and uncertain use. Agreeably to this, they do not allow of putting out money to interest. They allow of public and private diversions, so far as they are not connected with circumstances really sinful; and, apprehending a lot to be a thing sacred, they disapprove of lotteries and games of chance.' Such is Mr. Wilson's account.

The sect is said to be more numerous in America than in England.

SANDERLING. [SCOLOPACIDÆ.]

SANDGATE. [KENT.]

SANDOMIR. [POLAND.]

SANDO'RICUM, a genus of plants of the natural family of Meliaceæ, which is named from a change in one of its eastern names, Suntoor or Sundoor. The genus contains only a single species, found in the hot parts of Asia, and is characterised by having the calyx 5-toothed. Petals 5. Stamens 10, joined into a tube, which is 10-toothed, and bears the anthers inside. Stigmas 5-bifid. The drupe contains 5 ovate compressed nuts, which are 2-valved at the base, and 1-seeded. *S. indicum*, the only species, is an elegant tree of considerable size, which is found in the Molucca and Philippine Islands, as well as in the southern parts of India. The leaves are alternate and trifoliolate, leaflets entire, panicles axillary, with the flowers crowded on the short partial peduncles. The fruit is acid, and sufficiently agreeable to be mixed with syrups to make cooling drinks: its root is bitter, and used in medicine in bowel complaints. It is sometimes called false mangosteen, from some resemblance to its fruit, and also Indian sandal-wood.

SANDOVA'L, FRAY PRUDENCIO DE, an eminent Spanish historian, was born at Valladolid, others say at Monterey in the province of Galicia, about 1560. His parents having educated him for the church, he took the monastic orders at the Benedictine convent of Santa Maria la Real de Naxera, where he passed several years, devoting all his attention to the study of the civil and ecclesiastical antiquities of Spain. Having gained some reputation by his writings, he was made abbot of San Isidro de Guengua at Valladolid, and soon after appointed historiographer to Philip III. This monarch charged him with the continuation of the 'Cronica General' of Ambrosio de Morales [MORALES], which Sandoval published under the title of 'Historia de los Reyes de Castilla y de Leon.' Other historical works which he published at the same time, attracted the notice of Philip, and he was rewarded by him with the bishopric of Tuy in Galicia, which Sandoval held until he was translated to that of Pamplona in 1612. Sandoval's whole life was spent in visiting the public archives and principal libraries in Spain, where he found many interesting documents. He died at Pamplona, March 17, 1621, at the age of sixty-one. Besides the above, Sandoval wrote several other works on the history and antiquities of his native country, among which the following are the most deserving of notice:—'Cronica del Inclyto Emperador de España Don Alonso VII.,' Mad. 1600, fol.: this is a chronicle of Alfonso VII., king of Castile and Leon, surnamed 'the Emperor.' 'Historia de la Vida y Hechos del Emperador Carlos V.,' in two parts (Valladolid, 1604, fol.), Pamplona, 1614, and Antw., 1681. This work is greatly praised by Robertson, who used it for his 'History of Charles V.' There are two old English translations, or rather abridgments, of it; one by James Wadsworth, under the title of 'The Civil Wars of Spain,' Lond., 1652, fol.; the other by Capt. John Stevens, 'History of Charles V.,' Lond., 1703, 8vo. 'Antiguedad de la Ciudad y Iglesia Cathedral de Tuy,' Braga, 1620, 4to. 'Catalogo de los Obispos de Pamplona,' Pamp., 1604, fol. 'Regla e Instruccion de San Leandro,' Valladolid, 1604, 8vo. He also edited the chronicles of Isidorus Pacensis, Sebastianus Salmanticensis, Sampirus, bishop of Astorga, and Pelagius Ovetensis, all writers of the twelfth century, the whole being published in a volume under the title of 'Las Cronicas de los Quatro Obispos,' Pampl., 1615 and 1634, fol. Sandoval is justly considered by Spaniards one of their best historians. His style is clear and unaffected, and his erudition vast, though, like most writers of his time, he is occasionally led away by a strong spirit of nationality.

SANDPIPER. [SCOLOPACIDÆ.]

SANDSTONE. The aggregation of sands into stone takes place by the entire confluence of the grains (through a sort of semifusion), as in quartz rock, and in common gritstones which adjoin trap-dykes or great faults; by mere coherence of grains, as in many white sandstones; by interposition of finer particles of carbonate of lime, clay, oxide of iron, &c., as in the sandstones of coal tracts; or by a complete infiltration of sub-crystallized carbonate of lime, as in some of the Hastings sandstones, grès-de-Fontainbleau, &c. In regard to structure, we have laminar sandstones, the laminæ plane, waved, or even slightly concentric; and freestones, in which, without any real lamination, the grains are arranged unsymmetrically and indiscriminately, so as to present in the mass equal resistances in every direction. The laminar sandstones can be split; the freestones may be worked with ease in any direction. Sandstones, in popular language, occupy a station intermediate between sand and gritstone; but there is little consistency in the geological application of the term.

SANDRART, JOACHIM VON, well known as a painter and engraver, but more celebrated for his writings on the arts, was born at Frankfort on the Main, in 1606. Having received a good general education, he devoted himself to the study of the arts, and was first instructed in engraving by Theodore de Bry and Matthew Merian. When he was only fifteen years of age, he went to Prague, where he was for some time instructed in engraving by Giles Sadeler, who however advised him to apply to painting, which he judged to be better suited to his genius. He accordingly went to Utrecht, where he became a pupil of Gerhard Honthorst. Under this able teacher he made great progress, so as to be shortly able to assist his master in many of his most important works.

Descamps affirms that when Honthorst was invited to England by Charles I., he engaged Sandrart to accompany him, that the king bespoke many pictures of him, that he copied several portraits by Holbein for the Earl of Arundel, and that he remained in England till 1627 (in which case he would have been only twenty-one years of age), when he went to Venice. Pilkington's Dictionary, edited by Fuseli (1818), gives a similar account. But Bryan (1816) says 'there appears to be very little authority for this account. No picture of Sandrart's is mentioned in king Charles's collection, and what renders the story of his having been in England more improbable, is that he takes no notice of it himself in his Life of Honthorst, though he mentions that artist's journey to England, and gives an account of his works here.' We may add that Dr. Waagen does not mention a single picture by Sandrart among the numerous English collections which he describes. It is certain that he spent several years in Italy. At Venice he copied the finest pictures of Titian and Paul Veronese, and at Rome was much employed by Cardinal Barberini and Prince Giustiniani. After a long residence in Italy he returned to Frankfort, and executed many considerable works for the emperor Ferdinand, and for Maximilian, duke of Bavaria. He passed the latter years of his life at Nürnberg, where he died in 1683, aged 77 years. At Nürnberg he published several works, particularly his Lives of the Painters, under the title of 'Academia Artis Pictoriæ.'

SANDWICH, a municipal and parliamentary borough, in the county of Kent, about 67½ miles from the General Post-office, London, through Rochester and Canterbury. It was early a place of importance, and an original member of the Cinque Ports. [CINQUE PORTS.] It probably arose out of the decay of the Roman Ritupæ. [KENT, vol. xiii. p. 191, col. 2.] The name Sondwic occurs as early as A.D. 665. (Boys's *Hist. of Sandwich*, p. 833.) The Danes were defeated here, A.D. 851 or 852, by Athelstan, son of Ethelwulf. They were at Sandwich again in A.D. 993 or 994, and in A.D. 1006 or 1007; the Anglo-Saxon fleet was at Sandwich in A.D. 1008, and the Danish fleet in A.D. 1013 and 1014. Canute landed here in A.D. 1016. It is again mentioned as a place of rendezvous for naval armaments in the time of Edward the Confessor, in whose reign the town had 307 inhabited houses. At the time of the Domesday Survey there were 383. At this time the port belonged to the archbishop of Canterbury and the monks of Christchurch, Canterbury. Part of the rent received by the archbishop consisted of 40,000 herrings for the monks' food. In the reigns of Edward I. and III. the archbishop and monks gave up Sandwich to the crown, in exchange for lands granted elsewhere. In the time of Henry III. the town was burnt by the French. In the French wars of Edward III. it is mentioned as a place of rendezvous or of landing. In the reign of Henry VI. the French took and plundered the town three times. To prevent similar disasters, Edward IV. renewed the fortifications; and in following reigns attempts were proposed or made to preserve or improve the harbour, which was beginning to decay from the accumulation of sand. This choking up of the harbour led to the decline of the town, which was however revived by the settlement of the Flemish refugees, in the reign of Elizabeth, and the introduction by them of the manufacture of baize and other woollens. The same emigrants cultivated the lands round the town for vegetables, flax, and canary seed.

The town stands in the marsh lands which border on the Isle of Thanet, on the south side of the Stour, near its mouth in Pegwel Bay. It is irregularly and inconveniently laid out: the streets and lanes are paved and lighted, but they are very narrow. The antient municipal limits comprehend the three parishes of St. Mary, St. Peter, and St. Clement, and the extra-parochial district of St. Bartholomew, and the town is partly in each. The area comprehended in these limits is 1960 acres; the population, in 1831, was as follows:—St. Mary's parish, 952; St. Peter's, 1220; St. Clement's, 912; district of St. Bartholomew, 52: total, 31

The parishes of Deal and Walmer, adjacent to Sandwich, and the villes of Ramsgate and Sarr, in the Isle of Thanet, are in the jurisdiction of the Cinque Port of Sandwich; in the parish of Deal the corporation of Sandwich has concurrent jurisdiction with that of Deal, but this jurisdiction is only partially exercised. A part of the town wall is standing, and one of the gates, Fishergate, on the north side of the town, towards the bridge, which is a stone structure, with a swing-bridge in the middle, to admit the passage of vessels. St. Clement's church is a massive building, consisting of a nave and two aisles, a chancel, and a tower rising above the centre of the church. This tower is of Norman architecture, supported by four semicircular arches with massive piers, and is by far the most antient part of the edifice: it is built of Caen stone. The rest of the building, which is of later date, is built of flint boulders from the shore, sandstone, and Caen stone, probably from the ruins of the more antient Norman church. There are an antient octagonal font and some wooden stalls. St. Peter's church consisted originally of a nave, with two aisles and a chancel, but the fall of the steeple, in A.D. 1661, demolished the south aisle, which has never been rebuilt. The church appears to have been built of Caen stone, well squared and neatly joined; some portions built in this way still remain, but the remainder is built of fragments of the older structure, mixed with sandstone, Kentish rag, and flints from the shore; the upper part of the tower is of brick. St. Mary's has a nave, with north aisle and a chancel: it was rebuilt after the greater part of the church had been beaten down by the fall of the steeple, A.D. 1667, but includes some parts of the more antient structure. The steeple was built A.D. 1718, upon the south porch, and is of brick, with the upper part of wood. On the south side of the town is the hospital of St. Bartholomew, a charitable foundation of great antiquity. The chapel is a small neat building, of antient date. The Guildhall is of the date of Elizabeth; the gaol, which is clean, airy, and well-arranged, was built about ten years since. The Wesleyans and Independents have each a place of worship. There are a free grammar-school, founded in the time of Elizabeth, and some almshouses.

The business of the place consists chiefly in tanning leather and in sorting wool. Only small vessels can come up to the town. Some timber and iron are brought from the north of Europe; and corn, malt, flour, seeds, hops, fruit, and wool are shipped, chiefly coastwise. The market-days are Wednesday and Saturday; the latter is a large corn-market, and there is a large cattle-market once a fortnight. There is a yearly fair.

The corporation, under the Municipal Reform Act, consists of four aldermen and twelve councillors. The municipal boundaries were not altered; and the borough was not to have a commission of the peace except on petition and grant. Sandwich returned two members to parliament from the forty-second year of Edward III. By the Boundary Act the parishes of Deal and Walmer were, for parliamentary purposes, added to it. The population of the parliamentary borough, thus enlarged, was, in 1831, 12,183; the number of voters on the register, in 1834-5, was 934; in 1835-6, 841, beside those in Walmer, who were not included in the last return.

The living of St. Peter's is a rectory, of the clear yearly value of 144*l.*, with a glebe-house; those of St. Clement and St. Mary are vicarages, of the clear yearly value of 310*l.* and 117*l.* respectively; there is a glebe-house to St. Mary. All are in the diocese and archdeaconry of Canterbury.

There were in the three parishes, in 1833, two infant or dame schools, with 14 boys and 18 girls; one boarding-school, with 21 girls; a national school, with 90 boys and 65 girls, supported partly by endowment and subscription, partly by the payments of the children; and eight other day-schools, with 134 boys and 112 girls. There was an endowment for a grammar-school, but there were no children in it. There were three Sunday-schools, with 75 boys and 112 girls.

SANDWICH ISLANDS are a group of islands situated in the northern part of the Pacific, between 18° 55′ and 22° 20′ N. lat., and between 154° 50′ and 160° 40′ W. long. They extend within these limits in a slightly curved line from south-east to north-west, and are thirteen in number; eight of them are of moderate size, and the other five small. The larger islands are Hawaiï, Mauï, Tahaurawe, Ranaï, Morokaï, Oahu, Tauai, and Nihau.

Hawaiï, formerly called *Owhyhee*, the most south-eastern island, is the largest of the whole group, and indeed twice as large as all the rest together. In form it approaches to a triangle, and is nearly 100 miles long from south to north, and nearly 80 miles wide in the broadest part. The surface is said to be 4000 square miles, but it probably does not fall much short of 5000. It is therefore somewhat more than 1000 square miles smaller than Yorkshire, about the size of the state of Connecticut, and above 1600 square miles larger than the island of Corsica. The interior is occupied by a table-land 8000 feet above the sea-level, and almost entirely unknown, as it has never been visited by Europeans, and not much more by the natives, there being no road over it from one side of the island to the other. According to the scanty information collected from the natives by Ellis, it is chiefly covered with lava and ashes, but in some places overgrown with wanti-trees, or paper-mulberry-trees. The edge of this table-land towards the east is about 25 miles from the sea, but on the west and south it seems to approach the shore within 20 miles. Near these edges are situated three volcanoes, of which the highest, Mouna Kea, is near the eastern declivity of the table-land. Its summit attains an elevation of 13,587 feet above the sea-level, but it is extinct. Near the south-western corner of the table-land is the Mouna Roa, whose summit is 13,175 feet above the sea. No eruption of this mountain is recorded, but it does not appear to be extinct. The present crater has a circumference of about six miles and a quarter, and the antient orifice is not less than 24 miles round. On the western edge of the table-land is the volcano called Mouna Huararaï, whose elevation has not been determined, but it is estimated at 10,000 feet. It is still active, the last eruption having taken place in 1800. On the table-land there are many other conical peaks, which are evidently extinct volcanoes. But the most remarkable volcano is that of Kirauea, which is at no great distance from the eastern declivity of Mouna Roa, but properly on the southern declivity of the table-land. This volcano is not, like other volcanoes, a conical mountain, but a depression below the general surface of the slope, of somewhat irregular shape, with almost perpendicular sides. The elevation of the slope where this vast pit occurs, is 3873 feet above the sea-level. The steep descent to the crater is interrupted by two narrow plains or ledges, one of which is 715 feet below the upper surface, and the other about 100 feet. The surface of the volcanic lakes is 43 feet below the last-mentioned ledge. The crater contains two lakes, the smaller of which is nearly of a circular form, and 319 yards across; the larger is 1190 yards long, and in one part about 700 yards wide. These lakes are vast caldrons of lava in a state of furious ebullition, sometimes spouting up to the height of 20 and even 70 feet. The fiery waves run with a steady current at the rate of nearly three miles and a quarter per hour southward, enter a wide abyss, and fall into the sea in 19° 11′ 51″ N. lat. All the country round this volcano is covered with lava. To the east of this volcano, and at the distance of 370 yards, is a perfectly circular volcano of much smaller dimensions. On the neck which separates these two volcanoes the ground opened in 1832, and discharged liquid lava for three days into both craters, a large part of which was thus filled up. The volcano of Kirauea has from time immemorial been prodigiously active, though it has not within the memory of living men been known to overflow, except in 1787, when a dreadful eruption took place, and lasted seven days.

From the edges of the table-land, which are about 8000 or 9000 feet high, the country has a gradual slope to the sea. The higher part of this slope, from the table-land to the distance of about four miles from the shore, where it sinks down to 1500 feet, is covered with dense forests, consisting chiefly of several species of acacia, which attain a great size, and of which the canoes of the natives are made. The underwood is tree-fern, from four to forty feet high, and clothed to the top with an almost endless variety of climbing plants. The soil on which these woods grow lies on lava, which frequently rises above it. This woody region occupies a tract from 15 to 20 miles wide, and is surrounded by a country similar to some parts of England, the surface being an alternation of groves and clumps of trees with cultivated grounds. The most fertile tract perhaps in the whole group of the Sandwich Islands is that which lies west of Byron's Bay, or Waiakea, and extends towards the base of the volcano of Mouna Kea. It is thickly inhabited and well cultivated; but nearly contiguous to it on the south, and adjacent to the volcano of Kirauea, is a desert of rugged lava, extending 40 miles along the shores, where no cultivation occurs, and which is only inhabited by fishermen. Along the north-eastern coast, nearly from Byron Bay to Cape Upolu, the most northern point of the island, the coast is bold and steep, and intersected by numerous valleys and ravines, in which, as well as on the declivities, the huts of the natives are built. Though the rocks, on which a thin soil rests, are volcanic, consisting generally of a brown resinous lava, it is rather a fertile tract, with abundant herbage. The western coast of the island is of a similar description, except that it comes down to the sea with a gentle slope.

Byron Bay, on the eastern shore, is a spacious harbour, which lies south and north: it is protected from the north-east wind by a coral reef, half a mile wide, which extends from the eastern point in a north-western direction two-thirds across the bay, leaving a channel three-quarters of a mile wide, and from ten to eleven fathoms deep. It is the best harbour and the only one on the eastern shore of the island. On the western coast are the harbours of Towaihae and Karakakoa. The first is not safe in winter, and in summer fresh water can only be obtained on this side of the island, at a distance of from four to six miles. Karakakoa is not safe, on account of its great depth, so that vessels are obliged to anchor too near to a rocky shore. In this harbour Cook was killed, in 1779.

The population of Hawaii is stated to be 81,000. The abodes of the inhabitants in no part extend more than four miles from the shore.

Mauï, or *Mowee*, is situated north-west of Hawaii, and separated from it by a strait 24 miles wide. It extends from east-south-east to west-north-west, 48 miles, and is, in the widest part, 29 miles across. It is composed of two masses of rock, surrounded by a narrow tract of low land, and united by a low and sandy isthmus which is nine miles in width. The surface is estimated at about 600 square miles, which is equal to that of Hertfordshire. The larger mountain-mass, which occupies the eastern portion of the island, is supposed to rise nearly 10,000 feet above the sea, but it contains only a small portion of low and cultivable land. The smaller mountain-mass or peninsula has a fine tract of level land along the south-western coast. It extends three miles along the beach, and runs three-quarters of a mile inland. At the back of it there are well-wooded slopes, with broad valleys, which terminate, towards the summit of the mountains, in deep ravines. The mountains, which rise to about 5000 feet, are also well wooded. The harbour of Laheina, nearly in the centre of the plain, is formed by two low projecting rocks, two miles distant from each other. Laheina consists of a number of scattered huts, and it contains an establishment for converting the natives to Christianity, and for diffusing useful knowledge among them.

Tahaurawe lies south-west of the larger peninsula of Mauï. It is about 11 miles long from east to west, and 8 wide in the broadest part. The surface hardly exceeds 60 square miles. Like the other islands, it is composed of lava, which however rises only to a moderate elevation. The soil is thin, and covered with a species of coarse grass. The population is small. Between this island and Mauï is that of Morokini, which is a small and barren rock of some elevation; it is only occasionally visited by fishermen.

Ranaï, which lies west of the smaller peninsula of Mauï, is separated from that island by a strait nine or ten miles wide. It is 17 miles long and about nine miles wide, and may cover a surface of somewhat more than 100 square miles, or about half the area of the Isle of Wight or the county of Rutland. It is likewise a mass of volcanic rocks, but it does not rise to a great elevation, nor is the surface so broken and irregular as that of the other islands. A great part of it is barren, and the remainder is only of moderate fertility, the soil being shallow, so that trees grow only in the ravines and glens The population is estimated to amount to 2000.

Morokaï, or *Morotoi*, lies north-west of Mauï and north of Ranaï; it extends 40 miles from east to west, and seven from south to north. The area may be 200 square miles, which is equal to that of the Isle of Wight. It consists of one mass of rocks, the most elevated portion of which rises about 5000 feet above the sea, and the sides are furrowed by deep ravines full of trees. Level tracts of small extent occur along the shores, and many of them are fertile. The number of inhabitants is said not to exceed 3000.

Oahu, or *Woahoo*, lies north-west from Morokaï, and extends 46 miles in length from south-east to north-west, and is 23 miles across in the widest part. The surface probably occupies 700 square miles, and is equal to that of the island of Skye. It is at present the most important island of the whole group, being the seat of government and the place in which the foreign commerce is concentrated. It contains also a larger proportion of cultivated land than the other islands.

A mountain-range traverses the island: it begins at the north-eastern point, called Mocapu, and runs first southward and afterwards inclines to the south-west, terminating, at Diamond Point, the south-western cape of the island, in a hill about 400 feet high. This range is more than 3000 feet above the sea-level, and, with the valleys by which it is intersected, covers about half the surface of the island. Another mountain-mass occupies the north-western part, but it is not connected with the chain, being separated from it by a plain extending from the mouth of Pearl River to Waiarua on the northern coast, a distance of nearly 20 miles. It is called the Plain of Eva, and is fertile and well wooded, but not much cultivated. The soil consists of a deep mould resting on lava. The country along the southern shores, from the mouth of the Pearl River to the vicinity of Honoruru, has a very broken and hilly surface, and varies greatly in fertility, some of the depressions having a rich soil, whilst most of the higher tracts are nearly destitute of vegetation. But the plain of Honoruru, which follows, and extends about ten miles along the shore, with a width varying from two to three miles, has a very rich alluvial soil, and is carefully cultivated. Several wide valleys, which extend northward into the mountain-range, open into this plain, and are also cultivated to the distance of six or seven miles from the shore, where they begin to be narrow, and to be enclosed by steep mountains on each side. South-east of the Plain of Honoruru, up to Diamond Point, the country is more uneven and less fertile. The country which lies between the mountains and the north-eastern shore is very hilly, and much less fertile and less populous than that along the southern coast. The declivity of the range towards this level plain is exceedingly steep, and there is only a path through the fertile valley of Anuanu, which constitutes the communication between the opposite sides of the island. The population of Oahu is stated not to exceed 20,000, which however seems to be a low estimate.

Honoruru, the capital of the Sandwich Islands, and the residence of the king, contains about 8000 inhabitants. It consists of about a dozen stone houses built by foreign merchants, and a number of huts of the natives not arranged in regular streets. The residence of the king resembles a Dutch barn. The harbour is small, being not more than half a mile long and a quarter broad; but it is tolerably deep, and perfectly safe. It is formed by a coral reef, which extends along the shores at the distance of some hundred yards, and against which the swell of the sea breaks. These reefs have a considerable width, and are dry at low-water. A narrow opening in them opposite to Honoruru forms the entrance to the port, which however is not deep enough for large vessels, and they remain in the roadstead, which is capacious, but has a rocky and uneven bottom.

Tauai, or *Atooï*, west-north-west of Oahu, is about forty miles long, and more than twenty-four miles broad in the widest place. The surface is between 600 and 700 square miles. It is a mountain-mass sloping on all sides towards the sea, where it terminates with a rather high coast. Wide valleys run from the shores towards the centre of the island, and they are well cultivated and fertile, though less so than the most fertile districts in Oahu or Mauï. On the southern coast, at Waimeá, there is a roadstead, but there is no other anchorage round the island. The number of inhabitants is stated to be 10,000.

Nihau, or *Oneehow*, the most western of these islands, is about 20 miles long from north to south, and seven across where widest. The surface may cover about 100 square miles. The most southern point rises abruptly to a considerable height; but about five miles north, the rocky mass sinks down to a moderate elevation, and afterwards rises again, but not so high as before. It is said that the population is small, but this is opposed by the fact that they make a great number of painted and variegated mats, which are extensively used in all the other islands, and that the island produces abundance of yams, which also go to the other islands. On the western side of the island there is a very good harbour.

Climate.—The climate is principally regulated by the trade-winds, which during the summer, or from March to October, are strong and regular, but in winter light, and frequently interrupted by calms and south-westerly winds. The rainy season occurs in winter. In summer the atmosphere is usually clear and bright, and in many places on the western or leeward side of the islands not a drop of rain falls. On the eastern or windward parts however, even in this season, seldom a day or night passes without a smart shower, and occasionally heavy rains fall. There seems to be some irregularity in this respect, as it is stated that the north-eastern districts of Oahu have much less rain than the south-western, and that this is the cause of their being less productive. From September to April the atmosphere is more or less hazy, obscure, and cloudy, with frequent light rains in some places, and in other parts heavy rains of two or three days' continuance. The small islands of Ranaï and Tahaurawe, which are rather low, and protected against the trade-winds by the high lands of Mauï, frequently suffer from long droughts.

The heat all the year round is considerable in the lower tracts, but perhaps less than might be supposed from the latitude. This is partly owing to the vast expanse of water by which the islands are surrounded, but principally to the prevalence of the north-east trade-wind, which during the greater part of the year sweeps over and about the islands with great velocity, and having passed a great expanse of sea, is far from being hot. In the eastern districts the thermometer in summer seldom rises higher than 80° or 82°, and during the winter not higher than 72° or 74°. But the lower tracts on the western side of the mountains are exposed to greater heat, and in those parts the thermometer frequently rises to 88° or 90°. According to observations made at Honoruru, the mean annual temperature of that place does not exceed 75°. In general the thermometer ranges between 70° and 83°. The greatest heat experienced was 88°, and the least 61°. The elevated table-land in the interior of Hawaiï is of course much colder, and snow frequently fall there. In 1834 the higher part of the Mouna Roa was covered with snow for 2000 feet from its summit in winter.

In the lower districts on the western side of the islands the sea and land breezes are generally regular, especially during the summer. The sea-breeze sets in at ten o'clock in the morning, and continues till sunset, when it is immediately followed by the land-breeze, which lasts till sunrise. From sunrise till ten o'clock a calm prevails.

Productions.—The quadrupeds found on these islands at the time of their discovery were the hog, dog, and rat, to which have been added the cow, horse, sheep, goat, and mouse, all of which thrive very well except the sheep. Fowls were found at the discovery; but turkeys, geese, ducks, and pigeons were introduced afterwards. Only a limited number of species of birds and other animals is met with even in the thick forests which surround the base of the mountains and ascend their sides to a considerable height. Fish abound; but there is no great variety. The most common are sharks, bonetos, flying-fishes, and red and white mullets. Many families live on the produce of the fishery. Pearls are found in Pearl River; they are small, but fine.

It does not appear that the European grains are cultivated to any great extent, with the exception of maize. The principal objects of cultivation are roots, especially the tarro-root (Arum macrorhizon). Potatoes, and camotes, or sweet potatoes, are also generally grown. The fruit-trees which were cultivated before the arrival of Europeans, were the cocoa-nut, the bread-fruit-tree (*Artocarpus incisa*), the ohia (*Eugenia malaccensis*) or jumbo-tree of the East Indies, and the kou (*Cordia orientalis*); several kinds of bananas were also grown, and among them one kind the fruit of which is dried by the natives. Strawberries and raspberries are also indigenous. The Europeans have introduced oranges, lemons, citrons, grapes, pine-apples, papaw-apples, pomegranates, and figs, all of which come to perfection, except pine-apples. The sugar-cane is indigenous and much cultivated, but only for eating. Melons and water-melons are excellent. The most cultivated vegetables are cucumbers, pumpkins, French beans, onions, and red pepper. The wauti, or paper-mulberry-tree (*Broussonetia papyrifera*), is grown for its interior bark, which is used here, as in China, for making cloth. But the finest tapas or wrappers are made from the *Böhmeria albida* (Hook), which grows wild in the forests, and is also cultivated.

The forests do not contain many trees fit for ship-building. In several parts the mountains were formerly covered with sandal-wood; but as the exportation of this wood to China has been very great, it begins to be rare, except in some places, as south of Byron's Bay in Hawaii and on the most western mountains of Oahu. The forests contain several plants the roots or fruits of which are used as food by the natives and for other domestic purposes.

Salt is the only mineral which is obtained in abundance. A large quantity is got from a salt-lake in the island of Oahu, west of Honoruru, which is between two and three miles in circumference, but has only a few feet of water in the deepest parts. The bottom and shores are incrusted with salt, the water being strongly impregnated, and the crystallization very rapid. This salt is exported to Kamtchatka. Large quantities of salt are also obtained from sea-water by evaporation, for which purpose there is along the shore a succession of artificial vats of clay, into which the salt water is let at high tide.

Inhabitants.—The population consists of natives, with the exception of a small number of whites, Englishmen and Americans, who have settled among them as merchants or as missionaries. The population was estimated, fifteen years ago, at 139,000 individuals, but it was probably underrated. The natives, who call themselves Kanaka, belong to the family of Malay nations. Their colour is neither yellow, as in the Malays, nor red, like that of the Americans, but something between both, a kind of olive, and sometimes reddish brown. They are of middle stature, and well formed, with muscular limbs, and open countenances. The roots of their language have a great affinity to those of the other Malay nations who inhabit the islands of the Pacific. When these islands were discovered by Cook, it was observed that the natives of this group had made further progress in civilization than those of the other islands and groups. This was evident from the care with which the tarro-fields were cultivated, but still more from their manufacturing cloth from the bark of the paper-mulberry and other trees, their beautiful mats, and the art with which they united, and as it were wove together, many beautiful feathers, so as to be used as articles of dress. They also made several utensils of stone, wood, and shells, without the use of iron tools. At that time they wore only a wrapper (called tapa) about their loins, but many of them now dress in the European fashion. They have also improved in other respects, especially in ship-building and navigation. Vessels built at Honoruru, and manned by natives, traverse the Pacific to Canton. Several of the chiefs have begun to build houses in the European style.

Commerce.—What is properly called trade is not important, as the natives have only two articles of exportation, salt and sandal-wood. Agriculture has not yet supplied an article for exportation, but by selling their produce to the vessels which visit the islands, the natives procure all the foreign articles that they are in want of. In 1832 the harbour of Honoruru alone was visited by 159 vessels, mostly American and English. Many of these vessels are whalers, and others go to several parts of the western coast of North America to get furs for the Chinese market. Several of them however are bound to China and the East Indies, and have passed round Cape Horn or through the Strait of Magalhaens. As the trade-winds in the centre of the southern half of the Pacific are very irregular, the most expeditious route to the East Indies is to sail at a considerable distance from the shores of South America to the Gallapagos, and thence to the Sandwich Islands, whence a regular and strong east trade-wind carries them to the coast of China. All these vessels get fresh provisions at the Sandwich Islands, and the demand is still greater than the supply, which is shown by the very high price which all provisions fetch. The number of these vessels is annually increasing.

History and Government.—These islands were discovered by Captain James Cook in 1778, and again visited by him on his return from Behring's Strait, when he was killed by the natives. Within the first twenty years after their discovery they were only visited by Portlock and Dixon, La Perouse and Vancouver. But towards the end of the last century whaling-ships from America began to visit these seas, and they were soon followed by fur-traders; all these vessels put into some of the ports for provisions. At that time each island had its sovereign and several other chiefs. One of the latter, Tamehameha, began to plan the conquest of the islands, and he succeeded in subduing all of them, except Tauaï and Nihau, whose sovereign, after the death of Tamehameha acknowledged the successor of that prince as his king. As Tamehameha had only succeeded in his enterprise by the aid of Europeans, and the assistance which he derived from their visits, he favoured their settlement in the islands, and in 1817 he placed his kingdom under the protection of England. His successor, Rhio-Rhio, came to London, where he died in 1824. Soon after the death of his father he had succeeded in abolishing idolatry and in the conversion of the natives to Christianity (1819). Since that time many English and American missionaries have resorted to these islands, and their labours have been attended with considerable success. At present, perhaps half of the population are Christians. Several books have already been printed in the native language at Honoruru and Laheina, and even a map of the island has been engraved at Laheina.

There are four distinct ranks in society. The first consists of the royal family; the second, of the first class of chiefs, whose dignity is hereditary; the third class is composed of the minor chiefs, who pay a ground-rent for the use of the lands in their districts; the bulk of the people, comprehending the whole productive class, constitutes the lowest section of the nation. The king is considered as the proprietor of the ground, which he has divided among the chiefs, who in return are bound to military service and to pay ground-rents. Every island has a governor, and is divided into several districts, each of which is under a chief. The taxes to the king are paid by the chief or governor of the island, who collects them from the minor chiefs, and these again from the people, with the addition of something for their trouble.

(Cook's *Third Voyage to the Pacific*; Portlock's *Voyage round the World*; Lord Byron's *Voyage of H.M.S. Blonde to the Sandwich Islands*; Ellis, *Tour through Hawaii*; Stewart's *Journal of a Residence in the Sandwich Islands*; Douglas, 'On the Volcanoes of the Island of Hawaii,' in *London Geographical Journal*, vol. iv.; and Bennet's 'Journal of a Voyage round the World,' in *London Geographical Journal*, vol. vii.)

SANDWICH LAND is the name given by Cook to a number of islands in the Southern Atlantic, between 57° 10′ and 59° 40′ S. lat. and between 24° and 27° 42′ W. long. They extend from north to south. The most northern group is called Candlemas Islands, and the most southern is named the Southern Thule. They are all of volcanic origin, and nine burning volcanos were seen on them by Morell. Some of them are very high, and covered with perpetual snow. Others are bare rocky masses, slightly elevated above the sea-level, but all of them are without any trace of vegetation. The surrounding sea contains sea-elephants and cetaceous animals.

(Cook's *Second Voyage round the World*; Morell's *Narrative of Four Voyages to the South Sea, &c.*)

SANDYHOOK. [New York.]

SANDYS, GEORGE, an English poet, was born in 1577, at the palace of Bishopsthorpe, his father, Dr. Edwin Sandys, being then Archbishop of York. In 1589, the year after his father's death, he was sent to Oxford, and became a member, first of St. Mary Hall, and afterwards, as Wood thinks, of Corpus Christi College. (*Athen. Oxon.*) We have no account how he passed his time between this period and the year 1610, when he commenced his travels in the East, returning, as Wood supposes, 'in 1612, or after, much improved in several respects, being master of several languages, of a fluent and ready discourse, and of excellent comportment; having naturally a poetical fancy, and a zealous inclination to all human learning, which made his company desired and most acceptable to most virtuous men and scholars of his time.' His account of his travels was published in 1615, being dedicated to Charles, then Prince of Wales, and entitled 'A Relation of a Journey begun in 1610, in Four Books, containing a Description of the Turkish Empire, of Egypt, of the Holy Land, and of the remote parts of Italy and islands adjoining.'

After this Sandys went to America, and appears to have succeeded his brother as treasurer for the English colony of Virginia. During his residence he completed his translation of the 'Metamorphosis' of Ovid, on which he had been for some time engaged. On his return to England he was appointed one of the gentlemen of the privy chamber to the king. In 1636 he published a 'Paraphrase upon the Psalms,' and two years afterwards 'Paraphrases on the Book of Job, Ecclesiastes, the Lamentations of Jeremiah, and Songs selected out of the Old and New Testament;' in 1639 a translation of 'Christ's Passion,' a tragedy by Grotius. His last work was the poetical version of the 'Song of Solomon,' in 1642. He died at Bexley Abbey, in Kent, March, 1643-4.

The writings of Sandys are simple, earnest, and devout: his travels are learned without pedantry, and circumstantial without being tedious; and are valuable for the picture they give of the East in his time, particularly of Jerusalem. His poetical writings contributed, like those of Carew and Herrick, to the formation of a well-tuned and harmonious versification, the natural accompaniment of the refined purity of thought and expression for which they are distinguished. His merits in this respect have been acknowledged by Waller, Dryden, and Warton. Specimens of his most beautiful compositions, both in poetry and prose, are given in the Memoir of his Life, by the Rev. H. J. Todd, prefixed to 'Selections from Sandys's Metrical Paraphrases,' &c., London, 1839, from which biography this sketch is taken.

SANGALLO, or SAN GALLO, a family of distinguished Italian artists and architects, whose original name was Giamberti.

1, Giuliano Giamberti, born in 1443, was the son of Francisco Giamberti, who was himself an architect of some repute in the service of Cosmo de' Medici. At first both he and his brother Antonio chiefly practised carving in wood, in which they acquired some celebrity. Giuliano was next employed in the capacity of military engineer by Lorenzo de' Medici, who rated his services very highly. So patronised, Giuliano determined on pursuing architecture as his profession; and he had soon an opportunity of displaying his talent in the fore-court or cloister of the church of Santa Maddalena de' Pazzi at Florence, wherein he introduced an Ionic order, whose capitals are remarkable for having an ornamental necking, at that time an innovation, and said to have been imitated from an antique fragment found at Fiesole. He was afterwards commissioned by Lorenzo himself to erect a large convent (destroyed during the siege in 1530) near the gate of San Gallo; whence he obtained the name of *da San Gallo*, at first jestingly bestowed on him by his patron, and afterwards adopted by himself and the rest of the family. In 1490 he commenced the Palazzo Gondi for a wealthy merchant of that name, but, owing to the death of the latter, the building was not completed; nevertheless, what was executed is a fine specimen of the Florentine style, though the irregularity both of the courses and lengths of the rustics [Rustication] is rather a defect. Among his numerous other works was a palace erected by him at Savona, for his patron the Cardinal della Rovere (now converted into the convent of Santa Chiara); besides other buildings for the same prelate. When Rovere was elevated to the pontificate by the title of Julius II., Sangallo expected to be employed as architect of the new St. Peter's church; but being supplanted by Bramante, he retired in disgust to Florence. On the election of Leo X. he returned to Rome, and on the death of Bramante was offered the appointment of architect of St. Peter's, but he declined it on account of his age and infirmities, and returning to Florence, died there two years afterwards (1517), at the age of 74.

Giuliano had a son named Francesco, who is spoken of by Vasari as a skilful sculptor then living, and who executed the mausoleum erected at Monte Cassino by Clement VII. in honour of Piero de' Medici.

2, Antonio Sangallo, brother of the preceding, was induced by him to quit the profession of sculpture for that of architect, and was left by him to complete the palace he had begun at Savona. He afterwards visited Rome, where he ingratiated himself with Alexander VI., to whom he proposed to convert Hadrian's mausoleum into a fortress, and he altered that building into its present form, since which time it has been called the Castle of St. Angelo. This work gave so much satisfaction, both to the pope and to his son the Duke Valentino, that the latter employed him to erect the fortress of Civita Castellana, and afterwards that of Montefiascone. He likewise erected several churches, among which that of the Madonna at Montepulciano is esteemed his best production of that class. Some time before his death, in 1534, he gave up both architecture and sculpture, and amused himself with agricultural pursuits.

3, Antonio Sangallo, the most noted of the family, was nephew to the two preceding on the mother's side, from whom he received their surname, that of his father, who was a cooper at Mugello, being Bartolomeo Picconi. He was at first put to the business of a common carpenter, but the fame of his uncles determined him to set out for Rome and become their pupil; and when they quitted that city, he found another instructor and protector in Bramante, to whom, then advanced in years, he soon rendered himself a most useful assistant. Nor was it long before his talents obtained for him the notice of persons of rank, among the rest of Cardinal Alexander Farnese (afterwards Paul III.), who employed him to rebuild his mansion in the Campo de' Fiori, the first beginning of that splendid pile, which would of itself alone have established the reputation of Sangallo. One of his earliest works was the church of la Madonna di Loretto, near Trajan's pillar; but as that edifice was begun in 1507, it is doubtful whether he did more than afterwards complete it. His other works of the same period were several private mansions or palazzi, especially one for Marchionne Baldassini; but as neither the buildings themselves are described nor their sites distinctly indicated by Vasari and his other biographers, and as many of them have repeatedly changed their names, it is now difficult to specify or ascertain them. It is equally difficult to determine their respective dates; and we may therefore break through chronological order, and mention here the house that he afterwards built for himself in the Strada Giulia, now known as the Palazzo Sacchetti.

Passing by the various works on military architecture, upon which he was employed at different times at Cività Vecchia, Parma, Piacenza, Ancona, and other places, we shall proceed to consider Sangallo's project for completing St. Peter's. After the works had been nearly suspended for several years, Paul III. determined that they should be resumed vigorously, and on the death of Peruzzi, in 1536, Sangallo became the sole architect. With the view of preventing those changes which had been made by all the preceding architects, the pope ordered him to prepare a model, upon such a scale and in such an expensive manner, that there should be no danger of its being either forgotten or destroyed. This model, which is said to have taken several years to execute, and to have cost upwards of 5000 crowns, is still preserved in one of the rooms of the Vatican. It is formed of wood, and is in length 35 Roman palms, or nearly 20 English feet. Little more however was done to the fabric by Sangallo than to strengthen the parts already erected; and after his death his design was abandoned altogether, not a trace of it being visible in the present structure. An elevation of Sangallo's model is given in the first volume of Wood's 'Letters of an Architect,' from which it may be seen that if it had been followed, the building would have been totally different from what it now is. The cupola would have had two orders, one around the tambour, another carried up above the spring of the dome, which would also have been of much lower proportions than the present one, while other very conspicuous features would have been two exceedingly lofty and tapering campanili, contrasting and at the same time harmonising with the cupola itself. It is true the design is broken into a multiplicity of parts, yet they are both agreeably proportioned to each other, and picturesquely combined; and the whole is consistent in character, which is more than can be affirmed of Maderno's façade, where there is a want of agreement between the order itself and the other parts, and also a deficiency in variety of outline.

The Palazzo Farnese, begun by him for his patron Paul III. when cardinal, and afterwards greatly extended, is the most celebrated of Sangallo's works. He must however share the repute of it with Michael Angelo, who, if he did not, as some have supposed, add the third tier of windows, designed the magnificent and majestic cornicione, which alone distinguishes this edifice from every other of the kind in Rome, and, aided by the loftiness and extent of the edifice itself, gives it a colossal air. This noble structure deserves notice, if only because it has been said that the Reform Club-House, Pall-Mall, is an imitation of it, which is true only as regards style and manner; for in regard to design there are quite as many points of dissimilarity as of resemblance between them, and many of them are to the advantage of Mr. Barry's building. In both the windows of the principal floor are *à la tabernacle*, that is, have small columns and pediments; but in Sangallo's edifice the centre window is different from the others, and having no pediment, like them, produces a disagreeable effect. Sangallo begun the Porta S. Spirito at Rome, but left it unfinished, in which state it has ever since remained. He died at Terni, in October, 1546, advanced in years, but at what precise age is not known. His body was brought to Rome and buried with great pomp.

SANGUINOLA'RIA. [Pyloridians, vol. xix., p. 145.]

SANGUISORBA, the name of a genus of plants, the type of the suborder Sanguisorbeæ, in the natural order Rosaceæ. Of this genus (called Burnet) there are nine known species. Most of them possess astringent properties. The common Burnet (*S. officinalis*) is a native of Britain, and was at one time cultivated in chalky districts to a very considerable extent, but it has lately been superseded by sainfoin [Sainfoin] and other artificial grasses.

SANGUI'SUGA. [Leeches.]

SANHEDRIM, or SANHEDRIN (סַנְהֶדְרִין), the great council of the Jews, which consisted of seventy-one or seventy-two members, and decided the most important causes, both ecclesiastical and civil. The name is a corruption by the Talmudists of the Greek *συνέδριον* (*a council*). The Rabbis attempt to find the origin of the Sanhedrim in the seventy elders who were appointed by Moses to assist him in his judicial duties (*Numb.*, xi. 16); but this council was evidently temporary, and we hear nothing of it in the subsequent history of the Jews. (Moses, p. 441; Michaelis *On the Laws of Moses*, art 50.) The exact time of the institution of the Sanhedrim is unknown, but there is no reason to suppose that it was earlier than the time of the Maccabees. There can however be little doubt that the Sanhedrim was an *imitation* of the seventy elders of Moses. The first mention of the Sanhedrim is in the time of Hyrcanus II., when Herod was tried before it. (Joseph., *Antiq.*, xiv. 9, s. 3, 4.)

The Sanhedrim had a president (רֹאשׁ or נָשִׂיא), who was generally the high-priest, a vice-president (אֲבִי בֵית דִין), who sat on the right of the president, and, according to some, a second vice-president (חָכָם), who sat on his left. The other members were:—1, *Chief Priests*, who are often mentioned in the New Testament and in Josephus, and who were partly ex-high-priests and partly the heads of the twenty-four classes of priests. 2, *Elders*, that is, the princes of tribes and heads of families. 3, *Scribes*, or men of learning. All chief-priests were members of the Sanhedrim, but of elders and scribes only so many were admitted into it as were required to fill up vacancies. (*Matt.*, xxvi. 57, 59; xxvii. 3, 12, 20, 41; *Mark*, viii. 31; xi. 27; xiv. 43, 53; xv. 1; *Acts*, iv. 5; v. 21, 27.) The Talmudists say that the tribunal had its secretaries and apparitors. Both Pharisees and Sadducees were found in it. (*Acts*, v. 17, 21, 34; xxiii. 6.)

The Sanhedrim met at Jerusalem, and, according to the Talmudists, in a chamber within the precincts of the Temple, called *Gazith*, in which also their archives were kept; but, according to Josephus (*Bell. Jud.*, v. 4, 2; vi. 6, 3), in a room on the east side of Mount Zion, not far from the Temple. In cases of emergency, as in the trial of Christ, they met in the high-priest's house. They sat in the form of a semicircle.

The causes brought before this tribunal were either appeals from the inferior courts, or matters which were thought of sufficient importance to come before them in the first instance; for example, the question whether a person was a false prophet (*Luke*, xiii. 33), and matters which affected the whole state, a whole tribe, or the high-priest. The accused was brought before the tribunal, and witnesses were required to appear to support the charge. Either capital or minor punishments might be inflicted by the Sanhedrim; but under the Roman government its power was so far restricted that a capital sentence required the confirmation of the Roman governor, who was also charged with its execution. The stoning of Stephen was not done in accordance with the sentence of the Sanhedrim, but in a riot; and the execution of James and others by the high-priest Ananus (A.D. 64) took place in the absence of the Roman procurator, and is admitted by the Jews themselves to have been an illegal act.

Besides the Sanhedrim at Jerusalem, there were inferior courts in each town of Judaea, consisting of twenty-three members, to which the same name is sometimes applied. From these courts an appeal could be made to the Sanhedrim.

(Jahn, *Archäol. Bibl.*, th. ii., b. ii., § 186; Calmet's *Dictionary;* Lightfoot's *Works;* Winer's *Bibl. Realwörterbuch*, 'Synedrium.')

SANJAK, a word primarily signifying a standard, is also applied to a military division such as those into which the whole Turkish empire is divided: in this sense, it signifies, as much as is congregated under one standard. The commander of such a division is styled Sanjak, Sanjak Bey, or simply Bey, and the supreme general of all the Sanjaks of a province is styled the Beglerbey (commander of commanders). The word is found under the forms Sangiak and Sandshak, the French and German modes of rendering the Turkish word.

SANKHYA. [Sanscrit Language and Literature.]

SANMICHE'LI, MICHE'LE, a master equally celebrated for his works in civil and military architecture, was born in 1484, at Verona, where both his father Giovanni and his uncle Bartolomeo pursued the same profession. By them he was instructed in the elements of the art, but he caught its spirit from studying the amphitheatre and other remains of antiquity in his native city; and their influence, especially that of the former, is visible in many of his designs, wherein he greatly affected massive rusticated work. About the year 1500 he set out for Rome, and remained either there or in other parts of the ecclesiastical states till the time of Clement VII., and was intimate with all the more celebrated artists of the time—Bramante, Michael Angelo, the Sangalli, Sansovino, and others. While he was in that part of Italy, he erected the cathedral of Montefiascone (the cupola of which was destroyed by fire at the beginning of the seventeenth century, and has since been rebuilt in a tasteless manner), and the church of San Domenico at Orvieto. Returning to the Venetian territory, he was employed by the republic (1525) to construct the new fortifications of Verona, when he first introduced the use of triangular and pentangular bastions, and thereby entirely changed the system of military architecture, that method being thenceforth adopted by other engineers. Here it will be sufficient merely to allude to his works of that class, as they belong to construction rather than design, though some of them are remarkable even in the latter respect; for instance, the stately rusticated façade of the fortress or Castello di S. Andrea on the Lido at Venice, and the three fortified gates at Verona, Porta Nuova, Porta del Palio, and Porta Zenone.

He was next employed by the republic in fortifying many places in Istria and Dalmatia, Cyprus and Candia, some of which works he confided to the execution of his nephew Gian-Girolamo. In consequence of their reputation, both uncle and nephew were invited by Francis I. and the emperor Charles V. to enter their service, which flattering offers they nevertheless rejected. Whether these numerous engagements and his divided application to two such very opposite studies did not prevent Sanmicheli from attaining to that excellence in the latter which he might else have reached, may fairly be questioned; for with many merits, his designs often exhibit glaring faults, which, if he had confined himself entirely to the study and practice of civil architecture, he would perhaps not have fallen into. In fact, the best of his palazzi and other works of that class are far from being models, except as to their façades and exteriors, being most inconvenient in their plans, besides abounding with monstrous deformities, such as rooms quite out of square, and sometimes with no two sides parallel; and in one instance (Palazzo Bevilacqua) he has placed the principal staircase in an open court, without any protection whatever from the weather. His exterior architecture exhibits less of mannerism, and more both of invention and nobleness of taste than that of Palladio, but also not a little that is decidedly faulty and offensive. Almost all his buildings are marked by a disagreeable inequality of design, there being a singular mixture of parts highly enriched and others nakedly plain in the same composition. His balustrades to windows and pedestals to columns are too high, and in more than one instance he has raised his columns on a second pedestal over the first one. His style shows itself to most advantage in his lofty rusticated basements, which generally possess an air of dignity. Among the palazzi erected by him are the P. Grimani and the P. Cornaro à S. Paolo at Venice, and the P. Canossa, Bevilacqua, Verza, Pelligrini, and Pompei at Verona. In Verona he also built the church of the Madonna di Campagna, and the much admired Cappella Pellegrini, for both which we refer to the table accompanying Rotunda. While Sanmicheli was enjoying a tranquil and honourable old age, esteemed by all no less for his personal qualities than for his talents, he received the intelligence of the death of his nephew and pupil Gian-Girolamo, who died in the island of Cyprus at the age of forty-four; and it had such an effect upon him, that he survived the fatal news only a few days, dying in 1559, in his seventy-fifth year.

SANNAZA'RO, JA'COPO, born at Naples, in 1456, of a noble family originally from Spain, studied at Naples, and afterwards, being disappointed in love, left his country and travelled to France, where he began writing his 'Arcadia,' a pastoral fable in Italian, in which he describes in poetical colours the scenes and occupations of pastoral life. It is a mixed composition of prose and verse, and has been much admired for the elegance of the style and the purity of the language. Indeed Sannazaro is considered as one of the best Italian classics. The 'Arcadia' has gone through numerous editions. Sannazaro also wrote a Latin poem, 'De Partu Virginis,' which was highly applauded, and which obtained for the author the sanction of two popes, Leo X. and Clement VII., expressed in two briefs. He also wrote Piscatory Eclogues in Latin verse. On his return to Naples, where he was highly esteemed by King Ferdinand I. and his sons Alfonso and Frederic, he fixed his residence on the delightful shore of Mergellina, at the foot of Mount Posilipo, where Frederic, the last king of Naples of the Aragonese dynasty, had given him a country-house, and where he saw before him the daily occupations of the fishermen under a sky and in a climate which render their labours less irksome, and impart to them a sort of poetical appearance. When the Aragonese dynasty was driven away from Naples by the treachery of their relative Ferdinand the Catholic of Spain, Sannazaro accompanied his patron King Frederic in his exile, and remained with him in France till Frederic's death, after which he returned to Naples, where he died in 1530. He was buried in a church on the slope of Posilipo, which he had built and dedicated to the Virgin, and where his monument is still seen.

SA'NNIO, a province of the kingdom of Naples, formerly called Contado di Molise, lies chiefly on the east side of the central ridge of the Apennines, and extends as far as the Adriatic coast. The district of Isernia however, which belongs to the administrative province of Sannio, lies on the west slope of the Apennines, and belongs to the basin of the Volturno. Sannio is bounded on the north-west by the province of Abruzzo Citra; north and north-east by the Adriatic; south-east by Capitanata; south by Principato Ultra, or the province of Avellino; and south-west by Terra di Lavoro. The province is crossed in its length by the river Biferno, the antient Tifernus, which rises from two sources in the high Apennines near Bojano, and flowing north-east enters the Adriatic near the town of Termoli, after a tortuous course of about 60 miles. The other principal river of the province is the Trigno, which flows nearly parallel to, but to the north of the Biferno.

In the lower part of its course the Trigno marks the boundary between Sannio and the province of Abruzzo Citra. South of the Biferno, the Tortore constitutes, during part of its course, the boundary between Sannio and Capitanata. The geographical character of the province of Sannio resembles that of the neighbouring provinces of Abruzzo. The central ridge of the Apennines, which runs in a general direction from north-west to south-east, sends out several offsets, which run in a north-east direction to the Adriatic coast. Between these offsets there are valleys through which the rivers flow with a rapid course. The two principal valleys are those of the Trigno and the Biferno. The valleys and the lower hills are very fertile, and produce corn, Indian corn, pulse, oil, wine, and fruits. Agriculture is however in a very low condition. The highlands are chiefly used for summer pasture. The forests with which the higher Apennines were once covered, have been wastefully destroyed, and the mountains are now nearly bare. The area of the province of Sannio is reckoned at about 1500 square miles, and the population, by the census of 1837, amounted to 342,778. Of the male part of this population 53,700 are proprietors of land or houses, 139,000 agricultural labourers, 6000 shepherds or herdsmen, 1700 domestic servants, 1100 are keepers of wine-shops, 323 sailors or fishermen, and the rest are employed in various trades. There are about 1100 priests, 327 monks, and about 80 nuns. (Serristori.) The chief manufacturing industry in the province is that of cutlery and fire-arms, which is established at Campobasso, Frossolone, and Agnone, and gives employment to about 400 men. There are about 120 fishing-boats and small craft belonging to the province; but there is no harbour on the coast. In 1824 there were only three printers in the whole province, and not a single bookseller. (Petroni, *Censimento de' Reali Dominj.*)

The province is divided into three districts:—Campobasso, which is the largest, and embraces the central part of the province; Larino, which extends near the sea-coast; and Isernia, which lies west of the Apennines. The whole province contains 135 communes; it has a civil and criminal court at Campobasso, from which there is an appeal to the Gran Corte, or supreme tribunal of Naples. The ecclesiastical administration is under the five bishops of Larino, Termoli, Isernia, Bojano, and Trivento; and there are 164 parish incumbents. There are 252 churches, 398 hospitals and other charitable institutions, a royal college, and an institution for female boarders at Campobasso, and three 'scuole secondarie,' a kind of grammar-schools, at Cascalenda, Montenero di Bisaccia, and Morcone. There are elementary schools in many communes, but the system of elementary instruction in the whole kingdom of Naples is neither uniform nor well arranged.

The following are the principal towns of the province of Sannio:—1. Campobasso, a town indifferently built, but pleasantly situated on the slope of a hill above the valley of the Biferno, has manufactories of cutlery, which supply the whole kingdom, and 8000 inhabitants. 2. Trivento, in the valley of the Trigno, is a bishop's see, with 3000 inhabitants: it contains some antient remains. 3. Sepino, the antient Sepinum, formerly a town of the Samnites, is situated in the Apennines, which here divide the valley of the Tiferno from that of the Tamaro, an affluent of the Volturno: it has several churches and convents, a classical seminary, a paper manufactory, and 4000 inhabitants. 4. Termoli, the antient Interamna, a small town on the sea-coast, between the mouth of the Trigno and that of the Biferno, has a castle on a promontory. 5. Larino is a small town, in the valley of the Biferno, not far from the sea, and the head of a district. Near Larino is the Albanian or Epirote colony of Ururi. 6. Agnone is a thriving modern town, with iron and copper works, and about 7000 inhabitants. 7. Bojano is an old decayed town in the Apennines, near the sources of the Biferno. 8. Isernia, an old-looking town, situated in a valley on the west side of the Apennines, near the Volturno, and on the high road from Naples to Abruzzo, contains several remains of antiquity, and has some manufactories of coarse woollens, with about 5000 inhabitants. From Isernia a carriage road branches off to the eastward, crosses the central ridge to Bojano, and leads to Campobasso and Larino. The province of Sannio comprises only a part of the antient Samnium, which also included the whole of the Principato Ultra and part of Terra di Lavoro. [SAMNITES.]

SANOK, one of the nineteen circles of Austrian Galicia, is bounded on the north by Rzeszow and Przemysl, on the east by Sambor, on the west by Yaslo, and on the south by Hungary. Its area is about 2130 square miles, with 250,000 inhabitants. The Carpathians rise in the south, and send their offsets through the whole circle; there are many and extensive forests; the soil is partly sandy, and poor, with some intervening parts that are more productive. The river San flows in a large curve through the country, and is joined by most of the smaller streams. The Wisloka rises in this circle, and passes, on the western frontier, into that of Yaslo. Agriculture, the breeding of cattle, and the cultivation of the forests are the chief occupations of the inhabitants. Salt and petroleum are sources of considerable profit, and the manufacture of yarn and linen is not unimportant.

SANOK, the chief town, is situated on a mountain on the left bank of the San. It is an ill-built open market-town; the houses are mostly of wood, and there are scarcely 2000 inhabitants. There are one Roman Catholic and one Greek church, a Minorite convent, a high school, and the court of justice of the circle. Opposite the town, on the right bank of the San, is the imperial stud of Olchowce, where there are stables for nearly 200 stallions, which is spoken of as well worthy the attention of travellers.

SANQUHAR. [DUMFRIESSHIRE.]

SANS SOUCI. [POTSDAM.]

SANSANDING, a town in Africa, in the kingdom of Bambarra, on the banks of the river Joliba, or Quorra, near 13° N. lat. and 5° W. long. It is a place of considerable extent, containing a population of between 8000 and 10,000. It appears to be a town of great commercial importance in the interior of Africa, perhaps not less so than Timbuctoo, with which it carries on an active trade by means of the river, which is navigable for large river boats all the way between the two towns. All the salt which is consumed in the western countries of Sudan is brought from the Sahara, and passes through this town. The merchants of Walet in Beroo bring to it the rock-salt of the mines of Shingarin, and caffilas from El Arovan bring the produce of the mines of Toudeni. By the latter it receives also coral and beads from the Mediterranean. These articles are sent to the countries south and west of Sansanding, and exchanged for gold, ivory, slaves, wax, honey, and cloth of Soodan, which are afterwards sent to Walet and El Arovan. Rice and cured provisions also go to the last-mentioned place, which is surrounded by an extremely sterile country. The trade of this place is in the hands of the Moors.

(Mungo Park's *Travels in the Interior Districts of Africa;* Caillié's *Travels through Central Africa to Timbuctoo, &c.*)

SANSCRIT LANGUAGE AND LITERATURE.—*Language.*—The Sanscrit is a branch of the Indo-Germanic family of languages. Of all those languages it is that which approaches nearest to the primitive type; and by the originality, purity, and abundance of its forms, is peculiarly calculated to throw light on the obscure laws of the formation of language. Being also possessed of a rich literature, and the whole of its materials having been fully treated of by native grammarians, it was no sooner introduced to the learned of Europe than it gave rise to a new philological science, that of comparative grammar, and led to the conclusion that the antient Persian, the Armenian, the Greek, and the Latin, formed but one language with the German, the Lettic, the Slavonian, and even the Celtic, each of these languages affording the most extraordinary illustrations of the others.

The Sanscrit was introduced into India when the Brahminical race obtained possession of the country (A. W. von Schlegel, 'De l'Origine des Hindous,' in the 'Trans Roy. Soc. Literature,' ii., 2, 405, &c.); and having driven out the languages of the aborigines of India, which are now only spoken in the Southern Deccan, as the Telinga, Tamul, and others, has spread over the extensive tract of country between the Himalayas, the Indus, and the Kistna. Within these limits it has had a history of its own, and has passed through various changes. It appears in its most antient form in the Vedas, in the 13th century before Christ, and in that state is very nearly related to the Zend, the antient language of Persia, and contains many forms and words which have become obsolete. The classical Sanscrit, on the contrary, having once become fixed, has, for about 3000 years, partly as a living language and partly as a learned one, retained the same structure, with the mere exception of difference in style, and a few archaisms, which only occur in the most antient works.

Pracrit Dialects.—Out of the Sanscrit however, even in comparatively early times, dialects arose, which gradually became still farther removed from the original and from each other; and from these dialects the languages now spoken in India are derived. There is a law however which pervades the whole of them; and it is worthy of remark, that this law is precisely the same as that according to which the Romance language, the Italian, the Spanish, and the French, have grown out of the Latin. There is the same softening, the same assimilation, and the same exclusion of the harsher sounds, the same weakening of the forms, the same substitution of particles for cases, and the same periphrastic conjugations. The general name given to these languages by the Indian grammarians is *Prâcrita*, that is, derivative languages; while the term *Sanscrita* is applied to that language which is regularly and grammatically constructed.

The oldest of these dialects, and that which deviates least from the Sanscrit, is the *Pali*, which has become the sacred language of the Buddhists, who, when they abrogated the institution of castes, required a language which, at least for works not strictly scientific, should not be exclusively understood by the privileged classes. Having been carried by the Buddhists from Northern India to Ceylon, the Pali has continued to exist in that island, and possesses a copious literature. (Burnouf and Lassen, 'Essai sur le Pali,' Paris, 1826; Clough, 'Pali Grammar,' Colombo, 1832.) The language which, in a peculiar sense, is called Pracrit, properly *Mâhârâshtrî* (for its local origin is to be sought in the country of the Mahrattas), differs little from the Pali; it is used by the Jains. The *Mâgadhî* and the *Sauraseni*, the former originally spoken in Behar, and the latter on the banks of the Jumna, are only a little farther removed from the Sanscrit. (Lassen, 'Institutiones Linguæ Pracriticæ,' Bonn, 1838.) In addition to these there are numerous more modern dialects, among which we shall only distinguish the Vrajabhâshâ (Brij Bhakha), on account of the excellence of its poetical literature, and as being the parent of the Hindustani.

The formation of the Pracrita languages out of the Sanscrit flowed naturally from the character of the parent tongue, and this tendency is manifested even in the earliest shape of the Sanscrit. This appears, to take a single instance, jn the substitution of the *ch* and *j* (the Italian *ci* and *gi*) for the original *k* and *g*, just as the Italian *gielo* is formed from *gelu*). In like manner, it was perfectly consistent with the character of the classical Sanscrit to adopt the verbal forms of the Pracrit, and to retain them together with the legitimate and settled forms, which is a proof that the two languages must have co-existed for a long period.

The Pali appears as a perfectly-formed language in the Buddhist works carried to Ceylon, which we cannot fix at a later date than the fourth century before Christ; and the Mâghadî dialect has been found distinctly recorded, in the middle of the third century B.C., in the inscriptions of King Asoka, which have for the most part been correctly deciphered by Prinsep. ('Jour. Asiat. Soc. Beng.,' 1837, pp. 566, 794, 963.) A Pracrit language likewise appears on the coins of the Greek kings found in Caubul, and near the Indus, most of which have been deciphered by Lassen. Many of the names also which have been transmitted to us by the Greeks are Pracrit; that of the Deccan, for instance, in the Periplus of the Erythræan Sea, Δαχιναβάδης, does not correspond to the Sanscrit *dakshinâpatha*, but strictly to the Pracrit *dakkhinabadha*. Hence it follows, that in the last five centuries B.C. the Pracrit must have become completely the language of the people; and indeed the dramas which were written about this time show the relation of the two languages in the most distinct manner, the men speaking Sanscrit, and the women and inferior characters Pracrit; which is likewise a proof that the Sanscrit was actually a living tongue, and was used in conversation by all educated people. This is proved by many other circumstances; and it would be a great mistake to view the Sanscrit as having become from this time merely a learned language. On the contrary, it was the language of the court of Cashmere as late as the 12th century A.D., and was probably in use in the small independent courts of Rajpootana even in the 14th and 15th centuries. It is consistent with all that we know, that the language should be in a different condition in the different provinces of India. The Mohammedan conquest however gave the final blow to the language, and it is now used only in learned disputations in the colleges of the Brahmins.

Literature.—The Sanscrit literature begins with the Vedas, and is founded entirely upon them. [VEDAS.] The rest of the literature may be divided into the poetical and the scientific. The poetical literature may be referred to two distinct periods, one of which is chiefly distinguished by the composition of the great epic poems, and the other may be characterised as the period of artificial poetry. In the former, the interest is a national one, and arises from the subject; in the latter, it depends upon the form.

Epic Poetry.—We possess the epic poetry only in its most perfect state, and consequently its origin is involved in obscurity, and must be looked for among the rhapsodists, whom the 'Râmâyana' presents to us pretty much in the same character as that in which they appear among the later princes of India. The materials of the epic consisted primarily of the genealogies of the princely families whom the rhapsodists served, and next, of certain prominent events in the family history, which were at first sung separately, but afterwards incorporated in the genealogy itself. It is possible therefore that there may have been as many epic poems as there were princely races. In the lapse of time however all these poems have been lost except two, which are indebted for their preservation partly to their poetical merit, and still more to the interest of the subject: these are the 'Râmâyana' and the 'Mahâbhârata.' But even these have undergone many important alterations since they came from the hands of the authors; in fact, they have been entirely remodelled in accordance with the interests of the priesthood, by the addition of those parts in which Râma and Krishna, originally no more than mortal heroes, appear as incarnations of Vishnu; these additions however have been so loosely attached, that they might easily be separated without detriment to the whole. In the 'Mahâbhârata,' the object has been kept in view of including in one collection the whole cycle of tradition; and as the epic poems were intended for the instruction and amusement of the warrior caste, not only was everything added which could increase their reverence for the Brahmins, but there are whole books, of considerable length, in which their systems of cosmogony, philosophy, and law are explained in a popular manner.

The Râmâyana.—The subject of the 'Râmâyana' is the descent of Vishnu, for the purpose of averting the threatened destruction of the whole world by the prince of the dæmons, Râvana. Râma, the son of Dasaratha, king of Oude, was brought up by wise Brahmins, especially Visvâmitra; while yet very young he overcame the dæmons in several battles, and by his superhuman strength obtained the hand of the beautiful Sîtâ. He was about to be appointed successor of his aged father and to be his partner on the throne, when the plan was frustrated by a court intrigue, and he was compelled to wander abroad as an exile. With Sîtâ and his brother Lakshmana, who also participated in the divine nature of Vishnu, he dwelt in the inhospitable wilds of the Deccan, in the forest of Dandaka, at the sources of the Godavery. This course of events was necessary in order to bring him and Râvana together, for here Râma made himself terrible to the dæmons, and having mutilated, among others, Sûrpanakhâ, the sister of Râvana, the dæmon-prince, partly out of revenge for this outrage, and partly inflamed by violent love for Sîtâ, carried her off, and brought her in safety to his residence at Lankâ (Ceylon). Râma and Lakshmana, unacquainted with the abode of Râvana, wandered about in the peninsula in search of Sîtâ. The ape-king Sugrîva, who had been dethroned by his own brother Bâli, was restored to his kingdom by Râma, and from a feeling of gratitude sends out a host of apes for the purpose of finding the abode of Sîtâ. The ape Hanumân at length discovers it, passes across the strait, seeks out and speaks with Sîtâ, sets fire to Lankâ, and conveys the intelligence to Râma, who proceeds with the whole army of apes to the southern point of the peninsula, when an enormous bridge is formed by throwing mountains into the sea. As the army is about to march upon the island, Râma is encountered by Vibhîshana, Râvana's brother, and a Titanian conflict commences, the description of which is one of the most admired parts of the poem: but the dæmons are at length subdued; Râvana falls by the hand of Râma; and Sîtâ is recovered, and having been found pure, as well by the ordeal of the gods as by the word of Brahma himself, she is again united to Râma, who, returning to Ayodhyâ, receives from the hand of his brother Bharata the dominion to which he is entitled.

These are the contents of the first six books, and here the poem terminates. But there is a seventh book, which is obviously a later addition, and consists of matters which are entirely independent of the former narrative: Sîtâ is again separated from Râma, and bears two sons, Kusa and Lava, to Vâlmîki. After her innocence has been again established, she is carried away by the goddess Earth. Kusa and Lava have learned the poem from Vâlmîki, its mythological author, and recite it at a great sacrificial festival, whereupon Râma acknowledges them as his sons. This is obviously an etymological myth, derived from the Sanscrit name of the rhapsodists, *kusîlava*. This agrees with the present introduction to the first book, in which the origin of the poem is told in the same way, and both parts must therefore be regarded as additions made by the last editor. That the 'Râmâyana' has undergone many other alterations, may easily be shown. It contains, in some parts, many things which point to very antient times; but customs introduced at a later period are not even alluded to, as for instance the burning of widows, which was practised in the age of Alexander. In other parts circumstances are referred to which bring us as far down as the second century A.D., the names of comparatively recent nations being mentioned, for instance the Huns.

The time of the composition of the poem cannot therefore be ascertained with any further degree of accuracy; and all minuter investigations must be deferred until the whole poem is printed. It is more easy to determine what historical fact forms the foundation of it. This is evidently the introduction of the Brahminical worship into the Peninsula, the wild aborigines of which, as being the opponents of Brahminism, are made to appear in the character of dæmons. The apes must represent another and a less hostile race, whom the Brahmins made use of in order to overcome the ruder tribes. This fact is indicated by another circumstance in the poem: the guide of **Râma** is the hermit Agastya, to whom tradition ascribes the conversion and cultivation of the Deccan, and who even now shines, according to a sublime symbol, as the radiant Canopus of the South.

The 'Râmâyana,' since the last re-casting of the poem, has undergone several revisions, of which we have become acquainted with three, or at least two, by means of MSS. That which contains the oldest and the best text is confirmed by commentaries; another, which we have from the later Bengalee critics, may almost be called a paraphrase. Cary and Marshman first commenced an edition (Serampore, 1806-10, 4to., 3 vols.) which contains the first two books, with an English translation. The text is founded on these two revised copies. A. W. von Schlegel is engaged upon a critical edition of the Râmâyana, founded on a comparison of the MSS. existing in Europe, in which the text of the commentators has been restored. Two volumes of the text have been published, and the first volume of an extremely elegant Latin translation (Bonn, 1829, 8vo.).

Mahâbhârata.—For the second of the two great epic poems, see the article MAHABHARATA.

Laws.—To the same period of literature belong the lawbooks, the *Sâstras*, among which that of Manu has obtained the highest reputation. [MANU.] Besides the book of Manu, there were many similar books, which were likewise referred to sacred mythological personages, as Vishnu, Vrikaspati, Nârada, and others. All of them have been put in shape in the course of time, and this has been done contemporaneously, for the several works contain references to and quotations from one another, and their contents do not materially differ. The 'Yâjnavalkya Sâstra' still exists in the commentary (the 'Mitâxara') which was written upon it; and indeed the original work might be tolerably well restored from it. The 'Mitâxara' quotes numerous passages from the 'Gautamasâstra,' another work of the class, which may still probably exist in India in a complete state.

Purânas.—The Purânas, if we regard the form, must be classed with the antient epic. They are voluminous collections of legends and traditions, written to elucidate the origin and history of some particular holy place or a certain sect, and to be read to the people for their instruction at the great festivals. They all begin with a cosmogony, to which they add the genealogy of the gods and the development of the periods of the world, as well as unconnected historical traditions, so as to form a fabulous chronology; and thus they come down to the history of the sacred place to which they are especially dedicated; they then conclude with the miracles, and so forth, which have been performed there. As they were intended to be read publicly, they are of course used as vehicles for conveying such instruction as the people might be presumed to require. They contain therefore not only recommendations to devotion and faith, and copious representations of the religious usages and customs, but also systems of the sciences which were known to the natives of India, as astronomy, mensuration, and jurisprudence, which are different in each Purâna, according as the priesthood of a temple belonged to this or that sect, or to this or that school of philosophy, astronomy, or law. In their present form the Purânas are decidedly very late compositions, but the elements out of which they have been constructed belong to very different periods. They themselves refer to still older sources, and all the circumstances combined lead to the conclusion that there must have been another set of Purânas, which are now lost, and of which the present are an altered form or an imitation. Their great similarity, as well in their general structure as in particular parts, shows that they must have been formed upon one type, and that one very antient, and that the differences which they present arise from the difference of object, according as they emanated from this or that place, or this or that sect. The older authorities actually give definitions of the Purânas which do not apply to them as they exist at present, and which presume an older form. It may even be asserted that entire portions of them must originally have belonged to the Vedas. In their present shape none of the Purânas can be referred to an earlier date than the ninth century A.D.; and the greater part of them are much later, and closely connected with the formation of the more recent sects. Though they are metrical compositions, they have no pretensions to poetic merit, if we except the 'Bhâgavatapurâna, which was probably written by Vopadeva. They are arranged according to a certain canon, and are eighteen in number, under the titles of Brâhma, Pâdma, Brahmânda, Agni, Vishnu, Gâruda, Brahmavaivarta, Siva, Linga, Nâradîya, Skanda, Mârkandeya, Bhavishyat, Mâtsya, Vârâha, Kaurma, Vâmana, and Bhâgavata. Besides these, there are said to be eighteen *Upapurânas*, or secondary Purânas, but the actual existence of these Purânas is somewhat doubtful. There are many others, not included in this canon, which are called *Sthalapurânas*, or local Purânas, and are of little importance. The Purânas have been chiefly made known to us by the analyses of Wilson, in the 'Asiatic Journals' of Calcutta and London, by his translation of the 'Vishnupurâna,' London, 1840, 4to., and by Burnouf's edition of the 'Bhâgavata,' vol. i., Paris, 1840, fol. The 'Bhâgavata,' with the scholia of the 'Srîdharasvâmin,' has also been printed (Calcutta, 1834).

Artificial Poetry.—Sanscrit poetry received a new character, and one essentially different from that which we have been just considering, in consequence of the revolution which took place in Sanscrit literature about the first century before Christ. Instead of the popular and national character which appears in the two great epic poems, it now assumed an artificial form, and became the poetry of courts and princes. How this was effected cannot be historically shown, for the various steps of the transition are lost, and the new poetry appears at once in its perfect state. It is however quite obvious that the two great epic poems had long been completed and were in universal repute. The new poetry is poor in invention, and drew its materials from the former. Its whole merit consists in what may be called style. Even the epic versification is for the most part neglected, and lyric metres are substituted for it. This is not merely a difference in external form, but it is connected most intimately with the mode in which things are viewed by the Indians, who, being devoted to contemplation, delight to work up their poetical materials not so much into a continuous action, as into a series of single situations. Each of these situations is exhibited in a single stanza or strophe, which forms an independent whole, and is not connected with the others either grammatically or metrically. This peculiarity is as obvious in the epic as in the lyric and dramatic poetry.

The *new Epic poetry* begins with Câlidâsa, to whom two works of this class have been ascribed, 'Kumârasambhava' and 'Raghuvansa.' [CALIDASA.] They are written in a style worthy of imitation, and their whole character shows that they are older than the others, from whose superfluities these early works are free. The materials belong to the mythic cycle of the 'Râmâyana.' The disposition to describe rather than to narrate is exhibited as well in single passages as in the whole. Whenever an opportunity occurs, long descriptions are introduced, such as pictures of natural objects, to which the old epic poetry was also inclined, but more sparingly, and only incidentally; here however they encumber the whole progress of the action. This is much more the case in the two following poems, in which the descriptions appear to the poet to be so important that he seems to have undertaken the works only for the purpose of introducing them. These are the 'Kirâtârjunîya,' or 'the battle of the Arjunas with the Kirâtas,' by Bhâravi, and 'Sisupâlabadha,' or 'the death of Sisupâla,' by Mâgha, both founded on episodes of the 'Mahâbhârata.' They are classical compositions and elaborated with the utmost nicety; but the art of the poet degenerates into a mere play upon words: there are verses which may be read forwards and backwards, and upwards and downwards; others in which only one and the same consonant is used (as 'Sis.

19, 114, 'dâdado duddaduddâdî dâdâdo dûdadîdado duddadan dadado dudde dudâdadadado dada,' which indeed is not very clear, but still has a meaning), or two consonants or more are used. These poems were printed at Calcutta, 1814, 1815, with the commentary of Mallinâtha. The 'Bhattikâvya,' written in the fifth or sixth century, in Vallabhî, the chief town of Guzerat, narrates the history of Râma, but only for the purpose of elucidating the more rare grammatical forms, every canto being written in a certain tense, &c. (Published at Calcutta, 1828, with two grammatical commentaries.) The 'Nalodaya,' falsely ascribed to Câlidâsa, gives the history of Nala out of the Mahâbhârata, but only to show the skill of the poet in an incessant play of words and rhymes. The most artificial of all these poems is the 'Râghavapândavîya' of Kavirâja. It is written with such a purposed double meaning, that the same words give us the histories of Râma and also of the sons of Pandu, which is only possible in consequence of most of the Sanscrit proper names having also a perfect appellative meaning, so that in the one history the proper names must be dropped, and in the other the appellative meanings. This poem has not yet been published. We shall mention in the last place the 'Naishadîya' of Srîharsha, king of Cashmere in the twelfth century. It treats of the marriage of Nala, and nothing else, in twenty-two long cantos, written throughout in a very artificial manner, which however makes it a great favourite among the Indians; the descriptions in this poem exceed in length and number all reasonable bounds, and there can hardly be said to be any action at all.

Lyric poetry, in the proper sense of the term, did not exist among the natives of India at this period, for even here their fondness for description has taken the place of everything else; and instead of lyric poetry, we have the epigrammatic, didactic, and descriptive. Even their amatory poetry appears to be not so much the expression and effusion of feeling, as a studied and laboured display of situations. An agreeable work of this description, the 'Amarûsatakam,' consists of 100 single small poems, each of them being nothing more than a stanza which represents an amatory scene, and which we should call an epigram. (Published at Calcutta.) To this class belongs also the 'Sringâratilaka,' which has been improperly ascribed to Câlidâsa. To these must be added the first book of the 'Centuries' of Bhartrihara, while the two other books contain didactic poetry. The work has been ascribed to the brother of King Vikramâditya, who lived in the first century B.C., but improperly, for it belongs to a much later period, and indeed it is not an original work, but a compilation. (First edited at Serampore, with the 'Hitopadesa,' 1804; and at Berlin, 1834, by Bohlen.) Among the poems properly called descriptive, by far the best is the 'Meghadûta,' certainly a genuine work of Câlidâsa, which, in a style of the utmost elegance and simplicity, describes the course of a cloud over a part of India, the residence of the god of riches and of the wife of a demigod who had been banished to earth [CALIDASA]: the poem is put in the mouth of the demigod himself. The value of this poem as a work of art lies chiefly in this, that every single external phenomenon receives a spiritual meaning, and all nature seems to be endowed with life. It is very different in the later poems of this class, which are properly only rhetorical centos and collections of all the current expressions and comparisons of previous poets. A work of this kind on the seasons, a subject indeed which is frequently introduced in the epic poems, the 'Ritusanhâra,' has been improperly ascribed to Câlidâsa. (Printed at Calcutta in 1792, and at Leipzig in 1839.) A similar one on amatory common-places, 'Chaurapanchasikâ' (in Bohlen's 'Bhartriharis'), is bombastic and spiritless. This branch of literature must have been very rich, and many of the older works have undoubtedly been lost.

The Drama.—In the opinion of the natives the Indian drama had its origin in very antient times, as appears from the fact of their attributing the invention of it to the gods. We are unable to trace it historically, for we know it only in its perfected form. Thus much is certain, that its development is due to the sacred solemnities, and partly to the dances; and accordingly the technical name for drama, *nâtaka* (dance), still remains (though in the extant dramas there is no dancing); and partly to the puppets, which are still used in Java in the representation of pieces taken from the Indian mythology: a trace of this latter origin is preserved in the name of the stage-director, *sûtradhâra*, which signifies *thread-holder*.

Such performances are still retained in their original form at the festivals of Râma and Krishna. The characters of the pieces come forward one after another, and sing a song accompanied with gesture. It is obvious that a considerable time must have elapsed before so simple a beginning could have grown into a regular dialogue and a complicated action, in which mythological, and domestic, and even historical materials are interwoven into the representation. But the Indian drama, even in its highest state, is still in a low condition. Among the Greeks and the moderns, individual action and the collision of moral powers form the moving forces of the drama; but that of India is rather a series of events and situations which are exhibited in succession to the spectator. The distinction between tragedy and comedy is unknown, and the Indian drama most nearly resembles the modern opera. The Indian dramatists have not yet arrived at the discrimination of character; the heroes and heroines resemble one another more or less in all their dramas; and the species rather than the individual is everywhere represented. There are also standing characters, such as the *vita*, who is the *gracioso* of the Spanish stage, and the *vidûsthaka*, who is the clown of the old English. This latter personage is always the necessary attendant of the principal hero, whom he parodies, and whose ideal wishes he contrasts with his own practical views, and these contrasts are often very strongly coloured. The strict rules of the Greek drama are unknown to that of India, and even in many external particulars it is comparatively unfettered, as for instance in the number of acts, of which there may be as many as ten. In the form there are two peculiarities which especially require notice: first, the interchange of dialects in the dialogue, which is in general skilfully and delicately managed, and gives us a high idea of the social cultivation of the Indians in those remote times (it has already been observed that the heroes speak Sanscrit, but that the women and inferior characters speak various dialects of Pracrit); and, second, the interchange of prose and verse. The dialogue is entirely in prose, but is interspersed with verses in the lyric metres, always of the descriptive character before mentioned, which sometimes exhibit a feeling or a situation, and sometimes describe something which cannot be actually represented on the stage, as the rapid travelling of a vehicle. As to the scenic representation our information is limited. It may be inferred from their rhetorical books that great care was bestowed on the declamation and the costume, but the stage-management and the decorations appear to have been very rude. Still the dramatic literature of India is beyond all doubt much richer than we are yet aware of. The names of about 60 pieces are known to us, of which 10 have been edited, and we are indebted to Professor Wilson for longer or shorter notices of 22 others. ('Theatre of the Hindus,' 2nd edit., Lond., 1835.) Fortunately the pieces which have been edited are sufficient to enable us to take a rapid view of all the æras and divisions of this branch of their literature.

The classic age of the Indian drama may be divided into three periods: the first includes the time before Câlidâsa, of which only one piece remains, 'Mrichhakati,' 'The Toy-Cart,' by King Sûdra. It is easy to discover that this piece belongs to the early period of art: the poet has to contend with materials which he does not well know how to handle. There is a certain clumsiness in the management of the acts and scenes, and the excess of descriptive poetry is fatiguing, a whole act, for instance, being occupied with the description of a storm. In other respects it is strikingly original, and contains few of the common-places which occur in the other poets; the different dialects of the Pracrit also are more closely amalgamated than in the other pieces. To Europeans this drama is particularly valuable, as giving a representation of Indian manners which cannot be found in any other work. Though it is the only remaining piece of this period, many others must have existed before Câlidâsa; for the general theory of the dramatic art was already perfected, which is obvious from his frequent allusions to it.

The second period begins with Câlidâsa, under whom the Indian drama reached its highest degree of perfection. We have two pieces by him, 'Sakuntalâ' and 'Vikramorvasî' [CALIDASA], of which the last has been denied to be his, but, to judge from the style and spirit, it must certainly be ascribed to him. Câlidâsa is indeed the most perfect of the Indian dramatists, for in his pieces we have the utmost elegance of style, without anything over-laboured or artificial; the development of his plot is natural and well considered; and here is always a correct relation of parts. As to his poetical merit, Europeans have been enabled to form a judgment from the translation of his 'Sakuntalâ,' by Sir William Jones.

The third period begins with Bhavabhûti, at the commencement of the eighth century, whose æra is estabished by a passage in the 'Chronicle of Cashmere.' Dramatic poetry had now undergone a great change, the hisorical progress of which we are unable to describe for want of the necessary evidence. Bahvabhûta was a learned poet, who constructed his works entirely according to the dramatic theory of previous writers. He has accordingly a very high reputation in India, but he has all the faults conequent on the direction thus given to his genius. With all his poetic talent, he is deficient in true dramatic spirit; its results are laboured, and there is always a display of rt and a want of nature. Description is with him always in excess, and the diction of single passages is not only too rtificial, but also pompous, and to Europeans therefore not without difficulty. There are three pieces of his; one in which a domestic subject is treated, the loves of Mâlati and Mâdhava, and two others taken from the cycle of traditions of the Râmâyana, 'Mahavîracharitra' (which has not been printed), and 'Uttararâmacharitra.' The last is most free from the excessive elaboration of style.

As specimens of dramas of intrigue in the Indian style, Ratnâvali' and 'Mâlavikâgnimitra' are worthy of notice. The first was written in the twelfth century by Srîharsha, king of Cashmere, or under his name; the other was probably prior to Bhavabhûti. The plan of these pieces is not unskilful, and the language is easy and graceful; the subect itself warning the poet to avoid a highly ornamental tyle. Another kind of interest belongs to the 'Mudrârâkhasa' of Visâkhadatta; the exact time to which this drama belongs is unknown, but it is certainly after Bhavabhûti; the matter is historical, namely the history of Chandragupta, the Sandrocottus of the Greeks. In the deficiency of historical information, even such a tradition is important, and the piece also throws much light on the politics of the ndian courts. As a drama it is not of much value; it is mostly written in prose. The 'Prabodhachandrodaya' ('the ising of the moon of reason') is of a character quite peculiar: t is an allegorical play, written by Krishnamisra in the twelfth entury, in which purely abstract ideas, as virtues, passions, and crimes, are personified and act, and by means of whom he Vedanta philosophy at last celebrates her triumph. Seting aside the strangeness of such a work of imagination, it must be admitted that the author has performed his task with great skill.

It was much later before the peculiar species of drama made its appearance which is called *prahasana* (*comedy*, or ather *farce*). The pieces are short, and are valuable as xhibiting an entirely new kind of literature. They are bitter satires, as unrestrained as those of Aristophanes, and imed at the deep state of degradation into which the Indians had sunk, chiefly through the corruption of the Brahmins. The 'Dhûrtasamâgama' ('the assembly of rogues') s a playful wrangle between a Brahmin and his scholars bout a courtesan. The piece has the merit of parodying in happy manner the bombastic style of Bhavabhûta, which s a proof that even in India there were critics who were pposed to the common opinion, and who ridiculed the perverseness of the general taste. This little piece belongs to he end of the fifteenth century. (Published in Lassen's Anthologia Sanscritica,' Bonn, 1838.) The later dramas onfine themselves entirely to mythological subjects. The greater number of the sixty pieces before mentioned belong o this class.

The 'Gîtagovinda' of Jayadeva, written in the twelfth entury, is entirely different from the works already described. It is a poem intended for performance at a festival of Vishnu, and belongs to that class to which we scribed the origin of the drama. It exhibits the separation f Krishna from his wife Râdhâ, his love-adventures with he shepherdesses, and the reconciliation of the husband nd wife, in a series of songs, which are connected and introduced by strophes which describe the situations. The trophes were intended for recitation, the songs to be sung. This is therefore the only Sanscrit poetry which we possess hat can properly be called lyric. But the songs are entirely written on the model of the Pracrit songs, which alone appear to have been intended for singing, and they have throughout the Pracrit metres. The word *govinda* itself is a Pracrit form of the word *gopendra*, 'the master of the shepherdesses,' which is one of the titles of Krishna. The scholiasts explain the poem in a mystic sense: Krishna is the soul, which emanated from God, with whom it was originally in union, but was drawn down from him by sinful objects (the shepherdesses); at length however, full of desire for its original purity, it returns to God. In fact, the author himself, in certain passages, seems to intimate that he had some such deep meaning in view: and perhaps we may here find indications of the influence of the mystic poetry of Persia. (Printed at Calcutta, 1806; and there is an excellent edition by Lassen, Bonn, 1836, 4to.)

Narratives.—As the old epic poems were especially designed for the warrior-caste, so the Vaisyas, the third class, have a literature of their own, the *narrative*, of which the first which requires notice is *Fable*, which is indigenous to India. In the 'Râmâyana' and in Manu there are allusions to well-known fables, and others are related in the 'Mahâbhârata.' The two chief works of later times, but which are still of some antiquity, are the 'Panchatantra' and 'Hitopadesa.' [Bidpai.] The 'Kathânakâs' are short narratives and tales. They are known to us chiefly through three modern prose works, which contain obvious marks of having been derived from older metrical collections. They are called—'Vetâlapanchavinsati,' 'the 25 tales of the ghosts,' by Sivadâsa; 'Sukasaptati,' 'the 70 tales of the parrots,' known in Europe as the 'Tutinameh,' from a Persian translation; and the 'Sinhâsanadvâtrinsati,' 'the 32 tales of the statues on the throne of Vickramâditya.' The whole series has only been printed in translations into the modern languages of India. Lassen has published part of the Sanscrit original in his 'Anthologia.' But there is another still more important work, a great collection of all the existing tales, which was undertaken by Samadeva of Cashmere in the twelfth century; it is entitled 'Vrihatkathâ,' 'the great narration,' or 'Kathâsaritsâgara,' 'the ocean of the streams of narrations.' It is written in the epic metre, and in a simple style. (About a fourth part of the work has been published by Brockhaus, Leipzig, 1840.) Viewed with reference to their matter, the works of this collection are peculiarly interesting to us, since even in the middle ages they had found their way to Europe under various forms, as 'The Book of the Seven Wise Masters, &c.; and the knowledge of the original text clears up many difficult questions of literary history. Some of the oldest and best of the 'Tales of the Thousand and One Nights' have been drawn from this source, and even in the Arabic version they retain many features which belong only to India.

There are two other kinds of narrative works, which need only be noticed briefly, as no part of them has been printed the *champûs*, which are narrations in prose and verse, sometimes written in the artificial style; and the *charitras*, which are short and wonderful stories from the history of some celebrated man. Of this last kind there are two which relate to the kings Vikramâditya and Bhoja, and at first sight appear to contain some valuable information; but they are entirely without authority, and have only served to introduce error into questions of literary history.

Before we proceed to the scientific literature, we must add to the narrative class the scanty remains of

Historical Literature.—The peculiarly contemplative cast of mind which distinguishes the natives of India, and the circumstance of the whole country having never been formed into a single kingdom, but consisting of small independent governments, will sufficiently account for the almost entire want of historical writings. With the exception of a very modern chronicle of Orissa (abridged by Stirling, 'Asiat. Resear.,' xiv.), there is only one historical work in existence in the Sanscrit, 'The Chronicle of Cashmere,' properly entitled 'Râjataranginî,' 'the stream of the kings;' it was written in the twelfth century by Kalhana, partly from antient sources, which he specially mentions. There have been three successive continuations of this Chronicle, which describe the period of the Mohammedan dominion down to Akbar. The work is written in the artificial style, in the epic metre, and has a good deal of the form of a 'Purâna.' The first part of it has been drawn almost entirely from Buddhist sources. It was first made known in Europe by Wilson's Analysis ('Asiat. Resear.' xv.); afterwards edited at Calcutta, 1835, 4to.; and lastly, the first six books, with a French translation by Troyer, were published at Paris in 1840. The Buddhists, on the other hand, have a history, chronologically worthy of credit, which is continued according to the series of their patriarchs. Hitherto the only publication of the original Indian text has been that of the 'Mahâvansa,' in Pali, by Turnour. (Colombo, 1837, vol. i., 4to.) This deficiency of historical literature is in some degree compensated by numerous inscriptions of various ages, which have been found in all parts of India, but of which hitherto very few have been deciphered and published. As most of them contain genealogies and other matters which indicate the time when they were written, they are of inestimable value for historical inquiries, being almost the only documents which we possess. As to any other historical notices, we are entirely indebted to the writings of the Greeks, the Chinese, and the Arabians, which have been very useful, at least for settling dates.

Scientific Literature.—The sciences to which the natives of India have been original contributors, are philosophy, grammar, and astronomy, together with algebra.

Philosophy is of great antiquity in India. The contemplative character of the natives must have early led them to metaphysical speculations, and the collision which must soon have occurred between the results of those speculations and the revealed word of the Vedas, would become a principal cause of the wider extension of philosophy. Hence arose many systems; of those which are held to be orthodox we are specially acquainted only with six; but as these six are related to each other by twos, they can only be regarded as three distinct systems. We are acquainted with them only in their complete form, in which they have a mutual relation to each other, and we are not able to point out their historical development.

The *Sânkhya* system however must be regarded as the first and most antient, and this system, on certain mythological grounds, has been traced back to Kapila. It is founded on a duality of soul and matter (or nature); the first being the free, pure, uncreated, and uncreating principle; the second, the creating power of nature, blind and purposeless. The one cannot be thought of without the other; they form for themselves the yet undeveloped being, and from them proceeds, by a regular gradation, from the spiritual to the intellectual, and then to the most corporeal, the whole visible world. Every human being indeed possesses the spirit, but in union with the senses; and his task is, by the conquest of the senses through the medium of the intellect, to attain to the final deliverance, 'moksha,' or blessedness, which is accomplished in the 'jnâna,' that is, the 'gnosis,' knowledge. But this system had an appearance of atheism, and therefore underwent a reformation in the *Yoga* system of the Pâtanjali. It is here established, that knowledge is the way to attain to the final deliverance, but knowledge itself can only be obtained through 'yoga,' absorption into God and mystical union with him, and a perfect abstraction from everything which can disturb the mind or awake the passions. The system further assumes, that the pure spirit is the creator, and thus it connects itself with the notions which belong to religion; it also adopts the metempsychosis, inasmuch as it fixes degrees of the yoga; the spirit comes back to inhabit new bodies till it has attained the highest degree of the yoga. The Vedas are also held in esteem as means of knowledge, but they are not valued more highly than other means, since a man is to perform what is said in the Vedas freely, and not merely on account of the written word. Hence has arisen the saying, that the 'yogin' is exalted above the Vedas.

The doctrines of the Buddhists are founded on the Sânkhya system, which they carry out into all its consequences, both in their religion and politics. [BUDDHA.]

The second system is the *Nyâya*, of which Gotama is the author. This system is entirely confined to logic and dialectic, on which it has been constructed even in the most minute particulars. It is therefore more in accordance than the Sânkhya with the other systems; and as the natives of India generally have bestowed much labour on the study of logic, so philosophers also of all the different sects have occupied themselves with it. The number of the Nyâya writings is very great. The *Vaiseshika* system may be looked upon as a reformation of the Nyâya. It is derived from Kanada. It applies the logical principle to nature, and has arrived at a complete atomic doctrine by the resolution of all substances into their elements. It asserts that there is a union of atoms, which however is purely mechanical; so that, contrary to the Sânkhya, in its consequences it necessarily leads to materialism.

The third system, the *Mimânsâ*, the first teacher of which was called Jaimini, is directly opposed to the two former. It maintains religion and the revealed word of the Vedas, and is a positive theological system. Accordingly it is occupied chiefly in commenting upon the Vedas, and in reconciling their contradictions. The first part of this system is predominantly practical; it is called 'Pûrvamimânsâ,' 'the first Mimânsâ;' here also it is affirmed that the final deliverance must be worked out by knowledge, but it limits the knowledge to that of the duties prescribed in the Vedas. The metaphysical part of this system is displayed in the *Uttaramimânsâ*, commonly called the *Vedânta*. Here the knowledge is considered as the condition of deliverance, but still the sacred word of the Vedas is the great rule to which all thought is to be regulated. The Vedânta requires philosophy and dialectic, and has therefore adopted from the other systems everything not contradictory to its objects; the consequence of which is, that one-half of the philosophy is given up, and the Vedânta is intermediate between philosophy and dogmatism, as was the case in the Christian system of the schoolmen. It has been however of great service in the later corrupted times, in regenerating the old religious and political system, and in maintaining it to the present time. The two greatest restorers of this system were Kumârilabhatta in the sixth century A.D., and Sankarâchârya in the seventh and eighth, both of whom contributed largely to the expulsion of the Buddhists. The latter travelled through the whole of India, combating and refuting the opposite sects. The system is indebted to him for its perfection, and it is even now universally received throughout India in the form into which he brought it.

The heterodox systems are chiefly known to us through the refutations of them by their opponents, especially Sankarâchârya, for the writings themselves have been intentionally destroyed. They are alluded to in Manu, and they are combated in the 'Râmâyana;' which are proofs of their antiquity. The most important among them is that of the *Lokâyatikas*, a connected continuation and development of the *Vaiseshika* doctrine, and a perfect materialism. Those who adopt this system do not announce a final deliverance as the highest aim, but deny a future existence, and regard the soul as a material substance. The only source of knowledge is considered to be that of a true perception by means of the senses; and the world is held to be uncreated and eternal; they consequently deny the first cause of things, and are perfect atheists.

(Colebrooke, 'On the Philosophy of the Hindoos,' *Essays*, vol. i.; 'Sankhyakarikâ,' edid. Lassen, Bonn, 1832, 4to.; ed. Wilson, London, 1839, 4to.; 'Bhagavadgîtâ,' ed. Schlegel, Bonn, 1823; 'Nyâya Sûtra Vritti,' Calcutta, 1828, 8vo.; 'Bsâshâ Parichheda and Siddhânta Muktâvali,' Calcutta, 1827, 8vo.; 'Vedântasâra,' by Sadananda, Calcutta, 1829, 8vo.; 'Sarîraka Mimânsâ Bhâshya,' by Sankarâchârya, Calcutta, 1829, 4to.; 'Sankara, sive de Theologumenis Vedanticorum, auct. Windischmann,' Bonn, 1838, 8vo.)

Grammar.—The *Philological Sciences* arise among an antient people as soon as a sacred literature gives occasion to their growth. The Vedas were written in a language which soon became obsolete. The necessity of defending them against corruption and innovation, and of preserving their correct interpretation, naturally led to grammatical inquiries; and as the Sanscrit language is in itself so original, regular, and perfect, that its laws are easily discovered, philology has become the most valuable part of Indian literature. The Indian grammarians are far above those of any other antient people; and they have a strong predilection for this science, and have treated of it in numberless writings. The first beginnings of Sanscrit grammar reach back to very remote times, and are included in the collected system of the Vedas. The oldest grammarians appear also as the authors of the 'Upanishaden.' Here too we are unable to trace the gradual formation of the science; the system appears at once in its complete state in the 'Sûtras,' or Aphorisms, of Pânini, who certainly lived in the middle of the fourth century before Christ. He takes notice of a series of older grammarians, as well as of schools; and though in certain particulars there was some variation in what they taught, yet in general the system was the same; and they had the same technical terms. The form in which grammar is presented is one peculiar to the natives of India

dia, and they apply the same principles to other sciences, as for instance philosophy. Everything is compressed into rules, which are brought into the most concise forms of expression possible, and the grammatical categories are expressed by a kind of figures or algebraical signs. They are intended to be committed to memory, and without a commentary they are unintelligible; they are all connected one with another. Pânini is not systematic, but indeed very arbitrary in his arrangement, which appears to have been adopted merely from the necessity which the object of attaining the greatest possible brevity imposed upon him. The whole of more modern Sanscrit grammar is founded on Pânini, and at first grammarians were merely occupied in explaining and correcting him. Two antient commentaries by Kâtyâyana (who is also called Vararuchi) and by Pâtânjali, who in later times have themselves been copiously commented upon, are as old as Pânini himself. In comparatively recent times, grammarians began to take some pains to reduce the 'Sutras' to a system, and to compose grammars more in accordance with European notions. Here the 'Siddhântakaumudî' must be particularly mentioned, which was written by Bhattojidîkshita about the year 1600, and has served as the foundation of a number of more modern works. ('Siddhântakaumudî,' Calcutta, 1812, 4to.; 'Laghukaumudi,' ibid., 1827.) All these are entirely occupied with teaching the grammatical forms, and it is only as opportunity offers that they give a few syntactical rules. Syntax, on the contrary, is developed in many distinct works, and is grounded on the logic of the Nyâya system, which is a proof of enlarged and correct views. So in like manner the different Pracrit dialects have been exhibited in their separate grammars. The oldest work of this kind is the grammar of Vararuchi, which belongs to the fourth century before Christ (the greater part of it published in Lassen's 'Instit. Linguæ Pracr.'); it treats of the principal dialect and of the three others which are most nearly connected with it. He is followed by a series of later grammarians, who successively include within the limits of their works more of the inferior dialects. The most important of these grammarians is Hemachandra, a Jain. The canonical books of the Jains being written in the Pracrit, that language is regarded by them with peculiar interest.

Lexicography also had its origin as far back as the Vedas, for the necessity must soon have been felt of collecting and explaining the obsolete words. A work of this kind, entitled 'Nirukta,' forms an essential part of the Vedas themselves. For the purpose of perfecting grammar, it was afterwards found necessary to make alphabetical lists of the verbal roots. The nouns, chiefly for the purpose of fixing the genders, were arranged by themselves, not alphabetically, but according to the subjects to which they belonged. The chief work of this class, which has served as a foundation to all the later ones, is the 'Amarakosha' ('Amarasinha'), which they have imitated even in their arrangement. [AMARASINHA.] None of these works, of which there are many, completely exhausts the treasures of the language.

Metre.—In like manner, the *Veda-hymns*, which were to be committed to memory, led to the consideration of the laws of metre, and treatises on metre have been ascribed to very early teachers of the Vedas. Here also the more early essays have been superseded by a work which exhibited the subject as a complete system. Pâtânjali, who is here commonly called Pingala, is said to be the author of it: this work has been elucidated by numerous commentaries.

Music.—The theory of music has also been elaborated according to various systems, but in a strange manner, for the different notes and musical scales have been personified.

Of the metrical and musical sciences nothing has been printed, but this deficiency is supplied by Colebrooke's copious Treatise on Metre (*Asiat. Res.*, x.).

Rhetoric.—To the philological sciences belongs also the Indian system of *Rhetoric*, or rather *Poetry*, in which the rules for poetic composition are deduced, not from any principles of art, but from the existing classical works, with particular reference to the drama, the theory of which is extremely copious, and goes into the nicest distinctions. This theory belongs to a late period. There have been printed the 'Kâvyaprakâsa,' by Manmathabhatta of Cashmere (Calcutta, 1829), and 'Sâhityadarpana,' by Kavirâja (Calcutta, 1828), both of which belong either to the twelfth or thirteenth century.

Commentaries.—In later times the Indian grammarians have occupied themselves in writing commentaries on the older works, particularly the classical ones. The most important of the scholiasts with whom we are yet acquainted is Mallinâtha, on the more modern epic poems, and Srîdharasvâmin, on the 'Bhagavadgîtâ.' The commentators have done good service in fixing and maintaining a pure text, especially in the great epic poems. A philological school was established in Bengal, upon a directly opposite principle, for they began to make editions of classical works, in which, most uncritically, according to European notions, they kept to the meaning, but took the liberty of entirely altering the expression. As we have before mentioned, they made such a recension of the 'Râmâyana,' as well as of the 'Sakuntala,' and other dramas. Vopadeva, a grammarian of this school, in a similar manner invented a new grammatical system, according to which he altered the technical expressions of Pânini, without in other respects varying in the smallest degree from his method. ('Mugdhabodha,' Calcutta, 1826.)

Astronomy.—The oldest Indian astronomical documents are the calendars which are annexed to the Vedas, and which, according to Colebrooke, belong to the thirteenth century B.C. They include a solar year of 365 days, and are so composed as to determine it correctly. Here also we are unable to point out how the mathematical and astronomical sciences were gradually developed from such simple elements, as we possess them only in their perfected form. Assisted by the system of notation which they discovered, the natives of India have been particularly happy in their methods of treating arithmetic and algebra, which have had such influence on their mathematical studies that they prefer solving geometrical questions analytically, just as the Greeks, on the contrary, solved arithmetical questions by geometry. ('Lilâvatî,' by Bhâskara, Calcutta, 1828; Colebrooke, 'Algebra of the Hindoos,' Calcutta, 1817, 4to.)

In the earliest works on Indian astronomy now extant, several different systems are apparent, and these systems have been treated of in five works, entitled 'Siddhântas,' which apparently contain the same theories which were afterwards successively extended and improved. Varâhamihira, at the beginning of the sixth century A.D., compared them with each other, and other astronomers worked them up again under different titles, each with the view of introducing into them his own theory. The most important of all these astronomers is Aryabhatta, who was the first to free himself completely from all mythological notions; he was acquainted with the motion of the earth about its axis, and estimated more accurately than Ptolemy the precession of the equinoxes. His two works, 'Ariâshtasata,' an exhibition of his system in 800 strophes, and his abridgement of it, 'Dasagîtaka,' are only known to us by quotations. The age in which he lived is not accurately fixed. According to Colebrooke's reckoning, which seems very probable, the latest period at which he can be fixed is 478 A.D., and he may have lived two or three centuries earlier; but Whish ('Trans. Asiat. Soc., iii. 2, 509), fixes the year of his birth about 502 A.D. To fix the date with certainty would be of great importance towards the settlement of the question which has of late been investigated with so lively an interest, whether the Indian astronomy was entirely native, or whether it was constructed with the aid of that of the Greeks, with which the Indians were certainly acquainted. At all events Aryabhatta made greater progress in algebra than the Greeks. Astronomy has not been improved in India since his time; on the contrary, those who have come after him have not relinquished the false views consecrated by religion, but have endeavoured to defend them against him. This was chiefly done by Brahmagupta, the author of the 'Brahmasiddhânta,' in the seventh century A.D., who is the classical astronomer of the moderns, and whose track was followed by Bhâskara in the twelfth century, in his work 'Siddhântasiromani.' (Several discussions by Colebrooke in the 2nd volume of his 'Essays.')

Jurisprudence.—It was the chief business of jurisprudence to determine accurately the contents of the antient law-books and to complete them. This was done partly by commentaries (especially Kullûkabhatta on Manu, and Paradatta on the 'Yâjnavalkya'), and partly in special works, which for practical purposes must have soon superseded the imperfect and unsystematic 'Sâstras.' The wants of the present age have occasioned the printing of a small number of these works, chiefly on the law of inheritance and adoption, and on procedure; others have been translated into English. Besides Manu, which was translated by Sir William Jones, Colebrooke's 'Two Treatises of Inheritance' (Calcutta, 1810, 4to.), and his 'Digest of Hindu Law on Contracts and Successions,' 1797, which is translated from a modern compilation, particularly deserve mention.

Medicine.—There are many Indian works on medicine, and the systems are various. Many parts of the medical science of India are valuable even to us, as for instance the Materia Medica, in which they were much favoured by nature. The Indian physicians were highly esteemed by the Greeks. In surgery especially they have made considerable progress, and have even discovered and performed difficult operations, as for instance the restoring of noses. The most celebrated medical work, 'Susruta,' has been printed (Calcutta, 1835, 2 vols. 8vo.); and Ainsley, and more recently Royle, have done much to make known the Indian systems of medicine.

Natural History.—The observation of external nature still remains in a very low state among the natives of India, and they seem never to have made any progress even towards the commencement of a scientific system of natural history; at least no works of this kind are known.

Study of Sanscrit.—The Sanscrit language was for many years considered unattainable, but towards the close of the last century this study received a powerful impulse, partly from the necessities of the English government in India, and partly from a desire of knowledge among the learned of Europe. The study of the language having been once commenced, its progress was extremely rapid, the acquisition of it being much facilitated by the previous labours of native grammarians; and by the printing of a great number of their most important works, a large part of the literature became generally accessible, an advantage which the other oriental languages have not enjoyed. In India this progress has been connected with the names of Wilkins, Jones, Colebrooke, Wilson, and Prinsep. But Europe did not remain behind; and the rich collection of manuscripts in the possession of the East India Company in London, and that of the library of Paris, have been abundant sources, and perhaps more than sufficient to compensate for the peculiar advantages enjoyed by India. In England, the study of Sanscrit is most indebted to Haughton and Rosen [ROSEN]; in France, where it was chiefly introduced through Hamilton in 1804, to Chézy and Burnouf. In Germany however Sanscrit has experienced the most cordial reception, though, owing to the want of manuscripts, the study of it has been prosecuted under the greatest disadvantages. In that country, the knowledge of Sanscrit has been chiefly diffused by A. W. von Schlegel and Bopp, both of whom learnt it about the same time in Paris. The latter however has only had in view comparative grammar, a science which has been called into existence by the study of Sanscrit. But A. W. von Schlegel and Lassen have founded in Bonn a Sanscrit school, the object of which is a well-grounded and complete knowledge of the language as well as of the literature and antiquities of India. With what success this attempt has been attended, appears from a series of works which have already issued from this school, and which embrace the most varied branches of Indian philology.

SANSEVIE'RA, a genus of Liliaceous plants, found on the coasts of Western Africa, of Ceylon, and other Eastern islands, as well as of India, remarkable for the strength and fineness of the fibres of their leaves. The genus is characterised by having a corol-like funnel-shaped perianth, which has a long rather straight tube, a sexifid limb, of which the divisions are either spreading or revolute. Stamens six, inserted into the throat; filaments filiform; ovary three-celled; ovules solitary; style filiform; stigmas obtuse, obscurely three-lobed. Berry 3-celled, 3-seeded, or, from becoming abortive, 1-celled and single-seeded. The plants have a thick creeping root-stock, with radical equitant leaves, which are fleshy and often spotted; the stem-leaves are scale-like, and the flowers in racemes or thyrsi. They are easily cultivated and propagated in sandy loam in bark stoves.

Sanseviera zeylanica, a species found in Ceylon, has smooth oblong, acute, flat, and linear-lanceolate, channelled, glaucous leaves, which are shorter than the scape; the style as long as the stamens, the bracts equalling the peduncle in length. This, like some of the other species, is remarkable for the tenacity and fineness of the fibres of its leaves.

S. Roxburghiana is a species, according to Mr. Haworth, which was confounded with the former by Dr. Roxburgh, and which the latter has figured in his Coromandel Plants. It has linear ensiform leaves, which are channelled, keeled, subulate at the apex, green, and longer than the scape. Style as long as the stamens; the bracts minute. Dr. Roxburgh describes this plant, and says it is called *moorva* in Sanscrit, and in Bengalee *moorba*, that in English it may be called bow-string hemp, and that it grows very commonly under bushes in the jungles in almost every soil in the southern parts of India; it flowers from January to May. In a good soil, and where the plants are regularly watered, the leaves become three or four feet long, and contain a number of fine remarkably strong white fibres, which run their whole length. The natives make their best bow-strings of these fibres, which are separated by the leaves being placed upon a flat strong table, when one end is pressed down with the foot, and the rest scraped with a piece of hard wood held in both hands. Forty pounds of leaves thus scraped yield about one pound of clean dry fibres.

The fibres may be applied to a great variety of uses. Dr. Roxburgh was inclined to think that the fine line called China grass is made of these fibres. As the plant grows readily from the slips which issue in great abundance from the roots, and as they require little or no care, Dr. Roxburgh recommended their cultivation in sandy soils. It has lately been proposed in Calcutta to try the fibre on a large scale for rope-making.

S. lanuginosa is a third species, found on the sands of Malabar, while S. guineensis is a species found along a great extent of the west coast of Africa, and which, from affording fibres which, like those of the Indian species, are fine and strong, has been called African bow-string hemp. This has been proposed as a substitute for and considered even superior to New Zealand flax. S. guineensis is distinguished by having uniform lanceolate leaves, the style twice as long as the stamens; the bracts only a third of the length of the tube of the corolla; the flowers sessile.

SANSON, NICOLAS, designated, by a writer in the 'Biographie Universelle,' the creator of geography in France, was born at Abbeville, December 20, 1600. His father, of the same name,[*] being passionately fond of geography, wished all his sons to cultivate that science, but Nicolas responded best to his desire. He was educated at the Jesuits' college at Amiens, on leaving which he returned to his family, and for a time devoted himself wholly to the study of geography. At an early age (barely sixteen, according to the *Biog. Univ.*), he laid down a map of antient Gaul, superior to those of Ortelius and Gerard Mercator; but he did not immediately publish it, lest, according to some authorities, it should be attributed to his father; or perhaps, from not thinking it sufficiently correct for publication. Sanson married early, and applied himself to commerce, to meet the claims of his family; but so much of his time was devoted to his favourite studies, that his affairs became embarrassed, and, having suffered great losses, he ceded his remaining effects to his creditors, and in 1627 went to Paris, taking with him his map of Gaul. The talent displayed in this production, which was published in the year just mentioned, obtained for him the patronage of Richelieu, by whom he was introduced to Louis XIII., who took lessons in geography from him, and employed him as an engineer in Picardie. He soon went to his destination, examining the works of the towns in that province, and returned to Abbeville, where he superintended the repair of the fortifications. In 1638, Louis XIII. being in Picardie to direct the operations of the army, lodged, while at Abbeville, in Sanson's house, and displayed great regard for the geographer, who frequently accompanied him on his excursions, and had the honour of being several times called to the council. His duties as engineer did not diminish his zeal for geography, and he published many maps; but having disagreed with the person who managed their sale, Sanson established himself at Paris, about 1640, to superintend their publication in person. Soon after this he received the brevet of geographer to the king, and a pension of 2000 livres. He was also made a counsellor of state, but did not assume the rank and titles of that office, lest his children should be induced to abandon the study of his favourite science. His incessant labours brought on an illness, of which, after lingering nearly two years, he died at Paris, July 7 (or, according to the account in *La France Littèraire*, July 16), 1667.

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[*] The identity of name between the subject of this article, his father, and his eldest son, has led to some confusion. In Watt's 'Bibliotheca Britannica' some works of Nicolas Sanson *the second* are erroneously attributed to his father.

The maps of Sanson are very numerous, amounting, it is said, to about three hundred; of which a great number were devoted to an accurate delineation of France. Though the services he rendered to geography were very important, he has been blamed for working too hastily, and not taking sufficient advantage of astronomical observations for the improvement of his maps. He published many works to accompany his maps, and others on geographical subjects. In a dissertation entitled 'Britannia, ou Recherches sur l'Antiquité d'Abbeville,' 1636, 8vo., he attempts to prove that Abbeville is the Britannia mentioned by Strabo (iv., p. 190, Casaub.), and that she furnished the first colony established in Great Britain, and gave her name to the country. On turning to Sanson's dissertation (p. 4), it appears that he misunderstood the original, which simply says that neither the people of Massalia (Marseille), nor those of Narbo and Corbilo, with whom Scipio conversed, could give him any information about Britannia. But 'this learned and curious dissertation,' as it is styled in the 'Biographie Universelle,' compels us to form a very low estimate of Sanson's critical sagacity, though these (Narbo and Corbilo) were the chief cities in this part of Gaul. His 'Tables méthodiques' of the divisions of the dominions of Christian princes, engraved on about a hundred folio plates, were first published in 1644, and passed through several editions. Sanson's map of antient Gaul was attacked by a Jesuit, Father P. Labbe, who nevertheless copied largely from it without acknowledgment. This led to a reply, in which the mistakes and plagiarisms of Labbe were exposed; but only a portion of the reply was published, the remainder being destroyed by Sanson in consequence of the mediation of the chancellor Seguier. His maps were collected into an atlas by his sons, and published in two folio volumes, in 1693. In the *Bibliothèque du Roi* is preserved a MS. dissertation by Sanson, in which he endeavours to prove that Boulogne was the Portus Itius of Cæsar. [BOULOGNE, vol. v., p. 271.] There is a portrait of Sanson, engraved by Edelinck.

Sanson had three sons, all of whom followed in his steps. Nicolas, the eldest, was killed August 27, 1648, in defending the chancellor Seguier from the fury of the populace, at the age of twenty-two. Adrien, the next son, succeeded his father as geographer to the king, and died in 1718. Guillaume, the youngest, in concert with his brother, continued the publication of maps and geographical works, and died in 1703. Adrien was succeeded in the business of publication by his nephew, P. M. Sanson. (Chiefly from the *Biographie Universelle.*)

SANSOVI'NO, JA'COPO TATTI. This eminent artist, equally distinguished as sculptor and architect, was born at Florence in 1479. He was the son of Antonio Tatti, whose surname he afterwards exchanged for that by which he is now universally known, and which he assumed out of compliment to his master, Andrea Contucci da Monte Sansovino. Contucci had just returned from Portugal, where he had acquired great reputation as a sculptor, when Jacopo, who was then twenty-one years of age, became his pupil, and afterwards greatly surpassed him. His superior talent however was so far from exciting any jealousy, that it served only to increase his instructor's attachment to him. At this time Jacopo profited greatly by his intimacy with Andrea del Sarto. They almost pursued their studies in common, and both of them copied Michael Angelo's celebrated cartoon representing an episode of the war with Pisa. Becoming acquainted with Giuliano Sangallo, then architect to Julius II., he was taken by him to Rome, where his talents procured for him the notice of Bramante and other eminent artists, and also of the pope himself. He was probably indebted to Sangallo for his first instruction in architecture—an art which he did not begin to practise till some years afterwards, but in which he ultimately attained the highest distinction. On his return to Florence he produced his Bacchus, a chef-d'œuvre in modern sculpture, but now known only from drawings and copies, it having been destroyed by a fire that broke out (1762) in the gallery at Florence, where it had been placed. During his residence at this period at Florence, he had an opportunity of displaying his talents as an architect, in designing several triumphal arches, and decorating the front of the Duomo with a temporary façade adorned with Corinthian columns, niches, reliefs, &c., in honour of the public entry of Leo X. (1515), who complimented him by saying that the design deserved to be perpetuated in marble.

He returned to Rome a second time, but quitted it for ever on the city being taken and sacked by the Imperial troops in 1527, and retired to Venice. He was not however entirely a stranger in that city, having visited it shortly before, when he was introduced to the doge, Andrea Gritti, whose patronage was of essential service to him. One of the first works he was employed upon was the repairing the domes of St. Mark's; after which he executed a great number of structures, both for the republic and private individuals, among which are S. Giorgio de' Greci, La Scuola della Misericordia, the Palazzo Cornaro a S. Maurizio (one of his best works), S. Francesco della Vigna, La Zecca or Mint, the Public Library, the Loggia del Campanile, S. Geminiano (now taken down), Palazzo Delfino, Fabbriche Nuove di Rialto, &c. Among these the Zecca is considered one of his finest works, yet it certainly is deficient in character, and the windows are too large and too numerous. Inconsistencies of a different kind occur in the Loggia del Campanile, a highly ornamented piece of architecture, for while the sculptures on the exterior represent heathen deities, the Virgin Mary occupies the niche within. Still this incongruity is excusable in comparison with that exhibited by him in a magnificent bronze door in the sacristy of St. Mark's, the two principal compartments of which represent the Saviour's death and resurrection, while the smaller panels are decorated with the heads of the evangelists, besides those of some of his own friends, including that of Peter Aretin. His professional reputation was at one time in great jeopardy, for scarcely was the vaulted ceiling of the Public Library completed, when it fell down, in consequence of which he was imprisoned and fined, though shortly after liberated and restored to his former office. Notwithstanding his numerous engagements as an architect, he did not give up sculpture entirely, but he executed the two colossal figures of Mars and Neptune, which adorn what is from them called the Giants' Staircase in the ducal palace, when upwards of 75 years of age. He died at the age of 91, November 27th, 1578. According to Vasari, he enjoyed unimpaired health and strength to the last. As a sculptor, he formed many excellent scholars, and among others Danese Cataneo and Alessandro Vittoria. Jacopo had a son, supposed to have been illegitimate, viz.:—

SANSOVINO, FRANCESCO, who was born at Rome in 1521, was educated to the law, took his degree at Padua, and began to practise at the bar in Venice, but with so little success that he resolved to try his fortune some other way at the court of Rome, Cardinal di Monte, his godfather, having been elected pope (Julius III.) in 1550. Yet although he was kindly received by the pontiff and made one of his chamberlains, he was so disappointed in the chimerical expectations he had formed, that he returned to Venice, where he thenceforth applied himself entirely to literature. The number of his productions, among which are several translations from the classics, histories, and historical collections, abridgments, &c., attest his industry; but the works by which he is now chiefly remembered are his 'Description of Venice,' and the 'Cento Novelle scelti de' piu nobili Scrittori della Lingua Volgare;' which last has been frequently reprinted, but though the later editions have been augmented by a hundred additional tales, they are less esteemed than those of 1565 and 1566. Francesco died at Venice, 28th September, 1583.

SANTA CRUZ. [MEXICAN STATES.]

SANTA CRUZ RIVER. [PATAGONIA.]

SANTA FE'. [MEXICAN STATES; PLATA, LA.]

SANTA FE' DE BOGOTA'. [BOGOTA.]

SANTA MARI'A DE BETANCURIA, the capital of the island of Fuerteventura, is situated near 28° 30′ N. lat. and 14° 10′ W. long., towards the southern extremity of the valley of Oliva, which is about 15 miles long and generally from two to three wide, and very fertile. The commercial produce of the island is brought to this town, and hence sent across the island to Cabras, which is the only harbour in the island, and is connected with the town by the only paved road. The anchorage at Cabras is indifferent and the landing-place still worse. It exports barilla, orchilla, corn, honey, and goat-skins. The population of Santa Maria de Betancuria may be between 3000 and 4000.

(Arlett, 'Survey of the Canary Islands and of part of the

Eastern Coast of Africa,' in the *London Geographical Journal*, vol. vi.)

SA'NTA MA'URA, the antient Leucas, called Leucadia by the modern Greeks, and Santa Maura by the Italians, in honour of a saint of that name, is one of the seven Ionian Islands. It lies west of the coast of Acarnania, between 38° 46′ and 39° 6′ N. lat. It is about 20 miles long, and the breadth varies from 5 to 8 miles. The north-east extremity of the island lies very near the mainland, being separated from it by a narrow and shallow channel which is crossed by a sand-bank, dry in some parts, and having from three to four feet water upon it in others. This is the Leucadian isthmus mentioned by Thucydides (iii. 81; iv. 8). The strong fortress of Santa Maura stands on an island in the middle of the channel, surrounded by lagoons, which can be crossed only by monoxyla, or canoes, made of the hollow trunk of a tree, and drawing no more than one foot of water. An aqueduct nearly a mile and a half long, supported by about 300 arches, which serves also as a footpath across the lagoon, connects the fortress with the town of Amaxichi, which lies southward on the eastern coast of the island, and supplies the fortress with good spring-water. It was built by the Turks under Sultan Bayazid II., and is a remarkable structure.

The surface of the island is covered with calcareous hills from 1000 to 1500 feet high; one summit, called Mount St. Elias, attains the height of 3000 feet. The island has no rivers, but there are several springs of good water.

In the north-east part towards Amaxichi there is a fine plain six miles long and about two miles wide, which produces corn, Indian corn, flax, cotton, pulse, and all kinds of fruit. Oil and some wine are the chief produce of the hills. Some sheep and goats are bred; and mules are used for riding and carrying burdens. Fishing is a great resource of the inhabitants, and a large quantity of salt is collected in the lagoons. The population is about 18,000. [IONIAN ISLANDS.]

Amaxichi, the head town of the island, has 5400 inhabitants, several churches and convents, and is the residence of the authorities, as well as of a Greek bishop. It stands in a fine plain on the sea-coast. The air is considered unhealthy. South of Amaxichi, at the southern entrance of the channel, is the port of Drepano, which is the chief anchoring-place in the island. There are also about 30 villages and hamlets scattered about the country.

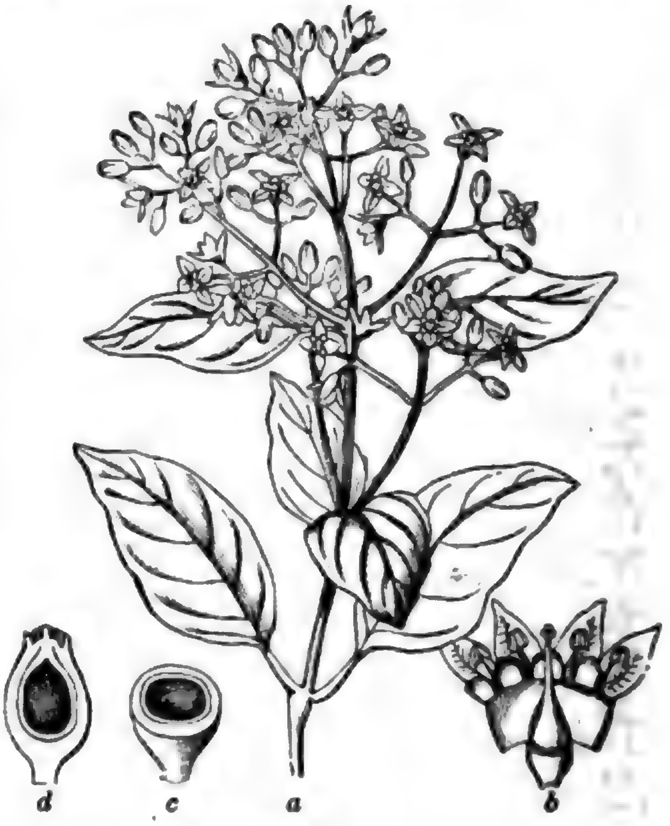
Cape Ducato, the southern extremity of the island facing the island of Cefalonia, which is about five miles distant, is the rock of Leucas spoken of in antient history. [SAPPHO.] There are hardly any vestiges left of the temple of Apollo which once stood here. The antient town of Leucas stood near the site of Amaxichi.

The small island of Meganisi, or Megolonisi, lies along the south-eastern coast of Santa Maura, and belongs to it. It is inhabited, and has olive plantations and pasture for sheep. (Neigebaur, *Ionische Inseln*.)

Leucas was a Corinthian colony. (Thucyd., i. 30.) It is mentioned by Livy (xxx. 17) as forming part of Acarnania, and the town of Leucas as the place of assembly of the Acarnanian council. It was taken by Flamininus in the war against Philip of Macedonia. It afterwards made part of the Roman province of Epirus. After the division of the empire it belonged to the Byzantine emperors till the twelfth century, when the Franks or Latins established a new dynasty at Constantinople, and created several great fiefs in the provinces. Leucas was for a time subject to the counts of Tocco, who bore the name of despots of Achaia, and who raised the fortress of Santa Maura, which gave its name to the island. It afterwards fell into the hands of the Venetians, was taken by the Turks under Sultan Bayazid II. in the latter part of the fifteenth century, and was again restored to the Venetians by the peace of Carlowitz in 1698. After the fall of Venice it was occupied by the French, and attacked unsuccessfully by Ali Pasha of Joannina, and was at last taken from the French by the English at the same time as Cefalonia and the rest of the Ionian Islands.

SANTALA'CEÆ, a natural order of plants belonging to the class of Exogens and subclass Incompletæ. They are trees, shrubs, or herbaceous plants, with round or irregularly-angled branches; alternate or nearly-opposite undivided leaves, sometimes minute, and resembling stipules. The flowers are small, in spikes, racemes, umbels, or solitary. The calyx superior 4- or 5-cleft. Stamens 4 or 5, oppos the segments of the calyx. Ovary 1-celled, with from 1 t 4 ovules. Fruit 1-seeded, hard, dry, and drupaceous. Albumen fleshy. This order is closely allied to Elæagnaceæ and Thymeleaceæ. One of its most remarkable characters is that its unilocular ovary contains always more ovules than one, which are pendulous and attached to the apex of a central receptacle. In the form of weeds the genera of Santalaceæ are found in Europe and North America; in New Holland, the East Indies, and the South Sea Islands they exist as large shrubs or small trees.

The Osyris belongs to this order, although it differs in having diœcious flowers and a trifid calyx. This is however a different plant from the Osyris of Pliny, which possessed in former times a reputation for curing every disease. The modern genus possesses no sensible properties as a medicine, and is principally employed for the manufacture of besoms, for which its long slender branches well fit it. The Ogeebee lime, which is used on the Mississippi instead of olives, is the fruit of *Nyssa candicans*. The *Nyssæ* form trees of great beauty, and their wood is white, soft, compact, and light. The most valuable genus in this order is its type, the *Santalum*, of which the species *S. album* forms the true sandal-wood of commerce.



Santalum album.

a, Branch with leaves, flowers, and fruit *b*, Flower with the calyx open, showing the perigynous stamens and their appendages, the inferior ovary simple style, and lobed stigma. *c*, Transverse section of fruit, with one seed. *d*, Longitudinal section of fruit, with solitary pendulous seed.

SANTALIN, the colouring matter of the *Pterocarpus santalinus*, or red sandal-wood. It was examined by Pelletier, in 1814, and is readily obtained by digesting the rasped wood in alcohol, and then diluting the clear solution with water, by which the solution is precipitated of a beautiful red colour; it is tasteless, nearly insoluble in water, but dissolved by alcohol, æther, alkaline solutions, and slightly by the oils of lavender and rosemary.

The alcoholic solution of santalin gives different coloured precipitates with metallic solutions; thus with tin it gives a beautiful purple, with lead a violet, iron a deep brown, silver a reddish brown.

Santalin is decomposed by the stronger acids, with the usual phenomena and products.

According to Pelletier, santalin is composed of

Eight equivalents of hydrogen .	8
Sixteen equivalents of carbon . .	96
Three equivalents of oxygen . .	24
Equivalent	128

Santalin, or rather the red sanders which contains it, is little used in this country as a dye stuff, but in India it is employed both in dyeing silk and cotton; it is used in pharmacy to give a colour to certain tinctures, but the colour is not generally regarded as a permanent one.

SA'NTALUM, a genus of plants which gives its name to the natural order Santalaceæ, to which it belongs. Sandalwood yielded by one or more species of Santalum is well known both in commerce and the arts as a fragrant-smelling wood, whence it is used as incense, and employed in the manufacture of necklaces, fans, elegant boxes, and cabinets. being a product of the Malabar coast of India, as well as of the Indian archipelago, it has been a question whether, like so many of the other remarkable products of India, it was known to the antients. But it does not appear to have been so; at least no name or description has been considered to refer to this substance. It might therefore be inferred that the sandal-wood of the Eastern islands did not then reach India, and also that the sandal-wood produced on the Malabar coast had not been then discovered; but notices of it occur in early Sanscrit works. The earliest certain notice of sandal-wood is in the works of the Arabs, who describe it under the three heads of *sandal abiuz* (white), *sandal usfur* (yellow), and *sandal soorkh* (red). Actuarius is the earliest Greek author who mentions Santalum. The above kinds are referred to in the older European works on Materia Medica by the names of *Santalum album*, *S. citrinum*, and *S. rubrum*. The last is the red sandal or sanders-wood of commerce, which is used only as a dye-wood and as a slight astringent in medicine. This has already been described under the genus PTEROCARPUS, and the species *P. santalinus*. The yellow and white sandal are both yielded by species of Santalum, though there is some difference of opinion on the subject. The names are no doubt of Eastern origin, as the Arabic and Persian *sundul* are evidently derived from the same source as the Hindee *chundun* and *chundul*, which in Sanscrit is *chundana*, and in Tamul *shandana*.

The genus Santalum has hermaphrodite flowers, the perianth united at the base with the ovary, the limb superior, tubular, and ventricose, quadrifid, deciduous; glands four, compressed, inserted into the throat, alternating with the lobes of the limb. Stamens four, inserted into the throat opposite to the lobes of the limb; filaments awl-shaped, loaded with a pencil of hairs behind; anthers 2-celled. Ovary half inferior, 1-celled. Ovules two, antropous pendulous from the apex of a free central placenta. Style filiform, simple. Stigma obscurely 2-3-lobed. Drupe berried, one-seeded; margined at the apex. Seed inverse. Embryo straight at the apex of a fleshy albumen. Radicle above.

Santalum album, or the white sandal-wood, is a native of the mountainous parts of the coast of Malabar, and also of Timor and the islands of the Indian Archipelago, as it is probable that the same species extends to great distances. It forms a tree of moderate or rather of small size, but much branched, and in general appearance has been often compared to the myrtle, and in inflorescence to the privet. The leaves are opposite, with short petioles, oblong, entire, smooth, glaucous underneath; length from one and a half to three inches. The inflorescence is in axillary and terminal thyrsi. Flowers numerous, small, straw-coloured when they first expand, but change to a deep ferruginous purple: they are inodorous, as are all the exterior parts of the growing plant even when bruised. The tree when felled is about nine inches or a foot in diameter; it is then barked, cut into billets, and said to be buried in a dry place for about a couple of months. The deeper the colour and the nearer the root, the more fragrant it is. As seen in commerce it is in compact pieces of a white colour and agreeable odour, but with little taste. It is usually described as being the young and outer wood, and that the inner parts, as they become older, become coloured towards the centre, and that this is the source of the *yellow*, while the *white* sandal-wood consists of the outer and younger wood of the same tree.

This is the general opinion respecting the origin of yellow sandal-wood, but Garcias thought it in his time to be the produce of a different tree. M. Gaudichaud is of the same opinion; and has moreover figured the plant in plate 45 of the botanical part of the 'Voyage de l'Uranie.' This he saw in the Sandwich Islands, and has named it S. Freycinetianum; stating it to produce the sandal-wood which is so much valued by the Chinese, which they also obtain from the Feejie and Marquesa Islands, Moluccas, &c. They manufacture various articles with the yellow sandal-wood, which is the most fragrant. They also burn it both in their temples and private houses as an incense, and especially in the form of long slender candles, which are formed by covering the ends of sticks with the sawdust of sandal-wood mixed with rice paste.

S. myrtifolium is another species, or a strongly marked variety of S. album, found by Dr. Roxburgh in the mountains of the Rajamundry Circar, and which was figured by him in plate 2 of his 'Coromandel Plants:' it is distinguished by its opposite lanceolate leaves. The wood is of little value, according to Dr. Roxburgh, but Dr. Wallich says it is 'certe odoratissimum.'

About 200 tons are annually imported into Calcutta from the Malabar coast, and about twice as much into Canton from the islands of the Indian Archipelago.

SANTANDER, a small province of Spain, on the southern coast of the Bay of Biscay, formerly annexed to the province of Burgos. The capital, Santander, is a large seaport town, in 43° 28′ N. lat. and 3° 40′ W. long. It is the centre of considerable trade, especially since the breaking out of the last civil war, which caused most of the wealthy merchants of Bilbao and S. Sebastian to settle in it. Santander is well built, and has a safe and commodious harbour capable of holding men-of-war. The coast has some other excellent harbours. Its commerce with the north of Europe, to which it still exports much wool, is very considerable. It sends likewise flour to the islands of Cuba and Puerto Rico, being one of the *puertos habilitados*, or seaport towns which are allowed to trade with the colonies. The environs of Santander consist of steep mountains and deep valleys, whence the name of 'Montañas de Santander,' which has been given to the particular district in which the capital is situated. The hills are covered with wood, and abound with iron of the best quality, owing to which the government has cannon-founderies and manufactories of cast steel in the neighbourhood, the former at the village of La Cavada, the latter at Lierganes. The population of Santander, which has considerably increased of late years, may now be computed at 30,000.

SANTAREM, a district of Portugal, in the province of Estremadura, extending for nearly thirty miles on both sides of the Tagus, which intersects it from north-east to south-west. The capital, Santarem, is situated on the right bank of that river. The town is well built, and the streets tolerably clean. It is divided into three *barrios*. In former times it was surrounded by thick walls and strong towers, built by the Arabs during their occupation of the Peninsula; but no trace remains at present of the antient fortifications, except the five gates, which serve as entrances to the town, and a ruinous old castle, named 'A Alcasaba,' the residence of the Mohammedan governors. The Roman name of the town is believed to have been 'Scalobis,' and 'Præsidium Julium,' which the Arabs changed into *Shantareyn*, whence Santarem. Alfonso VI. of Castile, the famous conqueror of Toledo, was the first to wrest Santarem from the hands of the Moslems in 1093. It fell again into the hands of the Almoravides, and was retaken by Alfonso Henriques, king of Portugal, in 1147. Yúsuf Abú Yakúb, the second of the Almohades, besieged it 1184 with all his forces; but he was wounded in a sally made by the garrison, and compelled to raise the siege and cross over to Africa, where he died of his wounds, in August, 1184. [MOORS; PORTUGAL.] Near this town the French under Massena remained for some time, being unable to penetrate to Lisbon. There is in Santarem an academy of history, instituted in the year 1747. The population is estimated at 16,000.

SANTEE, River. [CAROLINA, SOUTH.]

SANTERRE. [PICARDIE.]

SANTIA'GO, a province of Spain, and one of the seven into which the antient kingdom of Galicia is now divided. It is also the name of the capital, 'Compostella' (Campus Stellæ), which, from its celebrated temple dedicated to the Apostle St. James, or Santiago as the Spaniards call him, is more generally known as 'Santiago de Compostella.' This city is situated in a beautiful plain surrounded on all sides by fertile hills, and close to the rivers Sar and Sarella, which unite their waters about two miles below. Two other rivers, the Tambre and the Ulla, irrigate the neighbouring districts, which are exceedingly fertile and productive. Santiago is badly built and worse paved; the streets are narrow and crooked, and with the exception of two or three monastic buildings, and the cathedral, which is in itself a curiosity, there is nothing remarkable in it. The cathedral was built about the end of the ninth century, by Alonso el Magno, king of Asturias and Leon; but it has since been so altered and added to, that scarcely any part of the original building remains. It contains some very fine wood-carvings, and richly-painted windows. In a subterraneous chapel underneath the principal altar, pious Catholics adore what are believed to be the bodies of St. James and two of his disciples, Athanasius and Theodorus, which, according to tradition, were discovered at the time when the cathedral was built. This circumstance made Compostella the resort of innumerable pilgrims from all the Catholic countries in Europe. In 1428 the number who left the shores of England amounted to 916; and in 1433 it was increased to 2480. It was the practice for the crown to grant licences to masters of ships for carrying out a limited number of pilgrims, who generally took with them large sums of money to defray their travelling expenses, and to present offerings to the church. Pilgrims from France, Italy, and all parts of Germany went thither by land across the Pyrenees, and traversed Biscay and Asturias. In order to encourage their visits, the canons of San Eloy, a church outside of Compostella, built several hospitals on the route for the accommodation of the pilgrims, and formed themselves into a brotherhood to protect them against the attacks of the Moslems. This was the origin of the celebrated order of Santiago (Mariana, *Hist. Gen. de Esp.*, lib. xi., cap. xiii.), instituted by Ferdinand II. of Leon, in 1158. It was long believed that from the offerings made by the pilgrims the canons attached to the church had been enabled to amass immense riches. These however had been greatly exaggerated; for, in 1809, when Marshal Ney took possession of the city, and compelled the chapter to exhibit their treasure, and give him half of it for the pay of his troops, it was found to consist only of about 40,000*l.* The gold statue of St. James turned out to be of gilt brass, and his diamond eyes imitation stones. The convent of San Martin, founded by Sisenando, bishop of Compostella, at the beginning of the tenth century, is another building remarkable for its great antiquity and excellent preservation. There is likewise an hospital for the use of the pilgrims, erected by the command and at the expense of Ferdinand and Isabella, about the close of the fifteenth century.

Santiago was one of the first towns wrested from the Arabs by the successors of Pelayo. [MOORS.] They maintained themselves in it until A.D. 997, when the celebrated Al-Mansúr took the city, destroyed the temple, and carried away its bells to Cordova, there to be suspended from the ceiling of the mosque, where they remained in the place of chandeliers, until, on the taking of Cordova, Fernando III. caused them to be taken back to Santiago on the shoulders of his Moslem captives. (Al-Makkari, *Moham. Dynast. in Spain*, Lond., 1840, vol. i., p. 41.)

Santiago is the see of an archbishop, and the seat of a university, founded in 1533, but which is seldom frequented by any students except those who are natives of Galicia. The trade of the place is of little importance, consisting only of a few tan-yards and manufactures of coarse linen-stuffs for the country people. In former times there was a considerable trade in images, chaplets, &c. for the pilgrims, but this has long ago ceased to be a source of profit. The population is computed at 20,000. It is 98 miles from Astorga; in 42° 52′ N. lat., 8° 30′ W. long.

SANTIA'GO, the capital of the republic of Chile, in South America, is situated in 33° 20′ S. lat. and 70° 40′ W. long., in a large plain which extends eighty miles north and south, and about fifty miles east and west. This plain borders, on the east, on the high range of the Andes, which are covered with snow during the greater part of the year, and on the west on a range of hills called the Cuesta de Prado, which divides it from the shores of the Pacific. This plain is about 1850 feet above the level of the sea, and unfit for agricultural purposes, except where it is irrigated along the banks of some small rivers, and a canal which brings water from the river Maypú to the vicinity of the town, and fertilizes a tract more than twenty miles in length and several miles in width.

Santiago is one of the finest cities in America in respect to buildings, convenience, and healthiness. It stands on a very gentle slope towards the west; and it is regularly laid out, being divided, like other Spanish towns, into rectangular and equal squares, called quadras. The principal streets, which are about forty-five feet wide, eight in number, run south-east and north-west, and are crossed by twelve other streets, all of equal width. The streets are paved with small rounded stones taken from the bed of the river Mapocho, and have a gutter in the middle, through which a current of water, flowing from the river, is suffered to run during two hours in the day, by which means the streets are kept clean. Most of the streets are paved on one side with slabs of red porphyry quarried from the neighbouring hill of San Christoval; the width of this pavement is nine feet. The houses are usually only one story high, on account of the earthquakes, but they are very large, and contain many rooms, arranged round three quadrangular squares, called patios. The entrance of the house is through a wide and lofty archway, which leads to the front patio, which is paved, and separated from the second by a large sala and dormitorio. The second patio is laid out with flowers, and the third is used for domestic purposes. The windows of the rooms looking into the front patio, and especially the large windows of the sala, are protected by handsome fancifully-wrought gratings, which are sometimes gilt, but the rooms in the other patios have no windows. The front of the houses along the street is occupied by small rooms, which have no communication with the interior of the house, and serve as shops for mechanics and retailers. The walls of the houses are four feet thick, and built of large bricks made of baked mud, but they are all whitewashed or painted, which gives them an agreeable appearance. They are roofed with red tiles.

The Plaza, or great square, stands nearly in the middle of the city; it occupies the space of a whole quadra. It has a handsome bronze fountain in the centre, surrounded by a basin of hewn stone, from which the inhabitants are supplied with water by water-carriers. The buildings on the north-west side are, the government palace, the prison, and the chamber of justice. On the south-west side stand the cathedral and the palace of the bishop; on the south-east side are a number of little shops, and on the north-east there are private residences. The palace is an extensive building, in the Moorish style, of which it is a good specimen. The cathedral is the only stone building in Santiago: though somewhat heavy, it is ornamented, but not finished. The other public buildings of the town are in a good style, but they are not large, except the Casa de Moneda, or Mint. This building occupies a whole quadra, or about 250 paces every way, is two stories high, has three court-yards, and a great number of apartments for those who were formerly officers of the establishment. But no money has been coined there for some years, and the machinery has been removed to Coquimbo. There are several handsome churches and convents in Santiago, especially those of San Domingo, San Francisco, and San Augustin.

At the eastern extremity of the town is a small rocky eminence, on which the fort of Santa Lucia is built, which is much visited by foreigners on account of the beautiful view which it affords of the Andes. Adjacent to the hill on the north is the Tajamar, or breakwater. The river Mapocho skirts the northern side of the town, and though in the dry season a small river, it swells in the rainy season and during the melting of the snow in the mountains to such a formidable size that it would inundate the town if it were not kept off by the Tajamar. This breakwater is of substantial brick and mortar masonry, about six feet across at the top, widening towards the ground, with a parapet of a single brick in thickness, and three feet high: it is neatly paved in the whole of its extent, which is two miles, with small black pebbles. It was formerly used as a public walk. At the western extremity of the Tajamar is a handsome bridge over the Mapocho, of eight arches, which leads to the suburb of Chimba. Along the south-western side of the city is the Cañada, which is a large open place, planted with four magnificent rows of poplars, which are watered by small canals constantly full of clear running water. This is at present the public walk. The Cañada separates the city from the large suburb called La Cañadilla. At the western extremity of the city is the small suburb of Chuchunco.

As no census has been taken, the population of Santiago is not exactly known. Thirty years ago it was estimated at 40,000, but modern travellers have made it 60,000. The inhabitants are nearly all of pure European blood; only a few have a slight mixture of Indian blood. The town owes its flourishing condition to the circumstance of having been for many years the seat of government and the residence of the great landed proprietors. The state of society has much improved since the country acquired its independence; many schools have been established, and there are even several schools for females, whose education is almost en tirely neglected in the other countries of South America. It has also a college.

Coarse ponchos and saddlery are made to some extent, and sent to the other parts of Chile. Santiago exports the produce of its mines, and jerked beef, hides, and fruits to Valparaiso, from which place it receives the manufactures of Europe, China, and the East Indies, with sugar, cacao, and some other colonial productions from Peru and Central America. A good road leads from Santiago to Valparaiso, a distance of ninety miles; it is the best artificial road in South America, and practicable for carriages, though it crosses three ranges of steep hills. Santiago has some commercial intercourse with Mendoza on the eastern side of the Andes. Two roads connect these towns. The northern traverses the Andes by the mountain-pass of Uspallata, which, at its highest elevation, called the Cumbre, attains 12.454 feet above the sea-level, and may be passed on mules from the beginning of November to the end of May. The southern road leads over the mountain-pass of Portillo, south of Mount Tupungato, which attains an elevation of 14,365 feet above the sea-level, and is seldom open onger than from the beginning of January to the end of April. By these roads Santiago receives mules, hides, soap, allow, dried fruits, and wine from Mendoza.

(Miers's *Travels in Chile and La Plata*; Haigh's *Sketches of Buenos Ayres, Chile, and Peru*; *Campaigns and Cruises in Venezuela and New Granada, and in the Pacific Ocean*; Parish's *Buenos Ayres and the Provinces of La Plata*; and *Surveying Voyages of the Adventure and Beagle*.)

SANTIAGO DEL ESTERO. [Plata, La.]

SANTONIN, a vegetable principle possessing acid properties, obtained from the seeds of the *Artemisia santonica*, or southernwood. Its properties are, that it is colourless, crystallizes in six-sided prisms and some other forms, is destitute of smell, and when long chewed is slightly bitter. It is soluble in 4000 to 5000 times its weight of cold water, and 250 times when boiling. It is soluble in alcohol, and in the fixed and volatile oils. When strongly heated, it is decomposed. The alcoholic solution reddens itmus-paper, and with some bases it forms neutral and crystallizable salts; this is the case with santonate of soda and santonate of lime; some of the metallic santonates are oluble and others insoluble in water. None of them is applied to any use.

Liebig supposes it to be composed of

Thirty-six equivalents of hydrogen .	360
Sixty equivalents of carbon . .	360
Twelve equivalents of oxygen . .	96
Equivalent . . .	816

SANTORIN. [Thera.]

SANTOS. [Brazil, p. 365.]

SANZ, AUGUSTIN, a Spanish architect, was born at Saragossa, December 29, 1724. He studied the practical art of his profession under Raymundo Cortês, surveyor-general of the public buildings in that city, and the theoretical one in the school of design established there by the culptor Ramirez at his own expense. But for the progress he afterwards made, and the taste be displayed, he was chiefly indebted to the instruction and advice of Ventura Rodriguez [Rodriguez], when the latter was engaged at Saragossa on the chapel *del Pilar*. In 1775 he was elected member of the Academy of St. Ferdinand, and when the school instituted by Goicoechea was made an academy by the title of that of San Luis, in 1792, Sanz was appointed irector, having previously given instruction in architecture there without any emolument. In his capacity of public teacher he did much towards eradicating the prejudices and corrupt taste of the preceding period, when the rt was in a very degraded state in Spain; and towards ntroducing a better style. Nor was his influence inconsiderable, as the government appointed him to inspect all designs for public buildings proposed to be erected in Aragon. Among those erected by himself the principal re, the church of Santa Cruz, Saragossa (of the Corinthian rder, and forming a Greek cross in its plan), and those at Urrea and Binaces, both of them built at the expense of the Duke de Hijar. He also designed the theatre and some other public edifices at Saragossa, besides a number of private houses. He died July 25, 1801, and left a son, Matias Sans, who was also an architect, and who completed the façade of the church at Epila, which building had been begun by his father.

SAÔNE, River. [France.]

SAÔNE ET LOIRE, a department of France, bounded on the north by the department of Côte d'Or, on the east by that of Jura, on the south-east by that of Ain, on the south by that of Rhône, on the south-west by that of Loire, on the west by that of Allier, and on the north-west by that of Nièvre. Its form is tolerably compact, but irregular; the greatest length from north to south is from the neighbourhood of Lucenay l'Evêque to the neighbourhood of Châteauneuf 68 miles; the greatest breadth from east to west is from between Lons-le-Saulnier (Jura) and Louhans to the banks of the Loire near Crona or Cronat, 85 miles. The area is estimated at 3316 square miles, being rather greater than the aggregate area of the English counties of Chester, Stafford, and Derby. The population in 1831 was 523,970; in 1836 it was 538,507; showing an increase in five years of 14,537, or 2·8 per cent., and giving 162 inhabitants to a square mile. In amount of population it is very far above the average of the French departments, but very far below the English counties with which we have compared it. In density of population it is just below the average of the departments, and far below the English counties. Mâcon, the chief town, is 208 miles in a direct line south-east of Paris, or 244 miles by the road through Melun, Sens, Auxerre, Autun, and Châlons-sur-Saône.

The department is traversed from south to north through its centre by the Charolais and Mâconnais heights, which form the prolongation northward of the Cévennes, and unite them with the Côte d'Or, the heights of Langres, the Faucilles, and the Vosges. These heights in the southern part consist of short parallel ranges of hills separated by longitudinal valleys drained by the feeders of the Saône or the Loire. In the northern part of the department they do not occupy so much space as in the southern, and consist of two ranges of low hills separated by the valley of the Dheune, through which the Canal du Centre passes. On the eastern and western sides of these heights the surface of the department is tolerably level. The principal summits are Mont St. Vincent, in the centre of the department, estimated at about 1915 feet; Monts Suin, Crozan, Dun, and La Mère-Boitier in the south; the latter, which is near Mâcon, has an elevation of 3177 feet.

The Charolais heights consist of granitic or of the lower stratified rocks, and these formations overspread the more level country on the west side of the chain. The eastern slopes of these heights, and the plain at their base nearly to the Saône, are occupied by the formations which intervene between the cretaceous group and the new red-sandstone group. A considerable extent of country around Charolles, on the west side of the heights, extending northward almost to the Arroux, is occupied by the same formations. The immediate banks of the Loire (above the junction of the Arroux and of the Saône, and that portion of the department which lies east of the Saône, are occupied by the supracretaceous formations.

In minerals this is one of the richest departments in France. In productiveness of coal it is exceeded only by the departments of Loire and Nord. It contains two distinct coal-fields, which had, in 1834, ten mines at work and seven not at work, giving employment to 1390 men in the pits and 409 others, and producing 150,456 tons of coal. In 1835 the larger coal-field, Le Bassin du Creusot et de Blanzy, had eight mines at work out of thirteen: the smaller coal-field had three mines at work: the total produce was 142,149 tons. At Creusot, where the pits are deepest, the workings are 650 feet below the surface. The produce of these coal-fields is adapted for nearly all manufacturing purposes, and is distributed by means of a railroad seventeen miles long, which conveys the coal to the Canal du Centre. There were, in 1834, in the department, eleven iron-works, in which were eleven furnaces, seven employing charcoal and four coke, for the manufacture of pig-iron; and forty-five forges for the manufacture of wrought iron. The richest manganese-mine in France is at Romanèche, near the Saône, in the southern part of the department: it yielded, in 1835, 900 tons of manganese, being more than half the whole produce of France. Marble, alabaster, lithographic stones, and abundance of freestone are quarried.

The department is partly in the basin of the Loire, partly in that of the Saône, or, more properly, of the Rhône, to which the Saône is tributary. The line of separation between the two basins is formed by the Charolais heights, the country on the east of them being drained by the Saône, and the country on the west by the Loire. The Saône itself enters the department on the north-east side, between Seurre (Côte d'Or) and Verdun-sur-Saône: it pursues a winding course south-south-west past Verdun and Châlons-sur-Saône, from which town its course is more directly south, to the junction of the Reyssouce, near Pont-de-Vaux (Ain), where it reaches the boundary of the department, and has its course along it to the neighbourhood of Thoissey (Ain), where it quits the department altogether. Its length within or upon the border may be estimated at 72 miles, navigable throughout. Its principal affluents are the Doubs (of which about 17 miles are within or upon the boundary of the department), and the Seille (of whose course about 41 miles, 27 of them, viz. from Louhans, navigable, belong to this department), on the left bank; and the Dheune (38 miles long), the Gaye (40 miles long), and the Grône (50 miles long), on the right or east bank. The Doubs receives the Guiotte on its left bank, and the Seille receives the Solman and the Sane on its left bank.

The Loire enters the department on the south-west side, crosses the south-west corner, and for the remainder of its course, until it quits the department altogether, forms the western boundary; about 53 miles of its course, all navigable, belong to this department, but the navigation is so inconvenient, that a lateral canal through this part of its course is in execution. It receives the Arconce, or Reconce (40 miles long); the Arroux (65 miles long), which has 12 miles of navigation, and receives the Creusevaux (25 miles long), the Bourbince (42 miles long), and other streams; the Somme and the Tannay, all on its right or east bank. There are a number of small lakes, some of them, as those of Montchanain and Long Pendu, amid the Charolais heights, on the limit of the two river-basins.

The canals are as follows:—the Canal du Centre (formerly called Canal du Charolais) unites the Loire and the Saône: it was commenced A.D. 1783, and finished A.D. 1792. It commences in the Loire at Digoin, and follows the valley of the Arroux for a very short distance, then that of the Bourbince, at the head of which valley is its summit-level, about two miles long, where the canal crosses a depression in the Charolais heights: it then descends by the valley of the Dheune to the neighbourhood of Chagny, where it turns off, and joins the Saône at Châlons. Its length may be estimated at 75 miles, all in this department. The lateral canal to the Loire consists of two parts, one extending from Roanne, in the department of Loire, to Digoin, in this department; the other from Digoin to Briare, in the department of Loiret. We are not informed what progress has been made in the formation of these canals; the last-mentioned part, the earliest in point of time, was commenced by virtue of a law passed in 1822.

The official statement of the navigation of the department is as follows:—

Rivers.—	Saône	73 miles	
	Doubs	9	
	Seille	25	
	Loire	57	
	Arroux	12	
		—	176
Canals.—	Canal du Centre	73	
	Canal latéral à la Loire, from Roanne to Digoin	11	
	Canal latéral à la Loire, from Digoin to Briare	3	
		—	87
			263

The number of Routes Royales, or government roads, is seven, having an aggregate length (Jan. 1, 1837) of 343 miles, viz. 256 miles in good repair, 48 miles out of repair, and 39 miles unfinished. The principal road is that from Paris to Lyon by Sens and Auxerre, which enters the department on the north-west side, and runs to Lucenay L'Evêque and Autun, from whence it proceeds south-east across the Charolais heights, by Conches and Bourgneuf, to Châlons-sur-Saône: here it turns south, and follows the valley of the Saône, by Grand Senecey, Tournus, and Mâcon, into the adjacent department of Rhône. This road formerly followed another line from Saulieu (department of Côte d'Or) to Châlons, avoiding Autun, entering the department at Chagny on the northern boundary, and passing from thence to Châlons; but this line, though the shorter of the two, has been abandoned, in order to take in Autun. A second road from Paris to Lyon by Dijon enters this department at Chagny, and runs to Châlons. A number of roads unite at Autun; one from Nevers and Château Chinon, in the department of Nièvre; another from Moulins, in the department of Allier; a third from Dijon and Beaune, in the department of Côte d'Or; and a fourth from Mâcon. Roads run, one from Châlons across to the Saône to Louhans, and from thence to Lons-le-Saulnier, in the department of Jura; another from Tournus across the Saône and the Seille, by Cuisery and Romenay, to Bourg-en-Bresse, in the department of Ain; and two others from Mâcon, one by Charolles, Paray, Digoin, Bourbon, Laney, and Crona or Cronat, to Nevers; and the second across the Saône to Bourg. The Routes Départmentales, or departmental roads, had, at the same date, an aggregate length of 492 miles, viz. 385 in repair, 68 out of repair, and 39 unfinished. The bye-roads had an aggregate length of nearly 8000 miles. There are few departments so well provided with the means of communication both by land and water.

The climate is changeable in the Charolais heights, where intermittent fevers are common: it is too cold in this part to allow the culture of the vine. In the rich plain extending from these heights to the Saône, the climate is delightful. The area of the department may be estimated in round numbers at 2,140,000 acres, of which 1,140,000 acres, or more than half, are under the plough. The produce in corn and potatoes, taken together, is about equal to the consumption of the people, with the exception of oats, in which the produce is far below the demand. In rye and maslin (wheat and rye sown together), and still more in maize, the produce is above the average: in barley and buckwheat, and in potatoes, though these last form the staple food of the inhabitants of the heights, the produce is below the average. That part of the department which lies on the east of the Saône is chiefly a corn-growing district: the parts immediately adjacent to the river are productive in wine and pasturage, as well as in corn; and the plain between the heights and the Loire abounds in pasture. The meadows and grass-lands have an extent of 320,000 acres nearly, beside 64,000 to 65,000 acres of heath or other open pasture-ground. The number of horses is comparatively small; that of horned cattle, especially oxen, is above the average. The beef of the district is very good: the principal supply of Lyon is from this department. The number of sheep is very small indeed, scarcely amounting, when computed relatively to the population, to one-seventh part of the average of France. A considerable number of pigs are bred. Oxen are very generally employed in the labours of agriculture, and a considerable number are sent from the neighbourhood of Charolles for the supply of the markets of Paris. The vineyards occupy about 95,000 acres, and some of the wines are in high repute: those of Les Thorins and Chenas are among the red wines of the first class; and those of Fleury, La Chapelle-Guinchey, and La Romanèche, of the second class: the white wines of Pouilley and Fuissey are first-class wines; and those of Cheintré, Solutrée, and Davayé are of the second class. These are mostly grown in the neighbourhood of Mâcon. The great bulk of the vintage ranks however only as common table-wine; but that of Mâconnais, or the district of Mâcon, which is sent to Paris is the best of its class. That of Charolais, or the district of Charolles, which is chiefly sent to Lyon, is, on the other hand, among the worst, and has nothing to recommend it but its low price.

The woodlands occupy nearly 400,000 acres: the timber is chiefly oak, beech, ash, pine, fir, and chesnut. The wolf and the wild boar are found in those woods which occupy the Charolais heights.

The department is divided into five arrondissements, as follows:—

Name and Situation.		Area in Sq. Miles.	Cantons.	Communes.	Population. 1831.	1836.
Mâcon	S.E.	477	9	133	114,061	115,77
Autun	N.W.	727	8	85	85,485	87,35
Charolles	S.W.	963	13	138	120,551	125,65
Châlons-sur-Saône	N.E.	668	10	155	120,461	124,35
Louhans	E.	481	8	81	83,412	85,3
		3316	48	592	623,970	538,5

The arrondissement of Mâcon contains the following owns:—Mâcon, pop. in 1831, 10,998; in 1836, 11,944 MACON]; and Tournus, pop. 4316 town, 5311 whole comnune, on the Saône; Lugny, on a small feeder flowing from he Charolais heights into the Saône; Matour and Cluny, op. 3368 town, 4152 whole commune [CLUNY], on or near he Grône; St. Gengou, between the Grone and the Gaye; nd Romenay, east of the Saône, between the Seille and he Sane Vive, one of the affluents of the Sane. Tournus pleasantly situated at the foot of a little hill on the bank f the Saône, over which there is a good wooden bridge: he houses are indifferently built; there are two public ralks, and a quay along the river. The townsmen manuacture hats, blankets, cotton counterpanes, beet-root sugar, nd potash: they send a great quantity of good buildingtone to Lyon by the river, and carry on trade in corn and ine. There are twelve yearly fairs. There is a tribunal of ommerce. Greuze, the painter, was born at Tournus. latour is pleasantly situated in a grazing country: it has welve yearly fairs. St. Gengou, or St. Gengoux, is in a istrict producing some of the best wine in this part of rance, in which the townsmen carry on a considerable ade; they manufacture hats and leather, and have six attle-fairs in the year.

In the arrondisement of Autun are—Autun, population in 831, 8610 town, 9921 whole commune; in 1836, 10,435 comnune [AUTUN], on the Arroux; Lucenay-l'Evêque, on the reusevaux, a feeder of the Arroux; Issy-l'Evêque, on the omme; and Montcenis, and Couches, between the Arroux nd the Dheune. Montcenis is on a hill in the coal-mining istrict, and at the foot of the hill, near the town, is the village f Creuzot or Creusot, population 3117, celebrated for its glassorks, which are among the most important in France for aking and cutting flint glass, and for its foundry of cannon r the navy, with the connected iron-works for the manuacture of heavy iron goods. From 1500 to 2000 workmen re employed in the coal and iron mines, iron-works, glassorks, &c., of these places and the surrounding villages.

In the arrondissement of Charolles are—Charolles, populaon in 1831, 2781 town, 2984 whole commune; in 1836, 226 commune, on the Reconce; Le Bois-Sainte-Marie, on small feeder of the Reconce; Paray-le-Monial, population 722 town, 3400 whole commune, on the Bourbince; Perecy, on the Oudrache a feeder of the Bourbince; Toulon and ueugnon, on the Arroux; Crona or Cronat, Bourbon-Lancy BOURBON-LANCY], La Motte-St.-Jean, Digoin, population 877 town, 2900 whole commune; Marcigny, population 102 town, 2620 whole commune; and Semur, all on or ear the Loire; and La Clayette and Châteauneuf on or ear the Sornin. Charolles has one or two fiscal offices, a bordinate court of justice, a tribunal of commerce, an gricultural society, and a high school. The townsmen are ngaged in iron-works, which supply wrought iron to the ailers of St. Etienne in the department of Loire, and in potries They carry on trade in the wine, wood, and fat cattle f the surrounding country, which are sent to Paris. Paray-Monial is a tolerably well built town, in a fertile valley; has an hospital and a high-school. The townsmen trade corn and have nine yearly fairs. Perrecy and Gueugnon ave iron-works. Digoin, at the junction of the Canal du entre with the Loire, carries on a considerable trade, espeially in salt. There is a manufactory of earthenware. Six airs for cattle are held in the year. The inhabitants of Iarcigny manufacture leather and table linen, and carry on rade in corn and wine; they have five fairs in the year. emur is distinguished as Semur-en-Brionnais, from another nd more important town, Semur-en-Auxois, in the adjacent epartment of Côte d'Or. The townsmen trade in corn, wine, nd cattle. Cotton goods and leather are manufactured at layette. At Chauffailes, near Châteauneuf, is a considerable inen factory.

In the arrondissement of Châlons are—Châlons-sur-Saône, opulation in 1831, 12,220; in 1836, 12,400 [CHALONS-SURAÔNE]; and Verdun sur Saône, population 1796, on the aône; Chagny, population 2989, on the Dheune; Givry, opulation 2882, and Bourgneuf, between the Gaye and the heune; Mont St. Vincent, between the Gaye and the ourbince; Buxy, population 1954, between the Gaye and the rône; and Grand Senecey, or Senecey le Grand, popuation 2406, between the Grône and Saône. Verdun-suraône is immediately below the junction of the Doubs with he Saône, on the left or east bank of the latter. It was a fortified town in the middle ages, and was often taken and retaken. The towsmen manufacture pottery and earthenware, and carry on trade in corn, wine, and fruit. They have three yearly fairs. Chagny is rather a pretty town in the midst of a country of vineyards, but the wines are not of the best quality. The townsmen carry on considerable trade, and have five yearly fairs. Bourgneuf consists principally of one wide street, of which one side is in the commune of Bourgneuf, the other in that of Touches. It is a pretty town of 1200 inhabitants. The country round Givry produces excellent wines. Mont St. Vincent is sometimes called Belvéder (Belvidere), from the fine prospect which, from its situation on a lofty eminence, it commands. The chief trade is in wool. There are six yearly fairs. Senecey le Grand is a handsome well-built town, though small. The townsmen carry on trade in corn and wine. They have six yearly fairs.

In the arrondissement of Louhans are—Louhans, population in 1831, 3411; in 1836, 3674; and Cuisery, population 1732, on the Seille; Sainte Croix, on the Solman; Cuiseau or Cuiseaux, population 1753, on a branch of the Solman; Montpont, on the Sane Vive, one of the streams which unite to form the Sane; Bellevesvre, on a feeder of the Seille; and Mervans, on the Guiotte. Louhans is an old town, with the upper stories of the houses projecting over the causeway. It has an hospital, an agricultural society, and a high school, besides some judicial and fiscal government offices. It stands on the left bank of the river Seille, the navigation of which commences here. The town is a mart for the manufactures of Lyon and Switzerland, and there are some ironworks. There are nine yearly fairs. The townsmen of Cuiseaux or Cuiseau (sometimes written Cuzeau), the country of the historian Paradin, carry on trade in corn, wine, and poultry. There are nine yearly fairs.

The population of the towns given above, is, where not otherwise mentioned, that of the whole commune, and from the census of 1831.

The department constitutes the diocese of Autun, in the ecclesiastical province of Lyon and Vienne. It is in the jurisdiction of the Cour Royale of Dijon, and of the Académie Universitaire of that city. It is in the eighteenth military division, the head quarters of which are at Dijon. It sends seven members to the Chamber of Deputies.

In respect of education this department is behind the average of the French departments. Of the young men enrolled in the military census of 1828-29, only 32 in every 100 could read and write, the average of the departments being a little under 40 in the 100.

In the earliest historic period this part of France was chiefly comprehended in the territories of the Aedui and the Sequani, two Celtic nations, separated from each other by the Arar or Saône, the Sequani being on the east and the Aedui on the west of that river. The south-western part, known in the middle ages as the district of Brionnais, appears to have been the seat of the Aulerci Brannovices or Brannovii, a people dependent on the Aedui, mentioned in the present copies of Cæsar as two nations, but whom D'Anville is inclined to consider as only one. The Aedui were, under the Romans, comprehended in the province of Lugdunensis Prima, the Sequani in Maxima Sequanorum, a subdivision of the province of Belgica.

Several Gallic or Roman towns were within the limits of this department. Bibracte, which Cæsar describes as the principal town of the Aedui (*De Bell. Gall.*, i. 23; vii. 55), and to which the Romans gave the name of Augustodunum (Αὐγουστόδυνος or Αὐγουστόδυνον, Ptol.), may be identified with the modern Autun, a place remarkable for its antiquities. [AUTUN.] Cabilonum, mentioned by Cæsar (*De Bell. Gall.*, vii. 90) and by several subsequent writers, and Matisco, also mentioned by Cæsar (*De Bell. Gall.*, vii. 90), are the modern Châlons and Mâcon. The modern names of these three towns are obviously derived by corruption from the antient ones. The Boxum and Teionnum, or, by a probable correction of D'Anville, Telonnum of the Peutinger Table, may be recognised in the village of Bussière, and in the little town of Toulon on the Arroux; and the Aquae Nisineii and Pocrinium of the same authority, in the town of Bourbon Lancy and the village of Porigny or Perigny on the Loire. The Pons Dubis of the Peutinger Table was probably on the Doubs just within the limits of this department. Tinurtium, mentioned in the Antonine Itinerary and the Peutinger Table, is identified by D'Anville with Tournus. The place 'duodecimum apud lapidem' (*i.e.* the twelfth milestone from Augustodunum), where the Aeduan rebellion under

Sacrovir was put down by Silius (Tacit., *Annalium*, lib. iii., cap. 45, 46), must have been near Couches, between Autun and Châlons. The subsequent changes of this part of France are noticed elsewhere. [BOURGOGNE.]

SAÔNE, HAUTE, a department in the eastern part of France, bounded on the north by the department of Vosges, on the east by that of Haut Rhin, on the south by that of Doubs, on the south-west by that of Jura, on the west by that of Côte d'Or, and on the north-west by that of Haute Marne. Its form is tolerably compact, approximating to an oval. The greatest length is from east-north-east to west-south-west, from the junction of the three departments of Vosges, Haute Saône, and Haut Rhin, to the border near Gray, 72 miles; the greatest breadth, at right angles to the length, is from the neighbourhood of Jonvelle, on the Saône, to the bank of the Oignon near Rougemont in the department of Doubs, 38 miles. The area of the department is estimated at 2056 square miles. The population in 1831 was 338,910: in 1836, 343,298; showing an increase in five years of 4388, or rather more than 1 per cent., and giving 167 inhabitants to a square mile. In area and amount of population it is below the average of the French departments; but in density of population is just about the average. In area it may be compared with the English county of Norfolk; but falls short of it both in amount and density of population. Vesoul, the chief town, is on the Drejon, a feeder of the Saône, 193 miles in a direct line south-east of Paris, or 210 miles by the road through Provins, Troyes, Chaumont, and Langres.

The eastern side of the department is occupied by the branches of the Vosges, the main ridge of which is just upon the border. The principal elevations are Le Ballon de Servance, 3967 feet; and Le Ballon de Lure, 3718 feet. A range of heights branching from the Vosges skirts the right bank of the Oignon, as far as the road between Vesoul and Besançon, and indeed rather farther; and some of the branches of the Faucilles overspread the northern portion of the department, near the banks of the Saône and the Semousse.

The eastern extremity of the department is occupied by the primary rocks which form the nucleus of the Vosges. The country on the west and south of this primary district is occupied by the sandstone of the Vosges and other of the lower secondary formations, but the greater part of the department is occupied by the secondary formations which intervene between the cretaceous group and the sandstone of the Vosges. The minerals are granite (red and grey), porphyry (purple and green), freestone, stone for lithography, and excellent grindstones, gypsum, and a white sand valuable for the manufacture of glass. There were in 1834 four coal-pits in work, giving employment to between 400 and 500 miners and others, and yielding that year 36,303 tons of coal. In 1835 the produce was only 16,128 tons. Peat is also procured. Iron-ore is abundant: there were, in 1834, 45 establishments for the manufacture of pig and wrought iron and steel, comprehending 37 furnaces for the making of pig-iron, 53 forges for the production of wrought-iron, and 5 forges for steel. Charcoal was the fuel almost exclusively employed.

There are several mineral-springs, of which those of Luxeuil, a town at the foot of the Vosges, on the river Breuchin, are the most frequented.

The department belongs to the basin of the Saône, a subdivision of the more extensive basin of the Rhône. The Saône enters the department on the north side, at about 25 or 30 miles from its source, between Châtillon-sur-Saône and Jonvelle: it flows southward, though with some considerable bends, to the junction of the Drejon; after which it turns to the south-west, and flows in a very winding channel past Seveux and Gray, into the department of Côte d'Or. That part of its course which belongs to this department may be estimated at about 80 miles; the navigation, which, according to Brué's Map of France, commences at Seveux above Gray, may be estimated at nearly 30 miles; but the official statements give the navigation at only 15 miles. The principal tributaries which it receives are the Coney, the Superbe, the Lantenne or Lanterne, the Drejon, the Romain, the Morte, and the Oignon, on the left bank; and the Amance, the Gourgeon, and the Saulon on the right bank. Of these the Oignon is the most important: it rises near the eastern extremity of the department amid the Vosges, and flows south-west, partly within, partly upon the border, 90 miles into the Saône. There are no canals.

There are five government roads, having an aggregate length (on 1st Jan., 1837) of 180 miles; viz. 145 miles in good repair, 29 out of repair, and 6 unfinished. The principal road is that from Paris to Vesoul, Béfort, and Bâle or Basel in Switzerland, which enters the department beyond Fay-le-Billot (Haute Marne), and runs through Port-sur-Saône to Vesoul; and from thence by Lure to Béfort. Roads branching from this, one at Langres (Haute Marne), and the other between Fay-le-Billot and Port-sur-Saône, run to Gray, from which town there are roads to Dijon and Besançon, in the adjacent departments of Côte d'Or and Doubs. Roads run from Vesoul to Besançon, and to Epinal in the department of Vosges. The departmental roads have an aggregate length of 252 miles, all in good repair: the bye-roads have an extent of above 2000 miles.

The climate of the department is milder than that of the neighbouring departments; the heat of summer and the cold of winter are less intense, and the autumn is usually fine: but the spring is variable owing to the changes of temperature produced by the melting of the snows in the neighbouring mountains. The soil is on the whole fertile. The area may be estimated at 1,300,000 acres in round numbers, of which about 640,000 acres, or almost one half, are under the plough. The quantity of wheat raised is about the average produce of the departments, in rye and maslin (wheat and rye mixed), in maize, barley, and oats considerably below the average, especially in oats. From the extent however to which the potato is cultivated, the inhabitants are enabled to spare their corn, of which a considerable quantity is sent to the departments of the south. Millet, beet-root, pulse, and seeds for oil are also grown. The meadows occupy an area of nearly 150,000 acres: they are chiefly along the banks of the Saône and Oignon, and afford abundance of good pasture. The heaths and open passages occupy nearly 55,000 acres. The number of horned cattle, especially oxen, is above the average; but the number of horses, and still more of sheep, is below the average. The draught horses are in good repute. Pigs, goats, and asses are reared, but the mule is rare. The vineyards occupy nearly 30,000 acres, and the produce is about equal to the average of the departments, but the wine is of very ordinary quality. The woods occupy nearly 400,000 acres, and contain abundance of oak, beach, and hornbeam; on the slopes of the Vosges there is abundance of fir timber: the elm, the ash, the maple, and the aspen are not common. The wolf, the fox, the squirrel, and the otter are common. Game is tolerably plentiful, especially the hare, the rabbit, the partridge, the rail, the woodcock, the snipe, the wild duck, the quail, the thrush, and the ortolan. The rivers abound with fish, including trout, carp, pike, barbel, eels, and crayfish.

The department is divided into three arrondissements as follows:—

	Situation.	Area in Sq. M.	Population. 1831.	Population. 1836.	Communes 1837.	Cantons. 1836.
Vesoul	Central	740	113,200	114,018	252	10
Lure	N.E.	701	137,473	139,381	211	10
Gray	S.W.	615	88,237	89,899	188	7
		2056	338,910	343,298	651	27

The number of cantons or districts, each under a justice of the peace, has, since the above Return, been increased to twenty-eight.

In the arrondissement of Vesoul are—Vesoul, population in 1831, 5482 town, or 5583 whole commune; in 1836, 585 for the commune, on the Drejon; Jonvelle, Port-sur-Saône, population 1965 town, or 2067 whole commune, and Scey on the Saône; Jussey, population 2705, on the Amance; Amance, on the Superbe; Faverney, on the Lanterne; Montbozon, on the Oignon; and Noroy-l'Archevêque, on the heights which skirt the valley of the Oignon.

Vesoul is not mentioned in history before the tenth century. In the middle ages it was a place of some strength. About the middle of the sixteenth century, although then a German town, it was assailed by a German army, which, returning from an expedition into Bresse, determined to pillage it; a sudden inundation however alarmed the assailants and saved the place. In 1644 it was taken by Turenne, who violated the terms of capitulation, and gave it up to pillage. Upon the union of La Franche Comté to France, the prosperity of the town increased, and several public buildings were constructed. It is well built, and is adorned with handsome public walks. There are a church, with a handsome high altar in marble, a town-hall, a court-house, a covered market, and handsome cavalry barracks, all erected about the middle of the last century; there are also a theatre, an hospital, and public vapour-baths. The townsmen manufacture calicos and other cottons, braid, hats, nails, wrought-iron roofs, and clock and watch works. There are dye-houses, tan-yards, and bleach-houses for wax. Trade is carried on in corn, hay, wine, cattle, iron, and hides: there are twelve yearly fairs. There are a high school with a cabinet of natural philosophy and natural history, a public library of 21,000 volumes, an agricultural society, by which interesting papers on agriculture are periodically published, a society of the sciences and commerce, and a departmental nursery-ground.

Jonvelle has four fairs in the year for cattle, horses, coarse woollens and straw hats, of which last two articles a considerable quantity is made in the neighbourhood and sold at these fairs. Port-sur-Saône occupies the site of Portus Abucini, a place mentioned in the 'Notitia Provinciarum Galliæ:' numerous fragments of Roman tiles, the remains of an aqueduct, tessellated pavements, and medals have been dug up. The place suffered much in the wars of the fifteenth and sixteenth centuries; it has the ruins of a strong castle n an island of the Saône. The townsmen manufacture candles, iron, and wool combers' cards; form boats or rafts of timber for ship building or other purposes, which are sent down the river to the ports of the Mediterranean; and trade n corn, cattle, and iron. There are seven yearly fairs. There is a handsome bridge over the Saône. Scey, distinguished as Scey-sur-Saône, is a busy little place, with iron-works, and a considerable corn-trade; there is a bridge of fourteen arches over the Saône. Scey has six fairs in the year. At Jussey fine clock and watch works are made; and here are five yearly fairs for horses and cattle, and the coarse woollens and straw hats manufactured in the district. At Faverney trade is carried on in corn and wine. Cotton-weaving and dyeing are carried on at Noroy-l'Archevêque, otherwise Noroy-le-Bourg. There are many iron-works and potteries at villages and hamlets in the arrondissement.

In the arrondissement of Lure are—Lure, population in 831, 2847; in 1836, 2950; and Villersexel, on or near the Oignon; Grange-le-Bourg, on a tributary of the Marcour, which joins the Oignon; Héricourt, population 2644 town, 907 whole commune, on a feeder of the Doubs; Faucogney and Luxeuil, population 3570, on the Breuchin; and Conlans, on the Lanterne; St. Loup, population 2601 town, 663 whole commune, on the Semousse (called also the Angrone), a feeder of the Lanterne; and Vauvillers, not far from the Coney. Lure was antiently celebrated for its abbey, founded in the reign of Clotaire II; it became a Benedictine abbey, and was secularised in 1764. The sub-prefect occupies the former residence of the abbot. The own consists principally of one long and very wide street, nto which some smaller streets or lanes open; the houses are low, but tolerably well built. The inhabitants have tan-yards and dye-houses, and carry on trade in leather, iron, corn, timber, and cheese. There are eight yearly fairs for cattle, draught horses, and straw hats made in the district. There are a subordinate court of justice, an agricultural society, a seminary for priests, and a school of commerce. Villersexel or Villers-sexel is in the midst of an iron-making district. Grange-le-Bourg has four yearly fairs for cattle of every kind, woven goods, and straw hats. Héricourt is a busy town; it has a factory for spinning cotton-yarn, where steam is the moving power; and various kinds of cotton goods are manufactured, also linens, cotton and woollen hosiery, and chamois and other leather. There are dye-houses. There is a monthly fair for cattle, straw hats, and hardwares. Héricourt has an antient castle. Faucogney has some cotton and linen manufactures: hones for razors are dug near the town. Luxeuil is pleasantly situated, and has mineral waters which were known to the Romans, who called the place Lixovium: an inscription found in the ruins of the antient baths, and preserved in the town-hall, runs as follows:—LIXOVII . THERM. REPAR. LABIENVS . IVSSV . C. IVL. CAES. IMP. The baths at present are six in number, supplied from hot and cold springs, and are much frequented. The town was ruined by Attila, but revived on the foundation of a monastery here in the seventh century by the Irish saint Columban, which continued down to the suppression of religious houses at the Revolution. The town was pillaged by the Saracens in the eighth century. The townsmen manufacture leather, hats of felt and straw, hardwares, clock and watch works, and tin-plate wares; they have dye houses; and carry on trade in kirschenwasser (cherry-water) fruits, mill-stones, and timber: there are six yearly fairs. St. Loup is in the centre of a considerable manufacture of straw hats; the townsmen also manufacture druggets, currycombs, chamois and other leather; there are oil-presses, flour-mills, a brewery, a tile-yard, and some other works, all comprehended in one vast establishment. There are candle-manufactories, tan-yards, and glass-houses at Vauvillers. There are several important manufacturing establishments at the villages in this arrondissement; there are cotton-mills for spinning yarn, and factories for weaving cotton, one of which, at Vy-les-Lure, near the Oignon, gives employment to five hundred persons; vellum paper, iron goods of various kinds, beer and kirschenwasser are also made in the district. The chief mineral treasures of the department are found in this arrondissement, in which granite, coal, peat, brick-earth, grindstones, and manganese are dug. A considerable quantity of timber and deals are also procured.

In the arrondissement of Gray are—Gray, population in 1831, 5937; in 1836, 6535, on the Saône; Champlitte, population 3535 town, 3835 whole commune, and Dampierre on the Saulon; Gy, population 2848, on the Morte; and Marnay and Pesmes, population 1582, on the Oignon. Gray is not mentioned before the eleventh century; it was fortified in the time of the emperor Charles V., but Louis XIV., on gaining possession of it, demolished the fortifications. The town is built on the slope of a hill rising from the river, and is commanded by the ruins of an antient castle formerly inhabited by the dukes of Bourgogne. The streets are crooked and steep, but the houses are built with tolerable regularity. There are cavalry barracks, a theatre, a fountain, a public walk, an exchange, two hospitals, and several parish churches. Before the Revolution there were as many as eight convents. Some woollen cloth and other articles are manufactured; but the chief business of the town arises from its situation on the Saône, on which river goods are here embarked from different parts of Lorraine, Champagne, Bourgogne, and La Franche Comté, in order to be sent to the south of France; and goods from the south are landed. There are immense mills on the Saône, comprehending, in one establishment, a saw-mill, an oil-mill, a fulling-mill (used also in the preparation of leather), and a flour-mill. The flour is sent down the river chiefly to Lyon and Marseille. The chief articles of trade are corn, hay, timber, deals, wine, iron, and colonial produce. Gray has some government offices, an agricultural society, a college, and a public library. There are four yearly fairs for cattle, horses, woven goods, and straw hats. At Champlitte, linens, druggets, and hats are manufactured; and trade in corn and wine carried on: there is a bleaching-house for wax; and there are five yearly fairs. At Gy, druggets, cotton goods, and vinegar are made, and considerable trade is carried on in wine: there are six considerable fairs in the year. Pesmes has some iron-works and the ruins of a castle: the town is pleasantly situated on a hill sloping down to the Oignon: there are four yearly fairs. Iron-works are numerous in this arrondissement.

The population, when not mentioned to be otherwise, is that of the commune, and from the census of 1831.

This department, with that of Doubs, constitutes the archiepiscopal diocese of Besançon; it is included in the jurisdiction of the Cour Royale and the Académie Universitaire of that city. There is a Lutheran consistory at Héricourt. The department returns four members to the Chamber of Deputies. It is included in the sixth military division, the head-quarters of which are at Besançon.

In respect of education, this department is considerably in advance of the average of the French departments. In 1828-29, of every 100 young men enrolled in the military census, 59 could read and write, the average of France being rather under 40. The inhabitants are generally large and swarthy, remarkable for strength rather than agility, and for courage and perseverance rather than refinement.

In the earliest historical period this part of France was comprehended in the territory of the Sequani, except a portion of the western side of the department, which was included in the territory of the Lingones. These were both, as it appears, Celtic nations, but their country was included in Gallia Belgica on the division of Gaul into four provinces by Augustus Cæsar: the Lingones were however afterwards taken from Belgica and added to Gallia Lugdunensis; upon the subdivision of which they were included in Lugdunensis

Prima. The Sequani, in the subdivision of Belgica, were included in the province of Maxima Sequanorum. The following Roman towns appear to have been included in the limits of the department:—Portus Abucini, and Luxovium or Lixovium, already noticed; Didattium, supposed to be in the neighbourhood of Jussey, at a place where the remains of vast buildings and roads, statues, reliefs, and medals have been found; Segobodium, now Seveux, at the commencement of the navigation of the Saône, above Gray; Velatodurum or Velatudurum, probably on the Oignon, not far from Montbozon; and Amagetobriga or Admagetobriga (the spot where Ariovistus the German defeated the Aedui just before Cæsar's conquest of Gaul), placed by some at the junction of the Oignon and the Saône, just on, or perhaps beyond, the boundary of the department. These were all in the territory of the Sequani. The only town of the Lingones, which is supposed to have been in this department, was Varcia, which appears to have been about 8 or 9 miles north-west of Seveux, on a site not ascertained. In the middle ages this department formed part of La Comté de Bourgogne, or the province of La Franche Comté. [FRANCHE COMTE'.]

SAP, in vegetable physiology, is the fluid which plants imbibe from the soil in which they are placed, and is the great source from which they are nourished, and their various peculiar secretions produced. One of the most important conditions of the growth of plants is, that they be placed in circumstances to absorb from the soil those constituents of which their sap is composed. The constituents of sap may be divided into those which are essential, or necessary for the growth of all plants, and those which are special, or necessary only for the growth of particular plants or families of plants. The elementary bodies which form the essential constituents of sap are carbon, oxygen, hydrogen, and nitrogen. These bodies are capable of uniting with each other and forming a great number of secondary combinations, and are seldom, if ever, absorbed in a pure state by plants. The forms in which they enter the plant and constitute its essential ingredients are those of carbonic acid, water, and ammonia. The sources from whence plants mostly derive these are the soil in which they grow and the atmosphere. It is not precisely known from which of these two sources plants derive the greater proportion of the constituents of their sap. The atmosphere appears to be the great source from whence the carbonic acid and ammonia is supplied, and the soil would appear to supply the greatest quantity of water. But whatever may be the amount of these ingredients absorbed by plants from the atmosphere through the agency of their bark and leaves, all of them are found to enter the stems of plants through absorption by their roots.

The constituents of the sap which are not necessary for the growth of all plants are principally the metallic oxides, which it is well known enter very largely into the composition of some plants. The most common of these are the oxides of potassium, sodium, calcium, and magnesium. These oxides occur in combination with various acids, but the acid is not found to exercise so much influence on the plant as the base. Although any of these oxides when presented in solution would be absorbed by plants, it would be only those adapted to the peculiar habit of the plant that would be appropriated. Thus plants which grow naturally on the sea-shore, and require soda for their growth, will take up potassa when presented to them in combination with soda, but they would reject the potassa by excretion and retain the soda. [ROOT.] The sap therefore which is found in plants varies in composition both from the nature of the soil and the nature of the plant.

From the soil the sap is conveyed by the roots into the plant, and is not long before it undergoes certain changes in its composition, but the nature of these changes, and the period at which they take place, are not well known. It is however a fact that the nearer a tree is tapped to its root, the more fluid is the sap which exudes. The channels through which the sap passes in its upward course are also a subject of difficulty. Various observers have contended for each of the different tissues being the sole conveyor of this fluid, but it is most probable that, with the exception of the spiral vessels, which seem appropriated to the conveyance of air, all the tissues of a plant are engaged in conveying sap. There are some parts which seem to convey more than others, and the younger tissues are always more filled with fluid than the older. Thus, when the trunk of a tree is cut through in spring, sap will be seen to exude from all parts of the cut surface, but in greatest quantities from the alburnum or sapwood, the most recently formed portion of the timber.

By whatever channels the sap pursues its upward course, we find that it undergoes great changes between the period of its absorption from the soil and its ultimate disposition in the secretions of the plant. The most important of these changes is the loss of a large portion of that water which it possessed when first absorbed. This water is got rid of by the process of exhalation, which is not the mere evaporation of the water, but consists in a vital process, which appears to be analogous to insensible perspiration in animals. In this way it has been ascertained that a common sunflower, three feet in height, will lose one pound four ounces of water every day; and a common cabbage one pound three ounces. Hales contrived to measure the force with which plants exhaled during the summer, and computed that in some plants it was five times as great as that which impels the blood in the crural artery of a horse. The part of the plant in which this process goes on most rapidly is the leaf, which, from its extensive surface and delicate structure, is well adapted for the performance of the function. For this purpose however the leaf is endowed with especial organs called stomates. The stomates are small openings in the cuticle of the leaf, the number of which varies exceedingly in different leaves, and the process of exhalation bears a direct proportion to their number. Exhalation goes on principally during the day, under the influence of the light of the sun, and almost completely ceases when the sun's rays are withdrawn. It is on this account that plants loose so rapidly their freshness on exposure to the light of the sun, when they have been plucked, or otherwise deprived of the means of obtaining a fresh supply of water. Fruit in tropical climates is thus kept constantly cool whilst on the plant by the loss of moisture from its surface, and a constant supply of fresh juices from the cool earth. This fact may be taken advantage of in horticulture, in transplanting, which should be avoided in hot weather, and when the plant is full of leaves, as under these circumstances it would be likely to be destroyed by exhalation.

Subsequently to the process of exhalation, the sap in the leaves was at one time supposed to undergo a process similar to that of respiration in animals, during which the carbon of the sap united with the oxygen of the air, and carbonic acid, was given off. This process appeared to take place in the upper surface of the leaves; and it was concluded that the upper layer of cells in the leaf were devoted to respiration, and the under to digestion. The conclusion that plants respired as well as animals was arrived at from the fact of plants constantly giving out a small portion of carbonic acid gas, especially at night. This Liebig states arises from the carbonic acid which plants absorb not being entirely decomposed, and again returning into the atmosphere. Whilst the sap is in the leaf, an important change takes place which has been called digestion: it consists principally in the decomposition of carbonic acid, the giving out its oxygen into the air, and the combination of the carbon with other elements to form the various secretions of the plant, such as gum, sugar, starch, lignine, &c. [SECRETIONS, VEGETABLE.] The mode in which the carbonic acid is introduced into the leaf was at one time supposed to arise from the union of the carbon of the sap with the oxygen of the atmosphere; but from the statements of Liebig, the whole of the carbonic acid could not be derived from this source, as plants can always be made to produce more carbon after their growth than was contained in the soil in which they grew. By calculations on an extensive scale, Liebig proves that there must be some source of carbon independent of the soil. Besides this, as all carbonaceous matter in the soil must have been originally derived from plants, it is necessary that the first plants should have had some other source of carbon. This source is the atmosphere, which is constantly supplied with carbonic acid from the breathing of animals and other means, and is thus an abundant magazine of food for the vegetable world. In this way plants perform a very important function in the economy of creation. The carbonic acid which, accumulating in the atmosphere, would become injurious to animal life, is removed; and not only is the noxious ingredient removed, but it is decomposed; and the pure oxygen which it contains, and which is as essential to animal life as carbonic acid is injurious, is given out.

The necessity of light for the carrying on the processes of exhalation, the absorption and decomposition of carbonic acid, and the fixation of carbon, is seen in the result of placing plants in the dark. In the first place their stems become weak from the accumulation of water and the absence of solid secretions; and in the second place they lose their colour, or the young shoots are entirely destitute of it. A knowledge of this fact is made use of in horticulture for the purpose of rendering those plants available as articles of diet that would otherwise be too tough and acrid for the table. This is the case with celery, asparagus, &c., the parts which are eaten of these plants having been excluded from the influence of light under the soil in which they grew. This process is called etiolation, and all plants may be made to partake more or less of this quality by a total or partial withdrawal of the light. The loss of colour arises from an insufficient fixation of carbon, of which the green colouring matter of the leaves is composed. This colouring matter exists in the form of globules in the cells of cellular tissue, and is there called *chromule*. It is probable that the varied and beautiful colours of the flowers of plants are dependent on some modifications of the same substance.

From the period that the sap is absorbed by the roots to the time that the various secretions of the plants are elaborated, it is in a state of constant motion. This motion is called the circulation of the sap, but it is not intended to convey by the term circulation the idea that the movement in the fluids of plants is similar to that which takes place in the blood of animals, which is constantly sent out from and returned to a central point. The motions of the fluid in plants are of two kinds, general and special. The general motions of the sap are those of ascent and descent, both of which may be rendered apparent by cutting through the trunk of a tree, when not only the cut surface below will present an exudation of juice in its ascending course, but the cut surface above will present fluid that is descending. The existence and amount of the fluids thus circulating in plants has been demonstrated by an ingenious apparatus invented by M. Biot. By means of a groove in the lower surface of a hole in the stem of a tree, and a little trough applied to the upper surface, he measured the amount of ascending and descending juices, and also the influence of external circumstances upon the flow of the fluid. It was observed by M. Biot that the descending current is more dense and saccharine than the ascending, although this is subject to slight alterations during rain. Light is the principal agent in modifying the flow. Mild weather facilitates the ascent of the sap; and a sudden cold, by contracting the tree, appears to promote its descent. If the cold continues, the ground hardens, and the sap again ascends. If a thaw succeeds a frost, the roots require replenishing, and a downward current is established. The ascent of the sap, which is so strong in spring, ceases when the leaves are fully expanded. After the middle of summer, the sun's rays have less power, the leaves also are obstructed by the deposition of secretions, the whole tree attains a state of plethora, and there is then an increase of the descending juices.

The cause of the progression of the sap in plants has ever been a fruitful source of speculation. Malpighi supposed that it depended on the contraction and dilatation of the air enclosed in the air-vessels. Borelli attributed it to the condensation and rarefaction of the air and fluids of the plant. Du Hamel, who was also supported by Linnæus, accounted for it by the agency of heat. Hales demonstrated the insufficiency of this principle, but did not adopt one less objectionable. Capillary attraction has long been a favourite theory in explaining these motions, but it is liable to the same objections that all purely physical theories are, with regard to the movements of the fluids in plants and animals. Those botanists who have referred these movements to a vital agency have not been more happy. Brugmanns, Coulon, Saussure, and others adopted the theory of vegetable irritability. The vessels in which the sap was contained were supposed to be susceptible of the action of stimuli, and when the sap, which acted as a stimulus, was applied to them, the vessels contracted and the sap was propelled. Knight referred the propulsion of sap to contraction and dilatation not of the vessels, but of the medullary plates or rays. But the most recent theory and that which has received the sanction of the largest number of botanists, though far from being unobjectionable, is that of Dutrochet. He attributes the motions of the sap to the action of Exosmose and Endosmose. [ENDOSMOSE.]

The special motions of the juices of plants are of two kinds, the first called rotation, the second cyclosis.

1. It is now nearly a century ago since Corti observed a rotatory movement of the sap in the cells of Caulinia fragilis, an Italian plant, and his observations were subsequently followed up by Amici, Fontana, and Treviranus, especially the first. It was ascertained by these observers that this motion was not at all confined to the plant in which it was first seen, but that it existed in many others, as Valisneria, Hydrocharis, Potamogeton, &c. But of all the plants in which it exists, it may be seen to most advantage in the Chara. Some of the species of this genus are common in Great Britain, and are found inhabiting ponds and ditches The whole stem of these plants is covered with an incrustation of carbonate of lime, which is attached to their epidermis, and which must be scraped off before the cells can be exposed. If the cells thus exposed be examined with a microscope of the $\frac{1}{10}$th of an inch focal length, or even less, the movement spoken of may be easily witnessed. It is then found to consist of the constant motion of a number of little green globules, varying in size, which pass up on one side, and turning round the top of the cell, pass down the other side, and again ascend. According to Meyen, these globules are composed of various substances, the larger ones being grains of starch, others little bladders coloured by chlorophyle; and some, drops of oil. The currents which these globules indicate are entirely confined to the cell in which they occur, the motions in one cell not in any manner interfering with those in the next. Meyen states that the direction in which the globules move is in some measure dependent upon the internal structure of the cell, which is clothed with a number of little green bodies arranged sometimes in a longitudinal and sometimes in a spiral direction. The movement of the current is always on a line with these bodies, which are mostly arranged longitudinally in the young cells and spirally in the older ones. The rapidity with which the globules move in the cells depends in some measure on the age of the plant, but it mostly fails in proportion to the time which it has been withdrawn from connection with surrounding parts. The motion is increased by a range of temperature between 56° and 77° Fahr., and decreased by a greater amount of cold or heat. The motion may frequently be restored after it has stopped, especially in cold weather, by immersing it in warm water. According to Schulz this motion is also visible in the Algæ, Fungi, Lichens, Mosses, Naiadaceæ, Podostemaceæ, Zosteraceæ, Hepaticeæ, Lemna, and Ceratophyllum. It is not observed in the higher forms of plants, but in these its place appears to be taken by the second kind of special motions, of which we shall now speak, called Cyclosis.

2. Cyclosis is a motion of the fluids of plants which was first described by Professor Schulz of Berlin. Although his views on this subject have long been before botanists, it was not till 1839 that his essay 'Sur la Circulation et sur les Vaisseaux Laticifères dans les Plantes' was published. It was to this essay that the physical prize of the Royal Academy of Sciences of Paris was awarded in 1833.

According to Schulz, this motion of the sap takes place in a peculiar kind of tissue called cinenchyma, or laticiferous tissue. [TISSUES, VEGETABLE.] This tissue is composed of vessels which are observed in three different states.—1, broad and expanded; 2, narrow and contracted; 3, articulated. These forms are capable of passing one into the other, and are met with in the same plant. They appear to be the same vessels as those described by Malpighi and Moldenhawer under the name of *vasa propria*. These vessels as described by Schulz are found in nearly all the exogenous and endogenous plants, and always in those which possess spiral vessels. In those families or species which do not possess spiral vessels, the intercellular rotation is found taking the place of cyclosis. The parts of the plant in which the laticiferous tissue is most easily observed are the root, stem, petiole, peduncle, and flower. It is easily found in the stipules and bark of the fig, in the valves of the fruit of Chelidonium, the bark of Acer platanoides, and the interior of the sepals of Calistegia sepium. It is most easily seen in young plants.

Through this tissue a fluid passes, sometimes clear, but more frequently milky, to which the name of *latex* is given. The latex appears to be a portion of the fluids of the plant more slightly organised, and separated from the rest. It is viscid, insoluble in water, coloured mostly white but sometimes yellow, red, and brown, and is often transparent. It abounds with minute globules which give it its colour, and according to Schulz constitute the living part of the latex. These globules oscillate in the latex, and when the latter is separated from the plant, they coagulate, and leave a fluid lymph or serum. This property is not found in other vegetable secretions, and in this respect presents a remarkable similarity to the blood of animals. In fact the latex seems to bear the same relation to the system of the plant that the blood does to the system of the animal, and to be the immediate source of the various secretions of plants.

The cause of these special motions, like that of the blood in the capillaries of animals, is involved in much obscurity. That they should continue, several conditions are necessary, such as heat, light, and all those circumstances essential to the existence of vital irritability in plants, but none of these can be assigned as a true cause. Under such circumstances perhaps it is better not to speculate on the cause, but rather to observe the facts.

SAP is a mode of executing the trenches at the siege of a fortress, when the besiegers arrive within such a distance from the covered-way that the fire from thence becomes too dangerous to allow the men to work on the ground without being protected by some covering objects, as gabions, placed between themselves and the enemy.

The process of sapping varies with the distance from the works of the fortress and the degree of activity with which the fire of the defenders is kept up. It is therefore divided into what is called the *flying sap* and the *complete* or *full sap*. In ordinary circumstances the first begins to be used in forming the second parallel trench, which may be about 320 yards from the covered-way; and it is executed in the following manner.

If the distance from the depôt of siege-materials to the place of the intended trench is not too great, every man carries two gabions, one on each side of him, or both slung at his back; he carries also a pickaxe and a spade, and in the first case these are fixed in the gabions, but in the latter he carries them in his hands. If the distance which the working party has to march is considerable, this burthen would be too fatiguing, and then each man carries on his shoulder one gabion together with a pickaxe or a spade. The work is begun at a night, and when the sappers have arrived at the ground where the tracing-line for the intended trench has been laid down, they set up their gabions a few inches in front of that tracing-line, the officers observing that the row of gabions in its whole length is correctly placed. The portion of trench to be executed by each sapper, or workman, is equal in length to the space covered by two gabions (about 4 feet): the men sit down or otherwise keep themselves covered till the order is given to commence digging, and when the number of men who constitute the working party is greater than suffices to allow one man to every two gabions, those who have not room to work retire to a little distance till they are required to relieve the others. A man may fill his two gabions with earth in about a quarter of an hour, and then they will be proof against a musket bullet, except at the place where they touch each other; after this the earth obtained in executing the trench is thrown beyond the gabions towards the fortress. During the progress of the work the gabions are pushed a little way outwards at the top, in order that they may effectually resist the pressure of the earth which they are to retain; and they are sometimes crowned by two or three rows of fascines which are laid upon them in a direction parallel to the trench.

If the work proceeds by day and night, the parties are relieved every eight hours, and a trench executed by flying sap may, in soil of medium tenacity, be completed by three reliefs of men.

When the approaches of the besiegers have advanced so near the covered-way that the fire of the defenders will no longer permit the men to bring the gabions openly to the ground, the full sap is practised. For this purpose the sappers are divided into brigades of eight men each; and of these a demi-brigade only of four men is employed in the formation of a single line of trench. The party is provided with a mantelet (a plate of iron thick enough to be musket-proof, and capable of being moved forward by being mounted on small wheels) by which the men may be covered in front; or, instead of this machine, there is provided for the same purpose a great gabion called a sap-roller. This is a cylinder of basket-work, 6 feet long, and about 4 feet diameter, and having within it a gabion of equal length, but about 2 feet 6 inches diameter; the axes of the two gabions are coincident, and the space between the exterior of one and the interior of the other is stuffed with fascines, by which means it is rendered musket-proof. The sap-roller turning on its convex surface is found to be more manageable than the mantelet; and when it is intended to form a trench in any proposed direction, by breaking out from one which has been already executed, it is raised over the parapet of the latter trench, and gradually lowered on the exterior side, being guided by means of a hook, so that it may have a position perpendicular to the line of the intended trench. The leading sapper of the demi-brigade then cuts through the parapet, and pushing the sap-roller forward about 2 feet, he hastily places an empty gabion in rear of that extremity of the sap-roller which is nearest to the enemy's work, in order that he may be covered on his flank: then kneeling behind the gabion, he excavates a portion of a trench, 18 inches wide, and as many in depth, leaving a berme about 12 inches broad between the gabion and the nearest edge of the excavation, and throwing the earth into the gabion. When this portion is dug, the sap-roller is advanced about 2 feet farther, and another gabion is set up in its rear, adjacent to the former, and in the line of the intended trench; a short fascine, or two sand-bags (bags full of earth), are placed one above another in the hollow between the two gabions, in order that a musket-ball may not be able to penetrate through the screen in that part. The sapper then excavates as before, and having filled the second gabion, a third is handed to him, which he places and fills as he continues to advance. The second sapper of the squad follows the first, keeping a little way in his rear, and increases the width only of the trench by 20 inches on the side which is farthest from the line of gabions, and he also throws the earth into and beyond the gabions. The third sapper follows, and increases the depth only by 18 inches on a breadth of 20 inches measured from the rear side of the trench towards the gabions; and the fourth sapper excavates a portion 3 feet deep, increasing the breadth of the trench towards the rear by 10 inches. By this arrangement the tasks of the different men are rendered nearly equal, and complete cover is obtained when the work of the third man is executed. The four men thus form a trench 4 feet wide and 3 feet deep, and a step is left on the side nearest to the gabions for convenience in standing to fire over the parapet. The working parties from the infantry of the line afterwards complete the trench by increasing the width to its usual extent, about 12 feet.

Since the head sapper has the most dangerous post, the second, third, and fourth sappers relieve him by alternately taking his place; and the work advances about 8 or 10 feet per hour, according to the tenacity of the earth.

If the fire of the place should be considerably subdued by the action of the besiegers' batteries, the full and flying sap may be combined in order to expedite the approaches. Thus a party of sappers advancing on their hands and knees, and rolling gabions before them, on arriving at convenient places set up the latter in line; then two or three men, at certain intervals from each other, dig pits behind the gabions, in order to get cover, and afterwards work towards each other, making a small trench, and filling the gabions with earth. The trench may subsequently be made of the required width.

When the distance to be passed over is short, the line of trench is carried on directly towards the place, sometimes by a simple trench, with traverses at intervals, and sometimes by what is called the double sap. This is performed by two squads or demi-brigades, who work parallel to each other, each being covered in front by its own sap-roller, and there is a third roller in rear of the small interval between the others. A row of gabions is placed on the right of the trench executed by one squad, and on the left of that which is executed by the other: the distances between the rows of gabions is about twelve feet, and traverses are formed in the trench at intervals as the work advances. These project alternately from opposite sides, so as to leave a serpentine passage along the trench.

SAP-GREEN, a pigment, prepared by evaporating the juice of the berries of the *Rhamnus catharticus*, or buckthorn, to dryness, mixed with lime. It is soluble in water, less so in alcohol, and insoluble in æther and oils. Acids redden it, but the alkalis and alkaline earths restore the green colour.

SA'PAJOUS, the name generally given to a group of

South American monkeys, including in its larger sense the Ordinary *Sapajous* [Ateles; Lagothrix], and the other *Sapajous* (*Cebus*, Geoff.). These last, which are termed *Sajous*, have the head round, the thumbs distinct, but carcely opposable on the fore hands, and the tail entirely overed with hair, although still prehensile.

The species are very numerous, and Cuvier truly says, hat they are nearly as difficult to characterise as those of he American Howlers. [Mycetes.]

The whole of the *Sajous* are very active, climb admiably, and are altogether well formed for an arboreal life. The fore-hands suffer by comparison with those of the Old World monkeys, and exhibit a less perfect organization. The thumb is longer, but is more on a line with the other ingers. The palms both of the fore and hinder extremities are endowed with great sensibility. Small in size and playful n disposition, the Sajous lead a gregarious merry life, eeding chiefly on fruits and insects. The facial angle is about 60°.

One of the most common species is the *Weeper* (*Cebus Apella*); but why it should have obtained this dolorous title is not very clear, for when confined it is good tempered, playful, and hardy. The fur is rather rich, inclining to olive, with a golden tinge on the lighter parts; and the face is bordered with a paler circle, varying considerably in shading and breadth, being nearly wanting in some individuals. This species has been known to breed in confinement.

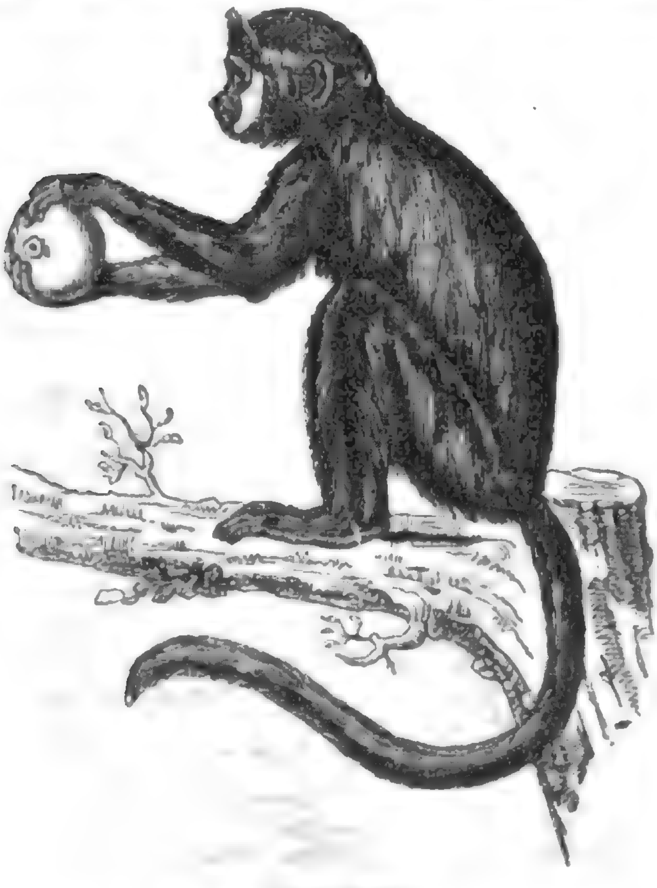
Humboldt describes another species, *Cebus albifrons*, the *Ouavapavi des catarractes*, about the same size as the last, with a greyish-blue face, excepting the pure white orbits and forehead. The colour of the rest of the body is greyish-olive; but the hue is lightest on the back and belly.

Locality, Habits, &c.—The distinguished zoologist above named found this pretty species living in troops in the forests near the cataracts of the Orinoco. Mild and active, they are often kept by the Indians as playthings, and are very entertaining. Thus Humboldt saw one domesticated worthy at Maypures that caught a pig every morning, and rode him about while he was feeding in the savanna the whole day. Another in the house of a missionary bestrode a cat which had been brought up with it and patiently submitted to the rider.

We proceed to illustrate this group by two species.

1. *Cebus fatuellus.*

Description.—In this, the *Sajou cornu* of the French, *Horned Sapajou* of the English, *Simia fatuellus* of Linnæus, we have a variety of the form marked by the extraordinary direction of the hair on the forehead. Colour, in some deep brownish or purplish black; in others, reddish brown. The skin on the naked parts dark purple. The hair of the forehead stands up like a crescent, or a waterman's cap with the front elevated. When viewed in front it exhibits the appearance of two horns. The tips of these erect hairs and of those on the cheeks are paler.



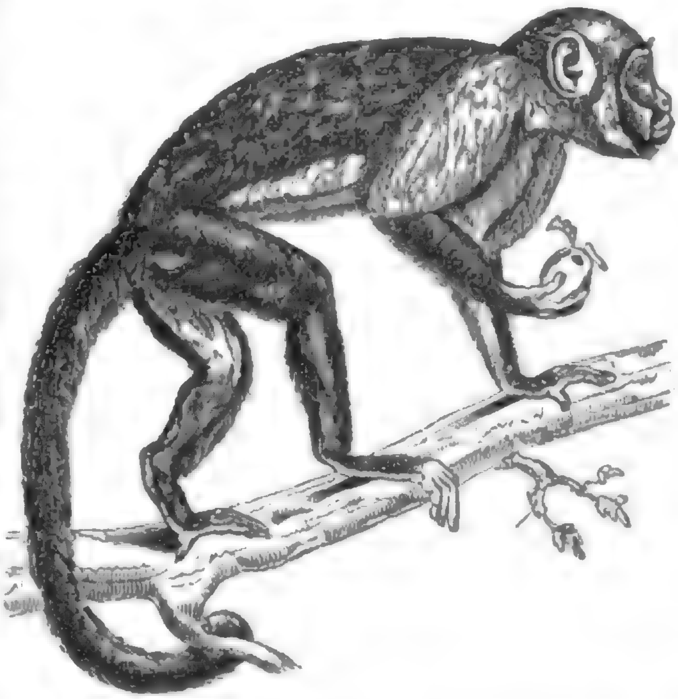
Cebus fatuellus.

There is a variety with more white about the tufts and jaw.

Locality.—French Guiana.

2. *Cebus monachus.*

Description.—This, the *Saï à grosse tête* of the French, *Large-headed Sapajou* of the English, has no frontal tuft like the last. On the contrary the head is covered with short whitish hairs of a shorn appearance. The breast and belly, sides of the cheeks, and all the front, yellowish white. Fore-arms, hinder extremities, and tail, black. Irregular patches of black and brown cover the rest of the body.



Cebus monachus.

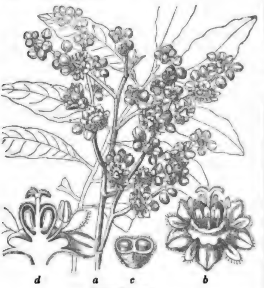
Fifteen or sixteen species are recorded of this the most numerous group of the American monkeys. They may be considered as representing in that continent the Guenons of the Old World, which are also very numerous.

SAPAN WOOD, a dye-wood which is yielded by a species of Cæsalpinia, as Brazil-wood is by *C. braziliensis*, found in the West Indies, and by *C. echinata*, a native of Brazil, and which is imported from various parts of the West Indies and South America. Sapan-wood, which is similar in properties, is a produce of Asia, and yielded by C. Sapan, a thorny tree which has been fully described and figured both by Rheede and Rumphius. It is a native of the southern parts of India, of Siam and Pegu, as well as of the various islands of the Indian Archipelago, Philippines, &c. The wood has been used as a dye-wood from very early times in India, and is described as a medicine in Persian works, under the name *bookum*, derived from its common Indian name, while it is also known by that of *puttung*, derived from the Sanscrit *patanga*. Sapan is its name among the Malays, according to Rumphius.

According to Dr. Bancroft it found its way into Europe some time before the discovery of America, and it still continues to be imported. Its colouring-matter differs little from that of Brazil-wood, but the best sapan-wood does not yield more than half the quantity that may be obtained from an equal weight of Brazil-wood, and the colour is not so bright. (Bancroft.) Brazil-wood therefore brings more than double the price, the latter selling for 30*l.* and upwards a ton, and the Sapan-wood from 12*l.* to 15*l.* The import of Sapan-wood into Calcutta amounted, in 1837-38, to 16,172¾ bazar maunds from Pegu, Singapore, Bombay, and China. Of this 4450½ maunds were re exported to Great Britain.

SAPINDA'CEÆ, a natural order of plants belonging to the calycose group of polypetalous Exogens. It consists of trees or shrubs, rarely herbaceous plants, with erect or climbing stems, with alternate often compound leaves, rarely simple, with or without stipules, and often marked with lines or pellucid dots. Their inflorescence is racemose or paniculate, with small white or rose-coloured rarely yellow flowers, which are seldom barren or hermaphrodite. The calyx consists of 4-5 sepals, slightly cohering at the base. The petals are the same in number as the sepals, one being occasionally abortive. They are in general furnished with a petal-like scale, but are sometimes naked. They have a fleshy glandular disk occasionally occupying the base of the calyx. The stamens are definite, about twice the number of the sepals. The filaments are free or slightly connate, the anthers 2-celled. The ovary 3-celled, rarely 2-4 celled, the cells containing 1-2-3 ovules. Style undivided, or more or less deeply 2- or 3-cleft. The seeds have usually an aril, are without albumen, and have a curved or spirally twisted embryo. They are inhabitants of most parts of the tropics, more especially of South America and India. They are not found in Europe or the United States of America. One genus is found in New Holland, Dodonea.

This order is closely allied to Aceraceæ, from which they only differ in their alternate leaves and petals. The number of their stamens eight, with five unequal sepals, point out a relation with Polygalaceæ. Their climbing habit and tendency to produce tendrils give them a remote relation to Vitaceæ. In this order, although the leaves, branches, and other organs act in a deleterious manner, yet their fruit and seeds are eatable and wholesome. The Litchi and Longan, favourite fruits in China, are produced by the genus Euphoria. These fruits are sweet, with a subacid flavour, and when dried are sometimes brought to this country. They are considered a great luxury in China, and are sent at a great expense from the provinces of Fokien and Quan-tong, where they grow, to Pekin, for the consumption of the emperor. Several other genera bear fruits which are very delicious, and are eaten in Japan and Brazil. The Sapindus is remarkable for bearing a pulpy fruit, the outer part of which has been used, on account of its detergent properties, as a soap. [SAPINDUS.] Some of the species of this genus also produce eatable fruits. Paulinia is another genus which has poisonous properties residing in the leaves and other parts of the plant, whilst the fruits are eatable. The whole of the order partakes more or less of these properties.



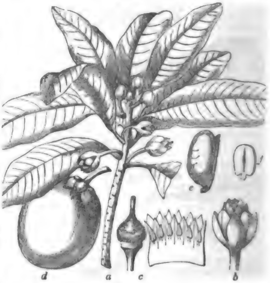
Euphoria longana

a, branch with racemose flowers and alternate leaves; b, flower showing the disk, stamens, petals, &c.; c, transverse section of ovary; d, longitudinal section of flower and fruit, showing divided stigma, erect ovules, disk, petals, and calyx.

SAPINDUS, contracted from Sapo Indicus, or Indian soap, and applied to a genus of plants of the natural order of Sapindaceæ, which has been so called in consequence of the berries of many of the species being employed for the same purposes as soap. The genus is tropical, containing between twenty and thirty species, which are found in the tropical parts both of the Old and New World. It is characterised by having the calyx 4- to 5-partite; petals as many as the sepals, a little longer, naked or hairy, or with a scale above the claw. Torus or disk occupying the bottom of the calyx. Stamens 8 to 10, inserted between the margin of the disk and ovary. Ovary 3- rarely 2-celled; ovule 1, erect at the base of each cell. Style with a 3- rarely 2-lobed stigma. Fruit fleshy, 1-2 rarely 3-lobed, each lobe 1- to 2- rarely 3-seeded, with the seeds furnished with an aril. The species consist of trees having leaves without stipules, with the inflorescence in racemes or terminal panicles. Flowers small, white, or greenish white. Berries all red and saponaceous, on which account they have been employed for washing woollens and clothes of various kinds in different countries. For instance, in the West Indies and the continent of America, S. saponaria yields the so-called soap-berries, and in Java, S. rarak; so in India several species, as S. acuminatus, laurifolius, emarginatus, and detergens, yield berries which are called *reetha*, and in their dried state may be bought in every bazaar, as they are everywhere employed as a substitute for soap. The fleshy part of these berries is viscid, and in drying assumes a shining semi-transparent appearance; when rubbed with water, they form a lather like soap. This is owing to the presence of a principle called by chemists *Saponine*, which is often united with an acrid principle, whence these berries are said to injure cloth which has been much washed with them. The bark and root have similar properties, and have been employed for the same purpose, as well as medicinally, in the countries where they are indigenous. The berries, which are about the size of cherries, enclose black shining nuts, which used formerly to be much imported and employed as buttons for waistcoats, after having been tipped with gold, silver, or other metal. The kernel of these nuts contains an edible oil, which is sometimes employed for burning. The fruits of S. senegalensis and of S. esculentus are eaten, and the wood of some species, as of S. rubiginosus, is close-grained and hard, and forms valuable timber.

SAPODILLA. [SAPOTACEÆ.]

SAPOTA'CEÆ, or **SAPO'TEÆ**, a natural order of plants belonging to the polycarpous group of monopetalous Exogens. It consists of trees and shrubs, which abound with a milky juice; the branches are round; the leaves alternate, simple, entire, coriaceous, destitute of stipules; their under sides being covered by a silky or downy pubescence. The flowers are axillary, regular, and united; the calyx is 4-6-cleft, imbricate in æstivation; the corolla is hypogynous, regular, and cleft; the lobes are equal in number to the sepals and alternate with them; the stamens are definite and distinct, some are barren and some fertile, the former being alternate with the sepals, the latter opposite; the ovary is superior, with several cells, in each of which is one erect ovule; style single; stigma undivided; seeds nut-like, sometimes cohering into a several-celled putamen; embryo large, erect, and enclosed in fleshy albumen. This family of plants is most nearly allied to that of Ebenaceæ, with



Achras sapota.

a, branch with axillary flowers; b, flower, showing the imbricate calyx; c, pistil, with style and simple stigma; d, fruit (sapodilla plum); e, seed; f, embryo which it agrees in habit, its monopetalous regular hypogynous corolla, the absence of a hypogynous disk, its several-celled ovary, and definite ovules and stamens. It differs however in the possession of milky juice, soft wood, hermaphrodite flowers, undivided stigma, and 1-seeded ovary with erect ovules. The plants of this family are chiefly natives of India, Africa, and America. Some of the species produce fruits which are much prized as articles of diet. Amongst these is the sapodilla plum, or naseberry, which is the produce of Achras sapota. The star-apple, marmalade, the medlar of Surinam, and other eatable fruits are derived from plants belonging to this order. Most of the species yield large quantities of a milky juice, which, unlike the secretions of most lactescent families of plants, may be used for alimentary purposes. The fruit and seeds abound in oil, which is solid like butter, and has a mild pleasant flavour. [Bassia.] The bark of some species of Achras is astringent and tonic, and has been recommended as a substitute for quinine.

SAPOR. [Persia—*History*.]

SAPPERS AND MINERS, ROYAL, the non-commissioned officers and privates of the corps of Royal Engineers. They are employed in building and repairing permanent fortifications, in raising field-redoubts and batteries, in making gabions and fascines, in digging trenches [Sap], and executing galleries of mines during sieges, and also in forming bridges of rafts, boats, and pontoons.

The troops belonging to the department of the engineers were first embodied at the termination of the war between Great Britain and her American colonies, and they then received the designation of Royal Military Artificers. The duke of Richmond, who was at that time master-general of the ordnance, formed them into independent companies, and caused them to be stationed chiefly at Portsmouth, Plymouth, Chatham, Dover, and Gibraltar. In the year 1807 the Military Artificers constituted a corps of 32 companies, each consisting of 126 men; and a sub-lieutenant was attached to each company, which was placed under any senior captain of engineers who might happen to be where the company was stationed. But the want of a proper organization, and of officers permanently attached to the troops, gradually brought on a relaxation of discipline and a neglect of the particular duties for which the men were intended; it is even said that when detachments were to be drawn from the companies for any intended expedition, the engineer officers who selected the men sent only those who were the least efficient, and that consequently, during the first years of the war against the French in Spain, the service suffered much from the inexperience of the troops of this class.

After the failure of the attack on Badajoz in 1811, it was proposed to select some companies from the corps of Royal Military Artificers, and to form them into a body expressly for the purpose of executing field-works; and in the following year this proposal was carried into effect. Lieutenant-General Mann, who was made inspector-general of fortifications, obtained permission to have the name of the whole corps changed into that of Royal Sappers and Miners; and Lord Mulgrave then formed at Chatham the institution at which the men have ever since been regularly instructed in all the duties connected with military engineering. The junior officers of engineers were at the same time appointed to act as the regimental officers of the companies. This institution has been from the first (April, 1812) under the direction of Colonel Pasley, a meritorious officer, who as an engineer had previously distinguished himself in the service of his country.

A detachment, consisting of 300 men, was sent, in 1813, to perform the duty of sappers and miners at the siege of St. Sebastian, where they rendered essential service. In 1814 a brigade of engineers was attached to every division of the army; each brigade consisted of a company of sappers and miners, with horses and carriages sufficient to convey the tools necessary for the work of 500 men; and five companies of sappers and miners served with the pontoon train, which consisted of 80 pontoons, with the forges, waggons, &c. The whole corps was under the orders of a brigade-major of engineers.

From 1812 to the peace in 1814, the corps of sappers and miners amounted to 2861 men; and during the hostilities in 1815, it consisted of 2421 men. At present it consists of 13 companies, each of 68 men; and, besides the regular course of instruction in sapping, mining, making gabions, fascines, &c., the men are taught the most elementary principles of fortification, the manner of drawing plans and sections of buildings, and, to a certain extent, the art of land-surveying. Several of the companies are employed in the Colonies in the exercise of their professional duties; and of those which remain in this country, some are engaged under the officers of engineers in the mechanical operations connected with the survey of Great Britain and Ireland which is being carried on by the Board of Ordnance; parties of the corps also regularly attend the Royal Military College at Sandhurst and the East India Company's seminary at Addiscombe, where they execute, for the instruction of the gentlemen-cadets, the several works connected with the practice of field-fortification. It ought to be mentioned that the troops of the corps have invariably, in whatever part of the world they have been employed, conducted themselves as intelligent men and steady soldiers.

SAPPHIRE. [Corundum.]

SAPPHO was a native of the island of Lesbos, though the exact place is uncertain, for according to some she was born in Eresus, and according to others in Mitylene. The time of her birth is also unknown, and there are few events of her life which can be exactly ascertained. Her own fragments, as well as those of Alcæus, show that these two greatest poets of the Æolic school were contemporaries, though Sappho must have been younger than Alcæus, for she was still alive in 568 B.C., as may be inferred from the ode that she addressed to her brother Charaxus, in which she reproached him for having purchased Rhodopis, the courtesan, from her master, and having been induced by his love for her to emancipate her. (Herod., ii. 135; Athen., xiii., p. 596.) Charaxus bought Rhodopis at Naucratis in Egypt, and in all probability not before the reign of Amasis, who ascended the throne in 569 B.C. Before this time, and when she was still in full possession of her beauty, she is said to have left her country for Sicily, but the cause of this flight is unknown. (Marm. Par., *Ep.* 36; Ovid, *Heroid.*, xv. 51.) It was formerly a common belief that Sappho destroyed herself by leaping into the sea from the Leucadian rock, in despair at her love being unrequited by a youth named Phaon. It is true that in her odes she frequently mentioned a youth whom she loved, who did not return her love, but there is no trace of the name of Phaon in any of her poems; and if the name did occur, it was probably the name of Adonis, the favourite of Venus, who was in some legends called Phaon or Phaeton. It is therefore not unlikely that the manner in which she described Venus addressing Phaon may have given rise to the story of her own passionate love for Phaon. The story of her 'leap from the Leucadian rock' is likewise, as O. Müller and others have shown, a mere fiction which arose from a figurative poetical expression, for the phrase appears to have been used by some poets to express a violent love from which relief is sought by a leap from the Leucadian rock into the sea. It is not expressly stated by any of the antients who tell the story, whether Sappho terminated her life by the leap or whether she survived it.

The genuine sources of information as to Sappho are the fragments of her own poems and some of Alcæus, and in reading them it should not be forgotten that Sappho belonged to the Æolian race, which at the time when the state of society in Attica had assumed a totally different aspect from that of the Heroic age, still retained much of the simplicity of antient Greek manners. At Athens women lived in the strictest seclusion, and the free intercourse of women of ability, such as Sappho and her numerous friends, would lead to the opinion among Athenians that she led an immoral life. It is now superfluous to vindicate the personal character of Sappho, for this has been satisfactorily performed by F. G. Welcker, in a little work called 'Sappho von einem herrschenden Vorurtheil befreit,' Göttingen, 1816.

With the exception of one complete ode and a considerable number of short fragments, the poems of Sappho have perished; but what we possess is sufficient to justify the admiration of the antients. In warmth and purity of feeling, in grace and sweetness, and in delicacy and beauty of diction, she has perhaps never been excelled by any lyric poet either of antient or modern times. The loss of her works is perhaps as much to be lamented as that of any other antient author whose writings have perished, for besides the pleasure that might have been derived from them as works of art, they would undoubtedly have thrown much light on the condition and social relations of women in some parts of Greece, a subject now involved in great obscurity. The antients divided her poems into nine books, which consisted of erotic odes, epithalamia, hymns to the gods, and other poems. The rythmical construction of her odes was essentially the same as that of Alcæus, though with many variations, and in harmony with the softer character of her poetry. There is a verse called the Sapphic verse, which derives its name from the Greek poetess, and which she is said to have invented. The verse is as follows:—

– ⏑ – ⏓ / – ⏑ ⏑ – ⏑ – ⏑

The Sapphic strophe consists of three Sapphic verses followed by a versus Adonicus. It has been very frequently imitated by poets of antient as well as modern times.

The fragments of the poems of Sappho are generally printed together with the poems ascribed to Anacreon. The best separate editions are: 'Sappho Lesbia, Carmina et Fragmenta, rec. comment. illustr. schemata musica adj., &c., H. F. M. Volger,' Lipsiæ, 1810, 8vo.; Sappho, 'Fragm. Specimen Operae in omnibus artis Graecorum Lyricæ reliquiis, &c., proposuit C. F. Neue,' Berlin, 1827, 4to. The best German translation is by K. L. Kannegiesser, Berlin, 1827. (Müller, *Hist. of Greek Lit.*, i., p. 172-180; Bode, *Geschichte der Hellenischen Dichtkunst*, vol. ii., pt. 2, p. 411, &c.)

SAPY'GIDÆ, a family of Hymenopterous insects of the section *Fossores*, the species of which are chiefly distinguished by the feet, in both sexes, being slender, and little or not at all spinose; the antennæ are at least as long as the head and thorax together, and generally increase in thickness towards the extremity. In the genus *Sapyga* the eyes are deeply emarginate; the antennæ are subclavate, slightly curved outwards at the apex in the males, straight in the females, and inserted in a cavity at the base of the clypeus, with an elevated ridge between them; the superior wings have one marginal cell, which passes beyond the third submarginal, and is acuminate; and four submarginal cells, the second the smallest and receiving the first recurrent nervure, the third receiving the second, and the fourth apical.

The species of this genus are usually of moderate size. The females are said to form holes in the mortar of walls, or in putrescent wood, in which they deposit their eggs with food to supply the larvæ. Latreille supposes them to be parasitic upon some of the wild bees; and Mr. Shuckard observes that he has caught the *Sapyga punctata* (a species found in this country) entering the cells of *Osmia bicornis*. The species just mentioned is from 4½ to 5½ lines in length, and of a black colour, excepting the abdomen, which is red, and has a transverse white spot on each side of the fourth, fifth, and sixth segments—such is the colouring of the female: the male has the body black, with a white spot on each side of the second, third, fourth, and fifth segments.

A second species of this genus, the *S. clavicornis*, is also found in England. Both sexes are black, and have interrupted yellow bands on the abdomen.

The genus *Thynnus*, according to Latreille, also belongs to the present family, and the species are readily distinguished by the antennæ being filiform, and the eyes entire, *i.e.* not emarginate, as in *Sapyga*.

Polochrum.—This genus, like *Thynnus*, has the antennæ filiform, but the eyes are emarginate, as in *Sapyga*; the mandibles are tridentate.

SARACENA'RIA. [FORAMINIFERA, vol. x., p. 348.]

SARACENS, a name improperly given by the Christian authors of the middle ages to the Mohammedans who invaded France and settled in Sicily. Concerning the etymology of this word there have been various opinions. Du Cange (*Glossarium*, *v.* 'Saraceni') derives it from 'Sarah' the wife of Abraham; Hottinger (*Bib. Or.*) from the Arabic word *saraca*, which means 'to steal, to plunder.' Forster, in his 'Journey from Bengal to England,' derives it from *sahra*, 'a desert.' But the true derivation of that word is *sharkeyn*, which means in Arabic 'the eastern people'—first corrupted into Saraceni (*Σαρακηνοί*) by the Greek, and thence into *Saraceni* by the Latin writers. Stephanus Byzantinus says that 'Saraka is a region of Arabia, adjoining the Nabathæi, and the inhabitants are called 'Saraceni.' Ptolemy (vi. 7) makes Saraka a city of Arabia Felix. The name Saraceni occurs in Pliny (vi. 28), and it seems that it began to be used about the first century of our æra, and was applied to the Bedouin Arabs who inhabited the countries between the Euphrates and the Tigris, and separated the Roman possessions in Asia from the dominions of the Parthian kings. The description of the Saraceni by Ammianus Marcellinus (xiv., c. 10) exactly corresponds with the habits of the Bedouins. In course of time it became the generic name of all the Arabian tribes who embraced the religion of Mohammed, and spread their conquests over the greater portion of Asia and Africa. For the history of these people see the articles ARABS, MOORS, &c.

SARAGOSSA, by the Spaniards written 'Zaragoza,' a large and wealthy city of Spain, the capital of the antient kingdom of Aragon, is situated in a fertile plain on the left bank of the Ebro, and at the conflux of the Gallego and the Huerva. The Ebro, which is navigable the greater part of the year, separates the city from its suburbs. A fine stone bridge six hundred feet in length, and resting on seven arches, is the only means of communication between the two. There was formerly another bridge built entirely of wood, but it was destroyed in a sudden overflowing of the river. The Gallego, a considerable stream, which rises in a branch of the Pyrenees, traverses the plain in which Saragossa stands, and falls into the Ebro at a short distance below the city. Nearly opposite, the Huerva, after running through a deep cleft, cuts the plain on the right bank, and passing close to the walls, likewise joins the Ebro. There is also in the neighbourhood a canal called 'La Azequia Imperial de Aragon,' which is intended for purposes of irrigation, as well as to form a communication by the Ebro from sea to sea between Santander in the Bay of Biscay and Tortosa on the shores of the Mediterranean, a distance of more than one hundred Spanish leagues. It was begun in 1529, under Charles V.; but the work, which has been abandoned and resumed several times, is far from being complete. What little is done however spreads wealth and abundance over the neighbouring districts; the plain of Saragossa, which is in a high state of cultivation, being much benefited by it. Most of the streets of Saragossa are narrow and crooked; the houses are old, but regularly built. The city however has many remarkable buildings. The *Lonja*, or the Exchange, is a fine stone edifice, round which marble busts of most of the kings of Aragon are placed in niches; the large hall is the place where the corporation assembles. Nearly opposite to the Lonja is *La Casa de la Diputacion*, a noble building erected by Alfonso V., in the principal hall of which are portraits of the kings of Aragon. It serves for the sittings of the *Audiencia*, or court of magistrates. The palace of *La Aljaferia*, formerly the residence of the kings of Aragon, is a fine square building with towers at the angles; it was built by Abú Jafar Al-mustaïn-billah, whence its present name, which is a corruption of *Al jaferiyyah*. 'La Casa de la Misericordia,' or Orphan Asylum, built by Ferdinand V., the last king of Aragon, is also much admired for its solidity and beautiful proportions. The metropolitan church, called 'La Seu,' is distinguished by its elaborate front and high tower. 'Nuestra Señora del Pilar' is likewise a superb building. The principal altar, built entirely of alabaster, in the Gothic style, is greatly admired as a piece of antient sculpture. In the middle of the church, under a high dome, stands the figure of the Virgin on a marble pillar, which the people of the place believe to be the same on which she is supposed to have made her appearance to Santiago. Many other monastic buildings are deserving of attention: San Cayetano, Santa Lucia, the palace of the Inquisition, and Santa Engracia. Most of these however were either entirely destroyed or riddled through with shot during the two sieges of the city by the French. Another singular edifice in Saragossa is the leaning tower (Torre Nueva), which in point of inclination rivals if it does not exceed that of Pisa. It has remained in its present inclined position since 1594, the year in which it was built. Saragossa has eight gates, besides the four old ones in the wall of Augustus, part of which may still be traced. There is a university, founded in the year 1474, and attended by about 1500 students, chiefly natives of the province. A society of Friends of the Country ('Amigos del Pais'), instituted about the end of the last century, supports professorships of political economy, botany, agriculture, chemistry, drawing, and mathematics. There is also an academy called 'Academia de Nobles Artes,' which in former times produced some eminent painters and sculptors; and a public library.

Saragossa was formerly called Salduba or Saldyva. (Plin., lib. iii.) It was in a flourishing state under the Romans, and the emperor Augustus having colonised it with the veterans of the fourth, sixth, and tenth legions, it was called Cæsaraugusta, which word was by the Arabs corrupted into *Saracosta*, whence its present name 'Zaragoza,' or, as written by antient authors, *Çaragoça*. In the time of the Romans, the place gave name to one of the seven 'Conventus' of Hispania Citerior (Cæsaraugustanus.) The Goths under their king Euric took it about 470. On the invasion of the Peninsula by the Arabs, it shared the fate of other large cities, and was taken and plundered by Músa Ibn Nosseyr in the year 712. [Musa.] When the dynasty of the Beni Umeyyah of Cordova was overthrown by Ali Ibn Hamúd, of the posterity of Idris, the governor of Saragossa, like those of Toledo, Seville, Granada, and other wealthy cities of Mohammedan Spain, refused to acknowledge the authority of the usurper, and declared himself independent. Saragossa and the whole of Aragon, with a portion of old Castile and Catalonia, were then erected into a kingdom by Al-mundhir Ibn Yahya Al-tojibí, who not only maintained himself in it, but transmitted it to his posterity. At his death, in 1039, he was succeeded by his son Yahya, who was shortly after dethroned by Suleymán Ibn Húd Al-jodhámí, surnamed Abú Ayúb, who held the empire until he died in the year of the Hijra 438 (A.D. 1046-7). He was succeeded by his son Abú Jafar Ahmed, surnamed Al-muktadir-billah, who died in 474 (A.D. 1081-2). The other Mohammedan kings of Aragon were: Abú Amir Júsuf, Al-mutamen-billah, who died in 478 (A.D. 1085-6); Abú Jafar Ahmed, surnamed Al-mustaïn-billah, who was killed near Tudela, in battle with the king of Aragon, in 503 (A.D. 1109-10); Abdu-l-málik Abú Merwán, surnamed Omádu-d-daulah (the column of the state), under whose reign (A.D. 1018) Alfonso I. of Aragon made himself master of Saragossa, after a siege of eight months; and lastly, Ahmed Al-mustanser, surnamed Seyfu-d-daulah (the sword of the state), who, after the loss of the capital, maintained himself in a part of his family dominions until he was killed in battle with the Christians near the town of Albecete, in 1145. Under the Christians Aragon remained a separate kingdom, until, by the accession of Charles V. to the throne of Spain as the representative of the rights of Ferdinand and Isabella, it became a province of the Spanish monarchy. [Aragon.] It preserved nevertheless its own laws and most of its antient privileges and exemptions, as well as a part of its liberal institutions, until Philip II., having taken offence at the interference of the Aragonese in the case of his secretary Antonio Perez, marched his army into Saragossa, put to death the Justizia and several of the principal inhabitants, and suppressed the liberties of Aragon. [Perez.]

Saragossa has gained celebrity by the two sieges which it sustained during the Peninsular war. When Spain was overrun by French troops, Saragossa was one of the cities whose inhabitants resolved to perish rather than submit. A French army having invested it in May, 1808, the people of Saragossa appointed Palafox their commander, and prepared for the defence. Saragossa being an open city, the French had no difficulty to encounter in the approach. They carried the post of Torrero, and some other exterior works, though not without great loss, pushed forward their attacks against the gates of El Portillo and El Carmen, bombarded the city, and forcing their way into it by the gate of Santa Engracia, at length made themselves masters of nearly half of Saragossa. The French general summoned Palafox to surrender in the following laconic sentence: 'Head-quarters, Santa Engracia: Capitulation.' Palafox's answer was equally laconic: 'Head-quarters, Saragossa: War to the knife.' A council of war was now summoned by the Spanish commander, in which it was resolved to defend the remaining quarters of the city inch by inch, and to retire, in case of defeat, across the Ebro into the suburbs, after destroying the bridge. The resolution being unanimously adopted by the inhabitants, the French were that very night attacked with irresistible fury. The struggle continued for eleven days, almost without intermission, until the French general, convinced that he could no longer hold his position within the city, raised the siege, with the loss of several thousand men. To obtain possession of Saragossa was, on many accounts, an object of great importance to the French. Accordingly, in November, 1808, a large army under Marshals Moncey and Mortier marched to re-commence the siege. Palafox, having imprudently sallied out, was defeated at Tudela, and again under the walls of Saragossa, and the place was invested. The French having speedily carried all the outworks, a furious bombardment began, and almost hourly combats took place, in which the besieged fought with desperate valour. At length, on the 27th January, 1809, a general assault was made, and the French established themselves on the breaches, and thence penetrated into the city, where they met with the most obstinate resistance—old men, women, and children all took part in endeavouring to stop the progress of the enemy. Not only street by street, but house by house and room by room were contended for like the outworks of a fortress, and often taken and retaken. At last an epidemic fever broke out among the besieged, who, after losing nearly a fifth of their numbers, surrendered upon honourable terms. During the second siege of Saragossa, a young woman of the lower classes distinguished herself by her bravery; and her name will descend to posterity as the 'Maid of Saragossa.' Another remarkable instance of the obstinate valour of the people of Saragossa occurred some time ago:—On the 2nd March, 1838, Cabañero, one of Don Carlos's generals, succeeded in penetrating at night into the city, and taking possession of the principal posts. The people however were not disheartened. Without chiefs, and badly armed, they fell upon the assailants, made 2000 prisoners, and expelled the remainder from their walls. A detailed history of the two sieges of Saragossa by the French was published by Ibieca, under the title 'Historia de los dos Sitios de Zaragoza,' Burgos, 1830-1, 3 vols. 8vo.

Saragossa is now the capital of the province of that name. It is also the see of an archbishop. The population is estimated at 50,000. It is 175 miles east-north-east of Madrid, in 38° 14′ N. lat. and 1° 42′ W. long.

SARAISK. [Riasan.]

SARATO'GA SPRINGS, an incorporated village in the state of New York and county of Saratoga, North America, is situated on the west bank of the Hudson, in 43° 4′ N. lat. and 73° 40′ W. long., 163 miles north from New York, 30 miles north from Albany, and 16 miles south from Glens Falls, all direct distances. This village derives its celebrity from its mineral springs; it is indeed the great watering-place of the United States, as many as 1500 persons having been known to arrive in a week. It consists of one handsome broad street bordered with trees, in which there are many hotels, four or five of them, especially the Congress Hall hotel, being of the largest and most splendid description, and occupied in the summer and autumn by some of the richest and most distinguished persons in America. The settled population in 1830 was 2461. Saratoga Springs is connected with Albany by two railroads, the Mohawk and Hudson railroad, which extends from Albany to Schenectady, 16 miles, and the Saratoga and Schenectady railroad, which extends from Schenectady to Saratoga Springs, 21½ miles. Ballston Spa, seven miles south-west from Saratoga Springs, is another village frequented for its mineral waters. The environs of both places consist of nothing but plains and hills of sand, producing a scanty crop between dark pine-trees. There are fourteen springs at Saratoga Springs, and four at Ballston Spa. The temperature is nearly uniform, varying from 48° to 52° Fahrenheit, and the quantity of water is not perceptibly altered by the difference of seasons. The waters are purgative and stimulant, and are chiefly useful in dyspepsia, chronic rheumatism, and diseases of the skin. The Congress Spring is the one most resorted to, a gallon of the water of which contains, according to the analysis of Dr. Steel, the following ingredients:—

			Grains.
Muriate of soda*	.	.	471·5
Carbonate of soda	.	.	16·5
Carbonate of lime	.	.	178·476
Carbonate of magnesia		.	3·356
Carbonate of iron	.	.	6·168

———76 grains,

and 343 cubic inches of carbonic acid gas, an exceedingly large quantity, perhaps greater than is contained in any other spring yet discovered.

(*Encyclopædia Americana*; Stuart's *Three Years in*

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* This is common salt, which was formerly supposed to be a compound of muriatic acid and soda, and therefore called *muriate of soda*; but has since been found to be a compound of chlorine and the metal sodium; its proper chemical name is therefore *chloride of sodium*.

North America; Arfwedson's *United States and Canada in* 1832-3-4; and as to the convention of Saratoga, BURGOYNE.]

SARATOW, a government of Asiatic Russia, lies between 48° and 53° N. lat., and 42° 20′ and 50° 20′ E. long. It is bounded on the north by Pensa, Simbirsk, and Orenburg, on the east and south by Astrakhan, and on the west by Tambow, Voronesh, and the country of the Don Cossacks. The northern frontier is 375 miles in extent, but the southern only 75 miles. The area, according to Schubert, is 90,000 square miles; but Koppen, who is probably correct, makes it 73,000, and the population 1,564,000. The soil of this government is very unequal: to the east of the Volga, which traverses it from north to south, and divides it into two nearly equal portions, it forms an immense steppe, destitute of wood and fresh water, and everywhere exposed to the winds; on the west of the Volga the surface is undulating and varied with hills, very fruitful in the northern part, but poor and stony towards the south. The steppe is flat, except towards the north, where the last branches of the Obchtchei-Syrt, a range of sand-hills, extend to the Volga. In the western portion there are hills of slate and limestone, which are pretty elevated in the south, and accompany the right bank of the Volga as far as Zaritzyn. These hills separate the Volga from the Don, which approaches it near Zaritzyn, and seem to form an invincible obstacle to the junction of those two rivers, which was contemplated by Peter the Great. The Volga traverses the government in its whole length from north to south, as far as Sarepta below Zaritzyn, where it forms an elbow, and, running to the east, divides this government from that of Astrakhan. It receives some small streams, both on the east and west. To the west of the Volga there are some tributaries of the Don, which run from south to north. In the eastern part there are many lakes, the most remarkable of which is the salt-lake of Elton, on the south-east, towards the frontier of Astrakhan. 'The appearance of this lake,' says Erdmann, 'is very singular: in the hottest season you fancy that you have before you a sea covered with ice and snow; so great is the illusion produced by the crystallized salt along the banks and over the whole surface.' On the north side the banks rise rapidly; on the south access to it is easy. The lake is of an oval form, the longest diameter being about 11 miles and the shortest nearly 9 miles. The superficial extent is 45,500 English acres. It yields annually 10 million poods (360 million pounds), producing, when refined, at least 100,000 tons of pure salt, in collecting which 10,000 workmen are employed. There are some other less considerable salt lakes. The climate is temperate, the air dry and healthy. The mean summer heat is 64°, and the mean winter cold 23°; the greatest cold is −17° and the greatest heat +97° of Fahrenheit's thermometer. Violent whirlwinds are frequent. The steppe beyond the Volga serves only for pasturage, and it is only along the banks that we meet with a little cultivation. To the west of the Volga, on the contrary, agriculture is the chief occupation of the inhabitants; and in the north-west part the soil is so rich as to need no manure. A harvest which does not yield five-fold is considered to be a bad one. The kind of grain most cultivated is rye; then wheat and oats, as well as millet and peas, flax and hemp. The foreign colonists have introduced the cultivation of tobacco, hops, and madder. The inhabitants cultivate melons (especially water-melons), fruit-trees, and even vines about Sarepta, and mulberry-trees at Saratow. The forests, which are chiefly to the north-west, consist of oaks, pines, maples, and poplars, but though pretty extensive, they do not suffice for the general consumption. The breeding of cattle is, next to agriculture, the chief occupation of the inhabitants; the breed of sheep, which yield coarse wool, has been improved by the importation of merinos. The Tartars keep a great quantity of bees. Game is still abundant in the north-west parts. The fisheries on the Volga not only supply the home consumption, but furnish a large surplus for exportation. The minerals are salt, millstones, and a little iron.

The population of this government is composed of Russians, Tartars, Cossacks, and other tribes, besides a great number of foreign colonists. At the accession of Catherine II., the population was extremely scanty, and that sovereign, wishing to introduce agriculture and civilization, turned her thoughts to the means of accomplishing this object. As no Russian province was sufficiently peopled to spare any part of its inhabitants, the empress invited foreign colonists to settle in lands on the banks of the Volga, which were allotted to them with very great privileges. Many Swiss and Germans came to Saratow, where they were joined by some French and Swedish families; the whole number was nearly 10,000. They were received at first in 16 large barracks near the town, and afterwards houses were built for them on the land assigned to them; the empress presented them with the utensils, flocks, draught-cattle, and seed-corn, and provisions for their subsistence for a considerable time; she also exempted them for ten years from all taxes. Thus they soon prospered, and gradually founded 104 villages, some of which are on the left bank of the Volga, near the river, or at the mouth of its tributaries. Most of them however are on the right bank between Volgsk and Kamyschinst, and on the banks of the Medweditza and of the Ilawlia, which fall into the Don. The names of Soleure, Schaffhausen, Zürich, Glaris, Lucerne, Unterwalden, &c., which are given to these villages, indicate the original country of the founders. Seventy-three of these colonies have Protestant churches: in most of the others the people profess the Roman Catholic religion. The little town of Sarepta was founded by the Moravian brethren, who are still its only inhabitants.

In the year 1836 the population of these colonies amounted to 109,795, and it appears to be rapidly increasing, for in that same year there were 6330 births, and only 2108 deaths. Yet still the government is very thinly peopled, there being only 21¼ inhabitants to a square mile. The emperor has therefore resolved, by a decree issued in March this year (1841), to remove from the crown lands in the better peopled governments many thousand peasants to those of Saratow, Orenburg, and Ekatarinoslaf, many of whom will doubtless regret leaving their homes, but will be indemnified by the superior advantages they will find in their new country.

SARATOW, the capital, is situated on the right bank of the Volga, in 51° 31′ N. lat. and 46° E. long., in an arid and barren valley, between the river and a range of pretty high calcareous mountains. The town, which is neither handsome nor regular, is divided into the upper and lower towns; it was built on its present site in 1665, and has been frequently ravaged by fire. In the year 1811, 1700 houses were reduced to ashes. The greater part of the city is built of wood, there being at present only 360 houses of stone or brick, and 2874 of wood. Some of the former are very handsome, and there are 7 stone and several wooden churches, 2 convents, and a very large market-place or bazaar. There is likewise a gymnasium and a botanic garden. Saratow is the seat of a consistory for the Protestant communities (except the Moravians at Sarepta) in the governments of Saratow, Astrakhan, Voronesh, Tambow, Riäsan, Pensa, Simbirsk, Kasan, Orenburg, and Perm, amounting to above 600,000 souls, most of whom are foreign colonists. The inhabitants were officially stated to be 21,57 males and 20,794 females. The increasing population of the colonies has had an influence on that of the chief town, which is the centre of a very extensive and advantageous trade. Volgsk, with 8500 inhabitants, is a very pretty town, built at the foot of a high mountain on the right bank of the Volga, about 90 miles above Saratow: it is inhabited by wealthy merchants, who carry on a considerable trade. The neat town of Sarepta was founded in 1765. All the streets, which are planted with poplars, terminate in a very large market-place, with a fountain in the centre, which supplies every house with water. The Moravians intended at first to follow agriculture, but in the midst of an arid steppe they could not execute this project; they now have manufactures of linen, cloth, tobacco, liqueurs, &c., with which they carry on considerable trade with the Calmuks. Among the public buildings there are three deserving of notice: 1, the Asylum of the Sisters, in which all the unmarried women reside; 2, the Asylum of the Brethren, for all the unmarried young men; and 3, that for widows: in the first two there are schools. The gardens round the town are cultivated with extreme care.

(Stein; Cannabich; Hörschelmann; Schnitzler.)

SARCOCELE (from *σάρξ*, flesh, and *κήλη*, a tumor) is the name of a disease by which the testicle becomes altered from its natural structure and converted into a hard flesh-like substance. The term however is of such general import, that there are few diseases of the testicle which may not be included under it; accordingly the older writers called all indurations and enlargements of this organ sarcoceles, whether they were of a benign or of a malignant ature. In modern phraseology the term is restricted to ertain chronic enlargements and indurations of the body f the testis, of a perfectly benignant character, but inconenient on account of their size and weight. These swellıgs may continue for years without undergoing any visible hange, or a sudden increase in their bulk may arise, and he testicle be converted into a painful, ulcerated, and inurable mass of disease. Sarcocele may be distinguished rom hydrocele, the disease which most nearly resembles it, y its hardness, weight, and want of transparency; but ocasionally the two diseases are met with together, and this ompound affection is called hydrosarcocele. With respect o the treatment of sarcocele, various and rather opposite emedies have at times proved successful. When the enargement is accompanied by pain or any degree of inflammation, leeches, hot fomentations, and poultices applied xternally, with the administration of an emetic, and the doption of a general antiphlogistic regimen, would seem to e indicated. When the disease is altogether chronic, stimulating lotions, liniments, or ointments may be applied to he swelling. In either case, the use of a suspensory andage or bag truss for the support of the part should not e neglected. If these means fail in arresting the progress f the disease, extirpation of the gland must be had recourse to.

SARCOÏDEA, a group of Polypiaria, of which the type s the old Linnæan genus Alcyonium.

On a general view of the structures of invertebral animals, we perceive in regard to their dermal system variations of much importance, coincident with the habits of life to which the individuals are destined. Among the acephalous mollusca, for example, it is a beautiful subject of investigation to examine into the use of the shelly valves which open and shut for respiration and motion in the Cardiaceæ, which open for respiration only in the oyster, and which are not required to open at all in the same sense in the Pholadariæ. Comparing with these last the Tunicata, we pass gradually down to the Ascidioid Polypiaria, and thus become familiarised with the ciliary movements and aquiferous tubes of the different groups of polypi.

The relation of the hard parts associated with the retractile substance of polypi to the way of life of these animals, is probably in reality quite as close and important as among the mollusca, but it is not so obvious. In the stony radiated plate of Fungia, the stony internal ramose axis of Corallium, the half-stony and half-horny axis of Isis, the wholly horny axis of Antipathes, and the fibrous skeletons of Alcyonium and Spongia, we see in general terms the use of these parts as *supports* ('fulcra') to the more active and animated parts, affording the requisite attachments, and permitting the assumption of suitable general shapes. Though insulated in some degree from the soft animal parts, they are perhaps not to be viewed as merely inorganic or even extravascular parts, any more than the wood of a dicotyledonous tree, which no longer serves to convey in a healthy condition the fluids which are circulated through it.

These considerations give more importance to the classifications of Polypiaria from the stony, horny, fleshy, or gelatinous character of their mass, than might at first sight appear. In the Sarcoid (or sarcinoid, or carnose) Polypiaria we may imagine the *distinct collected* axis of Corallium or Pennatula to be *ramified* and reticulated, and so involved (empâté) in the more active gelatinous mass, as to lose its distinctive character; we have then the alcyonium. One step further, let this expanded reticulation of fibres acquire somewhat more of rigidity, and the gelatinous mass, still united with it, become apolypiferous (as a plant may be supposed to become flowerless), and we have the sponge, perhaps the last, and yet not really doubtful term in the descending series of radiated invertebral life.

Lamouroux employs the title Polypiaria Sarcoïdea for one of his three great divisions of Polypiaria (1821). The arrangement stands thus:—

Div. 1. Supports flexible or not entirely stony.
2. „ entirely stony, and not flexible.
3. „ fleshy, more or less irritable, and without central axis.

This division includes three orders, viz.:—

Alcyoniæ, in which are eight genera, viz. Alcyonium, Lobularia, Ammothea, Xenia, Anthelia, Alcyonidia, Alcyonella, Hallirrhoë.

Polyclinicæ (belonging to Junicata).

Actinariæ, in which are seven genera, viz. Chenendopora, Hypalimus, Lymnoria, Pelagia, Montlivaltia, Isaura, Ierea. (These are fossil groups.)

This system is mainly based on the previous labours of Lamarck (1816), who placed Alcyonium in his group of Polypiers empatés, but gave, after Savigny (to whom we owe most of our knowledge of these animals), in his group of Polypiers tubifères, the genera Anthelia, Xenia, Ammothea, Lobularia.

Blainville (1834) includes in his *Sarcinoïdea*, the fourth family of Zoophytaria, the Alcyonoid types of organization, and notices eleven genera, viz. Briareum, Lobularia, Ammothea, Xenia, Nepthya, Anthelia, Alcyonium, Cydonium, Pulmonellum, Massarium, Cliona; but remarks that several of them are of small importance.

In Dr. Johnston's very commendable arrangement (*British Zoophytes*, p. 75, 76, 1838) the Alcyonidæ form a family of Asteroid Polypiaria.

From Blainville we take the following characters of the family and the genera:—

Family, Sarcoïdea or Sarcinoïdea.

Animals polypiform, with (mostly) eight pinnated tentacula, more or less immersed, and scattered on the surface of a common polymorphous, irregular, fleshy, adherent mass; the *mass* is composed of one (suberiform) substance, and supported by (calcareous) aciculæ. (The animals much resemble those of Pennatula.)

N.B. All the genera have eight pinnated tentacula, except when the contrary is mentioned.

Genus Briareum, *Blainville.*

Animals thick, issuing from prominences irregularly scattered on the *polyparium*, which is widely attached, subramose, externally composed of a fleshy thick distinct *envelope*, internally composed of an assemblage of closely fasciculated aciculæ.

Example.—Briareum gorgonoideum. (Gorgonia Briareus, Linn., Gmel.) Sol. and Ellis, tab. 14, figs. 1 and 2.

Genus Lobularia.

Animals entirely *retractile* into suboctangular cells, which are scattered on the mass, but are especially more numerous on the digitated extremities thereof: *mass* more or less pedicellated and widely attache.

Example.—Lobularia digitata. (Alcyonium manus diaboli.) Common on the English coasts. Dr. Johnston retains for this group the name Alcyonium.

Genus Ammothea, *Savigny.*

Animals rather short, *not retractile*, scattered, and numerous on the whole surface of the short crowded divisions of a common plant-like attached *mass*. (The nonretractility of the Polypi is the main character.)

Example.—Ammothea virescens. Red Sea.

Genus Xenia, *Savigny.*

Pinnules of the tentacula in *several rows;* tentacula not retractile at the base: *animals* collected at the extremities of short-lobed ramifications from a membranaceous base.

Example.—Xenia umbellata, *Savigny*. Red Sea.

Genus Nepthya, *Savigny.*

Animals not retractile, prominent on the surface of many hook-formed spiculiferous lobes, supported on pedicles from a common enlarged base of attachment.

Example.—Nepthya Savignii. (Blainville's 'Actinologie,' pl. 88, fig. 6.) Egypt.

Genus Anthelia.

Animals half-retractile and prominent on (herissant) the surface of a *crustiform* attached *mass*.

Example.—Anthelia glauca, Savigny. Red Sea.

Genus Alcyonium, *Fleming*. (Adopted by Blainville.)

Circle of tentacula complete: fleshy bases arborescent, investing or adnate, and regularly covered with polypiferous papillæ.

According to Lamouroux and Fleming, Alcyonium gelatinosum (Alcyonidium, *Lam.*) has 12, A. hirsutum 18 to 20, and A. echinatum 12 *simple tentacula*. They cannot therefore even belong to this family. The old genus Alcyonium is in fact lost in the modern divisions, or applied to forms and structures materially different.

Genus Cydonium, *Jameson.*

Animals with an orifice at the base of each of the tentacula, and retractile into stelliform cells scattered in the surface of the *mass*, which is externally coriaceous, internally fleshy, and contains numerous stiff spiculæ perpendicular to the surface.

Example.—Cydonium Mulleri; Alcyonium cydonium. (Müller, *Zool. Dan.*, tab. 81, figs. 3, 4, 5.) North Sea.

Genus Pulmonellum, *Blainville.*

Animals fusiform, with *six simple tentacula* immersed in six dentate cells, on the surface of a spheroidal lobed adherent *mass*, which is composed of a fleshy substance and spiculæ.

Example.—Pulmonellum ficus. Ellis, 'Corall.,' tab. 17, f. b, B, C, D.

(Ehrenberg properly doubts the propriety of this being retained in the family at all.)

Genus Massarium, *Blainville* (part of Sympodium, *Ehrenberg*.)

Animals contained in five-rayed cells, on the surface of an amorphous spongoid mass. (According to Ehrenberg the polypi are really octotentaculate.)

Example.—Massarium massa. (Müller's *Zoologia Danica*, pl. 81, figs. 1, 2.) North Sea.

Genus Cliona, *Grant.*

Animals cylindric, slender, transparent, with 8 *simple* tentacula, contained in papilloso-tubular cells; *mass* fleshy, spiculiferous, anastomosed.

Example.—Cliona celata, Grant. English Channel and North Sea.

On reviewing this series of genera it is very apparent that the group is not by any means completely defined or satisfactorily divided. If the tentacula may be pinnated, or simple, and from 6 to 20 in number, and the substance transparent or coriaceous, gelatinous, or fibrous, the family is not properly characterized.

Most of the fossil species from the chalk and oolites, often referred to Alcyonoidea, are more probably of the spongoid type—the Amorphozoaria of Blainville.

SARCO'MA is a morbid tumour whose tissue is fleshy and moderately firm. Several species of sarcoma were described by Mr. Abernethy in his 'Classification of Tumours,' such as the common vascular sarcoma, the adipose or fatty kind, the pancreatic, the mammary, &c. Some of these still retain the same names, but in general the term sarcoma has no other meaning in surgical works than the indefinite one already given, and includes all fleshy tumours that are not cancerous, or medullary, or melanotic. [TUMOUR.]

SARCO'PHAGUS (from a Greek word, σαρκοφάγος, which literally signifies *flesh-eater*), the name given to the Egyptian stone coffins. It is not known when this strange term was first applied to them, nor why. These coffins consist of two parts, a case formed of one piece, and open at the top, in which the mummy was to be deposited, and a lid to cover the opening. As these sarcophagi are generally of hard stone, and often extremely hard, the working of them must have been very expensive, and they could only have been made for kings and very rich persons. There are several fine specimens in the British Museum; one, which was brought from Alexandria after the capture of that city from the French, is probably unequalled by any other yet discovered. It was found by the French in the court of a mosque of St. Athanasius at Alexandria, under a small building, where it was a sort of object of adoration to the Mussulmans, who however had drilled two large holes in the bottom of it in order to use it as a reservoir of water or a bath. The material is a sort of breccia, similar to the Italian *breccia verde*, and is composed of rounded fragments of granite and porphyry set in a basis of deep green rock. The porphyry is of the most brilliant and varied colours. Though the stone is excessively hard and difficult to work, more than a hundred square feet of its surface have been sculptured with hieroglyphics of the most delicate workmanship, and so small that sometimes ten or twelve are included in a square inch. The number of hieroglyphic characters is said to exceed 21,700. The sarcophagus is rounded at the head and flat at the feet, the rest of it being like a large box. It is about 10 feet 3 inches long, 4 feet 2 inches wide at the feet, 5 feet 4 inches wide at the head, and 3 feet 9 inches in depth. The thickness, measured across the flat rim on the top, varies from about 9 to 10 inches. It is sculptured both within and without with various figures of men and animals, many of the animal forms being of the most easy and correct outline. Dr. Clarke wrote a dissertation to prove that this sarcophagus was the one in which the embalmed body of Alexander the Great was placed; but from a consideration of the chief facts of his funeral and other circumstances, it is almost demonstrable that the sarcophagus was not made for him, and it is indeed improbable that his body was ever placed in it.

Another very large sarcophagus in the Museum appears to be made of a species of black basalt, or perhaps a breccia. It has some sculptures upon it, which have been called volutes, but to which in reality they have little resemblance. The intaglios upon it are less numerous than on the former, but many of them are of a larger size.

There is one, also in the Museum, which is a very fine specimen of Egyptian workmanship. It is made of a very compact black stone. Though it differs very little in general form from the other sarcophagi, it is so made as to be in fact a mummy-case of stone instead of wood, sculptured inside so as to give room for the round parts of the body and the projecting part that indicates the feet. It was probably intended to be placed erect like the other mummy cases.

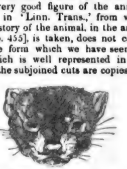
A beautiful sarcophagus of arragonite was discovered by Belzoni in the great tomb which he opened at Thebes. It has the appearance of white alabaster, and is translucent when a candle is placed in it. It is sculptured within and without with figures not more than two inches high. It is 9 feet 5 inches long, 3 feet 7 inches wide, and 2 inches thick. This unique specimen was bought by Sir John Soane from Mr. Salt.

The two sarcophagi found in the two great pyramids of Jizeh are of white granite. There are no hieroglyphics sculptured on either of them.

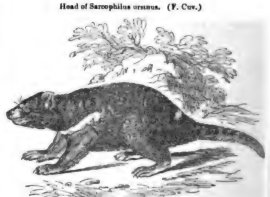
For further information see the *Library of Entertaining Knowledge*, 'Egyptian Antiquities,' from which this notice has been abridged.

SARCO'PHILUS, the name by which M. F. Cuvier designates a genus of *Marsupialia*, founded on *Dasyurus ursinus*, Auct., *Didelphys ursina*, Harris, upon essential characters which, in the opinion of M. F. Cuvier, well distinguish it, and for some of which he acknowledges that he is indebted to Professor Owen, who communicated to him a skull of the animal.

M. F. Cuvier states that *Sarcophilus* approaches nearer to the *Thylacini* than to the *Dasyuri*, but that it is very different from either. These differences are well pointed out in the last part of his 'Histoire Naturelle des Mammifères,' where a very good figure of the animal is given. That by Harris, in 'Linn. Trans.,' from which the cut illustrating the history of the animal, in the article MARSUPIALIA [vol xiv., p. 455], is taken, does not convey a satisfactory idea of the form which we have seen alive in this country, and which is well represented in M. Cuvier's figures, of which the subjoined cuts are copies.



Head of Sarcophilus ursinus. (F. Cuv.)



Sarcophilus ursinus. (F. Cuv.)

SARCORAMPHUS. [CONDOR; VULTURIDÆ.]

SARDANAPA'LUS is the name by which the Greek and Roman writers designate the last king of Assyria. He was a wealthy and powerful king, and is said to have built two towns, Anchiale and Tarsus, in one day. (Steph. Byz., *v.* Ἀγχιάλη; Suidas, *v.* Σαρδανάπαλος; comp. Herod., ii. 150.) But he was a man of voluptuous habits, and spent his life in his palace at Ninus or Ninive, surrounded by women. The only event of his life in which he is said to have acted like a man was also the last. The common account of the mode in which he ended his life, at the time when his kingdom fell into the hands of the Medes, is given by Diodorus Siculus (ii. 24-27) and Justin (i. 3). Arbaces, who was his satrap in Media, one day with great difficulty obtained admission to his master, and to his astonishment found him engaged in his usual unmanly occupations among his concubines. Filled with indignation, Arbaces on his return declared to his friends that he could no longer obey such a king. A conspiracy was formed, and Arbaces, with his Medes, joined by Beiesys, a Babylonian priest (probably a Chaldaean), marched against Ninive (comp. Herod., i. 95). Sardanapalus at first endeavoured to conceal himself; according to others, he marched out to meet the rebels, and was successful in three battles; and then, thinking himself safe, he gave himself up to his usual pleasures, and prepared a grand feast for his army. Arbaces however in the mean time surprised the king's camp, routed the enemy, and drove the king with a few followers back to his capital. Here Sardanapalus maintained himself for two years, though deserted by all the provinces, and when at last he saw that further resistance was useless, he caused a pyre to be raised on which he burnt himself with all his treasures and his women. Assyria thus fell into the hands of the Medes, who united it with Media. The time of this event is uncertain; some suppose that it took place about 880, some again place it in the year 717, and others in 606 B.C. The name of King Sardanapalus, both in antient and in modern times, has been used proverbially to express the highest degree of voluptuousness and effeminacy.

SARDEGNA, SARDINIA, a large island in the Mediterranean Sea, situated between 38° 52′ and 41° 17′ N. lat. from Cape Spartivento, the most southern point, to Cape Longosardo on the north, and between 8° 4′ and 9° 50′ E. long. from Cape Caccia near Alghero, the most western point, to Cape Comino on the eastern coast. Its form is a parallelogram 140 nautical miles in length, with an average breadth of 60 miles, leaving out the projections. The area is a trifle larger than that of Sicily, according to the admeasurement of Captain Smyth, and so it was considered by Scylax, who places Sardinia before Sicily in point of size. (Cluverius, *Sardinia Antiqua.*) The eastern shore of Sardinia faces the coasts of Rome and Naples, the north-eastern point of the island, near Terranova, being about 150 miles west by south of the mouths of the Tiber, and Cape Carbonaro, at the south-eastern extremity, being about 300 miles west of the coast of Calabria. Cape Spartivento, the most southern point of Sardinia, is about 120 miles north of Cape Serrat on the coast of Tunis; and Cape Carbonaro, the south-east point, is 170 miles from Trapani on the north-west coast of Sicily. Towards the north, the narrowest part of the Straits of Bonifacio, which divide Sardinia from Corsica, is about nine miles across; to the westward, Port Mahon in the island of Minorca is about 200 miles distant from Cape Mannu near Oristano on the west coast of Sardinia; and the islands of Hyeres on the coast of Provence are about 180 miles from Asinara at the north-west extremity of Sardinia. The situation of Sardinia is therefore central with regard to Italy, Sicily, Barbary, France, and Spain. The island contains excellent harbours; S. Pietro and Porto Conte on the western coast, the roadsteads of Maddalena on the northern and Terranova on the eastern, besides the spacious bays of Cagliari, Palmas, Oristano, and Alghero, and the roadsteads of Vignola, Tortoli, and Porto Torres.

A chain of primitive mountains runs from north to south along the whole eastern side of the island, occupying about one-third of its surface, and forming the wild districts of Gallura, Ogliastra, Barbargia, Sarabus, and Budui: this range consists of granite and schistus, with large masses of quartz, mica, and felspar. Few of the summits exceed 3000 feet, except the peak of Limbarra in the Gallura, which is 3686 feet high, and the group called Genargentu, which is near the centre of the island, and attains an elevation of 5276 feet. West of this highland region, and along the central length of the island, there is a succession of fine plains intersected by ranges of smaller hills, and stretching in some places as far as the western coast, such as at Oristano and Alghero. The remaining part of the western coast is occupied by several unconnected mountain-groups, some primitive, some secondary, and others of volcanic formation, jutting out in numerous and picturesque headlands, and giving to that part of the island a more varied and pleasing aspect than the abrupt and iron-bound eastern coast. At the south-western extremity of the island are the mountains of Sulcis, consisting of granite and primitive limestone, separated from the eastern chain by the Campidano, or wide plain which spreads north of Cagliari towards Oristano. North of the Sulcis, and separated from it by the romantic valley of Iglesias, are the mountains of Murgiani and Arcuentu, which rise along the western coast, and the latter of which attains the height of 2315 feet. North of these lies the deep gulf of Oristano, and east of it is a great plain, through which flows the Tirsi, the principal river of Sardinia. North of this plain, and near the western coast, is the group of Monte Ferru, which rises 2796 feet about the sea; and farther north towards Alghero is Monte Minerva, 2400 feet high. A succession of highlands, partly of volcanic formation, extends north of the basin of the Tirsi, and quite across the breadth of the island, through the district of Goceano, and joins the mountains of Gallura on the eastern coast. This range divides the north-west part of the island from the remainder. At the northern base of it is the extensive plain called Campo d'Ozieri, and Campo di Giavesu, through which the river Coguinas flows to the northward. This plain is bounded on the north-west by a hilly tract, mostly of volcanic formation, one point of which, whereupon stands the town of Osilo, is 2000 feet high. West of this hilly tract is the plain of Sassari, extending from the northern coast at Porto Torres to the western sea towards Alghero.

North-west of the plain of Sassari is the mountainous peninsula of Nurra, which stretches out into the sea, terminating in three abrupt headlands, Cape Caccia to the south, above 500 feet high, Cape Argentaro to the west, and Cape Falcon, the Gorditanum Promontorium of Ptolemy, to the north. A narrow and shallow strait, lined with sharp rocks, runs between this cape and the island of Asinara, the ancient 'Herculis Insula,' a mountainous island of a long irregular shape, indented by several gulfs and coves, and having nearly thirty miles of coast-line to a comparatively small surface. It is inhabited by a few shepherds and farmers. The north and west coasts of Asinara are very steep, Mont Scommunica, the principal elevation, being 1500 feet above the sea. The whole peninsula of Nurra is covered with mountains, the northern parts of which consist of great masses of granite with schistose rocks, and the southern part is compact limestone with gypsum and quartz. The principal summits in this range are from 1400 to 2000 feet high.

A volcanic district, as to which however there is no historical record of its having been in a state of activity, extends along the centre of the island, beginning at Monastir, north of Cagliari, and running northward between Nurri and Sardara: it comprehends the towns of Ales, Milis, and San Lussurgiu, which last is built in the crater of an extinct volcano. It then extends to Bonorva and Queremula, on the border of the great northern plain of Giavesu, where a crater is clearly distinguishable, which from its unbroken conical shape and fine red ashes bears the appearance o comparatively recent action; and the whole surrounding country consists of slaggy lava, rugged scoriæ, obsidian, and indurated pozzolana, with large hills of porphyritic tufa towards Bonorva, lying over calcareous rocks. The volcanic beds extend farther north, through Codrongianus and Osilo in the hilly region east of Sassari, where remains of craters occur, to Castel Sardo, on the northern coast, where they form abrupt cliffs 300 feet above the sea. The town-wall and most of the houses of Cassel Sardo are built of lava. The river Coguinas forms on this side the geological boundary between the primitive formations of the eastern country, and the trap and volcanic products to the westward. At Nurri, in the southern part of the island, on the borders of the eastern highlands overlooking the Campidano, or great plain of Cagliari, are two hills called 'pizz' e ogheddu' and 'pizz' e ogu mannu,' meaning peaks of the little and great eye, which appear to have been ignivomous mouths. A volcanic stream has run from them over a calcareous tract, which forms an elevated plain or table-land nearly 1600 feet above the sea, called Sa giara a Serri, from the neighbouring village of Serri. This plain is covered with oak, ilex, and cork trees, while its northern declivity contains rich pasture. North-west of this plain is the 'Giara,' or lava bed of Gestori, of similar formation, which has proceeded from a crater near the town of Ales: it is strewed with masses of obsidian and trachytic and cellular lava, so as to resemble a city in ruins. At Monastir, in the plain north of Cagliari, there is a distinct double crater now well wooded, and a new bridge has been of late years constructed there of fine red trap, which, with the bold outline of the neighbourhood, renders the entrance to the village by the new road very picturesque. (Captain Smyth's *Sketch of the present State of Sardinia*, 1828.)

The principal rivers of Sardinia are—1, the Tirsi, the Thyrsus of Ptolemy, which drains the central part of the island: it rises near Buduso on the west side of the Gallura mountains, flows first south and then south-west, along the base of the Goceano ridge, passes through the fine valley of Ottana, receiving several tributary streams from the mountains of Genargentu, and then flowing by Fordongianus, enters the plain of Oristano, passing north of that town, and then turning abruptly to the south enters the sea after a tortuous course of between 70 and 80 miles. In very dry summers it is fordable near its mouth, but in winter it contains a vast mass of water, and inundates considerable tracts. 2. The Coguinas, in the northern part of the island, rises in the volcanic region of Bonorva, flows northwards through the plains of Giavesu and Ozieri, receives several streams from the highlands of Goceano and of Gallura, passes between Mount Sassu and the Limbara ridge, when it assumes the name of Rio di Partidas, and flowing through a romantic ravine below the cliffs of Castel Doria, enters a fine plain adjoining the sea: it forms a small lake near its mouth, a few miles east of Castel Sardo. The course of the Coguinas is between 50 and 60 miles, and it is fordable near its mouth, except in rainy seasons. 3. The Flumendoso, the Sœprus of Ptolemy, the principal stream of the eastern part of the island, rises in the mountains of Corno di Bue and runs southwards along a high valley between the ridge of Genargentu on the west and the Ogliastra mountains to the east, passing through many solitary glens: it then turns eastward between the mountains of Sarrabus on one side and the hills of Parte Olla, which divide it from the Campidano or plain of Cagliari, and afterwards winding through the fertile grounds of Villa Puzzu, San Vito, and Muravera enters the sea between two low rocky points on which stand the towers of Xalinas and Corallo, after a course of between 50 and 60 miles. As it runs between two mountain-ridges, the basin of the Flumendoso is very narrow; in the winter it is swelled with the drainage of the surrounding mountain-region, and it then assumes a very imposing appearance. 4. The Mannu rises in the fountain of the Fig in the table-land of Sarcidanu on the south slope of the Genargentu ridge, and flowing southwards through the plain of the Campidano is joined by the Calarita from the mountains of Gergei on the east and the Sixerris which comes near Iglesias from the west: the united stream enters the lake of Cagliari, which lies west of that city and is six or seven miles long by three or four broad, and communicates with the sea by seven cuts through a narrow strip of sand. This lake is navigated by flat-bottomed boats, and contains abundance of eels, mullets, and other fishes; it is also frequented by flamingos and pelicans, which migrate thither in the winter, probably from the lakes of Bizerta and Tunis on the opposite coast of Barbary. Besides these four rivers there are many smaller streams, such as the Turritano, which flows through the plain of Sassari, and is crossed near its mouth by a substantial Roman bridge in excellent preservation; the Termo, or river of Bosa, on the western coast; the Cedrino, or river of Orosei, which is navigable by boats for about a mile and a quarter inland on the eastern coast; it is an abundant and impetuous stream from its source which is on the eastern slope of the Barbargia mountains.

The climate of Sardinia varies greatly according to the seasons and localities. Along the coast the thermometer ranges, in the course of the year, from 34° to 90°; but it falls at times considerably lower in the highlands. The summits of Genargentu are often capped with snow in the course of the winter. The north-west wind is the healthiest, and the east or south-east the most noxious. Hail and thunder-storms are rare, but rain falls copiously in the autumn. In the summer the country is subject to long droughts, but the heavy dews of the night partly compensate for the want of rain. Earthquakes are very rare and slight. The plains and some of the lower valleys of Sardinia have been notoriously unhealthy ever since the time of the Romans. Cicero, Strabo, Martial, and in later times Dante, all speak in strong terms of the insalubrity of Sardinia. The malaria of Sardinia is called by the natives 'intemperie,' and it appears to be somewhat different from the malaria of Italy; it does not always produce swelled bodies and sallow skins, but it acts more rapidly than the Italian malaria, especially upon strangers, and instances are related of persons carried off by it in a day or two. The intemperie fever is caught during day as well as night, awake or asleep, whilst the malaria is considered most fatal at night and during sleep. Exposure to the midday heat and to the dew of the evening are equally fatal. The natives avoid as much as possible going out of doors until an hour after sunrise, and they hasten home before sunset, carefully closing every door and window, and if they are obliged to go out, they hold a handkerchief before their mouth. It is generally agreed that fire is an excellent preservative against the intemperie, and the former lords of Oristano used to burn large fires round the town every night. Most people remove from the plains to the higher grounds on St. John's day, the 24th of June, when the air begins to be unhealthy though it does not become dangerous till August, from which time it continues so to the end of November, when heavy rains precipitate the miasma and purify the air. The intemperie of Sardinia lasts therefore for a month or two later than the malaria in the Maremme of Italy. Those people who are obliged by circumstances to remain, keep themselves well clad in thick woollens to protect themselves against the burning sun. Exertion, exposure to summer showers, and fatigue of all kinds are studiously avoided, and a spare but good diet is adopted, with cool acidulated drinks. In spite of these precautions however many persons die of the intemperie every year. The patient is first attacked by headache and a painful tension of the epigastric region, with alternate fits of heat and chilliness; fever ensues, the accesses of which are extremely severe, and are followed by great debility, which is injurious even to those who are accustomed to it, and generally fatal to strangers. Exhalations from the marshes and the beds of rivers which are nearly dry in summer, and putrescent vegetation, are active causes of the intemperie, though in Italy they appear not to be the only causes. [ROME, p. 91.] By draining the marshes, embanking the rivers, and cultivating the 'macchie,' or desert tracts which cover about one-third of the surface of the island, the intemperie might be diminished.

Many Sards are of opinion that the green figs of infected districts are particularly deleterious. Corn grown on such grounds, on the contrary, is esteemed the finest. Hedges of the 'Ficu Moriscu,' or Cactus Opuntia, are supposed to increase the intemperie, by abstracting the evaporation from the earth, without absorbing moisture like other trees. Wherever the oleander flourishes, intemperie of the worst kind may be expected.

The migrations caused by the intemperie, the scarcity of cottages, pastures, and enclosures, and the numerous tracts of uncultivated land, give to the plains of Sardinia an aspect of depopulation, especially in summer. The inhabitants of the plains are viewed by those of the highlands with marked contempt as weak and degenerate.

The lands of Sardinia are divided into feudal and non-feudal. Sardinia is now the only country in western Europe in which the feudal system remains. The feudal lands either belong to the respective nobles, several of whom are of Spanish families and non-resident, who entrust their domains to indolent 'podatarii,' or stewards, or have been sold to private individuals, who still recognise the feudal lord by paying him a trifling fee, and are under some restrictions, such as not planting vineyards or trees without his consent. The lands not feudal belong either to communities or individuals, and can be let or sold, or given away at the will of the owners. A small part of these lands are enclosed and well cultivated, and are called 'Tanche;' but the larger proportion consist of 'Vidazzoni,' that is, lands belonging to communities; they are mostly divided into three parts, each of which is cultivated in its turn, and while under culture is enclosed with a line of hurdles, and the rest, being fallow, is open to the wandering flocks, and is deemed common. The government has of late years issued decrees in favour of enclosures, and trees and hedges have been planted in many places. The leases are short, often for two years only, and the rent is generally paid in kind. In some parts farms are let on the metayer system, as in many parts of France and Italy. One-third of the surface of the island consists of macchie, or waste, consisting of sandy or stony districts, and lakes and marshes; another third is occupied by forests or natural pastures; and the remainder, which is estimated at five millions and a half of starelli (a measure about four-fifths of an acre), consists of corn-fields, vineyards, olive-grounds, orchards, and gardens. About one million of these starelli are allotted for the growth of corn, and if diligently cultivated they would produce enough to support three times the actual number of inhabitants. Wheat, under the present system of agriculture, gives a return of only seven or eight for one, but in some favoured districts the average is from fifteen to twenty. The Sardinian plough resembles the aratrum of the Romans; it is light, and penetrates only two or three inches into the ground, and has no coulter. Most of the garden-grounds are worked with the hoe, the spade and mattock being generally unknown. The corn is left in the fields until it is threshed, which is performed by the treading of mares or colts on an area prepared by paring off the sward and beating the soil with a mallet to the requisite hardness. Windmills are unknown, and water-mills are only found in some places in the Capo di Sopra, or northern part of the island. Winnowing is managed by tossing up the corn into the air, for the wind to blow off the chaff. Corn is generally ground in a corner of the house by means of the 'mola asinaria,' or domestic mill, turned by an ass. There is no regular system of manuring the ground; it is done however sometimes when urgently required. Paring and burning are the common processes. The only artificial fodder for cattle is the 'mischiale,' a mixture of barley, lucerne, basil, and vetches, well known to the antients.

Cattle, sheep, goats, and swine are divided into two classes; the 'manso,' or tame, being those which work or yield milk, wool, &c., are carefully tended and kept in the best pastures; and the 'rude,' which are for slaughter or for breeding, and which are allowed to ramble over hills and wastes almost in a wild state. Each flock or herd bears a particular mark on the ear. All the labour of the field is done by oxen. The breed of horses reared in the tanche, or enclosed grounds, is carefully attended to: horse-races are frequent. For the improvement of the breed there is a government establishment in the plain of Ghilarza, called 'Regia Tanca,' where Arabian and Spanish stallions are kept, and also Swiss bulls and rams. Sardinian horses are in general free from vice, patient of fatigue, and require but moderate food, and the Sards are generally very good horsemen. The very small horse, called 'acchetta,' which was antiently in esteem among the Roman ladies, is an easy-paced lively little animal. The mule is unknown. Oxen are used for drawing the carts, which are of the most primitive kind, like those in many parts of Portugal; the wheels are made of a solid piece of wood, and stuck round the edge with projecting triangular-headed nails, which are the only iron used in the whole machine. The axletree is fixed into the wheels, and turns round with them.

Sardinia is better provided with forests than Sicily; the best timber is in the mountainous districts of Gallura, Barbargia, Goceano, Marghimo, and Planargia. On the south-west side of the ridge of Genargentu is an extensive elevated plain, called 'su Sarcidanu,' covered with fine oak, beech, chestnut, and cork trees, and on the Menomeni range, between San Lussurgiu and Macomer is another elevated plain called 'su littu de St. Antoni,' about nine miles wide and eleven or twelve long, covered with a rich forest. Fine woods are also found in the Giarre de Serri, and on the hills of Trebina and Arcuosa, and they abound with wild hogs and game. Pine-trees are not common except near Terranova. The cork-tree grows very fine and in great quantity in the northern part of the island. Timber is very scarce in the plains, and the want of roads prevents the people from making use of that of the mountain forests. Dwarf mulberry-trees grow in abundance, but their cultivation is little attended to, although the government has repeatedly endeavoured to encourage the rearing of silkworms; and as early as 1788, a book was published at Cagliari, in both Sardinian and Italian, called 'Moriografia Sarda,' in the form of a dialogue, pointing out to the people the advantages of this branch of industry, and explaining the methods to be followed, but it seems to have produced little effect, at least as late as the years 1823-4, when Captain Smyth took his survey of the coasts of the island.

Among fruit-trees, the fig, the vine, the apple, apricot, peach, almond, and prickly pear are the most common Walnuts and chestnuts are only met with in some places. Oranges, lemons, and citrons are cultivated chiefly in the southern districts of Iglesia and Villa Cidro, and near Sassari, but are not held in great esteem. Date-trees grow on the Campidano, and some of the produce is gathered and sold, but it is not of a good quality.

Vegetables are fine and plentiful; peas and cabbage grow wild in the greatest luxuriance, and the asparagus of the hedges is abundant in the markets in March and April. Celery and tomatas are large and well flavoured. The 'torzo,' a kind of turnip-cabbage, grows to a gigantic size, weighing without the leaves eight or ten pounds. Saffron is cultivated, and is much used in cookery.

The vine is extensively cultivated, both soil and climate being highly favourable to it; and though the process of making wine is still very imperfect, Sardinia produces some excellent wines. 'The 'malvasia,' or malmsey-wine of Quarto, Cagliari, Bosa, and Sorso, the muscat wine of Alghero, the red wine of Alghero and Oristano, and the cananau, natue, and quarnacia of the Campidano are much esteemed. The natives in general make considerable use of wine. More common white wines are made near Sassari and Terralba, and also in the Campidano. About 2000 Catalan pipes of a hundred quartieri (the quartieri being about eleven pints English) are annually exported from Alghero, about 1700 pipes from Ogliastra on the eastern coast, and 500 or 600 from Cagliari.

There are several extensive olive-grounds, but the oil has not yet been largely exported, although this branch of commerce is on the increase. The best olives are those of Sassari. Inferior oil is produced from the Ogliastra, or wild olive, which, with that made from the Lentiscus, serves the peasants for burning.

Corn is the principal article of export, but the government does not allow the exportation unless the average price of wheat in the principal markets is under thirty reals (11*s.* 3*d.*) the starello, each starello being about a bushel and a quarter Winchester measure. A heavy duty is also imposed on the exportation. The importation of foreign wheat is prohibited, if the average price is not above ten reals the starello. The greater part of the wheat raised in Sardinia is of a superior though soft kind called trigue; it will keep good only eighteen or twenty months; it is sowed in November and December, and reaped in June. In seasons of abundant harvest about 400,000 starelli are exported. The barley is inferior in quality as compared with the wheat; about 200,000 starelli is the utmost quantity exported. Indian corn, though it thrives well, is not very extensively grown. One hundred thousand starelli of beans, 200,000 of peas, and 1000 of lentils are also exported annually.

Cheese is a great object of rural economy; it is made chiefly from sheep and goats' milk, and being steeped in brine, it has a salt bitter taste. A great quantity is shipped for Naples, where it is in great demand, being much used when grated to season maccaroni. Little butter is made, as the treatment of cows is not well understood, and fodder is scarce.

Salt is a monopoly of the government, and a profitable branch of the royal revenue, the continental states of the house of Savoy being supplied entirely from Sardinia. Sweden and other states take many cargoes of salt from Sardinia. The salterns, both natural and artificial, are round the gulf of Cagliari, at Oristano, Terranova, and on the northern coast west of Porto Torres. The salterns are worked by convicts sentenced to the galleys, but the excavation of the mounds and the carriage of the salt is a labour forced on the adjacent villagers, for which they receive a small compensation.

Tobacco is also a royal monopoly. This plant, which was introduced in 1714, while the island was subject to the House of Austria, thrives well, especially round Sassari, Alghero, and the adjacent villages. The Zenziglio, a fine sort of snuff, resembles that of Valencia in Spain.

Flax is cultivated in the neighbourhood of Oristano, and most of it is used in the linen manufactories of the country. The finer sort of linen is made at Busachi. Wool is coarse, owing to the flocks being neglected, and it is manufactured into coarse cloth for the peasantry. A better quality of cloth is made of lambs' wool, and also a fine sort of flannel called pannizzu, made in the district of Sulcis. Cotton grows very well in the Campidano, but is not cultivated to any great extent. Madder grows wild, and is only used by the peasants for dyeing their coarse cloth. Some rock mosses are also gathered for dyeing. But the beautiful tincture of a delicate vermillion, mentioned by the antients by the name of tinctura Sardiniaca, is no longer known. Barilla is forbidden to be cultivated, except in certain places, from an opinion that it impoverishes the land. Bullocks' hides, sheep and goat skins, and kid or lamb skins, are exported in great quantities. Leather is imported from Marseille and other places. Among the yearly exports are from four to five thousand fox-skins; 2000 martin skins and 60,000 rabbit or hare skins. The forests abound with stags, daini or small deer, wild boars, and mufioni, or 'murvoni,' a species of large sheep, clothed with hair instead of wool.

The fisheries of Sardinia are very productive, especially the 'tonnare,' or establishments for taking the tunny-fish, which are at the Saline on the north coast, at Flumentargiu, Porto Paglia and Porto Scus on the south-west coast, and at Cala Vinagra, in the island of S. Pietro; and Cala Sapone, in that of S. Antioco. The shoal enters the Mediterranean from the Atlantic in the spring, skirts the shores of Spain and France, and then descending along the western coast of Corsica, part of it finds its way eastward through the Straits of Bonifacio, while the rest passes towards the Black Sea round the south end of Sardinia, remaining on the coast of the island from April till July. Most of the tunnies weigh from 100 to 300 pounds, but some of them are above 300. All the parts of the fish are turned to account, and most of them are salted. Captain Smyth gives an account of the expenses and receipt of a tonnara for one season, in which 3680 tunnies were caught. The expenses of the company, which hired the tonnara for 1125*l.*, amounted to 5174*l.* The heaviest item besides the rent is the wear and tear of the nets, which are divided into several compartments called chambers, and made very strong, as the fish is powerful, and struggles hard. Then there is the oil and salt for pickling, the cost of the barrels, the wages of the men, &c. The receipts amounted to 14,690*l.*, leaving a profit of 9516*l.* Most of the tunneries are let to foreigners, who ship off the produce to various ports of the Mediterranean, and a comparatively small proportion is used in the island.

The fishery of anchovies and sardines, which once used to be very productive, is much fallen off. Coral is taken off the west and south coasts, especially off Alghero, between the months of March and October; but this branch of industry is also abandoned by the natives to the Neapolitans and Genoese, who send from 200 to 300 boats annually, and carry off the produce, paying only a small impost, and a small duty for anchorage. Each felucca or boat generally collects coral to the value of about 1500 dollars, at the rate of 6½*d.* per English pound weight. The coral is polished and worked into necklaces, earrings, and other ornaments, at Genoa, Leghorn, Marseille, and Naples. Pearls of an inferior quality are obtained from the pinna nobilis, which abounds in shallow bays, as at Porto Conte and Liscia. The shell measures from 15 to 27 inches in length, and is sought chiefly for the tuft of silky hair, the byssus of the antients, which is attached to it. The filaments are of a glossy brown colour, about eight inches in length, and are easily spun into gloves, stockings, &c.

Sardinia was noted in antient times for its mines, which were worked to a great extent, as is attested by vast excavations and remains of founderies. South-west of Iglesias is Monte d'Oru, which appears to have derived its name from the gold formerly extracted from it; the mountain has been reduced by excavation to a mere shell. There is no doubt that silver was found in considerable quantities, and is even now procured occasionally, but the government it seems neither undertakes to work the mines nor allows private individuals to work them. A vein of pure mercury being discovered near Oristano, the fiscal magistrate seized the place, on the ground that the walls and cisterns of the town would be damaged by following up the vein. Iron and lead ore are found in abundance in many places, as well as copper. The government has however of late years sent mineralogists to explore the island. In the eastern mountains are found porphyry, basalt, alabaster, and marble. Chalcedonies, jaspers, cornelians, sardonyx, turquoises, and rock crystal are found in the districts of Sulcis and other mountains of the west. Fossil wood is found at Ozieri and Bonorva, lignite at Villapuzzu, Tonara, and the neighbourhood of Sassari, and inferior coals at Villacidro, Martis, Mandas, Chiaramonte, and other places. Some alum is found in the grottoes of Sorrenti, nitre is procured at Isili and Sammugheu, and is carried to Cagliari for the royal manufactory of gunpowder. Amianthus and asbestos are obtained at Ploaghe and Isili. On the Espalmador of S. Pietro there is a grey mixture of carbonate of lime and alumine, resembling fullers' earth, which is used by the natives in washing, and is called terra saponaria. There are numerous mineral springs. The principal are those of Sardara, Villa Cidro, Fordongianus, in the south, and Castel Doria, Dorgali, Codrongianus, and Benetutti, in the north. They are however unprovided with buildings or any sort of accommodation for invalids. Vestiges of antient thermæ exist at the sulphureous springs of Fordongianus, on the left bank of the Tirsi, but they are now quite forsaken.

The population of Sardinia amounted, in 1833, to 491,973. The island is divided for administrative purposes into eleven prefetture, or small provinces: Cagliari, Iglesias, Isili, Lanusei, Nuoro, Alghero, Busachi, Ozieri, Cuglieri, Tempio, Sassari. For ecclesiastical purposes it is divided into eleven dioceses: Cagliari, Oristano, Sassari, Galtelli-Nuovo, Iglesias, Ales, Alghero, Ampuriase Civita, Bosa, Bisarcio, and Ogliastra, which are subdivided into 382 parishes. Cagliari, Sassari, and Oristano are archbishop's sees. There are also three mitred abbots, 93 convents of monks, and 13 of nuns. (Serristori, *Statistica dell' Italia; Calendario Sardo.*) Few of the convents are possessed of considerable property in land, the majority being mendicants. The number of monks does not exceed 1500. The Roman Catholic is the only religion of the country, no other is tolerated, and the natives boast that no heresy ever spread to this island. The court of the Inquisition, existing for centuries under the Aragonese and Spanish dynasties, probably contributed to this result.

Sardinia is at present administered by a viceroy, appointed by the king for three years: he has a salary of 60,000 francs. Every viceroy, on his arrival at Cagliari, takes a solemn oath to preserve inviolate the statutes and privileges of the island. Sardinia has a representative parliament, called 'Stamenti,' consisting of the three orders or estates, after the manner of other kingdoms during the middle ages: namely, the ecclesiastic stamento, selected from the prelates, the archbishop of Cagliari president; the military stamento consisting of all nobles, with or without fiefs, under the presidency of the most antient feudal nobleman above twenty years of age; and the royal stamento, composed of the representatives of the towns, under the Capogiurato of Cagliari. Each stamento holds its sittings apart, in a separate hall, and after separately discussing the matter in debate, they communicate by deputies. The assembly of the stamenti is convened and holden by and during the king's pleasure, and can therefore constitute no permanent opposition to the royal will. The chief topic of discussion is concerning 'donativi,' or supplies requested by the sovereign. Still, when the stamenti have not been convened for a number of years, there has been repeatedly a loud outcry for them, and at times something like a popular insurrection.

The feudal system continues in activity, though considerably limited by the interference of the crown. The seignorial rights vary according to the terms of the investiture, but the feudal lord is required, in all cases, to assist his vassals and support them during imprisonment. Nobles are subject to civil and criminal prosecutions, just as commoners are, with the privilege however of delaying their answer to any question for twenty-six days. The children of noblemen, unless there be a 'fide commesso,' or entail, in which case the property goes to the eldest, generally share the patrimony equally among them at the father's death, except the married daughters, who, when they have received their dowry, have no further claim. Besides manorial peers, of whom only one, the lord of Anglona, bears the title of prince, the others being marquises and counts, there is a numerous class of inferior nobles and knights, who have the privilege of carrying arms. Like the priests, they pay nothing to the feudal lord, but only to the king and to the clergy.

Vassals in Sardinia are born free, and can change their lord and residence at will, but while on a lord's estate they are bound to feudal services and tenures, all above the age of eighteen paying annual tribute, either in money or kind, besides the usual imposts on the land and stock, the contributions for robberies and arson committed in the district, and for the exemption from the 'roadia,' or one day's personal labour, and from other dominical services. These taxes are levied in addition to the tithes, the royal imposts, alms (asked as a due, and never refused) to mendicant monks, and other demands, which in some places amount to seventy per cent. on the earnings of the vassal.

The Sards were of old a very mixed race, partly of Celtic and Iberian stock, and partly of Greek and Etruscan race, o which a considerable infusion of Carthaginian and afterwards of Roman blood was added. In later times Pisans and Spaniards settled in the towns and lower country, but n the highlands the population has remained comparatively unmixed, and may be considered as the real descendants of the old Sards, who struggled hard against both Carthage and Rome. The Sards are of a middle stature, and well formed, with dark eyes and coarse black hair, though fresh complexions and blue eyes are also seen in the mountains. In the Campidano they are more swarthy than in the north part of the island, and have generally a large mouth and hick lips. They have strong intellectual faculties, though mostly uncultivated, and an enthusiastic attachment to heir country and their native district, in consequence of which families seldom remove or disperse. They are kind and hospitable, but are easily offended and excited o revenge. Being accustomed from early age to the use of the gun, they are excellent marksmen, and will lie n ambush for their victim for whole days, until they have an opportunity of shooting him. If the family of the sufferer has influence enough to stir justice into active measures against the offender, the latter flies to he mountains, where he joins others of a similar decription, and becomes a robber. Some of these bands however will not molest strangers; they do not call themelves robbers, but assassins. They levy contributions on he villages and shepherds to supply themselves with neessaries. But on the eastern coast, near Terranova, Dorgali, Galtelli, &c., there are real bands of robbers, who both plunder and murder: they are designated by the name 'malviventi.' The government however has of late ears done much towards extirpating the robbers; it has bolished in a great measure the privilege of sanctuary; t has forbidden the use of fire-arms, except to the militiamen, the nobles, and other persons duly authorised; it has sent troops against the more obnoxious bands, and hunted and destroyed them. But as long as revenge is onsidered by all classes as a moral and hereditary obligation, outlaws will take shelter in the impracticable reesses of the mountains, where it is extremely difficult for he police and the military to discover and arrest them.

Italian is the language of the government, and is also poken by all educated persons in the large towns. The ative tongue, which varies according to districts, is a dialect f the old Romance [ROMANCE LANGUAGE], and is evidently erived from the Latin, with an admixture of words of Greek and Arabic origin. The natives of the Barbargia istrict pride themselves on the number of Greek words which they retain, and their distinct but harsh and guttural nunciation, which is with difficulty attained by the rest of he Sards.

The language is considered to be purest in the Goceano nd in the western district of Marghine, north of Oristano, ut it is most elegantly spoken in the Sulcis. At Alghero he Catalonian is generally spoken, the inhabitants being in reat measure the descendants of a Catalonian colony, stablished by Peter the Ceremonious, king of Aragon, in 355.

The nobles and citizens generally follow the fashions f Italy in their dress, but the country people have peculiar costumes. In the Campidano they wear a jacket or pelisse of undressed sheep or goat skins, with the fleece utside, the 'mastruca' mentioned by Cicero; that which is worn in the Gallura highlands is made of coarse native loth; in the west, near Bosa, and in the Sulcis, they wear the 'collettu,' or close sleeveless waistcoat of tanned leather, folding on the breast and reaching nearly to the nee. Some 'collettus' are made of yellow or reddish leather from France, decorated with large silver buttons in he Maltese style. The shirt is fastened at the neck by silver buttons, but no cravat is worn. The 'cabbanu,' or heavy dark-brown Maltese cloak, is much worn by the armers. In Cagliari the men of the lower orders wear a ed cap, but in most other parts of the island black caps are worn. The cap or net for hair is also much worn in the southern part of the island. In the highlands of Gallura and Barbargia the men let their hair hang loose over their shoulders, which, with their bushy beards, gives them a ferocious aspect. A kind of black kilt over loose linen drawers, with cloth leggings, completes the dress of the men.

The dress of the females in the towns is an imitation of the Italian fashion; most women wear the Genoese 'mezzaro,' or white veil, thrown over the head and shoulders; those of the upper class wear bonnets. The peasantry adhere to their peculiar costumes. In the northern districts the women wear their sleeves divided in the Greek fashion, and a coarse white net envelops their hair, like that worn by the men. The females of the Sulcis wear a shawl round their heads, and scarlet stockings; at Orosei the women wear a highly ornamented busk projecting from between the breasts, in shape not unlike the prow of a galley, and they have moreover the Oriental custom of covering their mouths. In some places the head is covered with a yellow cloth having a deep red border, as in some parts of the kingdom of Naples; in others with a fine linen tied loosely under the chin. The petticoat is made very full, with small plaits; the shift is buttoned at the neck; the corset is low, over which, on gala days, a rich embroidered jacket is worn, with loose cuffs and silver buttons. Corals, rings, rosaries, and crosses are worn in profusion.

The villages are generally large and well situated, but with unpaved narrow streets, mean houses, and a general want of comfort. Large dunghills disfigure the principal avenues. The villages in the Gallura are built of granite blocks, and in the other northern districts of freestone; but in the southern division of the island most houses in the country are built of sun-dried bricks. The dwellings of the peasants have generally only one story, without windows, or if they have windows, they are not glazed. A whole family often dwells in a single room, with their chickens, dogs, and kids, whilst the patient ass turns the corn-mill in a corner. In the centre of the room there is a square hole in the clay floor for the fire; the smoke finds its way through the door or any accidental crevice. There is generally a large bed in one side of the room for the elders, the sick, or the stranger, for hospitality to travellers is common, and inns are scarce. The younger members of the family do not sleep in a bed till they marry, but they lie down round the fire-place on mats, and frequently in summer in the open air. A few low chairs and a low table constitute the remaining moveables. In the towns there are some tolerable mansions, though comfortless inside, like those of South Italy, and the access is generally dirty. The number of beds indicates the importance of the owner, whose own room contains the saddles, bridles, arms, cordage, and other implements, besides hams and dried sausages, which are hung up, and cabinets filled with walnuts, cheese, pastry, and dried fruit.

Throughout the island the cittadini, or inhabitants of walled towns, hold the contadini, or villagers, in utter contempt, a feeling which is cordially returned by the rustics, besides which the people of Cagliari and those of Sassari mutually hate each other. Kissing on meeting is an indispensable custom among men of all ranks. The hostess welcomes a stranger by a shake of the hand, saying, in a kind tone, 'the stranger is welcome.' Females however never sit at meals with visitors. It is to the honour of the Sardinian women that they are generally moral and dutiful wives, and the baneful custom of the cavalier servente is unknown. The extreme jealousy of the Sards, and their summary mode of avenging an injury, have probably contributed to prevent its introduction. In conversation however the women talk very freely, and laugh heartily at indelicate allusions, as is the case in other southern countries. Among the peasants women are mere servants; they are busily employed about their children and poultry, in manufacturing their linen and 'orbacci' or coarse woollens, and in making bread, and fetching water.

The Sards are fond of feasting; they drink wines and cordials, though rarely to excess, and entertainments on particular occasions are given with a profuse hospitality. Fine wheaten bread is in general use, except among the shepherds of the eastern highlands, who eat a coarse kind of bread, and sometimes acorns. The Sards eat more butcher's meat than the Sicilians or South Italians. Poultry is rather scarce, but game is plentiful. The 'minestra,' or substantial soup, made of pulse, cauliflowers, or herbs, is a national dish, as in Italy; and maccaroni, fideli, and paste of various sorts are manufactured at Cagliari and other places, and are in much request.

The Sards are no great pedestrians: the only mode of travelling for both sexes is on horseback. There are few coaches, and those only in the large towns, and the country people regard them as articles of effeminate luxury. Till lately there were no carriage-roads in the island, but by a royal decree of 1822, a high road of 125 miles in length was ordered to be cut from Cagliari to Sassari through the length of the island, passing by Oristano, and keeping as much as possible along the western plains. It was however necessary to pass the ridge of Menomeni, which runs across the middle of the island, as well as the hills south-east of Sassari, where a fine zigzag road, called 'Scala di Giocche,' has been cut down the face of an abrupt declivity 600 feet high. The whole of the road is now finished, as well as branch roads to the most important towns in the interior. The eastern highlands however still remain difficult of access.

Field sports, such as hunting the boar, stag, or moufflon, as well as sporting for birds, are favourite amusements with the Sards. Their religious festivities and processions, to which they are much attached, afford them also periodical seasons for rejoicing: they are attended with great pomp, and generally end in a feast. Weddings are celebrated with much ceremony and rejoicing. Captain Smyth observed traces of many customs which the Sards have in common with the modern Greeks, in their dances, music, arms, dresses, marriage ceremonies, and superstitions. Some of these peculiarities seem to be derived from the Romans, such as a belief in bad or good omens, the evil eye, a dislike to mention death, and the howlings of the 'accabadore,' a kind of præficæ, who are hired for mourning. The 'accabadora' in the mountainous districts of Barbargia and others used to perform another office, which was to throttle or suffocate dying persons in hopeless cases, in order to shorten the agony; hence the name, which means a 'finisher,' but the practice was abolished in the last century through the remonstrances and exertions of a missionary called Padre Vassello. A belief in witchcraft and dæmoniacal possession is still prevalent, and exorcisms are resorted to as a cure in the latter case.

The laws in force consist of—1, 'La Carta de Logu,' which is a code written in the Sardinian dialect, consisting of 198 chapters, which was published in 1395, by Eleanor 'Giudicessa,' or ruler of Arborea and of the greater part of the island. This charter or code, though tinctured with the barbarity of the times, is remarkable for its equity and wisdom, and being well adapted to the habits and opinions of the Sards, has been adopted all over the island; it remains in force, with few modifications, to the present day. 2, the Royal Pragmatics, a body of laws written in Spanish, and consisting of 51 chapters, which was promulgated by Philip IV. of Spain, in 1633. To it has been added a commentary, by D. Francisco de Vico, regent of the supreme council of Aragon. 3, Capitoli di Corte. These are memorials and petitions laid before the kings of Spain by the national stamenti, with the answers and decisions of the sovereign. To these also has been joined a commentary, by D. Giovanni Dexart, a Sardinian jurist. 4, The royal edicts, and the 'Pregoni,' or ordinances of the viceroys since the island has been under the dominion of the house of Savoy. 5, The new civil code, published in 1830, by the late king Charles Felix. (*Calendario Sardo*, 1831.)

This multiplicity of laws, upon which numerous forms have been grafted, tends to embarrass the course of justice, and gives rise to much litigation and delay. The country judges are very poor, and venality is of common occurrence. Besides this, should a local magistrate prove more than usually active in his office, he is sure to rouse the vengeance of some of the parties, and Sardinian revenge respects no persons, neither magistrates nor priests. The effect of the whole system, especially in the remote districts, is a fearful insecurity of person and property. The superior courts which sit in the towns have a better character for impartiality, but the procedure is very imperfect. In criminal cases the judges in their interrogatories follow the old practice of inducing the accused to criminate himself, by browbeating and endeavouring to entrap him by insidious questions, a method known in Italy by the name of 'interrogatorio suggestivo.' Torture has been abolished in Sardinia, and the horrid tree for mangling and dislocating limbs which stood on one of the bastions of Cagliari, was pulled down in 1821, amidst the acclamations of the people. Culprits are still sometimes flogged through the streets upon an ass previous to execution. Common criminals sentenced to death are hanged, but nobles and lawyers are beheaded. Nobles accused of capital crimes are tried by a jury of seven peers.

The law is the chief profession for young men of respectable connections, as the whole regular force raised in the island consists of only one regiment, which is usually in Piedmont. The liberal arts afford no employment, and trade and commerce are considered ignoble. The highest legal rank is that of a member of the 'Supremo Real Consiglio' for the affairs of Sardinia, which consists of seven members, and sits at Turin. It is a supreme court, and decides finally upon all important matters, appeals, &c. It also examines the projects of law for the island, proposed by the king's ministers. The high court, called Reale Udienza, sits at Cagliari, and is divided into two sections, one for civil and the other for criminal cases. It is also a kind of council of state for the viceroy, and it proposes to the king candidates to fill up the vacant bishoprics and the judicial and juridical offices. A numerous train of fiscal advocates, solicitors, advocates for the poor, assessors, secretaries, and notaries is attached to the court. The Magistrato della Reale Governazione is a high court, which sits at Sassari for civil and criminal matters relating to the northern part of the island. There is an appeal from it to the Real Consiglio at Turin. In every town or considerable district of the island there is a magistrate called Vicar, in some places Podestà, or Consul in others, who, with an assessor and secretary, judges in the first instance for the town and surrounding territory. The prefects in each of the eleven provinces are also judges in civil matters. There is a commercial court at Cagliari called 'Consolato,' which decides all commercial suits, besides which the 'Regia Capitania' constitutes a sort of Admiralty court for the island. A court called 'Tribunale delle Contenzioni,' decides questions which arise between the ecclesiastical and lay powers; it consists of a judge called 'Cancelliere Regio Apostolico,' who is a clerical dignitary, and a secretary. This court was established in the latter part of the 14th century, in consequence of serious differences between the clergy and the sovereign, and has been sanctioned by several popes.

Sardinia is free from the burthen of the conscription, which has been entailed by the French revolution upon most countries of continental Europe. It furnishes by voluntary enlistment one regiment to the royal army, besides which it has its militia, an irregular force of about 6000 cavalry and 1200 infantry, the officers of which wear a uniform, but receive no pay. The privates have no distinguishing dress except a cockade which they wear on particular occasions: they are armed with a long gun, a knife, and a cutlass, and are expected to patrole the country to arrest malefactors, to repair to any point which might be invaded by an enemy, and to assist the Board of Health in preserving the coasts from contagion. Besides these there is a kind of yeomanry called 'Barancelli,' an armed association for protecting property, especially in the lowlands, against robbers. Every village has its party, under a captain annually selected from among the most respectable inhabitants, and he chooses his men. They maintain a strict watch during the night, from a certain hour in the evening, which varies according to the season, and is made known to the inhabitants by the sound of a bell, after which no one is allowed to be out of doors till the tolling of the morning bell. The barancelli are obliged to make restitution for all thefts. To become a barancelli a man must have property to a certain amount, and be well known for his integrity. During the year of his service, and the following year also, he is exempt from royal and baronial service, and has the right of bearing arms. The remuneration of the barancelli arises from every landholder paying an annual sum, the aggregate amount of which, after deducting the losses which may have occurred, is divided among the men at the end of the year. In the year 1819, Count Reve. the viceroy, disliking so many armed men about the country, wished to abolish the barancelli, and supply their place with regular cavalry from Piedmont, called Royal Carabineers, like the French gendarmes, but as they proved inefficient for want of local knowledge, and the deadly hatred of the peasantry against them, the king was obliged to restore the barancelli under the name of 'Caccintori Provinciali.' The

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hink it their duty to arrest robbers only, and not persons lying from justice for other causes.

These minute details are given for the purpose of showing he social and domestic condition of the island, which has emained almost unchanged since the middle ages, and which is a curious specimen of the former state of Italy, Spain, Portugal, and other countries of Western Europe.

The regular force in the island consists of about 3000 Piedmontese troops, distributed in the several towns. There re only three regularly fortified towns: Cagliari, Alghero, nd Castel Sardo. The coasts are defended by a line of tout towers, garrisoned by a body of coast-guards called Corrari, under the superintendence of a council of three nembers, chosen for three years, one from each stamento, nd are supported by a tax on exports. The naval force of he island consists of one armed brig and two gun-boats alled 'corridors.'

Scientific education is given by the two universities of Cagliari and Sassari, each being under the inspection of a ouncil, 'magistrato sopra gli studj,' of which the respective rchbishops are presidents. The university of Cagliari is atended by about 250 students, and has the faculties of theoogy, medicine and surgery, law, and philosophy, with a full ist of professors in each. Among the accessories are a ibrary of above 15,000 volumes and a cabinet of natural history and antiquities founded by the late King Charles Felix. The university of Sassari, frequented by about 180 tudents, has likewise five faculties, but with a smaller number of professors, namely, three for theology, five for aw, three for medicine, one for surgery, and five for philoophy and eloquence, or, as it is called, the arts. The accesory establishments consist of a cabinet of natural history, ounded in 1823, and a library of only 5000 volumes. An nteresting account of the university of Sassari was given in he 'Bollettino di Notizie Statistiche' of Milan for the year 834. Poor students from the country, while following heir course of studies, support themselves by acting as atendants, errand-boys, &c. to wealthy families in the town, nd are called 'Majoli.' In the head town of every province there is a 'Scuola di Latinita Inferiore; the aggregate umber of the pupils is about 6650, of whom above 1000 re in that of Cagliari. In pursuance of an ordinance of he late King Charles Felix, dated 1823, most villages have n elementary school for boys, in which reading, writing, nd arithmetic are taught, besides the doctrines of religion nd the elementary principles of agriculture. There are no ublic establishments for female education; those young emales who can afford it become for a time boarders in the onvents of nuns. It was stated some years ago by the Baron Ferussac, in the 'Bulletin Universel des Sciences,' rom authentic sources, that the results of elementary instruction and other improvements, such as the opening of oads and the establishment of a more effective police, which ave taken place within the last twenty years, were already elt in the manners and morals of the people, and that murders, for instance, which are said to have amounted nce to above 100 in one year, had decreased by about onealf.

The art of medicine is not in great repute among the ards, and they have a proverb, 'Bivi de miegu e mori iiserabile;' 'Whoever lives by the doctor dies miserably.' n almost every town there is an hospital for the sick, the nsane, and the foundlings, supported by bequests and oluntary contributions, and served by the Benfratelli, or Order of S. Juan de Dios.

Although sciences and literature are not much esteemed n Sardinia, yet the island has produced many learned men, f whom few are known beyond its precincts. The followig deserve particular mention:—Fara, author of the work De Rebus Sardois,' Cagliari, 1580; Father Madao, who as written on the language of Sardinia; the judge Mameli, ho published an improved edition of the 'Carta de Logu;' Matthejo, author of 'Sardinia Sacra,' fol., Rome, 1761; the irist and historian Azuni, and his opponent, Father Napoli, who has refuted, in his 'Note Illustrate,' many of Azuni's statements concerning his native country; Cetti, the author f a very creditable work on the natural history of the island, 'Anfibj, Pesci, Uccelli, e Quadrupedi della Saregna,' 3 vols. 8vo., Sassari, 1774; and lastly, Don Giuseppe Manno, who has published a good history of Sardinia, Storia di Sardegna,' 3 vols. 8vo., Turin, 1826, as well as a ittle work on the 'Vizi dei Litterati;' besides several poets, ither in the vernacular language or in Italian and Latin.

The mechanical arts are in a very low state; the guns of Tempio are in some repute, but the cutlery is of the commonest sort; the potteries are very coarse, and wooden platters are used by the country people; builders and carpenters are very indifferent workmen, besides which all artizans are extremely indolent. Superior workmen come from Piedmont or Genoa.

The principal towns of Sardinia are:—1, CAGLIARI, the capital and the residence of the viceroy. 2, Sassari, the head town of the north part of the island, situated on a gentle declivity, in a pleasant and fertile country, about nine miles from the coast, is little if at all inferior to Cagliari, and, from its healthiness and other circumstances, preferable to it as a residence. Sassari has a good main street, which is the only one paved, fine public walks, shaded by trees, outside of the walls, twenty-four churches, ten convents, three nunneries, a clerical seminary, the university, a college kept by the Jesuits, several palaces, among which those of the governor and of the duke dell'Asinara are the largest and most remarkable, a public hospital, two tolerable 'locande,' or inns, besides coffee-shops, and some good shops of various kinds, among others a bookseller's shop, a rarity in Sardinia; about 20,000 inhabitants. The cathedral is a large structure, with a very elaborate façade. Provisions are good, abundant, and cheap; fruit and garden vegetables are excellent, wine good, and of various sorts. The town has no springs or wells, but good water is brought to the houses by water-carriers, from a handsome fountain called del Rosello outside of the walls. Sassari was built in the seventh century of our æra, by emigrants from the antient town of Turris, which had been ruined by the Longobards. A fine road leads to Porte Torres, which is the nearest harbour; and where the mail packet puts in from Genoa twice a month. 3, ALGHERO. 4, Oristano, a town of about 4,500 inhabitants, in a low unhealthy plain, near the mouth of the Tirsi, has several churches and convents, a clerical seminary, a college kept by the Scolopj, and a spacious cathedral, with a detached octangular belfry, which is the most striking object in the town. A spiral staircase of 150 steps leads to the top, from whence there is a splendid view. Oristano is a busy lively place in the winter and spring, but in summer all those who can, leave it for a healthier residence. Several noble families inhabit the town. 5, Bosa, a town of about 3500 inhabitants, finely situated in a valley, between two flat-topped hills, on the north bank of the river Termo, a short distance from the sea. Bosa has nine churches, some convents, a clerical seminary, several paved streets, and a long bridge over the river. The country around is very productive of oil, wine, fruit, flax, cheese, &c., and the inhabitants are very active; most of the travelling pedlars about the island are from Bosa. But the town is extremely unhealthy in summer. 6, Iglesias, a pleasant town, in a healthy spot, on an elevated and fertile plain, amidst limestone hills, is abundantly supplied with good water, conducted by an aqueduct, 8000 feet in length, to a fountain in the centre of the town. The streets are dirty and ill-paved, but they contain some good houses. The cathedral and bishop's palace are remarkable structures. The town is surrounded by a dilapidated Pisan wall, and the remains of a castle are seen on a hill to the north. Iglesias reckons about 9000 inhabitants. 7, Tempio, the head town of the mountainous province of Gallura, in the north-eastern highlands, stands in a very healthy situation; it has several large houses three stories high, built of granite, with wooden balconies, a collegiate church, a nunnery, a Scolopj college, and about 6000 inhabitants. The general appearance of the town is gloomy, as well as the dark dresses, black bushy hair and beards of the men, and the Moorish costume of the women, who, though generally handsome, stalk about with a coarse woollen petticoat turned over their heads so as to conceal their faces. 8, Quartu, east of Cagliari, near the sea-coast, has about 5000 inhabitants, and carries on considerable trade in wine, fruit, and fisheries. 9, Villacidro, at the foot of the mountains north-west of Cagliari, in a healthy situation, has 5500 inhabitants. 10, Osilo, on a mountain 2000 feet above the sea, east of Sassari, has 5400 inhabitants. 11, Sorso, in the same district, has 4000 inhabitants. 12, Bonorva has 4000 inhabitants. There are many large villages of between 2000 and 3000 inhabitants, scattered all over the island.

History of Sardinia.—Iolaus is said to have led a Greek colony into Sardinia, and to have founded Olbia on the north-east coast, afterwards a considerable town in the Roman period, and of which vestiges are found near Terranova.

Strabo (p. 225) says that the colonists of Iolaus inhabited the island jointly with the barbarians, who were Tyrrheni. From an inscription found at Stampace, it appears that Caralis or Cagliari assumed at one time the name of 'Civitas Iolæ.' The island became well known to the Greeks, and Herodotus (v. 106) mentions that Histæus of Miletus promised to Darius the son of Hystaspes that 'he would render the great island of Sardo (Sardinia) tributary to his power. According to Pliny, Timæus called the island Sandaliotis, from its resemblance to a sandal: it was also called Ichnusa by the Greeks, from its likeness to the print of a foot.

Nura, afterwards one of the chief towns of the island, is particularly noticed in the Roman period on account of the inhabitants having accused the prætor Scaurus of malversation, on which occasion Scaurus was defended by Cicero. But the ante-Roman origin of Nura is proved by one of those singular structures called Nuraggi, which is a large cone, constructed of coarse blocks without mortar, and flanked by four small ones, upon which rests the foundation of a Roman aqueduct that supplied Nura with water. There are also at Nura other Roman remains, such as a small theatre, baths, &c., all very much defaced. Nura is said to have been destroyed in the wars of the Vandals. The Nuraggi are attributed by some to Iberian colonists and their leader Norax. They are a kind of tower in the form of a truncated cone, constructed of large blocks of stone, lava, porphyry, or freestone, without cement, and forming two concentric walls, between which are stairs leading to the summit. The inner part has generally two vaulted rooms, one above the other. The entrance at the base is very low, and leads through both walls to the lower chamber. The stairs give access to the upper chamber. The Nuraggi are of two sorts; the most common, and probably the most antient, bear no marks of the chisel, and are constructed of massive blocks, with irregular faces, and smaller stones in the interstices. The exterior materials of the others are evidently worked by tools; and though the stones are not exactly square, they are placed in horizontal layers, and gradually diminish in size towards the summit. The Nuraggi stand generally on the summit of hills commanding a view of the plains. Some rest upon a solid and spacious substructure or platform walled round in the same manner, and in which are constructed hidden chambers, which communicate with the central one by a covered gallery. Captain Smyth gives the plan and section of one of these, which is in the plain of Giavesu near Bonorva. It is about 40 feet high, including the substructure, and the cone is about 40 feet in diameter where it rises above the substructure. One of the loftiest Nuraggi is between Samagheu and Fordungianus, in the district of Busachi, east of Oristano: it is nearly 60 feet high, and is called by the natives 'Su Nuraggi longu.' Nuraggi are scattered all over Sardinia, to the number of several hundred, and are seen in every state, some nearly perfect, others a heap of rubbish. They are very numerous in the district of Sulcis, or the south-west part of the island, and also in the hilly region of Le Marghine, north of Oristano. There are also fine specimens of them in the Campo d' Ozieri, and at Isili and Gennuri in the Campidano. The original purpose of these buildings was probably for watch and defence, though in after-ages some of them may have been used as monuments for the dead, fragments of Roman terracotta and coins of the Empire having been found in them; neither literal nor symbolical characters are discovered in these singular structures.

The first Carthaginian expedition to Sardinia, of which the epoch however is not ascertained, was led by Machæus, or Malchus, or Melech, who landed on the island, but was defeated by the natives, for which he was banished on his return to Carthage. Some time after, about 490 B.C., Hasdrubal and Hamilcar, sons of Mago, led another expedition to Sardinia, which gained a footing in the southern part of the island, and built or colonized Caralis and Sulcis. Hasdrubal however lost his life in fighting against the natives, who appear to have struggled bravely against the invaders.

We have no account of the wars of the Carthaginians in Sardinia, but it appears that they never reduced it entirely, as the natives took refuge in the mountains, ever ready to rise at any favourable opportunity. The lower country however was permanently in possession of the Carthaginians until the first Punic war. Sulcis was one of their chief colonies, but the site of that once wealthy town is now a subject of controversy, some placing it on the southern coast, where a district still retains the name; whilst others, with more plausibility, place it in the small island opposite, called S. Antioco, north of the town of that name, where considerable remains of walls, of a moat, and an extensive necropolis are seen, and where, in 1819, an inscription was found, in which Sulcis is styled a Roman municipium, and the name of the chief magistrate, L. Corn. Marcellus, is recorded. In the same neighbourhood, in 1820, part of a brass armour was discovered, which is now in the museum of Cagliari, and which is believed to be of Greek workmanship. (Grassi, *Ricerche Storiche intorno alle Armature scoperte nell' Isola di S. Antioco.*) In the neighbouring island of S. Pietro an amphora full of Carthaginian brass coins was found by a farmer in ploughing the ground, while Captain Smyth was at anchor near the spot.

During the first Punic war the Romans attacked and defeated the Carthaginian fleet at Olbia, where Hanno, the commander, fell; and again they gained another naval victory over the Carthaginians at Caralis, but they do not seem to have got a permanent footing on the island, which at the conclusion of the war still belonged to Carthage. But the mercenary troops that garrisoned the island, following the example of those at Carthage, revolted, and killing their commander Bostar and the other Carthaginians, took possession of the principal strongholds, and committed all kinds of depredations on the natives, who rose in arms, and at last drove them away. The mercenaries repaired to Italy, where they were countenanced by the Romans, eager for a pretence to seize upon that fine island. Taking advantage of the condition of their rivals, who were just released from the horrors of the war of the mercenaries, the Romans threatened Carthage with a new war unless Sardinia were formally made over to them. The Carthaginians were obliged to comply, besides paying the expenses of the Roman armament. The Romans, under T. Manlius Torquatus and M. P. Matho, met with considerable resistance from the Sards, but they succeeded in subjugating the principal part of the island, which was incorporated, with Corsica, into a Roman province, under a prætor, about B.C. 228.

After the breaking out of the second Punic war, the Sards, weary of their Roman masters, applied to Carthage for assistance. The Roman garrisons were in a weak state, and the prætor Q. M. Scævola was ill from the climate. The senate sent T. M. Torquatus with reinforcements to Sardinia, where he found the natives of the central part in open insurrection, under a chief called Arsicorus, who was soon after joined by a Punic force. A general battle took place near Caralis, in which the Sards and Carthaginians were utterly defeated, and Cornus, the stronghold of the insurgents, surrendered to the Romans. (Liv., 23, c. 40, &c.) After this Sardinia remained quite during the rest of the Punic war.

About 178 B.C., Sardinia, being in a state of open insurrection, was made a consular province, and T. Sempronius Gracchus was sent to it with an additional force of two legions and 12,000 Latin confederate troops. Sempronius defeated the Ilienses, the supposed descendants of some Trojan emigrants, and the Balari, another fierce tribe, believed to be the descendants of Iberian colonists, who lived in the eastern highlands. All the people of Sardinia returned to the allegiance of Rome, and a double tribute was imposed upon them. The number of prisoners brought to Rome, and there sold in the market as slaves, gave rise to the proverb 'Sardi venales,' which, from its double meaning, was afterwards construed into a term of reproach. It was stated that 80,000 Sards had either fallen or been made prisoners.

Caius Gracchus, the son of Sempronius, being questor in Sardinia, the Barbaricini, or mountaineers of the district still called Barbargia, revolted again, and another expedition was sent from Rome to subdue them, on which occasion bloodhounds were employed. Gracchus was accused by his enemies at Rome of courting undue popularity with the Sards to the detriment of his own country. He repaired to Rome, and eloquently defended himself from the charge, stating that it was true 'he had neither exacted forced gifts, nor torn women from the arms of their husbands, nor brought away vases full of money after emptying the wine out of them, as many other Roman officers had done; but that he had gone to Sardinia with a full purse and had returned with an empty one.' His vindication so pleased the people of Rome, that they elected him tribune.

During the great civil wars Sardinia shared the calam ies of the rest of the Roman provinces, following alternately the fortunes of Marius or Sulla, of Cæsar or Pompey. By the peace of Misenum, Sextus Pompey retained Sardinia with Sicily and Achaia. But his freedman Menodorus, who was prætor of Sardinia, forsaking his master, gave up the island to Octavian. The island remained quiet during the period of the Empire, being considered by the Romans as one of their granaries and a penal colony for their criminals.

Tiberius sent thither 4000 Jews to make war upon the freebooters who plundered the country, or to die of its malaria. Pliny (iii. 7) mentions Caralis, Sulcis, Nora, and other places as towns that had the Roman civitas, and Turris Libysonis as a colonia.

After the death of Valentinian III., Genseric, king of the Vandals, invaded Sardinia from Africa. The emperor of the East, Leo, sent an expedition against Genseric, which retook Sardinia, but the latter soon after recovered possession of it. His son Hunneric, being an Arian, like his father, persecuted the Catholics or orthodox with great cruelty, as well as his successors. Sardinia became a place of banishment for the orthodox prelates of the Vandal dominion. After he overthrow of the Vandal kingdom by Belisarius, Sardinia was annexed to the prefectship of Africa, and was governed by an officer styled duke. About A.D. 594, Zabardy, duke of Sardinia, having defeated the tribe of Barbaricini, obliged them to abandon idolatry as a condition of pardon. This forced convention however was eluded by many, and the archbishop Januarius went to Rome to complain that by giving a fee to the military officers of the emperor, the natives were allowed to sacrifice to their heathen deities.

Pope Gregory the Great, in his Epistles, complains of the oose conduct of the clergy of Sardinia. The Saracens began, about the year 720, to ravage the coasts of Sardinia; and as the Byzantine emperors were unable to protect their distant dependencies, the natives applied for assistance first to the Longobards, and afterwards to Louis le Debonnaire, Charlemagne's son, to whom they tendered their allegiance.

About the year 1000, Musait, a Moorish chieftain, sailed from Africa to Cagliari with a large force, took it, and conquered the greater part of the island, and assumed the title of king of Sardinia.

Musait, not content with the possession of Sardinia, sent from thence armed vessels to ravage the coasts of Italy. The pope issued a bull against him, offering the investiture of the island to those who should drive him out of it. The Pisans sent an armament which took possession of Cagliari. Musait came with a strong force by sea and by and, A.D. 1015, and obliged the Pisan garrison to capitulate, but massacred the Pisans as they came out of the town. Musait then sailed for the coast of Luna in Italy, and surprised and sacked that town. He was however attacked in his retreat, and lost most of his men, and even his wife, who was taken prisoner and beheaded. Musait escaped o Sardinia. The pope's legate now persuaded the Genoese o join the Pisans against Musait. The combined forces f the two republics attacked the Moors and drove them way from both Sardinia and Corsica (A.D. 1016-1017). After this 'the Genoese kept for themselves Corsica and Capraja, and the Pisans had Sardinia.' (P. B. Burghi, *De Dominio in Mari Ligustico.*) Musait however, having obained reinforcements from Africa, was still in the field in Sardinia, when the Genoese again assisted the Pisans in riving him away, A.D. 1022. The island being finally leared of the Moors, the Pisans divided it into four proinces, called Giudicature, and appointed Pisan noblemen ver each, styled 'Giudice,' each independent of the others, ut all feudatory to Pisa. Cagliari in the south, Torres in he north, Gallura in the east, and Arborea or Oristano in he west, were the names of the four judicatures. Some laces along the northern coast were however assigned to he Genoese, among others Castel Sardo, which was for a ong time in the possession of the Doria family, who built castle near it, still called Castel Doria.

The republic of Genoa however was dissatisfied at not aving a larger share of the island, and this creating a feelng of bitter animosity, led to those disastrous wars between Pisa and Genoa, which, after a lapse of more than two enturies, ended with the ruin of the maritime power of he former. [Pisa, History of.] Sardinia meantime ontinued under its 'judges' liege to Pisa, till 1164, when Barisone, judge of Arborea, instigated by the Genoese, offered to the emperor Frederic I. a sum of 4000 silver marks, besides an annual tribute, for the investiture of the crown of all Sardinia, and he was actually crowned at Pavia by the bishop of Liège, acting for the emperor, the commune of Genoa being security for the payment. The other three judges however were not disposed to submit to Barisone, who appears to have been a shallow-headed man, and having received assistance from Pisa, they ravaged the territory of Arborea. The Genoese as protectors of Barisone, whom they kept in custody at Genoa for his debts, laid claim to his dominions, and sent a fleet to Sardinia, which sacked and burnt the city of Torres. After the war had lasted ten years, Barisone, who had been released from custody, made his submission to the authorities of Pisa. The dominion of the island however remained long after a constant subject of contention between Pisa and Genoa, whilst the lords of the various provinces made themselves independent in reality. The emperor Frederic II. took advantage of this to make his natural son Hentzius king of Sardinia. For this purpose he negociated, in 1238, a marriage between him and Adelasia, the relict of Ubaldo, judge or prince of Gallura and Torres, who had however already made a bequest of her territories in favour of the papal see, in case of her dying without issue. Hentzius was proclaimed king of Sardinia, and having possession in right of his wife of the two northern judicatures, he added to them that of Arborea, whose judge, Pietro di Capraia, had thrown off his allegiance to Pisa. Cagliari alone continued in the allegiance of the republic. The subsequent disputes however between Frederic II. and the pope made Hentzius and the Pisans, who were Guibelines, join together against the pope and the Genoese, and their combined fleet defeated, in 1241, a Genoese squadron, and took twenty-two galleys with a number of prelates, apostolic legates, and ambassadors, who were going to Rome to attend the general council convoked by Pope Gregory IX. Hentzius distinguished himself for his bravery and determination both in Sardinia and Sicily, where he fought for many years for his father against the pope and the Guelphs, until he was taken prisoner by the Bolognese in 1249, who kept him in confinement for the rest of his life, during which he bore the title of King of Sardinia. His title was however a mere name, and the various judges of the island ruled as independent princes, whilst Pisa and Genoa continued to fight for their respective claims to the nominal sovereignty. Cagliari and some other towns continued to be garrisoned by Pisan troops. After the defeat of the Meloria (A.D. 1284), by which the Pisan naval power was annihilated, proposals were made by the Genoese to release their numerous prisoners, provided Pisa would make a cession of Sardinia, and give up the castle of Cagliari into the hands of the Genoese; but the prisoners themselves, it is reported, protested against recovering their liberty at such a price. Some years after, Nino Visconti, judge of Gallura, related to the famous count Ugolino, acted a considerable part in the civil broils of Pisa, which ended with the catastrophe of Ugolino and his family.

In 1297, pope Boniface VIII., wishing to obtain the crown of Sicily for his protegé Charles II. of Anjou, king of Naples, induced James of Aragon to give up Sicily, in exchange for which Boniface, in the plenitude of his assumed power of disposing of crowns and principalities, gave James the investiture of the kingdom of Sardinia as a fief of the see of Rome. Although the Sicilians themselves did not consent to the exchange, and proclaimed Frederic, James's brother, as their king, the investiture of Sardinia was confirmed to James by pope Clement V., in 1309. James however was not ready to enforce his claim till 1323, when he made large preparations on the coast of Catalonia for an expedition to Sardinia. The Pisans reinforced their garrisons in the island, and granted an amnesty to all outlaws who should enlist in their service. Hugo, judge of Arborea, however threw off his allegiance, and in order to facilitate the Aragonese occupation, he laid a plot for massacring all the Pisans in his dominions, which extended over the whole western part of the island. The plot being executed with the most merciless punctuality, he dispatched a messenger to Barcelona to hasten the departure of the expedition. In June the Infante Don Alonso arrived in the Gulf of Palmas, and having landed his troops, was joined by Hugo and some of the native nobles, who tendered their allegiance to his father the king of Aragon. The combined forces then besieged Iglesias, and after several months' resistance the Pisan garrison capitulated through famine. The Infante then proceeded to blockade Cagliari by sea and land. A Pisan fleet of fifty-two galleys arrived in the gulf in the spring of 1324, and landed a body of troops, which were joined by some of the natives, but being defeated by the Aragonese, a treaty was concluded by which Sardinia was given up by the republic to the crown of Aragon, on condition that the Pisan inhabitants and their property should be respected, and that the castle and suburbs of Cagliari, with the port, and the adjoining lakes should remain in possession of Pisa, on payment of an annual tribute as a sign of homage to the king of Aragon. This arrangement did not last long; mutual recriminations took place between the parties, and in the following year, the Pisan squadron being entirely defeated by the Aragonese in the Bay of Cagliari, the town was evacuated, and Sardinia was entirely lost to Pisa. But the judges were no more inclined to submit to their new masters than to the Pisans, and being assisted by the Genoese colonists of Castel Sardo and Castel Doria they blockaded Sassari, and carried on for many years a destructive warfare against the Aragonese. At last Peter the Ceremonious, king of Aragon, landed in 1354 with a strong force at Porto Conte, and having traversed and pacified the principal part of the island, made his public entry into Cagliari, where in April of the following year, with a view of checking the influence of the factious chiefs, he convoked a general parliament, after the model of the Cortes of Spain, consisting of prelates, peers, and commons, which was called 'Stamenti,' or Estates. He thus laid the foundation of a representative government in Sardinia, which, although on a contracted basis, has been the means of saving the island from military despotism, and still subsists at the present day. Neither Mariano, judge of Arborea, nor Doria, the head of the Genoese faction, attended the congress; and after Peter had returned to Spain, Mariano intrigued with pope Urban V. to obtain the investiture of the island for himself. His death in the plague of 1376 prevented his succeeding in his projects, and his son Hugo, who was as ambitious as his father, was murdered by his own subjects at Oristano in 1383. Brancaleone Doria, who had married Eleanor, daughter of Mariano, offered his services to the king of Aragon to bring the whole of Sardinia into subjection; but his wife, who was equally as ambitious as her father and brother had been, put herself at the head of a strong party of natives, who named her son judge of Arborea. Brancaleone, who had gone to Spain, was detained there as a hostage, and after fruitless negociations, Eleanor took the field, being joined by the people of Gallura, and drove the Aragonese from almost the whole northern division of the island. She ruled for several years by the name of 'Giudicessa,' but in fact as queen of Sardinia, and she compiled for her subjects the 'Carta de Logu,' or code of laws already noticed. This remarkable woman died of the plague in 1403, and her only son dying in 1407, without issue, the Sards invited over the viscount of Narbonne, husband of Beatrice, Eleanor's sister. But the viscount found an opponent in Brancaleone Doria, who after his wife's death had taken possession of Arborea, and was supported by the Genoese in the north. Martin, king of Sicily, son of Martin of Aragon, being then in Spain, urged his father to prepare an expedition for the recovery of Sardinia. The nobility of Catalonia, Valencia, and Aragon were summoned for the purpose, and the armament, headed by the younger Martin, sailed from Barcelona in the spring of 1489. Having landed and entered Cagliari, he issued from thence with 8000 foot and 3000 horse against the forces of both Doria and the Viscount, who had united against him. A battle took place at S. Luri, in June, 1409, in which the Aragonese obtained a complete victory, Doria was taken prisoner, and the Viscount fled precipitately. Martin however died shortly after of the malaria fever, and the Viscount continued to carry on the war. At last Alfonso V. of Aragon obtained the formal cession of the province of Arborea, in 1428, by paying 100,000 gold florins to the heir of the late viscount of Narbonne, and the whole island became subject to the crown of Aragon. In 1492 Ferdinand the Catholic established the Inquisition in Sardinia, and ordered the expulsion of all Jews who refused to be baptised, and their synagogues to be converted into churches. From that time the Jews have not been tolerated in Sardinia.

By the union of the crowns of Aragon and Castile, Sardinia became an appendage of the vast Spanish monarchy, and was ruled for two centuries by triennial viceroys sent from Spain, under whose administration the country sunk into decay, like Sicily, Naples, and the rest of the Spanish dependencies. In the war of the Spanish succession the mountaineers of Gallura having declared themselves for Charles of Austria, an English fleet under Sir John Leake appeared before Cagliari, and the viceroy capitulated, and the island acknowledged Charles; but by the peace of Utrecht, in 1713, Charles having resigned his claims to Spain, Sardinia was given to him as emperor. In 1717 Alberoni, the minister of Philip V., sent a large force in the midst of peace, under the Marquis de Lede, which took possession of Sardinia in less than two months. [ALBERONI.] By the treaty of London of 1720, Philip was obliged to restore Sardinia, which was finally given to Victor Amadeus, duke of Savoy, who then assumed the kingly title. From that time the history of Sardinia becomes closely connected with that of the house of Savoy. [SARDINIAN STATES.] Under the government of that dynasty Sardinia has materially improved. King Charles Emmanuel III., in particular, has been a great benefactor to Sardinia. Overgrown abuses in the local administration were corrected, a better police was formed, the national laws were confirmed, education was encouraged, Monti Frumentarii were founded for the assistance of small farmers, commercial tribunals were established, as well as the post-office, the Board of Health, and other institutions of civilised states.

In December, 1792, the National Convention, having declared war in the name of the French Republic against the king of Sardinia, sent a lage fleet under Admiral Truguet to attack the island. The Sards however had made some preparations for resistance, and the French, on anchoring before Cagliari, in January, 1793, met with a hot reception from the forts and batteries, whose fire greatly damaged their ships. They landed 5000 men near Quartu, but were repulsed by the natives, who are generally good marksmen and accustomed to the use of fire-arms. A storm which arose completed the discomfiture of the expedition, by the loss of a line-of-battle ship and several smaller ones. The French admiral, after uselessly bombarding the town for several days, reimbarked the soldiers and sailed away, leaving several hundred men killed or prisoners.

The king of Sardinia, pleased with his insular subjects, invited them to ask for anything that they might think useful for the island. The Sards demanded, 1, the convocation of the stamenti; 2, the confirmation of their laws, customs, and privileges; 3, that all offices in the island, except that of viceroy, should be held by natives; 4, the establishment of a council to advise the viceroy; 5, permission to send a minister to reside at Turin and watch over their interests. The Piedmontese ministers however dissuaded the king from listening to the petition; situations continued to be filled with Piedmontese, and the consequence was that insurrections broke out in 1794 and 1795, and the commander-in chief and the intendant-general were killed by the people of Cagliari. By the mediation however of the archbishop of Cagliari and of the pope, a general act of amnesty was proclaimed in 1796, and some of the demands of the islanders were granted. When King Charles Emmanuel IV. was driven away by the French from his continental states, the Stamenti of Sardinia sent a deputation to him at Leghorn to assure him of the entire devotion of the people. The king and his family landed at Cagliari, in March, 1799, where they where received with enthusiasm. The king however returned soon after to the Continent, and in 1802 abdicated in favour of his brother Victor Emmanuel, who, having lost all hopes of recovering his continental dominions, repaired to his island kingdom in February, 1806. Protected from external attack by his alliance with England, Victor resided in Sardinia till the fall of Napoleon, in 1814. During his residence at Cagliari he paid much attention to the agriculture of the island, as well as to the administration, but his pecuniary means were very limited. Still he was liked, although the expenses attending the residence of a court, however modest, as it necessarily was, pressed heavily upon a people under feudal tenure. Some local disturbances occurred in 1807, in the northern part of the island, the people of which have always been more easily excited than those of the south. On this occasion the insurrection assumed something of the character of a servile war, the peasantry against the nobles, the former pretending to be zealous for the predominance of the king's authority over the feudal aristocracy. Many of the baronial palaces were destroyed, among others that of Sorso, a town of 4000 inhabitants north-east of Sassari. At last the king's troops quelled the insurrection, and several of the leaders, who were not all peasants, were either executed or condemned to prison for life, which, in the present state of the Sardinian prisons, is worse than death.

In 1814 Victor Emmanuel returned to Turin, leaving his brother Charles Felix, duke of Genevois, viceroy of the island. In 1821, in consequence of the abortive insurrection of the Constitutionalists of Piedmont, Victor abdicated in favour of his brother, who took much interest in the affairs of Sardinia. Charles Felix was the founder of the Agrarian Society and of the museum of Cagliari; and he was the first to plan and execute a great carriage-road throughout the island.

SARDES (Σάρδεις), the antient capital of Lydia, now *Sart*, was situated in the spacious valley of the Hermus, and on the Pactolus, one of the tributaries of that river. The south side of the valley is bounded by the lofty range of Tmolus, the highest summits of which are generally covered with snow. The most remarkable feature in the site of Sardes is the Acropolis, one side of which, towards Tmolus, is so steep, that in the time of Crœsus, when the rest of the Acropolis was fortified, this part was considered secure against an enemy. It was on this side however that the place was taken by the Persians under Cyrus (Herod., i. 84). The Acropolis is continually crumbling, and it presents a very rugged and fantastic outline. There are the remains of a large and magnificent temple, the western front of which is on the bank of the Pactolus, and the eastern under the steep rock of the Acropolis. Two columns of the exterior order of the east front, and one column of the portico of the pronaos, with their capitals, are still standing; but the columns are nearly half buried in the accumulated soil. It is probable that the greater part of the temple might be discovered by an excavation. The capitals are Ionic, and exceedingly fine specimens of the order. (Cockerell.) There are the remains of two Christian churches, one of which is constructed of magnificent fragments of older buildings. Under the north side of the Acropolis there are traces of a theatre and an adjoining stadium: the exterior diameter of the theatre was 396 feet, and the interior 162. It is uncertain what the building was, commonly called the Gerusia, the remains of which are in the plain to the west of the Acropolis. Sart is now a miserable place, consisting of a few mud huts.

According to Strabo (p. 625), Sardes, though an antient city, was of more recent origin than the date of the Trojan war. Sardes was the capital of the Lydian kings, whose dynasty ended with Crœsus. After Asia Minor came under the dominion of the Persians, it was the residence of the Persian governor of this part of Asia. In the reign of Darius the place was surprised by the Ionians, aided by the Athenians, and the greater part of the city was burnt, owing to a soldier setting fire to the houses which were thatched. (Herod., v. 101.) When Alexander the Great entered Asia on his Persian campaign, Sardes surrendered to him. In the time of Tiberius, Sardes, with other cities of Asia Minor, suffered much from an earthquake, but the calamity was alleviated by the munificence of the emperor. (Tacit., *Ann.*, ii. 47.) Sardes was one of the seven churches of Asia mentioned in the book of Revelation. Julian, in his attempt to restore the heathen worship, built altars at Sardes, and repaired some of the temples.

Lake Gygæa is about five miles north of Sardes, and the burial-places of the Lydian kings were near it. The barrows are of various sizes, covered with green turf, and many of them retain their conical form. One, which is of much superior magnitude to the rest, is the mound of Halyattes. [HALYATTES.]

SARDINIA. [SARDEGNA.]

SARDINIAN STATES (STATI SARDI) is the name of the dominions of the house of Savoy, which constitute a monarchy, the head of which derives his title of king from the island or kingdom of Sardinia. These states consist of —1, the duchy of SAVOY; 2, the principality of PIEDMONT, in its larger sense; 3, the duchy of GENOA; 4, the county of NIZZA; 5, the island of SARDEGNA, which forms a separate state, and has its own distinct administration. A geographical description of each of these great divisions is given under their respective heads. The continental territories, 'Stati di Terra Ferma,' which have a population of 3,675,000 and an area variously stated by some at 16,000 and by others at 17,000 square Italian miles (60 Italian miles to a degree of latitude), have now one uniform system, administrative and judicial, being divided into 40 provinces, namely: 1, Savoy Proper, chief town Chambéry; 2, Tarantasia, chief town Moutiers; 3, Maurienne, chief town St. Jean; 4, Haute Savoie, chief town Hopital; 5, Genevois, chief town Annecy; 6, Carouge, chief town St. Julien; 7, Faucigny, chief town Bonneville; 8, Chablais, chief town Thonon; 9, Aosta; 10, Susa; 11, Valsesia, chief town Varallo; 12, Ossola, chief town Domo d'Ossola; 13, Pallanza; 14, Biella; 15, Novara; 16, Vercelli; 17, Lomellina, chief town Mortara; 18, Casale; 19, Torino; 20, Pinerolo; 21, Alba; 22, Saluzzo; 23, Cuneo; 24, Asti; 25, Alessandria; 26, Mondovi; 27, Acqui; 28, Ivrea; 29, Tortona; 30, Voghera; 31, Bobbio; 32, Novi; 33, Genova; 34, Savona; 35, Albenga; 36, Oneglia; 37, San Remo; 38, Nizza; 39, Chiavari; 40, Spezia. An account of most of these provinces and their chief towns is given under their respective heads, as well as under the names of some of the old divisions of the country, such as MONFERRATO and NOVARA.

Each province is administered by a political officer called intendente, appointed by the king. The province being an aggregate of communes, each commune has a sindaco, or maire, who is subordinate to the intendente. For judicial purposes, each province has a collegiate court, called Tribunale di Prefettura, which sits in the chief town. There is no jury in the Sardinian states. The provinces are divided into districts called Giudicature, in each of which there is a judge called Giudice di Mandamento, answering to the French Juge de Paix, with a secretary. There are in all 412 of these giudicature. There are four supreme courts, which are also courts of appeal from the Tribunali di Prefettura, and which are called Senato. The senate of Turin has jurisdiction over all the provinces of Piedmont in its most extended sense, that is to say, all the provinces on the Italian side of the Alps and north of the Ligurian Apennines. The jurisdiction of the senate of Genoa extends to all the provinces of the duchy of Genoa, with the exception of San Remo. That of the senate of Nizza extends to the provinces of Nizza, Oneglia, and San Remo. The senate of Savoy, which sits at Chambéry, decides all suits within the limits of the duchy of Savoy. Each senate forms two chambers, one for civil and the other for criminal matters. All trials for felony or high treason appertain to the senate. The senate registers all edicts, letters patent, and ordinances of the king, and is allowed to make remonstrances upon the subject of them; and it also decides contests concerning jurisdiction between the various authorities, as well as between the ecclesiastical and lay courts. In these and other important questions the two classes or chambers of the senate join in one body. The senators vote with closed doors; the president collects the votes, and secrecy concerning the individual votes is strictly enjoined on pain of dismissal. The senators are named as vacancies occur by the king for life, after a previous examination of the candidate by the senate, and they can only be dismissed for grave misconduct by a sentence of the senate itself. They are generally men of high character and acquirements, they have good salaries, and their probity is considered above suspicion.

A court styled Regia Camera dei Conti sits at Turin, and decides in all fiscal and feudal suits, for although political feudality is abolished, manorial and other territorial rights still remain, as well as Castellanie, or manorial courts, for petty suits; it acts also as an audit court over the treasury accounts, and also as a criminal court for all offences against the fisc, for the crime of coining, and also for malversations of the administrative officers. There is an admiralty court, which sits at Genoa.

Commercial courts are established at Turin, Chambéry, Nice, Genoa, Chiavari, Savona, Novi, and San Remo. Those of Turin, Chambéry, and Nice are called Consolati; the others, Tribunali di Commercio.

Ecclesiastical courts, Curie Vescovili, exist in every diocese; their jurisdiction comprehends matters relating to marriage and the misconduct of clerical persons, but for graver criminal charges ecclesiastics are tried by the respective senates, which judge also in civil matters concerning members or bodies of the clergy.

The old continental territories of the house of Savoy were administered till lately by the Reali Costituzioni, a compilation of numerous edicts and decisions of the dukes of Savoy, which was published in 1770, and is mainly based on the Roman and canon laws. The penal laws were very severe; blasphemy and sacrilege were punished by the galleys or death; a very extensive interpretation was given to the crime of high treason, which was punishable in most cases by death and confiscation; the same penalties were inflicted on duellists; domestic theft was punished in most cases by death; the body of a suicide was hanged; usury was punished by confiscation; the use or simple possession of offensive weapons was punishable by the galleys; libels were left to the discretion of the judge, who could inflict even the punishment of the galleys for life, according to the circumstances of the case. Correctional matters were left entirely to the discretion of the 'Tribunali di Prefettura.' The method of proceeding in criminal cases is the same as it was in the last century in most other parts of continental Europe, and still is in some, that is to say, secret, the depositions being taken in writing, and the witnesses, as well as the accused, being examined privately by the instructing judge, and often by the judge di mandamento, or local justice of the district where the offence had been committed; upon which the fiscal advocate, or king's attorney, draws the act of accusation, a copy of which is given to the accused, whose counsel replies to it in his defence. One of the judges delegated for the purpose examines the acts of the proceedings for and against the accused, and makes his report to the court, which, after examining and comparing the conclusions of the fiscal advocate with those of the council for the defence, pronounces its sentence. Neither the accused nor the witness appears before the court, nor is the accused confronted with the witnesses against him, except in rare cases.

The punishment of the wheel, which was in use in 1817, has been abolished since, as well as the torture. A new code, entitled Codice Albertino, has been promulgated very lately by the reigning king Carlo Alberto, but not having seen it, we cannot say how far it differs from the old one.

The towns and other communes have a communal council composed of notables of the place, at the head of which is the syndic, who is appointed by the king, and renewed every two years. The council superintends the local and economical administration of the commune, but its acts are subject to the sanction of the intendente of the province. The communes vary greatly in size, and especially in the amount of population, from 200 inhabitants to 120,000, which is the population of that of Turin. The very populous communes, consisting of large towns, such as Turin, Genoa, Alessandria, &c., have two syndics.

The city of Turin has a kind of charter with peculiar and extensive privileges, a numerous municipal council called Corpo Decurionale (council of civil administration), and a Vicariato, or judicial and political council, which superintends the police of the town; a Consiglio degli Edili, composed of architects and engineers, to superintend all buildings, works, and embellishments of the capital, and a Segreteria, or finance department, the city of Turin being possessed of large revenues derived from the octroi and other local taxes, besides landed property and manorial estates, with feudal jurisdiction over several villages. It is styled in public documents, L'Illustrissima Citta di Torino, Contessa di Grugliasco, Signora di Beinasco.'

The government in the Continental states of the house of Savoy is an absolute monarchy, the king being the sole source of law. All the laws emanate from him, and are promulgated in his name. He can abrogate all decisions and sentences even of judicial bodies. He imposes the taxes, and has the uncontrolled administration of the revenue. He or his delegates in his name appoint to all offices civil, military, and judicial. This form of pure monarchy dates from the reign of Duke Emmanuel Philibert, who, in the sixteenth century, abolished political feudality, and by doing away with the military services of the great vassals, and substituting a payment in money, formed a stipendiary regular infantry, and created the militia called provincial battalions, which was raised from every province in proportion to its population, and being exercised once every year, and receiving one-third of the regular pay in time of peace, was liable to be called out in time of war to join the regular forces. This system continues with some modifications to the present day in all the continental states, the army being recruited yearly by means of a conscription. Every conscript, unless he provides a substitute, is bound to serve eight years in the regular army, after which he is enrolled for eight years more in the provincial battalion of his respective district. In time of war the provincial battalions are called into active service, and the army becomes thereby increased to 100,000 men. The regular regiments are formed into brigades of two regiments, each regiment having three battalions; the battalion consists of six companies, each of which musters 176 rank and file. There are ten brigades of infantry, namely, Guardi, Regina, Savoy, Piemonte, Aosta, Cuneo, Casale, Pinerolo, Savona, and Acqui. The cavalry consists of seven regiments, one of which is raised by voluntary enlistment in the island of Sardinia. There are two regiments of artillery, besides the train, a battalion of sappers and miners, and a corps of engineers. The corps of carabineers, a numerous and most effective body of cavalry, consisting of picked men, is, like the French gendarmes, charged with the police of the country, being scattered in stations or detachments all over the various provinces. Both men and officers receive much higher pay than the line, and are handsomely dressed and accoutred. They are generally trusty and well-behaved men, above temptation or bribery, civil to travellers, and are noted for their devotedness to the monarchy, of which they gave abundant proofs during the insurrectionary movements of 1821 and 1831.

The naval force consists of four ships of war, four frigates, two corvettes, and two brigs of war, carrying in all 526 guns, and manned by 3450 men, besides 11 companies of cannoniers, or naval artillerymen, and one battalion of marines. The stations of the royal navy are at Genoa, Villafranca, and in the island of Sardinia. All sailors of merchant vessels and craft in the Continental dominions have their names registered in their respective districts, and when men are wanted for the royal navy, each district is obliged to furnish its quota. The same system prevails in France, and is called 'inscription maritime;' it is in fact a regularised system of impressment under another name, although French and other Continental writers are apt to declaim against the English impressment, which they call tyrannical, forgetting their own much more oppressive conscription of landsmen, and their 'inscription' of seafaring people.

The king's ministry consists of a secretary of state for foreign affairs, a secretary of war and marine, a secretary of finances, and a secretary for the 'interno,' or home department, which is divided into the following offices or boards:—1, General affairs, king's household, ceremonials, and precedence; 2, grace and justice; 3, ecclesiastical affairs, Valdenses, and Jews; 4, communal affairs, public works, waters, and forests; 5, board of trade and statistics, sciences, belles-lettres, and the fine arts; 6, board for the affairs of the island of Sardinia; 7, board of police. There are also a grande cancelleria, or board for receiving and examining memorials to the king, and reporting to him thereupon; an intendant, or master of the royal household, with many subalterns; a superintendant of the private domain and purse of the king; and a private secretary of his majesty, and a very numerous household.

The public revenue of the Continental states is sixty-nine millions of Italian livres or francs, of which seventeen millions are derived from the land-tax, which absorbs one-sixth or one-seventh of the annual rent of the land; thirty-two millions proceed from the gabelle, or customs and excise; the rest is made up of the post-office, registry-duty, monopoly of salt and tobacco, and other sources. The public debt amounted in 1834 to eighty-seven millions of francs. (Serristori, *Statistica dell' Italia.*)

The revenue of the island of Sardinia amounts to about 2,750,000 francs, derived from 'donativi,' as they are called, voted by the stamenti, and by indirect taxes, such as customs, salt, tobacco, and gunpowder, the fisheries, and the forage and royal patrimony, besides a small subsidy of 17,000 francs paid by the clergy.

The ecclesiastical administration of the Continental states is under the four archbishops of Turin, Chambéry, Genoa, and Vercelli, and twenty-six bishops, of Maurienne, Tarantaise, Annecy, Aosta, Susa, Pinerolo, Acqui, Alba, Asti, Cuneo, Fossano, Ivrea, Mondovi, Saluzzo, Alessandria, Biella, Casale, Novara, Vigevano, Albenga, Nizza, Bobbio, Sarzana, Savona, Tortona, and Ventimiglia. The number of parishes is 3756, that of collegiate churches, besides cathedrals, is 74, and that of clerical seminaries 54. In 1833 an ecclesiastical academy for the higher theological studies was instituted at Superga near Turin. There are in all the Continental states 241 onvents of monks, of which about one-half are of the mendicant orders. The rest having lost most of their property, which was sold under Napoleon, the restored government has given them property or rents equivalent to a capital of 00 millions of francs. There are 82 convents of nuns.

The number of Jews is about 6740, of whom about 1500 re at Turin, and the rest at Casale, Vercelli, Alessandria, Acqui, Genoa, and other places.

The Valdenses near Pinerolo amount to about 20,500 ndividuals, and their public worship is now unmolested. Their candidates for the church ministry generally study at Geneva or Lausanne in Switzerland. [Valdenses.] At Genoa there is a chapel for those Valdenses and foreign Protestants who reside there.

Although the clergy of the established Roman Catholic church have no longer any direct political power or jurisdiction over laymen, there being no Inquisition in the Sardinian states, yet they exert considerable indirect influence, reater perhaps than in any other part of Italy except Rome. The parish clergy exercise an active kind of moral censorship over their flocks. The introduction of prohibited ooks, especially on religious controversy, is strictly guarded gainst, and is subject to severe penalties, which some imprudent foreigners have incurred of late years.

The nobility are very numerous in Piedmont; they are hiefly landed proprietors with moderate incomes, many f whom reside in the country. The tone of society is decidedly aristocratical. The commercial class is not so numerous or important as in the duchy of Genoa. Most of he commissions in the army, as well as the principal offices f the administration, are held by noblemen. The nobles ave privileges even in courts of justice. 'The clergy and he nobility,' says an observing traveller who wrote in 1834, have evidently the upper hand in this country. The throne s supported by the altar; and as the population is generally eligious, this support is not so precarious as in some other ountries. If there is a vague feeling of discontent among he middle and lower orders, this feeling does not attain the height of revolt; and this has been proved in the late attempts at military insurrection, in which the masses took no part, and the efforts of the French propagandists have found no sympathy here. A great proportion of the inhabitants of Piedmont are landed proprietors, and are therefore attached to order and personal comfort. They have not forgotten the French invasion, they can appreciate the true meaning of a liberty which is enforced by foreign bayonets, nd they know that constitutions and systems of government transplanted from abroad seldom take root. All the enlightened liberals here expect no good from either a French intervention or an internal revolution; but they expect much from time and the progress of ideas. These liberals, whom I may style progressive, to distinguish them from hose who are merely revolutionists, are numerous in Piedmont, and exist even among the ranks of the nobility. The nly part of the French system which they regret is the equality of all before the law.' (Walsh, *Voyage en Suisse, en Lombardie, et en Piémont.*) During the years that have lapsed since the work just mentioned was written, several useful reforms in the administration and in the municipal and judiciary systems have been effected by the present king Charles Albert; and although the government continues to be a monarchy, the administration is becoming more enlightened.

Public instruction is afforded by the royal and communal colleges. In every province there are one or more royal colleges, in which grammar, rhetoric, and philosophy are taught; and in some of them there are chairs of law, medicine, and divinity. In most towns there is a communal college, besides grammar-schools, 'Scuole di Latinitá Inferiore.' The aggregate number of all these establishments amounts to 286, a number greater in proportion to the population than that of any other Italian state. In the old territories of the monarchy, Piedmont, Savoy, and Nice, the proportion is much greater than in the duchy of Genoa, which is a late acquisition. Of these 286 establishments, 23 are administered by monastic orders, and the others by laymen or secular priests without distinction. The result of all this is, that a considerable degree of information prevails among the upper and middle classes of Piedmont and Savoy. Female education is afforded almost exclusively in the convents of nuns, of which there are 42 that serve for that purpose. Scientific instruction is given in the two universities of Turin and Genoa, the former of which is attended by about 1250 students. [Torino.] The university of Genoa is attended by about 500 students, and has 36 professors. It has the faculties, or colleges, as they are styled, of divinity, law, medicine and surgery, and philosophy and arts, and a library of 45,000 volumes. Among the professors there have been some distinguished men, such as Viviani, professor of botany, known for his works, and especially for his 'Flora of Libya and Cyrenaica;' and Mojon, professor of chemistry. The great hospital of Genoa, which is admirably administered, affords a good opportunity for the medical and surgical students becoming acquainted with clinical practice. The studies of medicine, surgery, and pharmacy are perhaps those which flourish most at Genoa. The building of the university is vast and splendid, like most architectural buildings at Genoa. A board of instruction, styled 'Deputazione degli Studj,' composed of five members, has the superintendence of the university of Genoa, and of all the colleges and schools, public and private, of the duchy.

At Turin there is likewise a board, called 'Magistrato della Riforma,' which superintends all the establishments of education in the old territories of the monarchy, Piedmont, Savoy, and Nice.

Turin has a royal academy of sciences, a royal agrarian society, a royal academy of the fine arts, a royal military academy, and a philharmonic society. An academy of the fine arts exists at Genoa, an academy of sciences and arts at Alessandria, an economical society at Chiavari, and a royal academy at Fossano. There are a royal school of horsemanship and a royal veterinary school at La Veneria near Turin, a school of mineralogy at the mines of Moutiers in Tarantasia, and a naval school at Genoa.

Elementary education is not in such a thriving condition as collegiate and scientific instruction; most communes have schools for boys, but there is no general or uniform system.

The Continental states of the king of Sardinia have several fine carriage-roads across the Alps and Apennines, which intersect their territory. The most remarkable are:—1, the great road of Mont Cenis, leading from Chambéry to Turin, constructed by Napoleon; 2, that of the Simplon, leading into Switzerland, likewise constructed under Napoleon; 3, the road from Genoa to Sarzana and Lucca along the Eastern Riviera, constructed since the Restoration; 4, the new road from Genoa to Novi by Serravalle, constructed also since the Restoration; 5, the road Della Cornice, from Genoa to Nizza, along the Western Riviera, begun under Napoleon, and finished under the late king Charles Felix. A road leads from La Spezia to Pontremoli, partly through the Sardinian territory, by the valley of the Magra, and thence over the Apennines to Parma. A new road is in progress from Alessandria to Savona by the valley of the Bormida. There is a well-regulated post-office system throughout the Sardinian dominions, as well as diligences for travellers on all the principal lines of road; and public conveyances called Velociferi on the provincial or cross roads. For the important maritime trade of the country, see Genoa.

The plains of Piedmont are well supplied with canals, chiefly for the purpose of irrigation, the principal of which are in the provinces of Alessandria, Vercelli, Biella, Casale, Ivrea, Alba, and Turin. The river system of Piedmont is described under Po, Basin of the.

The staple products of the continental Sardinian territories for exportation are:—silk, which is produced annually to the value of between twenty-four and thirty millions of francs; rice, which is raised in the lowlands near the Po; hemp, wine, and oil. The whole exports amount to about fifty millions of francs. Most of the wine is consumed in the country. The principal manufactures consist of paper, silks, woollens, linen, glass, and cotton yarn. The importation of colonial articles and English manufactures takes place chiefly through the port of Genoa. A considerable trade is carried on with Switzerland and Germany by the Lago Maggiore and the new road of the Bernardin Mount leading to the Grisons.

History of the Sardinian States.—The history of the country is identical with that of the house of Savoy, for, unlike some compact European kingdoms, the various and heterogeneous parts of which the Sardinian monarchy is composed have been gradually united through the personal exertions of its sovereigns, that dynasty having become their common bond of union, and having succeeded also in creating a sort of national spirit where there was no common nationality. The history of such a house is therefore very curious, and forms no unimportant part of the history of

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Europe during the middle ages. The origin of the house of Savoy is involved in the greatest obscurity. Some genealogists have derived it from Witikind, the Saxon chief, who fought against Charlemagne; others from Adalbert, son and colleague of Berengarius II., marquis of Ivrea and king of Italy. The first historical ancestor of the house of Savoy is Humbert, called the 'white-handed,' count of Maurienne and great vassal of Rudolf III., the last king of the second kingdom of Burgundy. When Rudolf died, A.D. 1032, Conrad the Salic king of the Germans and emperor of the West, who had married Rudolf's niece, succeeded to his rich inheritance. He found a willing and able assistant in the count of Maurienne, who, commanding the passes of the Alps, was enabled to introduce the Italian militia of the emperor to assist in reducing the other refractory Burgundian vassals. As a reward for these services Conrad not only confirmed Humbert in his extensive fief of Maurienne, but gave him military jurisdiction over other parts of Savoy, the lower Valais, and also the valley of Aosta, on the Italian side of the Alps, which was part of the kingdom of Burgundy. Count Humbert died about A.D. 1048, and was buried in the cathedral of St. Jean de Maurienne. His eldest son Amadeus, styled I., succeeded him, but, dying shortly after, was succeeded by his brother Oddo, or Otho, who, by his marriage with Adelaide of Susa, daughter and heiress of Odelric Magnifred, or Manfred, count of Turin and marquis of Italy, extended the dominion of his house to the banks of the Po. These facts have been established by the best Piedmontese critics, and the line of succession from Amadeus I. to Oddo, and from Oddo to his son Amadeus II., is adopted in the official genealogy of the house of Savoy. (Cibrario, *Storia della Monarchia di Savoja*, Turin, 1840.) Former historians had confounded Amadeus I. with Amadeus II., and had left out Oddo altogether. [AMADEUS I.]

The Marquisate or March of Italy embraced the valleys on the Italian side of the Cottian Alps, including several counties, of which that of Turin was the principal. The former duchy of Turin, which in the time of the Longobards embraced the greater part of the actual Piedmont, had been parcelled, by the policy of the Carlovingian emperors, into the counties of Turin, Auriate, Bredolo, Alba, &c. After the Carlovingian empire became dismembered by the forced abdication of Charles the Fat, and Italy erected itself into a separate kingdom, those counties which adjoined the Cottian and Graian Alps became the frontier on the side of the new kingdom of Burgundy, and the military command over the whole border region or marches was given by the kings of Italy to a high noble, called marquis, who had jurisdiction over several counties. [MARCHES, THE.] The marquises of Italy resided generally at Susa, from whence they watched the passes of Mont Cenis and Mont Genevre, and they are accordingly also styled in the chronicles marquises of Susa.

The first husband of Adelaide was Hermann, duke of Suabia, who, after the death of her father Odelric, about A.D. 1036, became marquis of Italy in right of his wife. Hermann dying without issue, Adelaide married, about 1045, Oddo, count of Maurienne, and son of Humbert the White-Handed, who by this marriage became marquis of Italy and count of Turin, and master of the principal passes of the Western Alps; for, in addition to that of Great St. Bernard and Little St. Bernard, which were already within his Burgundian jurisdiction, which extended over the valley of Aosta, he became possessed of those of Mont Cenis and Mont Genevre. Of Oddo's life we have no other historical record, except an act of donation, dated A.D. 1056, of some land to St. Peter of Tarantasia, for the good of the soul of his father Humbert. (Muratori, *Antiq. Ital.*, i. 346.) Oddo must have died in or previous to the year 1060, as appears by another donation made by his widow Adelaide, on Trinity Sunday of that year, to the chapel of the Trinity in the cathedral of Turin, for the rest of his soul, in which it is mentioned that Adelaide's father, Odelric Manfred, was buried in that chapel at the foot of the altar. Oddo left by Adelaide three sons, Peter, who is styled marquis, and Amadeus, who is called count, having respectively assumed those titles after their father's death, and lastly, Oddo, who became a bishop: besides two daughters, Bertha, who married Henry, afterwards Henry IV. of Germany, and Adelaide, who married Rudolf, duke of Suabia, who was afterwards elected in place of Henry by his revolted vassals, during the famous War of the Investitures. Adelaide, the mother, appears to have governed, after the death of her husband, as regent or colleague of her sons, the extensive territories belonging to them on both sides of the Alps. Cardinal Peter Damianus, her contemporary, who was sent into North Italy as apostolic legate to effect a reform in the clergy, in a letter addressed to Adelaide, styles her duchess and marchioness of the Cottian Alps, and speaks of her jurisdiction as extending to the two kingdoms of Italy and Burgundy, and embracing several dioceses: he extols her firmness in bearing the cares of a kingdom without the assistance of a king. Her eldest son, Peter, married Agnes of Poitou, by whom he had two daughters, Agnes, who married Frederic of Monbéliard, count of Monzone, and Alice, who married the marquis Boniface del Vasto, from whom the marquises of Saluzzo derived their descent. After the death of Peter about 1078, his brother Amadeus became count. Amadeus does not appear to have assumed the title of marquis, the investiture of which, it is believed by some writers, was given to Frederic of Monbéliard, who had married the eldest daughter of Peter, the late marquis.

The emperor Henry IV., being excommunicated and deposed by pope Gregory VII., resolved to proceed to Italy, where he had a party in his favour. The passes of the Eastern Alps being closed against him by the duke of Bavaria and other revolted vassals, he proceeded through Burgundy, and arrived in the autumn at Vevay, on the banks of the Leman lake, where he was met by his mother-in-law Adelaide, and by Count Amadeus, his brother-in-law, whom he requested to allow him to pass into Italy with his wife Bertha and his son Conrad. Adelaide, being already ill-disposed against him for his neglect and ill-treatment of her daughter Bertha, refused him the passage, in order to obtain which the emperor added to the dominions of Amadeus, styled count of Savoy, a fertile province of Burgundy, not specified by the chronicler Lambert, but which is believed to have been that of Bugey. Henry, attended by Adelaide and Amadeus, crossed the Mons Jovis, or Great St. Bernard, in the depth of winter, and they all repaired to Canossa, where Gregory was, and where, partly by the mediation of Adelaide, the reconciliation between Henry and the pope took place, in January, 1077, after a severe trial of humiliation on the part of the emperor. [GREGORY VII.]

Little more is recorded of Adelaide, who appears to have exercised the chief authority in the name of her son Amadeus II. till he died, leaving by his wife Joan, daughter of the Count of Geneva, an infant son, who is styled Humbert II. The Marchioness Adelaide continued to administer to her dominions, as guardian to her grandson, eleven years longer, till she died at a very advanced age in 1091.

Humbert II., Count of Maurienne, succeeded to his father's Burgundian estates in Savoy, and even increased them by the acquisition of Tarantasia, but those on the Italian side of the Alps had been seized upon during his minority by several claimants. Boniface del Vasto, Marquis of Savona, and husband of Alice, Humbert's aunt, took possession of the counties of Bredolo and Aurate, which had belonged to the Marchioness Adelaide, whilst his sister-in-law, Agnes of Poitou above mentioned, occupied the county of Turin, which was also claimed by Conrad, son of Henry IV. of Germany, in right of his mother Bertha. In the midst of all this the great towns, Turin, Asti, Chieri, and others, availed themselves of the general confusion occasioned by the long struggle between the pope and the emperor to assert their independence of all vassalage except the nominal one to the Empire. Humbert crossed the Alps in 1097; and not being strong enough to attack all his opponents, he made a treaty of alliance with the town or commune of Asti and its bishop against Boniface, by confirming the newly acquired liberties of the citizens of Asti, and by ceding to them several villages and territories, and ensuring to them free passage and protection throughout his Burgundian or Transalpine territories. Durando in his 'Piemonte Cispadano antico,' gives the text of the treaty, dated July, 1098, between 'the honourable and great Lord Count Humbert of Savoy, and the consuls of the city of Asti,' which is one of the oldest documents in which the consuls appear as first magistrates of an Italian community. Humbert made donations to several churches and convents, and he also intended to proceed to Palestine with the Crusaders; but he died in Savoy in 1103, and was buried in the cathedral of Moutiers in Tarantasia. By his wife Gisia of Burgundy he had a son, who succeeded him by the name of madeus III., and a daughter Adela or Adelaide, who maried Louis VI., king of France. Anselm of Aosta, who beame archbishop of Canterbury, corresponded with Humert; and a letter from him to the count, in which he recomends to him the interests and privileges of the churches of is dominions, is contained in the works of St. Anselm. 1196.)

Amadeus III., who has been sometimes styled Amadeus I., received from Henry V. of Germany the investiture of ll Savoy as an Imperial county. His predecessors were erely counts of Maurienne, although they had extended eir authority over the greater part of Savoy. Amadeus reovered also in part his ancestorial Italian dominions, and, bove all, the city of Turin, of which he was acknowledged rd in the year 1131. In his diplomas Amadeus styles himelf Count of Savoy, Count of Turin, and Marquis of Italy. n 1140, Guy, Count of Albon, and Dauphin of Vienne, aving advanced by the valley of Isère, and laid siege to ontmélian, was defeated by Amadeus, and died of the ounds he received in the battle.

About the year 1147 Count Amadeus III. proceeded with e crusade to Syria, and died of disease at Nicosia in the land of Cyprus, in the year 1148. He was the founder of e magnificent abbey of Hautecombe in Savoy, which was r ages after the burial-place of the princes of the reigning ynasty, whose monuments remained to the end of the last entury, when they were plundered and destroyed by the rench revolutionists. The monuments were restored by e late king Charles Felix. Matilda, daughter of Amaeus III., married Affonso I., the founder of the Portuguese onarchy.

A.D. 1149-1188. Humbert III., called 'the Saint,' son of madeus III., succeeded him as count of Savoy and maruis of Italy. He compelled Manfred, marquis of Saluzzo, o acknowledge himself his vassal. During the long wars f the emperor Frederic I. against the Italian communes, umbert, as great vassal of the empire, at first followed the anners of his sovereign, but afterwards kept aloof from him, nd the consequence was that Frederic deprived him of part f his dominions, among the rest of Turin, creating the bishop f that city prince of the empire. Frederic, being irritated gainst the citizens of Susa, who had risen against him on s passage, burnt the town and castle, A.D. 1174, when the rchives of the house of Savoy are said to have perished in e flames. Humbert was fond of religious retirement, and pent much of his time in the abbey of Hautecombe. He ied in 1188.

1188-1233. Thomas I. succeeded his father Humbert II. Having acknowledged Philip of Suabia as king of ermany, in preference to his competitor Otho of Aquitania, hilip restored Thomas to all the titles and prerogatives of hich his father had been deprived by Frederic I. Thomas urchased of the Viscount Berlion the seignory of Chaméry for 32,000 sols of Susa, equal to 84,200 francs, and nlarged the town and built the castle. Until this time iguebelle had been the capital and residence of the counts f Savoy. Thomas enjoyed the friendship of the emperor rederic II., who appointed him his vicar in Lombardy. he citizens of Turin, instigated by Boniface, marquis of ontferrato, and also by their bishop, refused allegiance to e count of Savoy. Thomas crossed the Alps and laid siege Turin, but the people of Asti and other parts of Monterrato coming to its assistance, the count was obliged to ise the siege and return to Savoy. In the following year e came again with more force by the Val d'Aosta, but e fell ill and died, in January, 1233. He left a numerous mily: three of his sons reigned in succession after him; nother, Boniface, became archbishop of Canterbury; and nother, Thomas, became count of Flanders by marrying oan, the daughter and heiress of Baldwin, count of Flaners and emperor of Constantinople.

1233-1253. Amadeus IV., son of Thomas, recovered the ominion over Turin, the bishop and citizens swearing alleiance to him, and he was created by Frederic II. duke of he Chablais and of Aosta. He married one of his daughters o the Marquis of Montferrato, and another to the Marquis f Saluzzo, both old rivals of his house. Amadeus IV. died n 1253, and was buried at Hautecombe. Amadeus gave p to his brother Thomas, count of Flanders, the 'utile doinium' of his Italian states with the title of count of Piedont, retaining however the suzeraintè for himself.

1253. Boniface, the infant son of Amadeus, was placed nder the guardianship of his uncle Thomas, count of Flanders. The people of Turin, having revolted again and being supported by the free city of Asti, took Thomas prisoner. When Boniface was of age, he crossed the Alps, and laid siege to Turin, but the Marquis of Montferrato, and Charles, count of Anjou and Provence, who had begun to extend his dominions over part of Piedmont, marched against the Count of Savoy, and took him prisoner. Boniface died in prison at Turin, and left no issue.

1263-1268. Peter, son of Count Thomas I., and uncle of Boniface, born in 1203, succeeded to his nephew. By affinity, he was uncle of Henry III. of England, who had married Eleanor of Provence, daughter of Beatrix of Savoy, Peter's sister. In 1241 Peter had repaired to England, and had been received with great honours by Henry and his consort. Henry made him earl of Richmond, and gave him for his residence a palace near London on the banks of the Thames, which was from that circumstance called Savoy House. Peter was sixty years old when he succeeded his nephew Boniface as count of Savoy. His first care was to reduce the city of Turin, in which he succeeded after a long siege. Peter afterwards returned to England, where Richard of Cornwall, who had been elected king of Germany, bestowed upon him the extensive inheritance of Hartmann, count of Kyburg, styled 'the old,' who had married Peter's sister, and who died without issue in 1264. This inheritance extended along the northern banks of the Leman lake, and through this and the grants of former emperors to Peter's ancestors the house of Savoy became possessed of the whole of that fine county called the Barony of Vaud, afterwards Pays de Vaud, and now the Canton de Vaud in Switzerland. Peter died in the castle of Chillon on the shore of the Leman lake, in 1268, and was buried at Hautecombe. He left only one daughter by his wife Agnes, heiress of the barony of Faucigny. This daughter, Beatrix, made subsequently a donation of that barony to Amadeus V. Peter had a great reputation for wisdom and chivalric gallantry.

1268-1284 Philip I., Peter's brother, succeeded him as count of Savoy in his old age. He had some disputes with Rudolf of Habsburg, king of Germany, concerning the territories of Kyburg, north of the Leman lake, but they were settled by an honourable treaty. He died at the castle of Roussillon in the Bugey, leaving no issue.

1285-1323. Amadeus V., styled the Great, son of Thomas, count of Flanders, succeeded his uncle Philip. He had frequent wars with the dauphin of Vienne and with the counts of Geneva, whom he repeatedly defeated. He gave Piedmont in fief to his nephew Philip, who, having married, in 1304, Isabella of Villehardouin, heiress of the principalities of Achaia and Morea, received the investiture of the same from Charles II. of Anjou, king of Naples and count of Provence. Robert, the successor of Charles, however, aspiring to become master of all Italy, tampered with the citizens of Turin and Asti, and with the marquis of Montferrato, for the purpose of establishing his own dominion over all Piedmont, where the Anjous were already possessed of Alba, Cherasco, Savigliano, and other towns. But Henry of Luxemburg, the newly-elected king of the Germans, coming to Italy in 1310, passed through Savoy, where he was received and splendidly entertained at Chambéry by Count Amadeus, who, with his brother Louis, baron of Vaud, and his nephew Philip, prince of Achaia, accompanied the emperor to Milan, and afterwards to Rome, where he was crowned emperor, in August, 1312. The emperor then made a donation of the city and county of Asti in favour of Count Amadeus. Henry's death, which happened in the following year, prevented Amadeus from enforcing his title over Asti, which was occupied by king Robert of Naples. Amadeus afterwards is said by some chroniclers to have gone to Rhodes, to assist the knights of St. John to defend that island against Sultan Othman, and to have returned home after the Turks had raised the siege. In 1323 he went to Avignon, to induce Pope John XXII. to preach a crusade in order to save the Byzantine empire, which was then in great danger from the Turks, and whose emperor, Andronicus the Younger, married Anna of Savoy, daughter of Amadeus. But Amadeus, who was old, fell ill and died, at Avignon, 1323.

1323-1329. Edward, son of Amadeus, succeeded him. He had to repel the repeated attacks of the dauphin of Vienne, the count of Geneva, and the baron of Faucigny, who were leagued against him. At last, through the mediation of Philip of Valois, king of France, peace was made. The count of Savoy, in 1328, led a body of men to join King Philip against the Flemish, and contributed to the defeat of the latter by the French at Mount Cassel. After the termination of that war Count Edward went to Paris, where he fell ill and died, in November 1329, leaving no male issue.

1330-1343. Aymon, Edward's brother, was proclaimed his successor by the states of Savoy, in preference to Edward's daughter, who was married to the duke of Brittany. The states declared on that occasion, that so long as there were any male descendants or collaterals in the house of Savoy, no female, however near in the direct line, should reign.

Aymon's reign was peaceful, and the count applied himself to improve the administration of Savoy and his other states north of the Alps. He created the office of chancellor as the head of the judicial order, and he also established a supreme council of justice at Chambéry, to hear appeals from the local courts. He decreed, by an edict dated 1336, that any judge in his dominions might be summoned before the assizes to answer charges brought against him by private individuals.

Aymon married Yolande, daughter of Theodore Palæologus, marquis of Montferrato, and son of Andronicus the Elder, emperor of Constantinople. In the marriage contract it was stipulated that the house of Savoy should inherit Montferrato, in default of male issue of the marquis. Aymon died at Montmélian, in 1343.

1343-1383. Amadeus VI., called 'the green count,' son of Aymon, succeeded him. His long reign was eminently successful. He drove away the Anjous from Southern Piedmont; he defeated the marquis of Montferrato, who was leagued against him with the Visconti of Milan; he received the voluntary allegiance of Chieri, Mondovi, and other towns; and he consolidated and greatly extended the dominion of the house of Savoy on the Italian side of the Alps. His other deeds and chivalric adventures are related under Amadeus VI.

1383-1391. Amadeus VII., styled 'the red count,' from the colour of his armour, succeeded his father Amadeus VI. He soon after proceeded to the assistance of Charles VI. of France against the united Flemish and English, and distinguished himself in several actions. On his return home, he made the important acquisition of the county of Nice, the people of which chose him for their sovereign, A.D. 1388. Then, for the first time, the white cross, the standard of Savoy, floated over the blue waves of the Mediterranean. Amadeus died in 1391, of a fall from his horse, while hunting the boar in the forest of Lornes in the Chablais.

1391-1440. Amadeus VIII., son of the preceding, succeeded his father. His long reign is memorable in the annals of the house of Savoy for his having consolidated and enlarged its dominion on both sides of the Alps, and that mostly by peaceful means. By the extinction of the line of the counts of Geneva, he inherited the county of Genevois, and the suzeraintè over the imperial city of Geneva. He purchased the valley of Ossola from the Grisons. [Novara, Valli di.] He obliged the marquises of Saluzzo and of Ceva to swear allegiance to him; and he obtained of Filippo Maria Visconti, duke of Milan, the cession of the town of Vercelli and its territory west of the Sesia. In 1418, Louis of Savoy, prince of Morea and Achaia, and prince of Piedmont, dying without issue, Amadeus, his next heir, reunited the principality of Piedmont to his other dominions, which thus extended without interruption from the shores of the Leman lake to those of the Mediterranean Sea, and from the Rhône to the Sesia. The emperor Sigismund, on passing through Chambéry, formally created Amadeus duke of Savoy, in 1416, confirming all former investitures granted by his predecessors, and moreover debarring all subjects of the house of Savoy from appealing to the imperial chamber from judgments pronounced by the duke or his successors.

Amadeus VIII. bore the titles of duke of Savoy, Chablais, and Aosta, prince of Piedmont, count of Genevois, Bugey, and Nice, baron of Vaud and Faucigny, and marquis of Italy, and from his time the house of Savoy assumed a distinguished place among the sovereign houses of Europe.

He collected the edicts and statutes of his ancestors, and from them and the 'droit coutumier,' or customs of the Genevois and Faucigny, he compiled a code of laws for all Savoy, under the title of 'Statuta Sabaudiæ,' which he published in 1430.

Other particulars of the life and vicissitudes of this remarkable prince, who assumed for a time the papal tiara, are given under Amadeus VIII.

1440-1465. Ludovic, or Louis, son of Amadeus VIII., assumed the ducal crown in consequence of his father's abdication in 1440, when Amadeus was raised to the papal chair. Ludovic had married Anna Lusignan, of the royal dynasty of Cyprus, who exercised a great influence over him. His second son, likewise named Ludovic, married Charlotte, heiress of that kingdom, and he was crowned king of Cyprus in 1458; but he and his wife were soon after driven away by Charlotte's illegitimate brother, and the island ultimately fell into the hands of the Venetians. [Cyprus.] The title of king of Cyprus and Jerusalem is still assumed by the representative of the dynasty of Savoy. Ludovic established or restored the university of Turin; he created a supreme court of justice for Piedmont, called a Senate; and he admitted the barons of Piedmont to the first offices of the state, which had been till then monopolised by the Savoyards. Ludovic died at Lyon, in January, 1465, whilst proceeding to the court of his son-in-law Louis XI. of France.

1465-1472. Amadeus IX., son of Ludovic, succeeded him. He was of a sickly frame, and of a contemplative turn of mind, and was little suited to the cares of government. [Amadeus IX.]

1472-1482. Philibert, son of Amadeus, succeeded him while yet a minor under the guardianship of his mother Yolande, sister of Louis XI. The duchess sent a body of troops to join the army, with which Charles le Teméraire, duke of Burgundy, invaded Switzerland, A.D. 1476. These troops however almost all perished in the battles of Granson and Morat; and Charles, fearing that the duchess might turn against him in his adversity, gave secret orders to seize her and her children, which was effected by a party of men in ambuscade, who surprised the duchess while she was proceeding to Geneva without any armed escort. A Piedmontese gentleman succeeded in concealing the young duke Philibert, whom he carried to France, to his uncle Louis XI., who soon after sent an armed party to deliver the duchess from the castle of Rouvre, where she was confined by Charles, and he restored both her and her son to their dominions. In 1478 Yolande died; and in 1482 Duke Philibert, being now of age, went to Lyon on a visit to King Louis, but died soon after in that city, leaving no issue.

1482-1489. Charles I., Philibert's brother, assumed the ducal crown, and in November, 1483, made his public entry into Turin. He found himself engaged in a war against the marquis of Saluzzo; but Charles VIII., king of France, interfered, on the plea that the marquis was his vassal, and proposed himself as umpire between the two contending parties. After several years of negotiations, Charles fell ill and died at Pignerol, in March, 1489, being only twenty-one years of age.

1489-1496. Charles John Amadeus, styled Charles II., son of the preceding, was a mere child when his father died. His mother, Bianca of Montferrato, was proclaimed regent, with the assistance of a council. Turin was definitively chosen for the residence of the court. From that time the house of Savoy became really Italian. In 1494 Charles VIII. of France passed through Turin on his march to invade the kingdom of Naples. He was received by the duchess regent with great honours, and she even lent to the king her jewels, as he was in great want of money. In April, 1496, the infant duke died of a fall, at the villa of Moncalieri near Turin.

1496-1497. Philip II., count of Bresse, and a son of Duke Ludovic, succeeded as duke of Savoy and prince of Piedmont; but he died after eighteen months' reign, in November, 1497. He left by Margaret of Bourbon, his first wife, a son, Philibert, who reigned after him, and a daughter, Louisa, who married the duke of Angoulême, and was the mother of Francis I. of France; and by a second wife, Charles, who was duke of Savoy after Philibert.

1497-1504. Philibert II. married Margaret of Austria, daughter of the emperor Maximilian I. The dominions of the house of Savoy, placed as they were between France and the German empire, whose jurisdiction extended over North Italy, rendered the position of the dukes extremely delicate, especially in the long wars which broke out in the sixteenth century between the house of Austria and France. The duke of Savoy had the title of Imperial vicar in Italy, and was by interest as well as duty attached to the Imperial cause. Philibert however allowed Louis XII. of France to

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ass through his dominions on his way to invade the duchy Milan in 1799. In 1504 Philibert II. died without issue, nd was buried in the convent of Bron at Bourg-en-Bresse, here his monument, with his statue and those of his other and wife, is still seen.

1504-1553. Charles III., brother of Philibert, although nd of peace, found himself for the greater part of his reign in e midst of the most destructive wars; first between Louis II. of France and the Holy League headed by pope ulius II. against the French; afterwards between Francis on one side, and the Swiss and Duke Sforza of Milan the other; and lastly between Francis I. and his owerful rival the emperor Charles V.: in all of which the rritories of Savoy and Piedmont, though the duke pro-ssed neutrality, were devastated without mercy by French, wiss, and Imperialists.

Duke Charles acted as mediator between Francis I. and e Swiss, and afterwards between Francis and pope Leo .; but notwithstanding these good offices, Francis, having ken possession of the duchy of Milan after the battle Marignano, began to covet the territories of the Duke, as ey were interposed between France and his Italian con-est, and he purposely picked a quarrel with his uncle. e wrote to him in March, 1518, in an imperious tone, to ve him Vercelli as a former appurtenance of the duchy Milan, the county of Nice as forming part of Pro-ence, and other vexatious demands, and as the Duke de-urred, he declared war against him; but this time the wiss confederation interposed, and Francis became paci-ed. In 1524, the French having again lost the duchy of ilan, which was occupied by the troops of Charles V., rancis I. marched an army into Italy, passing through the rritories of Savoy with the forced assent of the Duke. he battle of Pavia, in 1525, having placed Francis in the ower of his rival, the duke of Savoy, together with his ster Louisa, who was regent of France, warmly interposed obtain the liberation of Francis, who afterwards acknow-dged that 'he lay under greater obligations to the Duke an to any other friend or relative,' obligations however hich he soon after forgot. In 1530 Duke Charles attended e coronation of Charles V., who treated him with marked ttention, giving to his wife Beatrix of Portugal, and her eirs, the county of Asti. Francis pretended to be offended this, and he sent to Turin the president Poyat to demand the Duke, Vercelli, Nice, the Bresse, and the Faucigny, in ght of his mother, Louisa of Savoy. Poyat appeared efore the council of the Duke, and as Porporati, the pre-dent of the council, rebutted the claim, offering to show his aster's original titles to those territories, Poyat insolently xclaimed, 'Words are useless, the King wills it so;' Por-rati replied, 'We have here no code in which the arbitrary ll of a king of France is laid down as law.' In 1535 rancis declared war against the Duke, and his troops oc-upied the whole of Savoy and Piedmont, except a few for-esses which held out for the Duke, who took refuge at ice. The troops of Charles V. entered Piedmont, and that nfortunate county was for many years the theatre of war etween the two great rivals. In 1543 Nice was attacked y a combined French and Turkish fleet; the town was acked, but the castle was saved by the timely arrival of ndrea Doria.

In 1547 Henri II., having succeeded Francis I., came to urin to take formal possession of Piedmont. In 1551 war roke out between France and the Emperor, and Piedmont as again the field of battle between the two armies. In he midst of this confusion, Duke Charles died in 1553, at ercelli, where he had taken refuge under the protection of he Imperial troops. Vercelli, Nice, Aosta, and Cuneo were he only places that still held out for the house of Savoy.

1553-1580. Emmanuel Philibert, son of Duke Charles, ad acquired great military reputation in the armies of harles V., and he continued in the service of his son and uccessor Philip II., for whom he won the great battle of St. Quentin from the French in 1557, and in the following ear he gained the battle of Gravelines. By the peace of ambresis, between Philip II. and Henri II. of France, it as expressly stipulated that the hereditary dominions of he house of Savoy should be restored to Emmanuel Phili-ert, who married Margaret of France, sister of Henri II. The Duke, having thus recovered Savoy and Piedmont, which had been estranged from his house for nearly half a century, ixed his residence at Turin, and applied himself to restore order in every branch of the administration. It has been already observed that he may be considered as the real founder of the monarchy of the house of Savoy. The states of Savoy, which had existed in the feudal period, became disused, being no longer convened. The Duke purchased the county of Tenda and the principality of Oneglia, and created a small naval force for the protection of the coasts. But he could not recover either Geneva, which had established its independence in the time of his father, nor the Pays de Vaud, which had been occupied by the Bernese. The Leman lake became the northern boundary of the dominions of Savoy. Emmanuel Philibert died at Turin in 1580, leaving Piedmont in a flourishing condition, very different from that in which he had found it.

1580-1630. Charles Emmanuel I., son of Emmanuel Philibert, married Catherine of Austria, daughter of Philip II., and became attached to the alliance of Spain, which was then the preponderating power in Italy, being possessed of the Milanese, Naples, Sicily, and Sardinia. Trusting to the support of Spain, Charles Emmanuel thought of taking from the French the marquisate of Saluzzo, upon which he had old and legitimate claims. Remonstrances having proved useless, the Duke collected his army, entered the territory of Saluzzo, took the capital, as well as the castles of Revel and Château Dauphin, and the Alps became the boundary between France and Piedmont. France, distracted by civil and religious wars, could not resent the loss at the time, but after the death of Henri III., Charles Emmanuel having taken the part of the League against Henri of Navarre, a desultory warfare was carried on for years on the borders of Savoy and Piedmont, between the troops of Savoy and the partizans of Henri IV. in Dauphiné, led by Lesdiguieres. When Henri IV. was acknowledged king of France, he claimed the marquisate of Saluzzo, and the claim being refused, he invaded Savoy in 1600. By the peace of Lyon of the following year, Saluzzo was definitively given to the house of Savoy, in exchange for the Bresse, Bugey, and the county of Gex, which were ceded to France.

In December, 1602, Charles Emmanuel attempted to surprise Geneva by scaling the walls in the night, but the attempt was discovered in time, and his troops withdrew, leaving behind many killed and prisoners. In the following year, by the treaty of St. Julien, the duke formally acknowledged the independence of Geneva.

Charles Emmanuel was afterwards engaged in a war against the Spanish governor of Milan for the possession of the marquisate of Montferrato, which was terminated by the peace of 1617. The war broke out again in 1625 on account of the affairs of Valtellina, and lastly the disputed succession of Mantova and Montferrato occasioned another war in Italy in 1628, when Charles Emmanuel joined Spain and the emperor against France. The French invaded Savoy and overran Piedmont, and in the midst of this Duke Charles Emmanuel died at Savigliano, in July, 1630.

1630-1637. Victor Amadeus I., son of Charles Emmanuel, obtained possession of the greater part of Montferrato, by the peace of Cherasco, in 1631. In 1635 he was obliged by the threats of Cardinal Richelieu to join the French against the Spanish possessions in Italy. He died in October, 1637, in the midst of the war, leaving two infant sons, the first of whom, Francesco Giacinto, reigned nominally only for one year, as he died in 1638.

1638-1675. Charles Emmanuel II., second son of Victor Amadeus, was proclaimed duke under the regency of his mother Christina of France. French troops, in their quality of allies, were in possession of the greater part of the country, and Cardinal Richelieu, who wished to reduce the dukes of Savoy to the condition of vassals of the crown of France, commanded in Piedmont by means of his generals. In the mean time Thomas of Savoy, prince of Carignano, and Cardinal Maurice of Savoy, uncles of the infant duke, being supported by Spain, demanded for themselves the regency and guardianship of their nephew, in order, as they said, to free the territories of their house from the baneful influence of France. A Spanish army from the Milanese entered Piedmont, led by the two princes, and most of the towns opened their gates to them. Turin was taken by surprise, and the duchess regent escaped to Susa, from whence she repaired to Grenoble, where her brother Louis XIII. then was. But Richelieu, who was more king than Louis, required her son to be sent to Paris, and that the fortresses which were still in her possession should be given up to the French. The duchess returned to Chambéry, and the war between the French and Spaniards continued to rage in Piedmont. In 1640 Turin, being in possession of Prince Thomas and the Spaniards, was besieged by a French army, which had possession of the citadel, and the French were in their turn surrounded in their entrenchments by a Spanish army commanded by Count Leganes. At last Turin capitulated, and Leganes withdrew. The duchess, disgusted with the French, and the princes her brothers-in-law, weary of the Spaniards, came at last to a secret understanding, which was facilitated by the death of Richelieu in 1648. Piedmont was freed of foreign troops, and Charles Emmanuel, being of age, assumed the government, and named his uncle Prince Thomas governor of Asti and Alba, and Prince Maurice lieutenant-general for the county of Nice. The peace of the Pyrenees in 1659 terminated the Italian wars between France and Spain, which had lasted with little interruption for nearly 80 years. Duke Charles Emmanuel enjoyed peace during the remainder of his reign. He applied himself to the improvement of his dominions. Among other things he opened the Pass des Echelles on the road from Chambéry to Lyon, for which purpose a cut was made through the rock for the distance of more than half a mile. He died in 1675, generally regretted.

1675-1730. Victor Amadeus II. succeeded his father Charles Emmanuel. He found himself harassed between Louis XIV. of France on one side and the house of Austria on the other. The imperious Louis sent him commands as if he were his vassal; he ordered him to persecute the Valdenses, to send him several regiments to join his army in Flanders, and lastly to give up to him the citadel of Turin. Victor Amadeus summoned round him the nobles of Piedmont, and declared war against France. Being joined by an Austrian force, he disputed every inch of ground against the French. The war lasted till 1695, when Louis XIV., by fair promises, succeeded in detaching the duke of Savoy from the emperor. The peace of Ryswyck restored peace to Italy, and the French evacuated all the territories of the Duke, including Pinerolo, which they had possessed for about a century. In the war of the Spanish succession Victor Amadeus sided first with the French, but afterwards joined the emperor, because he considered it extremely dangerous for his dominions to allow the house of Bourbon to become possessed of the Milanese and the other Spanish territories in Italy. The consequence was that the French armies again overran and devastated Piedmont, and in 1706 besieged Turin, which made a noble defence. Victor Amadeus, being joined by the Austrian army under his relative Prince Eugene of Savoy, defeated the French besieging army on the 7th September, 1706, and delivered Turin. By the peace of Utrecht, 1713, he obtained the Valsesia, the territory of Lomellina, the remainder of Montferrato, and other districts, and above all the island of Sicily with the title of king, and he was crowned at Palermo, in December, 1713. By the subsequent treaty of London, Victor Amadeus gave up Sicily to the emperor, and received in exchange the island of Sardinia with the title of a kingdom. [SARDEGNA, *History of.*] Thus through his gallantry and perseverance the house of Savoy became numbered among the royal houses of Europe.

Victor Amadeus employed the peaceful period which followed to improve the administration, to recruit his finances, and to encourage agriculture and industry. Through his care the cultivation of the mulberry-tree and the rearing of silkworms attained in Piedmont that perfection which they still maintain. He also reformed the university of Turin and founded several colleges. In 1730 Victor Amadeus abdicated in favour of his son Charles Emmanuel, and retired to the villa of Moncalieri, where he died in 1732. He was distinguished both as a general and a statesman, and was well worthy of being the first king of his dynasty.

King Victor Amadeus was married to Anne Marie of Orleans, daughter of Philip, duke of Orleans, brother of Louis XIV., and of Henrietta Maria, daughter of Charles I. of England. This alliance is the origin of the connection between the house of Savoy and the kings of Great Britain.

1730-1773. Charles Emmanuel III., King of Sardinia, Duke of Savoy, Prince of Piedmont, &c., assumed the crown in times of peace. But the ambition of the court of Spain, excited by Elizabeth Farnese, wife of Philip V., aimed at recovering its lost preponderance in Italy, and Spain was supported by France in consequence of the family alliance. The contested election for the crown of Poland became the pretext for a new war in 1733. The French cabinet, in order to obtain the alliance of the king of Sardinia, promised him the duchy of Milan, which was to be taken from Austria. Charles Emmanuel assented, united his forces to the French army under Villars, and the Milanese was conquered in a few weeks. Don Carlos, Infante of Spain, on his part conquered Naples. In September, 1734, the battle of Guastalla took place between the Austrians on one side, and the French and Sardinian troops, commanded by King Charles Emmanuel, on the other. The Austrians lost 8000 men, and were obliged to retreat. In 1735 the preliminaries of peace were signed, and Charles Emmanuel, instead of the duchy of Milan, obtained only the Novarese and Tortona. This was the last war in which the house of Savoy joined France against Austria.

In the war of the Austrian succession, King Charles Emmanuel took the part of Maria Theresa. He saw that the Bourbons had again become sufficiently powerful in Italy by the acquisition of Naples and Sicily, and it was not his interest to favour their further aggrandisement. His policy and that of his successors was therefore to be allied with Austria and England, and to prevent the French from crossing the Alps. In 1743 the king of Sardinia signed a treaty with Maria Theresa and England, engaging himself to defend Lombardy with 45,000 men. England agreed to pay him a subsidy, and to keep a fleet in the Mediterranean during the war. The French and Spanish combined forces invaded Piedmont by the way of Nice, and laid siege to Cuneo, which they could not take. In 1745 another French and Spanish army, passing the Riviera of Genoa, entered Lombardy, and took Milan. In the following year the king of Sardinia, united with the Austrians, drove them away. In 1747 a French force of fifty batallions, commanded by the Chevalier Belleisle, moving from Briançon, crossed Mont Genevre, and advanced by Cesane and Oulx, to the pass of the Col de l'Assiette, situated between the sources of the Dora and those of the Chisone, where the Piedmontese troops had formed an entrenched camp. The French attacked the camp on the 19th of July; but after the most strenuous efforts, they were completely repulsed, having lost their general, between 400 and 500 officers, and 6000 men. This defeat put an end to all attempts at invading Piedmont for half a century. By the peace of Aix-la-Chapelle the king of Sardinia obtained the upper Novarese, or Valli di Novara, and the districts of Voghera and Vigerano near the Po.

The remaining twenty-five years of the reign of Charles Emmanuel III. were spent in peace, and employed in the cares of administration, in which he was ably assisted by his minister Count Bogino. He published the 'Costituzioni Reali,' or code already mentioned; he effected the 'catasto,' or general survey of the land, in order to put the assessment of the land-tax on an equitable basis; he established special schools of artillery and mineralogy, and sent several learned men on scientific journeys; he opened new roads, excavated canals, gave new privileges to the town of Nice, in order to increase its commerce; and in 1771 he published an edict, empowering all individuals and communes to commute the feudal services to which they might be subject, for an equivalent in money, to be fixed by a court created for the purpose. He took off all the extraordinary imposts which had been put on during the long preceding wars, and yet the revenue of the state increased every year. Charles Emmanuel died at Turin, in February, 1773, at 72 years of age, regretted, both by his subjects and foreigners, for his able public conduct and his unspotted private character. He left to his successor a compact and extensive territory, a thriving population, a fine army, and a full treasury.

1773-1796. Victor Amadeus III., son of Charles Emmanuel, showed himself very fond of military parade and exercises, and he increased his army in time of profound peace. The finances became exhausted, the public debt increased, and fresh taxes were laid on the people. The king greatly favoured the nobles, giving to them almost exclusively the public offices, civil, military, and ecclesiastical. At the same time king Victor encouraged useful studies; he reorganised the public colleges and schools after the expulsion of the Jesuits, and he appointed fit professors to the chairs of the university of Turin. The storms of the French revolution rendered the end of his reign calamitous; he lost Savoy and Nice in 1792, Oneglia in 1794, and after two years more of a desultory but sanguinary warfare along the line of the Alps, in which the Piedmontese troops displayed their accustomed valour and discipline, the line of defence formed by the Alps was turned by the French passing rough the Ligurian Apennines, and the revolutionary tor- nt poured down into the plains of the Po. [Bonaparte, apoleon.] King Victor was induced to conclude a hasty ace, which left his dominions at the mercy of the French. e died soon after, in October, 1796.

1796-1802. Charles Emmanuel IV., son of King Victor, icceeded his father on a slippery throne. Savoy and Nice ere united to France, and Piedmont was overrun by rench troops, who held the principal fortresses in their inds. As long as Bonaparte remained in command in aly, he observed some degree of respect towards the king Sardinia, but after his departure the generals, commis- ries, and other agents of the Directory heaped insult upon sult on the fallen monarch, and exaction on exaction on s unfortunate subjects, until at last he was obliged to tire to Sardinia in 1799. The melancholy details of those ars are told by the historian Botta, himself a Piedmontese, the most striking language. In June, 1802, Charles mmanuel, who was then at Rome, abdicated the crown in vour of his brother Victor Emmanuel.

1802-1821. Victor Emmanuel, seeing no chance of being stored to his continental states, repaired to the island of irdinia. In the year 1814 he returned to Turin, and took ssession of the dominions of his ancestors, to which the ongress of Vienna added the Genoese territory. A mili- ry insurrection, which broke out in Piedmont, headed by me of the nobles, who wished for a representative constitu- n with two chambers, whilst another party wanted the nstitution of Spain of 1812, with only one chamber, in- iced the king to abdicate the crown in favour of his other Charles Felix (he himself having had no male spring), who was then at Modena. Victor Emmanuel iitted Turin with his family, leaving his relative Prince iarles Albert of Savoy Carignano, a descendant of Prince iomas, brother of Victor Amadeus I., provisional regent.

1821-1831. Charles Felix, supported by Austria, put down e insurrection in Piedmont, and restored the former stem of monarchy. He occupied himself with the busi- ss of administration, and also in making new roads and her improvements both in his continental dominions and the island of Sardinia, where he appears to have been ry popular. He died at the beginning of 1831, leaving male issue, and was succeeded on the throne by his col- eral relative Charles Albert of Carignano, the present king.

The following are among the best works for reference con- ning the history of the Sardinian states: Ludovico della iesa, *Storia del Piemonte, libri trè*; Agostino della Chiesa, *rona Reale di Savoia*; Paradino, *Chronique de Savoie*; sauro, *Origine delle Guerre Civile del Piemonte*; Galli, *riche del Piemonte e Paesi riuniti, colla Serie Cronolo- a delle Persone che le hanno occupate, dal Secolo X. fino Decembre*, 1798; Grillet, *Dictionnaire Historique, Litté- re, et Statistique des Départemens du Mont Blanc et du man, contenant l'Histoire Ancienne et Moderne de la voie*; Denina, *Quadro Storico, Statistico, e Morale dell' a Italia*; Tenivelli, *Biografia Piemontese*; Count Sa- zo, *Histoire Militaire du Piémont*; Costa de Beaure- d, *Mémoires Historiques sur la Maison de Savoie et sur Pays soumis à sa Domination depuis le Commencement XI. Siècle jusqu' à l'Année* 1796; Napione, *Storia Me- lica della Real Casa di Savoia*; and lastly, Count Dal- zo, who, in his *Essai sur les Anciennes Assemblées Na- nales de la Savoie, du Piémont, et des Pays annexés*, 8vo., ris, 1829, has collected much information upon the his- y of the old States-General of those countries. At present moment Luigi Cibrario, a Piedmontese writer some reputation, author of the 'Storia di Chieri,' is iting a general history of the monarchy, *Storia della marchia di Savoia*, of which the first volume has n lately published at Turin, and which promises to when finished, the best work on the subject. The gning king, Charles Albert, a great promoter of his- ical studies, has caused a collection to be made of the old onicles, charters, diplomas, and other documents of the ddle ages, the first volume of which has been lately pub- ned, *Monumenta Historiæ Patriæ Scriptorum*, in fol.

With respect to the island of Sardinia, the best modern rks are: Manno, *Storia di Sardegna*, 3 vols. 8vo., 1827; bert de la Marmora, *Voyage en Sardaigne de* 1919 *à* 25, with an atlas, Paris, 1826; and Capt. W. H. Smyth, *etch of the Present State of the Island of Sardinia*, to iich last we are indebted for most of the information con- ning that island.

SARDO'NICUS RISUS, a convulsive affection of the muscles of the face, in which the lips are drawn involuntarily apart, so as somewhat to resemble the expression of the countenance in laughter. The name is derived from a species of ranunculus that grows in Sardinia, called Herba Sardonica, or Sardoa, which is said to produce this affection in those who eat it.

Risus Sardonicus is observed as an effect of certain vegetable poisons, such as the *Ranunculus sceleratus* of Linnæus, but is more frequently met with as one of the symptoms of tetanus, or locked-jaw, or as an attendant on other convulsive affections.

The term is employed figuratively to denote that forced laugh by which persons sometimes endeavour to conceal their real feelings.

SA'RDONYX. [Quartz.]

SAREE. [Persia.]

SAREPTA. [Saratow.]

SARGUS. [Sparidæ.]

SARIGUE. [Marsupialia, vol. xiv., p. 459.]

SARK, or SERK. [Guernsey.]

SARLAT. [Dordogne.]

SARMA'TIA was the name given by the Romans to all the country in Europe and Asia between the Vistula and the Caspian. It was bounded on the south by the Euxine and Mount Caucasus, and was divided by the Tanais into Sarmatia Europæa and Sarmatia Asiatica. The people inhabiting this country were usually called Sauromatæ (Σαυρομάται), by the Greeks and Sarmatæ by the Romans.

Neither Herodotus nor Strabo makes mention of the European Sarmatians. The Sauromatæ of Herodotus dwelt to the east of the Tanais, by which they were separated from the Scythians of Europe, and inhabited a tract of country extending northward from the Palus Mæotis equal to fifteen days' journey in length. (Herod., iv. 21, 58.) Herodotus also says that the Sauromatæ sprung from the intercourse of a body of Scythians with some Amazons who came from the river Thermodon in Asia Minor, and that their language was a corrupted form of the Scythian (iv. 110-117). Strabo likewise places the Sauromatæ between the Tanais and the Caspian (ix., p. 507, 492), and speaks of the people west of the Tanais as Scythians.

The principal nations in European Samatia were—1, The Venedæ or Venedi, on the Baltic. 2, The Peucini, or Bastarnæ, in the neighbourhood of the Carpathian Mountains, who, as well as the Venedi, appear to have been of German origin. (Tac., *Germ.*, 46.) 3, The Iazyges, Rhoxolani, and Hamaxobii, in the southern part of modern Russia. 4, The Alauni or Alani Scythæ, in the central part of Russia, in the neighbourhood of Moscow. The knowledge which the antients possessed of these people was very small; they are universally represented as a nomade people with filthy habits. The people with whom the Romans were brought most in contact were the Iazyges, generally called Iazyges Sarmatæ, and sometimes Iazyges Metanastæ, because they were driven out of their original seats on the Euxine and the Palus Mæotis about the year 51 A.D. They settled in the country between the Danube and the Tibisis or Tibiscus (Theiss), after driving out the Daci, and carried on for a short time war with the Romans. (Plin., iv. 25; Tac., *Ann.*, xii. 29, 30.) They are frequently mentioned by subsequent writers as dangerous neighbours to the provinces of Pannonia and Mæsia.

The different tribes in Asiatic Samatia never acquired any historical importance.

There are some valuable remarks on the history of the Sarmatians in Niebuhr's 'Kleine Schriften,' p. 352, &c.

SARNO. [Salerno.]

SAROS, NEROS, SOSOS. These names are from the fragments left of Berosus, who says that the Chaldæans had three astronomical periods so called, the saros of 3600 years, the neros of 600 years, and the sosos of 60 years. Of the two latter we know nothing more, and as to the saros, the duration given by Berosus is either entirely wrong, or else subsequent writers have taken another Chaldæan period, which is neither of the three above, and applied the term saros to it. Geminus (ch. 15) mentions that the Chaldæans had found a period of 669 months, or 19,756 days (so the text stands after an emendation by Bouillaud). Ptolemy mentions the same period, and Pliny (lib. ii., c. 13) remarks relative to it, that eclipses return again after a period of 223 (the third of 669) months; but the text here again was corrupt, until Halley (*Phil. Trans.*, No. 194) restored the true reading, which was afterwards confirmed by manuscripts. To complete the misfortunes of this period, Suidas has the word Saros, but it was omitted from his Lexicon either by mistake or faultiness of manuscripts, until Dr. Pearson restored it (*Exp. of the Creed*, 1683, fol. 59, according to Weidler), and even then it gives 222 months instead of 223, which was again corrected by Halley. In the time of Riccioli, Geminus and Ptolemy were the authorities cited on this period, and the name Saros was not applied to it. Many writers (Costard for example) confound it with the Metonic period of 235 lunations, which is a totally different thing; others again, as Geminus, and even Riccioli, appear to consider it as a period for the determination of the lunation or month; and perhaps the assertion made by some others, that the Chaldæans were in possession of the Metonic cycle, may be another confusion between the latter and the saros.

Leaving the authorities on the subject, we know [Moon, p. 373] that 223 average intervals between full moon and full moon make up very nearly 242 nodical months, or passages of the moons from one node to the same again. Now since the eclipses entirely depend upon the manner in which the full and new moons take place relatively to the node, it is obvious that if 223 lunations were exactly 242 nodical months, and if the sun's and moon's orbits were truly circular, and their motions uniform, all the eclipses of one set of 223 lunations would be produced again precisely in the same order during the next 223; that is, if there were (say) an eclipse of the sun during the 47th lunation, reckoning from a given full moon, there would necessarily be another in the (47 + 223)rd, or the 270th lunation, and so on.

All these suppositions are near enough to the truth to make this sequence of eclipses very nearly take place. For since 223 lunations make 241·029 sidereal months, 238·992 anomalistic months, and 241·999 nodical months, it is obvious that at the end of a saros the moon is in the same position with respect to the sun, nearly in the same part of the heavens, nearly in the same part of her orbit, and very nearly indeed at the same distance from her node as at the beginning of the period. Now 223 lunations make 6585·32128 days, or 6585 days, 7 hours, 42 minutes, and 38 seconds; or 18 years (of 365 days), 15 days, 7 hours, 40 minutes, and 38 seconds. Consequently a saros of five leap years is 18 years, 10⅓ days, and one of four leap years is 18 years, 11⅓ days, nearly. The Chaldæan period is 6585⅓ days; and to avoid fractions they appear to have put together three such periods, making 19,756 days, and 669 lunations. From what has been said above, it might be inferred that the rotation of the moon's node is made in nearly a saros; and in fact that revolution does take 18·6 years.

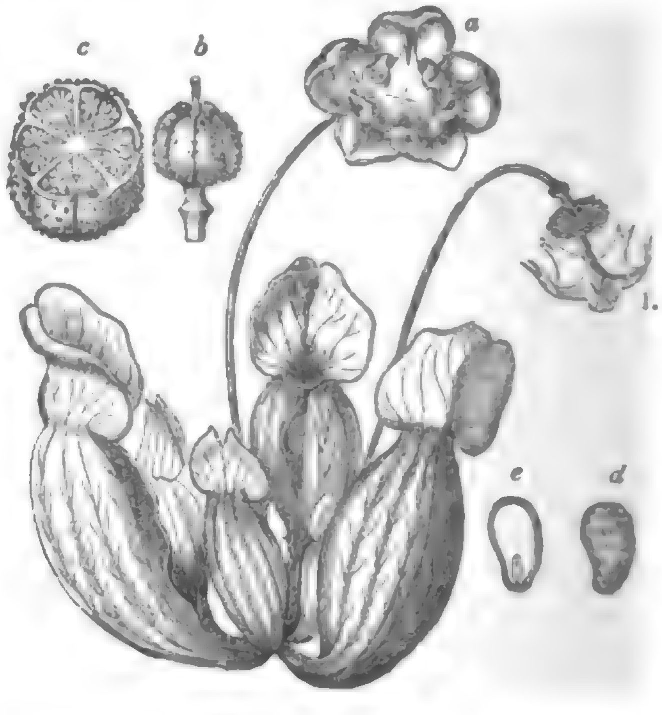
It is to be observed however that the end of each saros is not in the same part of the day as the beginning, which is of consequence as to the solar eclipses, though not so as to the lunar, and still more does the inexactness of the period affect the former. For a saros contains 241·998659 mean nodical revolutions; so that if the moon be in her node at the beginning of a saros, she will want ·001341 of a revolution of being in her node at the end of it. This is about 29′, nearly the moon's diameter, which makes it sometimes happen that a lunar eclipse which takes place in a certain lunation of one saros does not take place in the same lunation of the next, and very often causes the same as to a solar eclipse. And the effect must be that at last the eclipse of any lunation is destroyed, by the accumulation of these errors of 29′ each time. Nor do the circumstances of one saros precisely resemble those of another until a longer period of about 746 such periods has elapsed. But in the same manner that eclipses are removed out of one lunation by the inexactness of the period, they are carried into another. There are about 70 eclipses in each saros, 30 lunar and 40 solar.

The Metonic cycle of 235 lunations gives 255·021 nodical months, which is not near enough to a whole number to produce anything like a return of similar eclipses. But it is, as explained [Moon, p. 373], near enough to an exact number of years to restore the full moons to the same days of the year, or the preceding or following days. The Metonic cycle is a chronological period; that is, portions of time measured from a given epoch, and each equal to 19 years, are used in chronology. But the Saros is not a chronological period, but only a portion of time with any arbitrary commencement. Hence the student must not look in works on chronology for any information upon it. (Riccioli, *Alm. Nov.*; Weidler, *Hist. Astron.*; Bouillaud, *Astron. Philol.*; Ferguson's *Astronomy*.)

SAROS. [Hungary.]

SARRACENIA'CEÆ, a natural order of plants placed by Lindley in the albuminous group of polypetalous Exogens. It consists of herbaceous perennial plants inhabiting bogs, with fibrous roots and radical leaves, with a hollow urn-shaped or pitcher-shaped petiole, at the point of which is articulated the lamina, or blade of the leaf, which covers the petiole like a lid. The flowers are solitary or on scapes, and the petals and sepals are herbaceous. The calyx is composed of 5 persistent sepals, often having a 3-leaved involucre without, imbricate in æstivation. Corolla of 5 petals, unguiculate and concave. The stamens are hypogynous and indefinite, filaments short, anthers 2-celled, bursting longitudinally. Ovary superior, 5-celled, with a central many-seeded placenta; style single; stigma much dilated, peltate with 5 angles. Fruit a globose capsule, with 5 lobes, 5 cells, and 5 valves. Seeds very numerous; albumen abundant. The affinities of this order are not very obvious. It is usually placed near Papaveraceæ, on account of its dilated stigma, indefinite stamens, and embryo in the midst of a copious albumen. Lindley considers it to be related to Dionæa [Dionæa], wherever that genus may be ultimately placed. In the remarkable structure of the leaves this order agrees with Nepenthaceæ and Cephalotaceæ.

There is only one genus belonging to this order, of which there are about six species, all of them inhabitants of the bogs and swamps of North America. Of their properties we know but little; they are chiefly interesting on account of their pitcher-like leaves, which are capable of holding water, and are thus said to furnish drink to wild animals in their native forests during periods of drought. The pitchers frequently contain the dead bodies of flies and other insects, which become putrid and produce an unpleasant smell around the plant, but are said to afford to the plant a source of nutrition.



Sarracenia purpurea.

a, Entire plant with leaves and flowers; 1, the dilated stigma; b, ovary with columnar style; c, transverse section of fruit, showing seeds attached to parietal placentæ; d, seed; e, section of seed, showing the minute embryo and abundant albumen.

SARRALBE. [Moselle.]

SARREAU. [Morbihan.]

SARREGUEMINES. [Moselle.]

SARRU'BA, or SARRUBUS. [Gecko, vol. xi., p. 105.]

SARSAPARILLA. [Smilax.]

SARSAPARILLA, EAST INDIAN, a root used in medicine, and sold by druggists as a substitute for sarsaparilla, under the above name. This is imported from India, and has been said by some to be the produce of Smilax aspera, a plant not known to be found within the limits of that country. Species of Smilax are however common in India, but are not described as being employed by the natives in medicine. Dr. Royle (*Proc. R. Asiatic Soc.*, June, 183 states having received a portion of this root, which had been brought from India by Mr. Dodd, and that he obtained pecimens of an exactly similar root at Godfrey's, London, nder the name of Smilax aspera. On consulting the works f Ainslie, Roxburgh, and a figure of Rheede, he found that he root corresponded in every respect with that of Asclepias seudo sarsa, now Hemidesmus Indicus, which by the natives s called *Nunnari-vayr*, and by Europeans in India 'country arsaparilla.' The roots are long, slender, and have a pleaant odour, often compared to that of oris-root. It is rugose, ith its cortex often loose, furrowed longitudinally, and ivided transversely into ring-like pieces. It has been long nd extensively employed by the natives of India for much he same purposes as sarsaparilla, whence European practiioners were induced to give it a trial; and having been found fficacious, it has continued to be employed in the hospitals. ttention was first drawn to it in this country by Dr. Ashurner, in 1831, who says it increases the appetite, acts as diuretic, and improves the general health,—plumpness, learness, and strength succeeding to emaciation, muddiness, nd debility. It has also been employed by other pracitioners, who have spoken favourably of it; and as it is bundant and cheap, it seems worthy of introduction into eneral practice.

SARTHE, a department in France, taking its name om one of the streams by which it is watered, the Sarthe, n affluent of the Mayenne (which below the junction is alled Maine), belonging to the system of the Loire. The epartment is bounded on the north and north-east by that f Orne; on the east by those of Eure et Loir and Loir et her; on the south by those of Indre et Loire and Maine et oire; and on the west by that of Mayenne. Its form is emarkably compact, approximating to that of a circle, aving its chief town, Le Mans, nearly in the centre. Its ength from north to south, from the banks of the Sarthe elow Le Mêle (department of Orne) to the border of the epartment of Indre and Loire, near Chateau la Vallière, ay be estimated at 62 miles; its greatest breadth from east o west, from the neighbourhood of St. Calais to the bank of he Erve below Baillé, is about 58 miles. The area is estimated at 2407 square miles, being very near the average rea of the French departments, and rather exceeding the onjoint areas of the English counties of Hants and Berks. he population in 1831 was 457,372; in 1836, 466,888; howing an increase in five years of 9516, or above two per ent., and giving 194 inhabitants to a square mile. In mount and density of population it exceeds the average of e French departments in the proportion of about six to ve, and is a little superior in both respects to the English ounties with which we have compared it. Le Mans, the hief town, is 111 miles in a direct line west-south-west of aris, or 122 miles by the road through Versailles and hartres.

The surface is generally level. There are a few hills in ifferent parts, but none of any height. The principal are st on the north-western border, about Sillé-le-Guillaume. he south-east side of the department is occupied by the rmations of the cretaceous group which environ the chalk asin of Paris. The line which defines the outer edge of ese formations passes northward from the southern bounary of the department between Le Lude and La Flèche the neighbourhood of Le Mans, west of that town; it en runs north-east to the neighbourhood of Bonnetable, nd then turning east-south-east crosses the Braye into the epartment of Loir et Cher. From beneath the cretaceous roup, the formations between the chalk and the new red-ndstone crop out, and occupy the remainder of the deartment, except along the north-western boundary, where e lower stratified or the granite rocks of the great primive district of Bretagne make their appearance. Some of ur authorities speak of coal as produced in the department, ut whatever works existed appear to have been given up. here were in 1834 three pits of anthracite, which yielded at year above 18,000 tons, and gave employment to above 50 men. Iron is procured; and there were in 1834 five on-works, with five furnaces for producing pig-iron, and urteen forges for making wrought-iron; charcoal was the el almost exclusively employed. Freestone for building, arble, especially fine black, sandstone for paving, slates, illstones, granite, and fullers' earth are found. There are me mineral waters, but none in much repute.

The department belongs wholly to the basin of the Loire. he principal river is the Sarthe, which touches the border f the department on the north side near Alençon, and flowing south-west separates it from the department of Orne, except near Alençon, where its course is beyond the boundary, to which however it soon returns. Several miles above Frênay, or Fresnay-le-Vicomte, it quits the border and flows in a winding channel south-east to Le Mans, just below which it receives the Huine on the left bank from the north-east. From the junction of the Huine the navigation commences, and the river flows south-west into the department of Maine et Loire. Its whole course on or within the border of this department may be estimated at 110 to 120 miles, for about 50 of which it is navigable. The Loir, a tributary of the Sarthe, crosses the department just within the south-eastern and southern border, from between Montoire (department of Loir et Cher) and La Chartre to between La Flèche and Durtal (department of Maine et Loire): it does not join the Sarthe in this department. Its course in this department may be estimated at about 55 miles, for 35 or 40 of which, viz. from Château-du-Loir, it is navigable. Beside the Huine and the Loir, the Sarthe receives the Bienne and the Orne on the left bank; and the Geay, the Vègre, the Erve, and the Vaige on the right. The Loir receives the Braye, the Elangsort, and the Orne on the right bank; the Huine receives several small streams. The rivers abound in fish; the Huine and its affluents yield excellent trout.

The official statement of the inland navigation of the department is as follows:—

Sarthe	52	miles
Loir	46	„
Total	98	

There are no navigable canals.

There were, 1st January, 1837, seven Routes Royales, or government roads, having an aggregate length of 248 miles, all in good repair. The principal road is that from Paris to Nantes, which enters the department on the north-east side, and passes through La Ferté-Bernard, Connerré, St. Mars, Le Mans, and La Flèche. Roads run from Le Mans by Beaumont-le-Vicomte to Alençon (department of Orne); to Laval (department of Mayenne); by Ecomoy and Château-du-Loir to Tours (department of Indre et Loire); and by Bouloire and Saint Calais to Blois (department of Loir et Cher). A road from Laval to Tours passes just within the south-western boundary of the department, through Sablé, La Flèche, and Le Lude; and one from Alençon to Orléans (department of Loiret) passes just within the northern border through Mamers. The departmental roads had an aggregate length of 219 miles, viz. 199 miles in good repair, and 20 miles unfinished. The bye-roads had an aggregate length of 7000 miles.

The climate is mild and healthy. The soil varies much. The part occupied by the formations of the cretaceous group presents little else than a succession of sands. Part of this tract is made by care to yield good crops of grain, and other parts have been turned to account by planting them with the maritime pine (*pinus maritima*) as in the Landes of the south-west coast. The rest of the department has a tolerably productive soil. The area is estimated at about 1,550,000 acres, of which nearly 1,000,000 acres, or almost two-thirds, are under the plough. The principal grain crop is of wheat; but oats, buckwheat, and maize are also grown, and rye in the sandy districts. A considerable quantity of hemp and flax is raised, and a great quantity of trefoil seed, of which there is a large exportation, partly to England and partly to the North of Europe. The meadows and grass-lands occupy nearly 150,000 acres, and there are above 110,000 acres of heath or open pasture. The number of horned cattle is considerable; some of them are of a particular race which will carry a great deal of fat: sheep are numerous; the merinos are bred. Poultry and game abound; the former are an object of great attention round La Flèche, and are sent in great numbers to the markets at Paris. Bees are generally kept. The vineyards occupy about 25,000 acres; but the produce is for the most part of very inferior quality: the best growths are those of Les Janières, Chabaignes, and Bazouges, on the banks of the Loir. The orchards and gardens occupy as great an extent as the vineyards. Cider is the common drink of the people, but it is neither so pleasant nor does it keep so well as that of Normandie. A considerable quantity of fruit is grown, and some is exported. The chesnuts of Château-du-Loir are reputed to be excellent. The woodlands occupy about 170,000 acres.

The department is divided into four arrondissements as follows:—

Name.	Situation.	Area in Sq. Miles.	Cantons.	Communes.	Population in 1831.	Population in 1836.
Le Mans .	Cent. & W.	733	10	116	157,851	164,667
Mamers .	N.	622	10	144	131,867	133,444
Saint Calais	E.	432	6	56	71.334	70,834
La Flèche .	S.	620	7	78	96,320	97,943
		2407	33	394	457,372	466,888

In the arrondissement of Le Mans are—Le Mans, population in 1831, 19,672 town, 19,792 whole commune; in 1836, 23,164 commune [**Mans, Le**]; La Guierche and La Suze, on the Sarthe; Ballon, population 4078, near the Orne; Connerré and Montfort, on the Huine; St. Mars-la-Bruyère, on the Narais, an affluent of the Huine; Savigné, on the Coeslon, another small affluent of the Huine; Ecomoy or Ecommoy, population 3499, near the Orne, an affluent of the Loir; Vallon, on the Geay; Loué, on the Vègre; and Sillé-le-Guillaume, population 1917 town, 2696 whole commune; and Conlie, between the Vègre and the Sarthe. La Suze is on the left bank of the Sarthe, over which there is a handsome bridge. Close to the town are the ruins of the castle, formerly occupied by the lords of the place. The townsmen are engaged in the manufacture of wax-lights, hats, and poultry; and carry on a brisk trade in wood, woollen cloth, liqueurs, and hardwares: there are six yearly fairs. Ballon is remarkable for the ruins of an antient castle, which, from its situation on the top of a hill, forms a conspicuous object in the landscape: it was antiently one of the strongholds of Maine, and was taken, A.D. 1199, by Philippe Auguste. The townsmen manufacture coarse linen, in which, and in corn, they carry on considerable trade. Connerré has two remarkable druidical monuments. One is a cromlech formed by a slab or block of sandstone, about 2 feet thick, supported by five other blocks, forming three sides of an irregular quadrangle of more than 20 feet long and 8 to 10 feet wide. The other monument is an upright stone or obelisk, about 12 feet high above the ground, 8 feet broad, and on an average 2 feet thick. The blocks are all rough. The town of Connerré is small, but pleasantly situated in the meadows watered by the Longuève, a little stream which here joins the Huine, and over which, at the entrance of the town, is a good stone bridge. Montfort, distinguished from other places of the same name as Montfort-le-Rotrou, is on the slope of a hill, the summit of which is crowned by an old castle, whose massive walls render it at a distance a striking object. The townsmen are engaged in the manufacture of linen, which they excel in bleaching; and carry on trade in corn, hemp, yarn, and linen: there is a large market and four yearly fairs. There is an hospital in the town. The linen manufacture is also carried on at Savigné, distinguished at Savigné l'Evêque; that of paper at St. Mars. Ecomoy is a busy place: excellent butter is made, and building-stone and limestone are quarried and potters' earth is dug round the town; there are brick-yards, lime-kilns, and potteries; the townsmen manufacture linen. The church has a beautifully modelled equestrian statue of St. Martin. At Vallon, Loué, and Sillé-le-Guillaume linens are manufactured, and trade in corn is carried on: Sillé-le-Guillaume has an antient castle.

In the arrondissement of Mamers are—Mamers, population in 1831, 5720 town, 5822 whole commune; in 1836, 5704 commune, between the Bienne and the Orne; Fresnay-le-Vicomte, population 2775 town, 2840 whole commune; and Beaumonte-le-Vicomte, population 1918 town, 2381 whole commune, on the Sarthe; Bourg-le-Roy, between the Sarthe and the Bienne; La Férte Bernard, population 2535, on the Huine; Saint Côme and Bonnétable, population 3872 town, 5803 whole commune [**Bonnetable**], between the Orne and the Huine; and Montmirail, near the Braye. Mamers was antiently fortified, and was taken in the eleventh century by the count of Belême, and afterwards by the Normans; but there are now scarcely any traces of fortifications. The town is irregularly laid out, and consists of two large places or squares, with a number of streets adjacent to or terminating in them; neither streets nor squares are paved. The houses are tolerably well built, chiefly of stone. The smaller of the two squares is occupied by a handsome covered market; the other by a large building, formerly a convent, now containing the offices of the sub-prefect and the mayor, the college or high school, the public library, the theatre, the prison, and the barrack of the gendarmes. There are public baths. The townsmen are engaged in the manufacture of coarse linens, in which 1600 persons in and round the town are occupied, and of calico, which gives employment to 400 more. Hosiery is also made; and there are breweries and tan-yards. Great trade is carried on in corn, wine, brandy, wax, cattle, and especially sheep, which are considered to yield excellent mutton. There are five considerable cattle-fairs in the year. Near the town is an antient camp, ascribed by some to the middle ages, by others to the time of Cæsar. Fresnay, or Frênay-le-Vicomte, has a linen-hall, erected of late years, and a museum of stuffed animals. The townsmen are considered to manufacture the best of the linens sold at Paris as Alençon linens: and two-thirds of them are supported by this branch of industry. There are six yearly fairs for cattle and linen. Beaumont owes its origin and its distinctive epithet to the viscounts of Le Mans, who had a castle here, of which the remains serve as a prison. It is probably to one of these nobles that we may ascribe the artificial earthen mound which is adjacent to the town, and which has been planted and laid out with walks winding to the summit, like the Dane-john hill at Canterbury. The townsmen manufacture drugget, serge, and prunella. The market, which is held in a large market-place, with a market-house, is well attended; corn and fat geese are sold. There are several vineyards near the town, but they do not prosper. La Ferté Bernard was the scene of a conference in 1189, between Henry II. of England and Philippe Auguste of France. It was shortly after taken by Philippe: it was again taken, A.D. 1424, by the English, under the earl of Salisbury; and in the reign of Henri IV., A.D. 1590, by the prince of Conti. The town, whose population is augmented by that of the suburbs, which are comprehended in the adjacent communes, to nearly 4000, has a small but handsome parish church of Gothic architecture, a promenade, and an hospital. The old walls of the town remain; and there is a castle with keep and towers in pretty good preservation. The principal manufacture is of coarse checked linens for the colonies: linen-bleaching is also carried on; there are tile-works and tan, flour, and fulling mills. There is a well attended market, and much business is done in trefoil seed, in cattle fattened in the surrounding meadows, and in inferior butter and tolerable cheese. There are seven fairs in the year. There is a public library. Saint Côme is a pleasant place in a delightful situation. Roman medals have been dug up here. Montmirail is on a hill: it has considerable glass-works for making utensils for chemical and medical purposes. The townsmen trade in iron: they have four fairs in the year.

In the arrondissement of Saint Calais are—Saint Calais, pop. in 1831, 2864 for the town, or 3638 for the whole commune: in 1836, 3783 for the commune, not far from the right bank of the Braye; Vibraye, pop. 3037, and Bessé, on the Braye: La Chartre, and Château-du-Loir, pop. 2752 town, 3056 whole commune, on the Loir; Grand-Lucé, on the Veuve, which flows into the Elangsort; and Bouloire or Boulloire, on the Tortue, which joins the Longuève, or Longuere, a feeder of the Huine. Saint Calais was antiently called Anille, from the name of the brook on which it stands, until it received its present name, derived from a Saint Calais who founded a monastery here in the sixth century. The town lies in a hollow, amid hills covered with scanty crops of corn; it has an interesting Gothic church and a spire, two public walks, one of them by the side of the brook, and a large place or square. The inhabitants manufacture serge and other woollens, cottons, linens, leather, and glass; they carry on trade in cotton goods and trefoil seed. There are a subordinate court of justice and a high school. Near the town are the ruins of an old castle. Vibraye has an iron-work, a tan-yard, and an hospital. Much corn and many pigs are sold in its market, and it has seven yearly fairs. At Bessé, cotton goods, wax candles, and paper are made. Château-du-Loir gets its name from an antient castle of the counts of Anjou, erected in the eleventh century and demolished in the eighteenth. The older part of the town is badly laid out, and is composed of steep, narrow, and il-built streets; but the new street, along which the road from Le Mans to Tours passes, is straight and composed of neat stone houses with gardens; it traverses a handsome and regular square, planted with trees and serving as a public walk, on the site of the antient castle. Near the town, on a hill overlooking the valley of the Loir, is a singular faubourg, or suburb, consisting not of houses, but of caves hollowed out in the rock in two rows, one above the other, and inhabited by above a hundred families, linen-weavers chiefly, but some vine-dressers and labourers. There are at Château-du-Loir an hospital, a theatre, public baths, and a college. Linens, leather, and cotton yarn are manufactured; cattle, wood, corn, and wine are sold: there s a considerable weekly market; and there are six yearly fairs. La Chartre consists of one principal street, opening in one part into a small place or square, and of some smaller streets running into the principal one. Some of the poorer nhabitants live in caves, similar to those of Château-du-Loir, but not so pleasantly situated. Near the town are two mounds, the earthworks apparently of an antient castle. The inhabitants tan leather, and trade in wine and cattle; hey have six considerable yearly fairs. Grand Lucé was rebuilt after a dreadful fire in 1786; much trade in corn and cattle is carried on. Coarse linens are manufactured at Bouloire.

In the arrondissement of La Flèche are—La Flèche, pop. n 1831, 5970 town, 6421 whole commune; in 1836, 6440 commune; Le Lude, pop. 2182 town, 3250 whole commune; and Vaas, on the Loir; Pontvallain and Mansigné, on or near the Orne; Noyen, Malicorne, Parcé, and Sablé, pop. 304 town, 3999 whole commune, on the Sarthe; Précigné, between the Loir and the Sarthe; and Brulon, on the Végre. La Flèche is agreeably situated in the pleasant valley of he Loir. It consists of three principal streets, two of them parallel to each other running through the town for the istance of about half a mile, and the third at right angles to them; together with a few smaller streets or lanes. The wo parallel streets are straight, wide, and well paved; the road from Paris by Le Mans to Angers and Nantes passes hrough one of them: the other is partly lined by the extenive buildings of the military school. The places or squares re small. The principal public buildings are the town-hall, n edifice of regular design, which remained for some time nd perhaps still remains incomplete. The parish church resembles a village church: there is a pleasant promenade djacent to it. The royal military school occupies a royal alace built by Henri IV., and afterwards bestowed by him n the Jesuits for a college. On the suppression of the esuits, in 1762, it was converted by Louis XV. into a military school; and after being suppressed at the Revolution, as revived by Louis XVIII. Prince Eugene, Descartes, and the astronomer Picard were educated here while the esuits had the place. The buildings are arranged round ve courts; the principal of which, with its adjacent garden, very handsome. The principal gateway is adorned with culptured ornaments and a bust of Henri IV. There is lso a large park, which is embellished by the running water rought from two or three miles distance for the supply of he building. There are about 600 pupils, 400 of them suported by the government. There is a handsome chapel in he institution, and there are a library of 9000 volumes and gallery of paintings. The town has a theatre and two ublic bathing establishments. The trade of La Flèche is ot great; it consists chiefly in the corn, hay, wine, poultry, nd game of the neighbourhood; the two last are sent to Paris, where they are much esteemed for their delicacy. Black eils for nuns, leather, and glue are made. There are twelve early fairs. This town was repeatedly taken and retaken in he religious wars of the sixteenth century, and was also at a ater period the scene of contest between the republican and Vendean armies. There are the ruins of an old castle of the eudal lords of La Flèche. Le Lude consists of well-built ouses, but the streets are very irregularly laid out. It is commanded by an antient castle, whose massive quadrangular walls, situated on an eminence overlooking the Loir, and lanked by enormous round towers, one of them in ruins, preent a striking appearance. The park in which the castle tands was stocked with fine timber, now partially or wholly elled. There is a small hospital in the town. The inhabitants carry on a considerable trade in leather, and have eight yearly fairs, one of them for leather and two for cattle. Vaas has a small square planted with trees; the townsmen manuacture leather; there are four yearly fairs. The town was, before the Revolution, under the jurisdiction of the abbot of a Premonstratensian abbey founded in the reign of Charlemagne. At Pontvallain trade is carried on in cattle and swine; at Malicorne earthenware, pottery, and tiles are made; at Parcé paper is manufactured. Sablé was antiently a place of strength, but its fortifications have been entirely demolished. The streets are narrow and crooked; there is a small but pleasant boulevard raised like a terrace along the bank of the Sarthe, which forms a semicircular bend round the town. There is a bridge over the river, built of marble quarried near the town, which, though in its rough state of a slate colour, becomes of a deep black with veins of white when polished. There is a handsome mansion near the town, built in the beginning of the last century, but allowed to go to decay. A considerable manufacture of gloves, which are sent to Paris, is carried on; and there is considerable trade in corn, fruit, and the marble quarried near the town. There are four fairs in the year. At Précigné, or Pressegné, is a tolerably well frequented mineral spring; the town has a manufacture of coarse woollen cloth, and there are two fairs in the year. Leather is made at Brulon.

The population, where not otherwise noticed, is that of commune, and from the census of 1831.

This department, with that of Mayenne, constitutes the diocese of Le Mans, the bishop of which is a suffragan of the archbishop of Tours. It is in the jurisdiction of the Cour Royale and of the Académie Universitaire of Angers; and in the fourth military division, the head-quarters of which are at Tours. It sends seven members to the Chamber of Deputies. In respect of education it is considerably below the average of France. In every hundred young men enrolled in the military census of 1828-29, only thirty could read and write, the average of the French departments being above thirty-nine.

The department was in the earliest historic period chiefly included in the territories of the Aulerci Cenomani (*Αὐλίρκιοι οἱ Κενομανοί*, Ptol.); small portions just on the border were probably included in the territories of the adjacent tribes; the Arvii (*Ἀρούϊοι*, Ptol.), on the west, the element of whose name appears to have been preserved in that of the river Erve; and the Andes, or Andecavi (*'Ονδικάναι*, Ptol.), and Turones (*Τουρούπιοι* in some MSS. of Ptol., *Τούρονοι* in another), on the south. These were all included in the Roman province of Lugdunensis Tertia. The only antient town which is known to have been within this territory is Suindinum (Subdinnum, Tab. Peutinger; *Οὐινδινον*, Ptol.), afterwards Cenomani, now Le Mans; there is a position, 'Fines,' in the Peutinger Table, which D'Anville places just on the border of the adjacent dioceses of Le Mans and Chartres. In the division of France into provinces, this department was included in Maine, except the southern border, which was included in Anjou; it was the scene of frequent hostilities in the middle ages, during a short period of which it formed part of the extensive Continental territories of the Anglo-Norman princes. It suffered considerably during the Vendean war which followed the French Revolution.

SARTI, GIUSEPPE, a composer, once in high repute, and whose name is still too familiar to the readers of musical history to be omitted here—though his works, like most that are written to suit the fashion of the day, are, with the exception of a sacred terzetto, consigned to oblivion — was born in 1730, at Faenza. In 1756 he became *Maestro di Capella* at the court of Copenhagen: he afterwards composed for the court of Dresden; and finally entered into the service of Catherine of Russia, who treated him with a liberality truly imperial, at whose demise he was continued in all his appointments and emoluments by Paul, her successor. His *chef-d'œuvre*, '*Giulio Sabino*,' an opera, which was extravagantly applauded abroad, and is highly spoken of by Dr. Burney, did not succeed in London; indeed the neglect into which it speedily fell here, and, in time, everywhere else, may be adduced as a proof of its inherent weakness, and of the want of that power in the composer which is apparent in most of his works that are known to us. Sarti produced about thirty operas, and some sacred music. Of the latter, the terzetto alluded to above, 'Amplius lava me,' is well known and deservedly admired. He died at Berlin, in 1802.

SARTO, ANDREA VANUCCHI, called *del Sarto*, from the occupation of his father, who was a tailor, was born at Florence in 1488, and having shown an early predilection for drawing, was placed with a goldsmith to learn the business of engraving on plate. Being noticed by Giovanni Barile, a painter of no great celebrity, he persuaded his father to entrust his son to his care. With him young Sarto remained three years, and manifested such extraordinary talent that Barile placed him with Pietro Cosimo, who was considered one of the best painters in Italy. On leaving the school of Cosimo he formed an intimacy with Francisco Bigio, with whom he executed some works in the public buildings of Florence, which gained him considerable reputation. Lanzi observes that his improvement was not so rapid as that of many other artists, but slow and gradual. It has been erroneously asserted that he never was at Rome, but we are assured by Vasari that he passed some time in that city. We are informed that it was after his return from Rome that he painted for the monastery of the Salvi his admired pictures of the Descent of the Holy Ghost, the Birth of the Virgin, and the Last Supper. Of the last, Lanzi reports, that at the siege of Florence in 1529, the soldiers, after having destroyed the church and part of the convent, when they entered the refectory, stood motionless before it, and had not the heart to demolish it.

Francis I., king of France, desiring to procure specimens of the works of the most distinguished painters in Italy, Andrea del Sarto was commissioned to paint a picture for his Majesty, and sent in a Dead Christ, with the Virgin, St. John, and other figures, painted in his best manner, which is now one of the chief ornaments of the Gallery of the Louvre. This picture being universally admired, the king invited the artist to Paris, where he was received with great distinction, and obtained considerable employment both from Francis and the nobility. Amidst this success he received a letter from his wife, urging him to return to Florence. He accordingly requested leave of absence for a few months, promising to return with his family and settle in France. The king granted his petition; and not only made him liberal presents, but entrusted him with large sums of money for the purchase of statues, pictures, and drawings. Andrea however, on returning to Florence, squandered away the whole of the king's money as well as his own. At last he was reduced to poverty; and his conscience reproaching him with his ingratitude to his royal benefactor, he sunk into despondency, was abandoned by his wife and the false friends with whom he had spent his property, and at last his afflictions were ended by the plague, which carried him off in 1530, in the 42nd year of his age.

The churches, convents, and palaces of Florence contain many of his best works. Andrea is praised by Vasari as the prince of the Tuscan school, for having committed fewer faults than any other Florentine painter.

His colouring is distinguished by sweetness and harmony of tone; and he is remarkable for the boldness of his relief and his perfect knowledge of chiaroscuro. His draperies are easy and graceful, and his design extremely correct. Yet he seems to have wanted the grandeur which characterises the greatest masters.

SARUM. We propose under this head to give an account of Old Sarum, and a notice of the bishopric now fixed at New Sarum, or Salisbury. [SALISBURY.]

Old Sarum, situated about a mile and a half north of Salisbury, is generally regarded as the Sorbiodunum of the Romans. Its name, derived from the Celtic words *sorbio*, 'dry,' and *dun*, 'a city or fortress,' leads to the conclusion that it was a British post; it probably belonged to the Belgæ, who inhabited this part of Britain, and was perhaps one of the towns taken by Vespasian when engaged in the subjugation of this part of the island under the emperor Claudius. [BRITANNIA, vol. v., p. 442.] The number of Roman roads which met at Old Sarum, and the mention of the place in the Antonine Itinerary, show that the place was occupied by the Romans, but the remains present little resemblance to the usual form of their posts. The roads led to Calleva Atrebatum, now Silchester; to Venta Belgarum, now Winchester; to Durnovaria, now Dorchester; and to the shore of the Bristol Channel.

In the Saxon times, Sarum, under the somewhat altered name of Searobyrig, Serasbyria, and Sarisberia, is frequently noticed by historians. Kenric, son of Cerdic, defeated the Britons in this neighbourhood, A.D. 552; and in 1003 the place was taken and burned by Sweyn, king of Denmark. Under the Anglo-Saxon and Anglo-Norman princes, councils ecclesiastical and civil were held here, and the town became the seat of a bishopric. There was a castle or fortress, which is mentioned as early as the time of Alfred, and which may be regarded as the citadel; and the city was defended by a wall, within the enclosure of which the cathedral stood.

Early in the thirteenth century the oppression of the castellans, or captains of the castle, and their disputes with the bishops and clergy, led to the removal of the cathedral to its present site. Many or most of the citizens also removed, and the rise of New Sarum [SALISBURY] led to the decay of the older place: so that in the time of Leland there was not one inhabited house in it. It returned members to parliament 23 Edward I., and again 34 Edward III., from which latter period it continued to return them until it was disfranchised by the Reform Act. It was commonly referred to as the most striking instance of a rotten borough, continuing to return members when it had neither house nor inhabitant.

The earthworks of Old Sarum are very conspicuous. They are on the right of the road from Marlborough to Salisbury, and consist of a circular or rather oval entrenchment; a smaller entrenchment of similar form within the first; and some earthen banks extending from the inner to the outer entrenchment, and subdividing the area between them. The outer entrenchment, consisting of a vallum or rampart surrounded by a ditch, encloses an area of twenty-seven acres and a half: the outer circumference of the ditch is just above seven furlongs, or nearly one mile. From the bottom of the ditch to the top of the rampart the height is 106 feet. The height of the rampart of the inner enclosure, measured in a similar way, is about 100 feet. There are a few fragments of walls. The outer enclosure has two openings or entrances; one, defended by a hornwork, towards the east, the other towards the west. The inner enclosure has only one entrance, namely towards the east. (Sir R. C. Hoare's *Antient Wiltshire*.)

The diocese arose from that of Sherborne, which was formed, in the reign of Ina of Wessex, by dismemberment from the diocese of Winchester, previously the only one in Wessex. In the early part of the tenth century, the diocese of Sherborne was divided into three; and the bishop of one of these had his seat successively at Ramsbury, not far from Marlborough, at Wilton, and perhaps at Sunning in Berkshire. In the time of Bishop Herman, in the reign of Edward the Confessor, this diocese and that of Sherborne were united, and the seat of the bishop fixed at Old Sarum, from whence, as already noticed, it was removed to Salisbury.

The diocese, before the late alterations, comprehended the counties of Wilts and Berks, the former comprehending the archdeaconries of Salisbury and Wilts, and the latter the archdeaconry of Berks. These were divided into thirteen rural deaneries, as follows: I. Archdeaconry of Salisbury—1, Amesbury; 2, Chalk; 3, Pottern; 4, Wilton; 5, Wylye. II. Archdeaconry of Wilts—6, Avebury; 7, Marlborough; 8, Cricklade; 9, Malmsbury. III. Archdeaconry of Berks—10, Abingdon; 11, Newbury; 12, Reading; 13, Wallingford.

By the recommendation of the Church Commissioners the following changes have been made or are to be made. The whole archdeaconry of Berks is transferred to the diocese of Oxford; and the deaneries of Cricklade and Malmsbury, in the archdeaconry of Wilts, to that of Gloucester. On the other hand, the archdeaconry of Dorset, comprehending the five rural deaneries of Bridport, Dorchester, Pimperne, Shafton, and Whitchurch, has been added from the diocese of Bristol. The number of archdeaconries is still three, that of rural deaneries twelve.

The cathedral clergy consist of the dean, precentor, chancellor of the church, treasurer, six canons residentiary, who are also prebendaries, sub-dean, succentor, thirty-eight prebendaries, and four priest-vicars; besides singing-men, choristers, organist, and other officers. The net yearly revenue of the bishopric, on the average of three years ending with 1831, was 3939*l.*, but it was supposed that on a more extended average it would amount to 5000*l.* or from that to 6000*l.* per annum. It is not proposed by the commissioners to make any alteration in this respect. The revenue of the cathedral at the same period averaged 2799*l.*, and was expected to decrease; the corporation sharing this revenue consisted of the dean, who received two-eighths, and six canons, who received one-eighth each. The dean, chancellor, precentor, treasurer, and prebendaries had their separate revenues, and the four priest-vicars formed a corporation by themselves.

SARZA'NA. [SPEZIA.]

SARZEAU. [Morbihan.]

SASSAFRAS, the name of a genus of plants belonging o the natural order Lauraceæ. This is one of the genera nto which the old genus Laurus of Linnæus has been ivided by Nees von Esenbeck and other botanists. It is nown by its diœcious flowers, 6-parted membranous calyx, ith equal segments permanent at the base. The barren owers have 9 stamens in 3 rows, the 3 inner with double-talked glands at the base; the anthers linear, 4-celled, with heir faces turned inwards. The fertile flowers have sterile tamens, which are fewer than or as many as in the barren owers. The fruit is succulent, placed on the thick fleshy pex of the peduncle, and seated in the torn unchanged calyx. he leaves are deciduous; flowers yellow. The species of this enus most known is the *S. officinale*, the Sassafras Laurel, n account of its medicinal virtues. It is an inhabitant of the oods of North America, from Canada to Florida. It is nostly a small tree or bush, but sometimes attains the eight of 40 or 50 feet. Its flowers are arranged in naked owny racemes, which open before the leaves appear, and re furnished with subulate deciduous bracts. The leaves re membranous, bright-green, smooth above, finely downy eneath, very variable in form, and tapering in a wedge-like manner into the petiole. The fruit is of a bright blue olour, as large as a small cherry, and seated upon red claate peduncles. In America the sassafras is divided into wo varieties, the red and white. Its great use is for meicinal purposes. It is however employed in America for making bedsteads and other articles of furniture, which are ot liable to the attacks of insects, and give out a very greeable odour. This plant is interesting in connection with the history of America, as it is said that it was its trong aromatic smell that convinced Columbus, when seekng the New World, that a shore was near at hand, and ncouraged him to persevere, at a time when his crew had mutinied, and the failure of attaining the objects of his exedition was threatened. This tree has been grown in Great Britain, and in some instances has attained great eight and grown luxuriantly. It may be propagated by uttings of the roots or suckers, and should be planted in a heltered situation. Its foliage is best when grown against wall.

A species of Magnolia, the *M. glauca*, is called in Ameica the Swamp Sassafras, and the Sassafras nuts of the London shops are, according to Humboldt, the produce of he *Nectandra Puchoryminor*.

SASSAFRAS, Medical Properties of. The tree which yields this substance is the Sassafras officinale (Nees) Laurus Sassafras, Lin.); a native of North America, occuring from Canada to Florida. It is said to grow in Mexico, nd Martius mentions it as a part of the Materia Medica of Brazil; but it is probable that it was introduced from Florida. The root is the officinal part in the London Pharmacopœia; ut the whole plant possesses the aromatic odour common to he Laurineæ, and some assert that the bark of the stem and ranches is stronger than that of the root; but this seems o be an error. The root, invested with the bark, comes to Europe in pieces sometimes two feet long, and from the hickness of an arm to half a foot in diameter, irregularly ent, knotty, and with a light, soft, porous wood. The ark also occurs detached from the wood in pieces two or hree inches long, from one and a half to two inches broad, ometimes rolled outwards, but more generally curved inwards; of a dirty grey or brownish colour externally, and a ungoid surface, of a reddish colour internally. The taste s sharp, acrid, aromatic, and, as well as the odour, reembles fennel.

The chief constituents are; volatile oil, resin, and exractive. The oil is the most active. It may be obtained y distillation. Ten pounds of the root yield two and a half drachms. The specific gravity is 1·094. It consists of wo oils, separable by water, in which the one floats and he other sinks. By time or a low temperature, it deposits a stearopten, or crystals of sassafras-camphor.

Sassafras acts as a stimulant to the circulation, especially of he capillaries, causing an increased secretion from the skin, f the person be kept warm, or from the kidneys, if cool. Should these organs fail to be influenced by it, heat and general excitement, with headache, are the results. It is of unquestionable utility in gout and rheumatism, but its activity is generally destroyed by the improper mode of administering it. Decoction dissipates the volatile oil, and is a most objectionable preparation. Infusion or a tincture may be used, or the volatile oil rubbed up with sugar. Other species of Sassafras are used in India and Java.

SASSA'NIDÆ. [Persia—*History*.]

SA'SSARI. [Sardegna.]

SATELLITE (*satelles*, an attendant soldier or guard), a name given to the smaller planets which accompany and revolve round the larger ones. With this exception, that the rotation of a satellite round its own axis is made in the same time as its orbital revolution round its primary, in every case in which it has yet been fully made out that there is a motion of rotation, there seems to be no circumstance which can be pointed out in which the satellites have any distinctive peculiarities. Those of Uranus (which move from east to west) even form an exception to what would otherwise be the universal law of the bodies of the solar system, namely, that they move from west to east. The earth has one satellite [Moon], Jupiter has four, Saturn seven, and Uranus six (according to William Herschel), though owing to the difficulty of seeing them, two only have yet been seen by any other observer: this point is further treated in Uranus. See also Gravitation, Solar System, Astronomy, Galileo, Huyghens, Cassini, Herschel, &c.

SATERLAND, a district in the grand-duchy of Oldenburg, comprises the three parishes of Scharrel, Ramsloh, and Strücklingen, with a population of about 2000 inhabitants. This little tract forms a plateau surrounded by impassable morasses, over which there has hitherto been no road and scarcely a path. It is situated on two rivers, the Markä and the Ohe, which unite at Scharrel, and then, under the name of Sater-Ems, run north-west through the country to the Söste. It is 12 miles long, 5 broad, and is surrounded on all sides, except the river, with marshes and heaths. In very dry weather it is possible to enter it from East Friesland on horseback and in light carriages, though this is attended with considerable difficulty. On the other side the ground is not firm, except in the severest frost. The inhabitants, who are all of Frisian descent, still speak their mother tongue and likewise the Westphalian dialect. From their secluded situation, they have retained the manners of their ancestors, and are in this respect a very remarkable people. Their country is watered by the Sater-Ems, which facilitates their communication with East Friesland, whither they send their superfluous produce for sale, and receive in return the few articles which they require. They cultivate rye and buckwheat, which thrive very well in their sandy soil. They have oxen, sheep, and cows, considerable turf-moors, but no wood, and only here and there an isolated fruit-tree. They are exempt from game-laws, which is a very profitable privilege on account of the number of wild-fowl. They employ themselves in knitting stockings, and manufacture most of their clothes from the wool of the sheep; all of them are likewise free to exercise the trades of brewing, baking, and distilling, and also to fish without paying for a licence. At the haymaking season, the morasses are crossed in very light waggons with broad wheels not hooped with iron, and the horses have pieces of board attached to their feet, to prevent them from sinking in. The country is governed by twelve burgomasters, four from each of the three parishes; half of them go out every year, and choose their successors, who must not be related to them by consanguinity, and whose appointment is confirmed by the people. This takes place in a general assembly of the inhabitants, held every year, on Shrove Tuesday, at Ramsloh, in the church of which the archives are kept.

SATIN. [Silk.]

SATIN SPAR, *Carbonate of Lime, Fibrous Arragonite* (?). Structure fibrous, the fibres parallel, usually waved, and always transverse to the vein in which the mineral occurs. Like arragonite in general, it is harder than common calcareous spar. Colour white, sometimes yellowish or greyish. Translucent. Specific gravity 2·7. It occurs at Alston Moor in Cumberland, and North America, in tabular masses of an inch or two in thickness, in veins in slaty clay and shale. It consists chiefly, if not altogether, of carbonate of lime.

SATIRE is properly a species of Roman poetry, and must not be confounded with the Satyric drama of the Greeks. The Latin word *Satura* or *Satira* appears to have originally signified a collection of various things, and accordingly this name is applied to food composed of various ingredients, and also to a law consisting of several d [illegible] of particulars of a different nature. (Festus, *s. v.*; Diomed., iii., p. 483, ed. Putsch.) The Roman satire is first mentioned as a kind of dramatic performance (Liv., vii. 2), and appears to have been, like the early Atellanæ Fabulæ, only a rude improvisatory farce, without dramatic connection, but full of raillery and wit. This species of composition arose from the practice, which has prevailed in Italy from the earliest times to the present day, of the country people making rude extempore verses in ridicule of one another at various festivals, and especially at the time of the vintage. Such were the Fescennini verses, which Macrobius tells us (*Saturn.*, ii. 4) were sometimes written as satires upon persons. The old dramatic Saturæ continued to be performed on the Roman stage till a late period, under the name of Exodia, which were laughable interludes in verse, and were performed between the different Atellane plays. (*Dictionary of Greek and Roman Antiquities*, art. *Exodia.*)

The name of satire was afterwards limited to a species of poetry peculiar to the Romans, in which Ennius is said to have been the first writer. The satires of Ennius appear to have been so called because they were written on a variety of subjects, and in many different metres; but as hardly any fragments have come down to us, we know very little of the subjects of which they were composed. Lucilius however was the first who constructed satire on those principles of art which were considered in the time of Horace as essential requisites in a satiric poem. Lucilius principally used the hexameter metre, which was afterwards almost exclusively employed by the satiric poets. His poems were not only satires upon the vices and follies of mankind in general, but also contained attacks upon private individuals. They formed the model on which Horace wrote his satires; but the circumstances of the times prevented Horace, even if he had the inclination, from attacking eminent political charaters, as Lucilius had done. His own easy temper and happy disposition, as well as the principles of the Epicurean philosophy, led him to attack the foibles and follies of mankind in a style of playful raillery, which forms a striking contrast to the severe invectives of Juvenal. The increased corruption of morals at Rome under the early emperors, and the cruel punishments which had been inflicted by Domitian upon the wise and the good, naturally led Juvenal to attack the vices of his age with severity and vigour. The works of the other Roman satirists are lost, with the exception of Persius and a few verses on the banishment of the philosophers by Domitian, which are ascribed to Sulpicia, who is supposed by some writers to be a contemporary of Tibullus, and by others of Ausonius. A of list modern authors on the subject of the Roman Satire is given in the article Rome, p. 115.

SATISFACTION, in Law, is said to exist where a party, having a right of action, accepts from the party against whom he has it, a certain and valuable thing, or the performance of a certain and beneficial act, in lieu of his right of action. If the action is afterwards brought, the satisfaction may be pleaded in bar of it. Satisfaction may exist as to actions in which damages are recoverable, and as to some others (Blake's case, 6 Co., *Rep.*, 44; Peytoe's case, 9 Co., *Rep.*, 78); but it cannot operate so as to dispense with the performance of a covenant under a deed, by reason of the rule of law that a deed can only be made void by an instrument of the same nature, and therefore implying the same degree of deliberation. Though where a right of action upon the deed has vested, in consequence of some wrong or default occurring subsequent to the execution of the deed, as in the case of a breach of covenant to repair, to pay rent, &c., there may be satisfaction. The satisfaction, to be valid, must have been accepted by the party who has the right, and must have proceeded from the party who is liable.

Nothing which is paid or done to a third party, or proceeds from him, can operate as a satisfaction. It must also be certain, that is, definite as to time, &c., and available; thus where the satisfaction is by a mutual agreement, it must be such an agreement as an action may be maintained upon. It must be valuable; by which it is understood not only that there can be no satisfaction consequent of a thing which has no value, as, for instance, a rush; but also that the value must be at least not obviously inferior in amount to that for which it is given, such as a payment of a less sum of money at the same or a subsequent day as that on which a greater is due. Although if there are advantageous circumstances attendant on the payment of a less sum, as payment before the day when the larger is due, or at another place than that where it is payable, this may operate as satisfaction. But the giving of a horse or a statue may be a satisfaction of a claim for a sum of money, if accepted as such, though the horse or statue be in reality of less value than the money.

A negotiable instrument may operate as a satisfaction of a debt; and if the party who accepts it, by his own negligence fail to recover upon it, the debtor will nevertheless continue discharged. The performance must be actually executed; a mere endeavour, or a readiness to perform, such as a tender of money, or a part performance, cannot operate as a satisfaction. It must be beneficial; thus where one has made a forcible entry on the lands of another, it is not a satisfaction for the wrongful entry to permit that other to re-enter. In an action for trespass and taking cattle, a mere redelivery of the cattle is not a satisfaction, though their conveyance to another place, and redelivery there, may be so. The benefit also must be one partaking in some shape of a pecuniary character. It must either be money, or capable of being measured by money. Thus a submission before certain persons made in pursuance of the order of a court-martial, or an acknowledgement of the injury and prayer for forgiveness kneeling, though a satisfaction in honour, is not such satisfaction as to deprive the party of his right to damages. The thing must be given or done and accepted in lieu of the right of action; otherwise it will not be a good satisfaction. Satisfaction to one of several plaintiffs is a bar to all; and satisfaction by one joint wrongdoer discharges the others. (Com., *Dig.*, tit. 'Accord.')

SATRAP (*σατράπης*) was the name given to the governor of a province of the Persian empire. He was appointed by the king, and was responsible alone to him. Such a system of government has always existed in the large Asiatic empires; but the advantage which the Persian system had over many others of a similar kind, was the careful separation made between the civil and military powers. The governors of the garrisons and the commanders of the troops were independent of the satraps, and responsible only to the king. The duties of the satraps are briefly defined by Xenophon to consist in governing the inhabitants, receiving the tributes, paying the garrisons, and attending to whatever else is necessary. (*Cyrop.*, viii. 6, § 1-3.) In the later times of the Persian empire, it became the custom to appoint the satraps to the command of the troops also, especially if they were members of the royal family. In this manner the younger Cyrus was appointed satrap of one of the western provinces of Asia Minor, and at the same time general of all the forces which assembled in the plain of Castolus. (Xen., *Anab.*, i. 1, § 2.) The practice of uniting the civil and military powers in one person tended to promote revolt among the satraps, and to prepare the way for the internal dissolution of the empire. The greatness of the command entrusted to some satraps was also dangerous to the royal power. An instance of this kind occurs as early as the time of the first Darius, in the case of Oroetes, who was governor of Phrygia, Lydia, and Ionia, and was so powerful that Darius dared not proceed openly against him. (Herod. iii. 127.) Subsequently this practice became still more frequent; Cyrus had the command of the greater part of the western provinces of Asia Minor; and after his death, Tissaphenes was allowed to hold them in addition to his own. From this period we frequently read of revolts of the satraps, and many of them became quite independent of the king of Persia. (Heeren's *Asiatic Nations*, vol. i., p. 417-26.)

The word satrap is evidently of Persian origin, but its etymology is not certain. Bohlen (*Das Alte Indien*, vol. ii., p. 21) supposes it to be only another form of *Kshatriya-pa*, that is, the lord or master of the kshatriyas, or warriors, the name of the warrior caste of the Hindus. But this etymology is opposed to what has been stated above, namely, that the satraps were civil and not military officers. Malcolm (*History of Persia*, vol. i., p. 271) supposes it to be another form of *Shattrapatti*, 'an umbrella-carrier;' while other modern writers connect it with the Sanscrit *kshetra*, a plain (from *kshi*, to inhabit), and the Persian *shehr*, a city (Pott, *Etymologische Forschungen*, p. lxviii.); but none of these etymologies are satisfactory. In the Book of Esther the satraps of the Persian empire are called *Achashdarpenim* (אחשדרפנים from the singular *Achashdarpan*, which Gesenius (*Heb. Lex.*) appears to consider rightly as merely another form of writing the word satrap or *kshatrap*, as the *an* is a comm ermination of Chaldee nouns; and the *a* prefixed to the ord causes it to correspond to the *Exatrapes* (ἐξατράπης), hich is used by Theopompus instead of satrapes.

SATTARA, or **SATARA**, a city of Hindustan, the apital of the small state of Sattara, is situated in the proince of Bejapore and district of Moritzabad, in 17° 40′ N. at. and 74° 3′ E. long., 57 miles south from Poonah in a traight line. Sattara is a small town on a rocky and preciitous mountain, with a fortress of great strength, and a andsome palace built by the raja since he came under the rotection of the British. The Mahratta ancestors of the resent raja were deprived of their power by the Peshwa in 689. The British however captured Sattara in 1818, and estored it and the territory to the raja. A notice of these ransactions and of the limits of the territory is given in the rticle BEJAPORE; see also MAHRATTAS.

SATURATION. When common salt, or indeed most ther saline and many vegetable bodies, are added to water ntil it ceases to dissolve them, the solution so obtained is ermed a saturated solution of the substance dissolved.

Saturation may exist with regard to one body and not to nother; thus water saturated with common salt will still issolve sulphate of soda, and *vice versâ*; so also a saturated olution of common salt will dissolve sugar. There are nany other cases in which the point of saturation may be etermined by the cessation of solution; if, for example, arbonate of lime or carbonate of lead be added to dilute itric acid, no more of these substances is dissolved than is equisite to saturate the nitric acid; and the solutions proured, when excess of these bodies remains unacted upon, are ermed saturated solutions of nitrate of lime or nitrate of ead.

But there are other cases in which saturation cannot be etermined by insolubility; as when both bodies are emloyed in a fluid state, or when the excess of a solid body s soluble in the water which holds the saturated salt in soation; if, for example, we add carbonate of potash in powder o dilute nitric acid, it will for some time continue to dissolve n the acid with effervescence, owing to the expulsion of arbonic acid in the gaseous state; and when this effervesence ceases, we may consider the solution as consisting of itrate of potash, or nitric acid and potash, in which the aturation has been mutual; but the carbonate of potash, nlike the carbonate of lime, is soluble in water, and hat which holds the nitrate of potash formed in soluon is capable of dissolving it. In these cases the point f saturation is determined by the use of papers stained ith different vegetable colours; if, for example, too much arbonate of potash should have been added to the nitric cid to saturate it, its presence will be indicated by turning aper coloured yellow with turmeric, brown; while, on the ther hand, excess of acid is in general ascertained by paper ained blue with litmus, which is rendered red by the ction of acids.

By these means a very important process in the manucture of soap and glass is conducted; it is termed *alkalietry*, and employed for ascertaining the strength of difrent samples of the carbonates of potash and soda, so rgely used in glass and soap making. Sulphuric acid dited to a known extent is added to the alkaline solutions, d when they affect neither blue nor yellow paper, the turation is perfect, and the purity and strength of the kalis are determined. The saturating power of bodies is many cases greatly influenced by heat, while in others riation of temperature produces but little effect; thus cold ater will take up nearly as much common salt as hot ater; but sulphate of soda is more soluble in hot water an in cold, and hence it is that a saturated hot solution of is and many other salts deposits crystals on cooling. old water, on the contrary, dissolves more lime than hot, d a saturated solution prepared with water at about 32° olds nearly twice as much lime in solution as one prepared 212°, and when the cold prepared solution is heated, me is deposited. This however is a case of much rarer currence than the contrary one.

SATURDAY. [WEEK.]

SATURN, the name of one of the old planets, the largest all the bodies of the solar system, except the sun and upiter. The planet itself is of a spheroidal figure, the axis revolution being to the equatorial diameter in about the roportion of 11 to 12. It is accompanied by two rings of lid matter, unconnected with the planet and each other, at revolving round the former; these, not being usually called satellites, are, we suppose, to be considered as parts of the planet, though the former denomination would perhaps be more correct. There are also seven satellites, of which and the rings we shall presently speak more at length. There are also, as in Jupiter, certain thin zones or belts on the surface of the planet, though they ar not always seen.

The apparent equatorial diameter, at the mean distance from the earth, is about 16″·2: the real diameter, that of the earth being 1, is 9·982, or about 79,000 miles, which gives a bulk of about 995 times that of the earth. The mean density is about ·55 of that of the sun, or one-eighth of that of the earth; and the mass of the planet is about 1-3512th of that of the sun. It revolves on its axis in ·428 of a day, or 10 hours, 29 minutes: its equator is inclined to the ecliptic at an angle of 31° 19′. Its light and heat are to those of the earth as 11 to 1000.

Elements of the orbit of Saturn.

Epoch 1801, January 1, 12^h mean astronomical time at Greenwich.

Semiaxis major, 9·5387861, that of the earth being assumed as the unit.

Excentricity, ·0561505; its secular diminution (or diminution in 100 years) ·000312402.

Inclination of the orbit to the ecliptic 2° 29′ 35″·7; its secular diminution 15″·5.

Longitudes from the mean equinox of the epoch: (1) of the ascending node 111° 56′ 37″·4; its secular increase (combined with the precession) 3070″; (2) of the perihelion 89° 9′ 29″·8; its secular increase (combined with the precession) 6950″; (3) of the planet (mean) 135° 20′ 6″·5.

Mean sidereal revolution in 365¼ days 43996″·13; sidereal revolution 10759·2198174 mean solar days.

The first six satellites move nearly in circular orbits (though that of the sixth is said to be sensibly elliptical) round the planet, their circles being exactly (or very nearly) in the plane of the planet's equator, which is also that of the rings. The seventh satellite, which is much the largest (and which is known, by William Herschel's observations, to revolve on its axis in the same time as its revolution in its orbit) moves more nearly in the plane of the ecliptic than in that of the planet's equator, and has a sensibly elliptical orbit. This is all that is known; for while on the one hand the difficulty of seeing the satellites so as to get good measures has prevented an accumulation of proper observations, the ring on the other hand presents by its attraction a new disturbing force, the complete effects of which, in the absence of sufficient observations, it has not been thought worth while to trace.

The farthest satellite but one, and also the largest but one (now called the sixth), was the first discovered, by Huyghens, in 1655. As soon as the five last satellites were discovered, and until the time of Herschel, they were called the first, second, &c., in the order of their distances from the planet. This old nomenclature was gradually abolished after the discovery of a sixth and a seventh satellite by Herschel, being in reality the first and second in order of distance. Some confusion however has ensued in various places: thus, in the article ASTRONOMY (pages 535 and 536) it is said that Cassini discovered the first and second satellite, and also that Herschel did the same: both assertions are true, inasmuch as Cassini discovered what were the first and second satellites (now the third and fourth), and Herschel discovered what immediately became the first and second satellites in right of their position. The following table contains all the comparisons requisite to correct this confusion:—

Satellites of Saturn.

Order in dist from planet	Order of discovery.	Antient Nomenclature	Sidereal revolution in mean solar days.					Mean distances, equatorial semidiameter of planet being 1.	Date of discovery	Discoverer.
			d.	h.	m.		d.			
1	5	..	0	22	38	or	0·94271	3·351	1789	W. Herschel.
2	6	..	1	8	53	..	1·37024	4·300	1789	W. Herschel.
3	4	1	1	21	18	..	1·88780	5·284	1684	D. Cassini.
4	4	2	2	17	45	..	2·73948	6·819	1684	D. Cassini.
5	3	3	4	12	25	..	4·51749	9·524	1672	D. Cassini.
6	1	4	15	22	41	..	15·94530	22·081	1655	Huyghens.
7	2	5	79	7	55	..	79·32960	64·359	1671	D. Cassini.

The rings are solid circular bodies, rounded, it would seem, at the edges, and two in number, having a motion of revolution round their centres, which is completed in ·428 of a day, or 10 hours, 16 minutes; about 13 minutes less than the rotation of the planet itself: this is also the table in which a satellite would revolve at the same distance from the planet as the middle part of the ring. Sir John Herschel gives the following as the result of Professor Struve's observations and his own:—

Exterior diameter of exterior ring	=	176418	miles
Interior „ „	=	155272	„
Exterior diameter of interior ring	=	151690	„
Interior „ „	=	117339	„
Equatorial diameter of the body	=	79160	„
Interval between the planet and interior ring . . .	=	19090	„
Interval of the rings . .	=	1791	„
Thickness of the rings not exceeding		100	„

Several observers have seen concentric black lines on the outer ring, as if it consisted of several rings; but neither W. Herschel, Sir J. Herschel, nor Professor Struve, with the most powerful instruments, could detect these lines. The question is a curious one, because if it were the consequence of a telescopic defect, it is difficult to say why the *external* ring only should exhibit these appearances. Captain Kater sums up this question ('Mem. Astron. Soc.,' vol. iv., p. 387) in the following manner: 'From the observations which have been given in the present paper, we may deduce the following conclusions:—

'That the exterior ring of Saturn was observed by Short to be divided into three or four concentric rings.

'That Professor Quetelet, in December, 1823, at Paris, with an achromatic telescope of ten inches aperture, saw the outer ring of Saturn divided into two concentric rings.

'That on the 17th December, 1825, the outer ring of Saturn appeared to me to be made up of at least four rings, the widest interval being in the middle. That on the 16th and 17th January, 1826, I again remarked these divisions of the exterior ring.

'That these divisions were also observed by a friend who was with me on the 17th December, 1825, but who did not remark that one division was stronger than the others.

'That another friend, who was with me on the same evening, and who is very shortsighted, saw the stronger division, but could not perceive the others. I think it will be allowed that the evidence here given goes far to establish the probability of the outer ring of Saturn being composed of several concentric rings. On the other hand it appears that Sir William Herschel, Mr. Herschel, and Mr. Struve, though observing with very superior instruments, could perceive no such divisions as those which I have described.

'On the 22nd January, 1828, the evening being perfectly favourable, I again examined Saturn with great care for several hours, but no divisions of the outer ring were then perceptible.

'It has been remarked by Sir William Herschel, by Mr. Struve, and by most persons who have observed Saturn, that the exterior ring is much less brilliant than the interior: may not this want of light in the outer ring arise from its having a very dense atmosphere: and may not this atmosphere, in certain states, admit of the divisions of the exterior ring being seen through it, though under other circumstances they remain invisible. With respect to the form of the edge of the inner ring of Saturn, next to the planet, the appearance under favourable circumstances is such as to leave no doubt on my mind of its being rounded.'

The physical theory of the rings is curious as having been one of the points in which theory outstripped observation. Supposing the figure of Saturn a perfect spheroid, and the rings to be perfectly concentric with the planet, and perfectly regular in figure, it is obvious that the attraction of the planet would never disturb the system, since it would draw all sides equally towards the centre. But let the slightest disturbance take place, that is, let the centre of the rings be thrown in the smallest degree out of that of the planet, and one side begins to be drawn more forcibly towards the planet than the other, and this effect must continue and become stronger, until at last the ring is thrown upon the planet at one point. Laplace showed that it was essential to the stability of this system that the centre of the rings, instead of being fixed in that of the planet, should describe a small orbit; that is, that the rings should have a slight oscillating motion to and from the planet combined with an oscillating motion of their planes; and recent observations have shown that such is the case. (Sir J. Herschel, *Astronomy*, p. 284.)

The phenomena of the rings to an inhabitant of (say) the northern hemisphere of the planet must be as follows: when the sun is on the northern side of the equator, a pair of luminous arches must be visible, extending from horizon to horizon. At the equator, only the thickness of the ring will be seen extending over head from east to west. In going from the equator towards the north pole, the arch will gradually rise and set farther south, but its meridian thickness will increase, and its greatest altitude will diminish. At about 40° of north latitude the lower arch will have become a luminous segment of an ellipse, the top of which will become lower and lower until, at 50° or thereabouts, the higher arch will have become only a segment; and a few degrees more of north latitude will make it vanish altogether. But in the south latitudes, the ring will not shine at all while the sun is north of its plane, except in a portion of its thickness; while those who are in the shadow of the rings will not see the sun at all, sometimes for several years. For many days together, in certain situations, the only day will be the emergence of a part of the sun from the ring for a short time.

To an inhabitant of the earth, the phenomena of the rings are as follows:—They are projected into an elliptical form, of which a portion is sometimes hidden behind the planet: when this is the case, the shadow of the planet is seen on the ring. When the sun is in the plane of the ring, which happens twice in every Saturnian year, the edge only of the ring is enlightened, and it can only be seen in the very best telescopes: the next arrival of this disappearance is in December, 1847. As the sun (and with it the earth) leaves the plane of the rings, the latter appear to open, and the opening continues during a quarter of the Saturnian year; when the opening is widest, the longer diameter appears about double of the shorter one. The north or south side of the ring is seen, according as the sun is north or south of its plane.

SATURNA'LIA, a festival celebrated by the Romans in honour of the god Saturnus. [SATURNUS.] According to some traditions, it had been celebrated by the Aborigines long before the building of the city, and was instituted by the fabulous king Janus, after the disappearance of Saturnus from the earth. Others said that it was instituted by the Pelasgians, or by the followers of Hercules, who had been left behind in Italy. (Macrob., *Sat.*, i. 7.) A second set of traditions referred the institution of the Saturnalia to a much later period; one of them ascribed it to king Tullus Hostilius, who, after a successful war against the Albans and Sabines, was said to have founded the temple and established the festival of Saturnus at Rome. (Macrob., *Sat.*, i. 8.) Another tradition, adopted by Livy (ii. 21) and Dionysius (vi., *ab init.*) which refers it to a still later time, ascribed the institution of the Saturnalia to the consuls A. Sempronius and M. Minucius (497 B.C.). The apparent incongruity of this and some other accounts may easily be removed: those who trace the Saturnalia to a period antecedent to the building of the city, can only mean that the worship of Saturnus was very antient in Italy, while those who assign a later date to the institution must be understood to refer to the introduction of the worship into the city of Rome; and although festivals in honour of Saturnus may have been celebrated at his altar in the Roman Forum previous to 497 B.C., yet the regular and periodical celebration of the Saturnalia may not have been established before this time, when a temple was dedicated to the god in the clivus leading from the Forum to the Capitol. After this time the Saturnalia were celebrated regularly every year, on the 19th of December, the whole of which month was sacred to Saturnus; but after J. Cæsar had added two days to this month, the celebration began on the 17th (Macrob., *Sat.*, i. 10), and the people, being fond of such merry-makings, continued the festivities until the nineteenth, and even longer. This however was not an innovation produced by the alteration of the calendar, for long before that event the Romans had been in the habit of making many holidays (generally seven) at the season of the Saturnalia, though it was known that the festival of Saturn itself did not last more than one day. Augustus at last sanctioned the celebration of the Saturnalia during three days, and Caligula and Claudius increased the number to five days. (Macrob., *Sat.*, i. 10; Sueton., *Calig.*, 17; Dion Cass., lix., p. 739.)

The Saturnalia was a harvest festival, and was held, as e have seen, at a time when all agricultural labours were ver, and as at such a season every husbandman would na- arally give himself and his servants a holiday, and offer is prayers to the god whose especial protection he solicited, the Saturnalia were national festivals instituted with the ame object. It was generally believed that during the olden age of the reign of Saturnus there were no slaves, nd the Saturnalia were intended to restore that happy state f things for a short time, by giving to servants and slaves a omplete holiday. They were on this occasion allowed to ppear in the dress of free citizens (Dion Cass., lx., p. 779), ere waited upon at their feasts by their masters, were free om every kind of service, and enjoyed the most perfect eedom of speech. Even criminals were sometimes restored freedom, and then dedicated their chains to Saturnus. he whole season was one of universal rejoicing for all the eople of Rome, and the city resounded with the shouts, o, Saturnalia! Io, bona Saturnalia!' Everybody ate and rank plentifully, and invited or visited his friends and re- tions. It was also customary for persons to make presents one another on this occasion (Senec., *Epist.*, 18; Sueton., *ug.*, 75), and clients presented their patrons with wax- andles. (Macrob., *Sat.*, i. 7; Varro, *De Ling. Lat.*, iv., 19, Bipont.) Children generally received little figures, hich were called oscilla, or sigilla, from which the last day f the Saturnalia derived the name 'sigillaria.' During his festival all business, private as well as public, was sus- ended; no war was commenced, no battle was fought, and o punishment was inflicted on offenders. (Macrob., *Sat.*, 10.) The persons who offered sacrifices to Saturn had eir heads uncovered.

The Greek writers, when speaking of the Roman Satur- alia, generally call the feast 'Kronia,' as they considered he two festivals, as well as the deities in whose honour they ere held, Saturnus and Kronos, as identical. (Comp. uttmann, *Mythologus*, ii., p. 52, &c.; Hartung, *Die Re- gion der Römer*, ii., p. 124, &c.)

SATURNUS, one of the principal divinities of the ntient Italians, was considered to be the protector of griculture and of all civilization arising from it, whence e is generally represented with a sickle in his hand. His ame probably contains the same element as the verb *sero* sa), whence he was considered as the protecting divinity f all that was sown and planted, and as the giver of plenty. he Italian legends represented him as having come from broad to the shores of Italy, in the reign of Janus, by whom e was hospitably received. Notwithstanding this, Saturnus as always considered as the first king of the Aborigines, robably because agriculture and civilization in Italy dated om his reign. (Virg., *Aen.*, viii. 319; Aurel. Vict., *De rig. Gent. Rom.*, c. 1, &c.) He was said to have esta- lished a settlement on the Capitoline Hill, which from this ircumstance was called the Saturnian Hill, and the settle- ent itself, Saturnia. He now began to teach the Italians he art of cultivating the fields, and led them from their avage state to the peaceful occupations of civilised life, that the whole land of Italy was called, after him, Sa- rnia, or the land of fruit. In agriculture he is said to ave taught his subjects the use of manure (stercus), from hich he derived the surnames of Sterculus, Stercilinus, and tercenius. (Macrob., *Sat.*, i. 7.) His rule was so just and ild, that the age in which he reigned was afterwards de- ribed as the golden age of Italy. His wife, called Ops, as in aftertimes worshipped as the goddess of plenty. fter the death of Saturnus, or rather after his disappear- nce from the world, he was raised to the rank of a god, an ltar was erected to him on the spot which was afterwards alled the Forum, and a temple near the foot of the Capito- ne. Concerning his worship at Rome, see SATURNALIA.

The Greek writers and the later Romans, who were fond f identifying the deities of the two nations, by which they roduced great confusion in the mythology of Italy, con- dered Saturnus and Kronos as the same divinities. This pinion has been maintained with strong arguments by Butt- ann, *Mythologus*, ii., 28, &c.; but Hartung, in his *Die elig. der Röm.*, ii., p. 123, more justly considers the two ivinities as quite distinct, and Saturnus as an antient na- onal divinity of the Italians.

SATYR (Satyrus, Σάτυρος) is the name by which the ntients designated a class of rustic deities, or Dionysii. ike the Panes and Fauni, they were a kind of intermediate eings between men and animals, and the features which they had in common with the latter were chiefly derived from goats. They seem originally to have been a sort of rustic or sylvan gods, who were worshipped in some parts of Peloponnesus. In the earlier works of antient art they are represented with rather long and pointed ears, bald-headed, and with little protuberances like horns behind their ears. Sometimes their figure approached still nearer to the animal form, as they were represented with goats' feet and horns. During the best period of Grecian art the human form is entire, and the animal character is expressed by a little tail at the lower part of the back, and by a considerable degree of sensuality in the features and attitudes. Satyrs were the constant companions of Bacchus, and in Bacchic processions they always appear dancing, with cymbals or flutes in their hands. In the Greek drama the chorus at the Bacchic festivals originally assumed the character of satellites of Bacchus, that is, of satyrs, and it is expressly stated that Arion not only invented the tragic dithyramb, but introduced satyrs, whence, according to some accounts, the name tragedy, or goats' song, arose. But the chorus of the Attic tragedy, in the course of time, gradually lost its satyric character, and a distinct satyric drama was developed, which is described by the antients as a playful tragedy. The complete separation of this satyric drama from tragedy is ascribed to Pratinas of Phlius.

(Müller, *Archäolog. der Kunst*, p. 515, &c.; H. C. A. Eichstädt, *De Dramate Græcorum Comico-Satyrico*, Lips., 1793; and above all, Casaubon, *De Satyrica Græcorum Poesi et Romanorum Satira.*)

SATYRIC DRAMA. [EURIPIDES.]

SAUERLAND. [GERMANY.]

SAULIEU. [CÔTE D'OR.]

SAUMAISE. [SALMASIUS.]

SAUMUR, a town in France, in the department of Maine et Loire, on the Loire; 182 miles from Paris by Orléans and Tours, 40 from Tours, and 29 from Angers, the capital of the department. Saumur is not noticed in history before the eighth century. In the eleventh century it belonged to the count of Blois, from whom it was taken by Foulques or Fulk Néra, duke of Anjou. In the reign of Henri III. it was placed, as security for some engagement, in the hands of Henri IV., who appointed Du Plessis Mornay governor. Under the care of this eminent man, it rose to great prosperity; the Huguenots from all parts came to settle here; an academy was instituted, and commerce and the arts flourished. But the revocation of the edict of Nantes ruined the town: the population diminished from 25,000 to a fourth of that number; and it has with difficulty recovered so far as to number, in 1831, 9977 for the town, or 10,652 for the whole commune; and in 1836, 11,925 for the commune. Saumur was taken in June, 1793 by the Vendeans, but they were forced, after a few days, to evacuate it. The town stands on the south bank of the Loire, which here flows in a divided channel, forming a number of small islands opposite the town. The suburb of La Croix Verte, through which the road from Tours to Angers passes, is on the north bank of the river, and is united to the town by a succession of bridges, of which that nearest Saumur is a noble structure nearly 900 feet long, with twelve arches. The river Thoué flows near the town on the south-west side, and joins the Loire a short distance below. Saumur is ill laid out, but the houses are pretty good and built of stone, and a considerable number of them may be called handsome; the new quarter of the town presents a fine appearance. There is a fine quay along the bank of the river. Among the public buildings are the church of St. Pierre, an antient structure with a modern portal and a steeple remarkable for the boldness of its architecture; the church of Notre-Dame-des-Ardillières; the town-hall, a Gothic building; the antient castle, long used as a state prison, and now occupied as an arsenal; the theatre, elevated on arches which inclose a market-house, and handsome within; a fine range of cavalry barracks, with two riding-houses; the abbey of St. Florent; and the house formerly belonging to the abbot, restored by Napoleon. There are altogether in the town five bridges, four churches, two nunneries, a foundling and two other hospitals, a high school, a cavalry school, a public library, a theatre, handsome public baths, and a prison.

The townsmen manufacture beads and other small ornamental wares in glass and enamel, and some copper and iron utensils: there are rope-walks, tan-yards, curriers' shops, and a refining-house for saltpetre. The glass and enamel works give employment to 600 persons of both sexes and of all ages. Trade is carried on in corn, pulse, white wines of good repute, brandy, vinegar, hemp, flax, and plums; there are four tolerably large fairs in the year. Sandstone, which does well for building, is quarried in the neighbourhood: a considerable quantity is sent down the Loire to Nantes.

Saumur gave name to the district of Saumurais, a subdivision of Anjou. It was the birth-place of Madame Dacier.

SAUNDERSON, DR. NICHOLAS, an English scholar, particularly distinguished by the extent of his acquirements in classical learning and mathematics, under the disadvantageous circumstance of having become blind from the small-pox at the age of twelve months.

He was born in 1682, at Thurleston in Yorkshire, where his father held an appointment in the Excise; and at an early age he attended the free-school at Penniston, where he was taught the rudiments of the Latin and Greek languages. It is not stated by what means the youth obtained a knowledge of the forms of letters or numbers; and probably the first instruction which he received in literature and science was conveyed to his mind by oral information only.

The elder Saunderson appears to have very soon observed the predilection of his son for mathematical subjects, and though burthened with the duties of his appointment and the cares attending a numerous family, he laboured diligently to make him acquainted with all the science which it was in his power to communicate. This consisted merely of the first elements of numbers; and low as these may be in the scale of knowledge, it will be readily conceived that the anxious parent must have had an arduous task to perform in enabling a pupil bereaved of sight to understand the combinations which enter even into the rules of common arithmetic. The benevolence of Mr. Richard West of Underbank and Dr. Nettleton came however in furtherance of the father's efforts; and these gentlemen perceiving the remarkable talent of the youth, then about 18 years of age, zealously exerted themselves to communicate to him instruction in algebra and geometry. By the kindness of his friends, young Saunderson was also enabled to spend some time in the prosecution of his studies at an academy near Sheffield. From this time his progress became rapid. By the help of a retentive memory he succeeded in resolving the questions usually given as exercises in elementary works, and by the power of his genius he discovered methods of investigating propositions of considerable intricacy. His application to mathematics did not however prevent him from continuing to cultivate the study of classical literature; and it is stated that, besides making himself familiar with Cicero, Virgil, and Horace, he became enabled to understand the works of Euclid, Archimedes, and Diophantus, when read to him in the original Greek.

Mr. Saunderson having decided on making an effort to establish himself at Cambridge as a teacher, went to that university in 1707. He resided in Christ's College, and immediately commenced a series of lectures on the Universal Arithmetic, the Optics, and the Principia of Newton. At this time, Mr. Whiston, the Lucasian professor of mathematics, was engaged in the delivery of lectures on the same subjects; and it is honourable to the benevolence of this gentleman, that he readily consented, at the request of the friends of the blind youth, that the latter should labour in the same field. The peculiar circumstances under which Saunderson taught, and his great talents, procured for him many pupils, and were the means of bringing him into a correspondence with Sir Isaac Newton, and to an intimacy with the other great mathematicians of that time. When Whiston was removed from his chair, in 1711, queen Anne, at the recommendation of Sir Isaac, was induced to confer on Mr. Saunderson the degree of M.A., in order that he might become qualified to hold the place which had become vacant by the retirement of his friend. Saunderson, on being appointed, pronounced an inaugural discourse in Latin, and from that time devoted himself wholly to his professional duties. In 1723 he married a daughter of the Rev. Mr. Dickons, rector of Coxworth; and in 1728, when the king, George II., visited the university, he was, by the royal authority, made Doctor in Laws.

Dr. Saunderson continued to enjoy good health till near the end of his life. He died on the 19th April, 1739.

This extraordinary man composed, in writing, for the use of his pupils, several lectures on different subjects in natural philosophy, but they were never prepared, nor perhaps intended for publication. A valuable treatise which he had composed on the elements of algebra, appeared at Cambridge in 1740, in two vols. 4to.; and another on fluxions in 8vo, including a commentary on some parts of Newton's 'Principia' came out in the year 1756.

In order to perform arithmetical computations, Saunderson used a square board divided by lines at one-tenth of an inch asunder, and parallel to the sides, into many small squares, each of which was pierced with nine holes in three parallel rows. Small pins were placed by the hand in these holes, and the value of a digit was indicated by the particular hole, in each square, in which the pin was placed. A pin with a large head placed in the centre hole denoted zero, and one with a small head in the same hole indicated unity. A large-headed pin in the centre, with a small-headed pin in the first hole of the first row, expressed the number 2; a large-headed pin in the centre, with a small-headed pin in the second hole of the first row, expressed the number 3; and so on. The process is described in the first volume of the 'Elements of Algebra,' and it is evident that by such means any number may be easily expressed, and any arithmetical operation performed. He used the same machine for representing geometrical diagrams; the pins being placed at the angles of the figure, and connected by threads which indicated the lines.

His ideas of the forms which plane or solid figures would assume when viewed by an eye placed in a given position, were remarkably correct and distinct; and we are informed by Dr. Reid (*Inquiry into the Human Mind*, ch. 6), that he understood the rules of perspective and the projections of the sphere. But the mental process by which he acquired this kind of information was probably peculiar to himself; for Dr. Reid states that once in conversation Saunderson acknowledged that he had found great difficulty in understanding Dr. Halley's demonstration, that the angle made by two circles of the sphere was equal to the angle made by their projections on a plane, adding that when he considered the proposition in his own way he became aware of its truth.

Dr. Saunderson possessed in a high degree the senses of feeling and hearing. It is said that he could distinguish true from counterfeit Roman medals by the different degrees of their smoothness; and on one occasion, when some students were taking the sun's altitude in the garden of Christ's College, he could tell, by some effect of the air upon his person, when very light clouds were passing over the disk of the luminary. When he entered a room, he could judge of its magnitude and of his distance from the walls by the sound of his footsteps. In his youth he had learned to play on the flute; and it is said that he succeeded so well as to give room to suppose that if he had applied himself to music, he might have excelled in it to as great a degree as in mathematics.

Saunderson is described as having been extremely passionate. He was imbued with a strong sense of the importance of truth, but he too often expressed his sentiments with a freedom which caused him to have many enemies. It may be said that he was better qualified to inspire admiration than to make or preserve friends. He is accused moreover of having been decidedly a sceptic in matters concerning religion.

SAURAT, a town in France, in the department of Ariège, not far from Tarascon. The inhabitants, who, in 1831, amounted to 2563 for the town, or 5014 for the commune, are engaged in the manufacture of wrought-iron, into which the ore is immediately converted. Charcoal is the fuel exclusively employed. The ore is obtained in the neighbourhood. There are two fairs in the year.

SAURIANS (*σαῦρος*, or *σαύρα*, a lizard), the term by which the great family of Lizards is generally designated. The animal forms more strictly included under it are those comprised under the genus *Lacerta* of Linnæus (after deducting the Crocodilians and the Salamanders), and under the genus *Draco* of the same author.

To these, Cuvier observes, the family *Anguis* might even be joined, because their osteology, especially that of the head, resembles the osseous structure of many of the Lizards.

In the large acceptation of the term *Saurians*, the Pterodactyles, Enaliosaurians, and Crocodiles are included.

The general arrangement of this order will be found under the article REPTILES.

ORGANIZATION.

Skeleton.—If we take the living forms collected under the enera of Linnæus above mentioned, after eliminating from e genus *Lacerta* the groups above excepted, we shall find at all the animals have a similar structure of the skull, of e shoulder-blade, and of the *os hyoïdes*, or that they xhibit but slight variations in the composition and proporon of the parts, whilst they differ considerably from the rocodiles and Tortoises, and still more from the Salamaners, as Cuvier, with his usual acuteness, has observed.

Skull.—Cuvier remarks that the common characters of is family, relatively to the osteology of the head, consist rincipally of the following points:—

1. The four ordinary occipital bones form the ring which rrounds the encephalon backwards. The lateral occipital not divided into two, as in the Tortoises. In front of e occipital bones are placed the sphenoïd below, and e *os petrosum* laterally: the parietal covers the whole ke a roof.

2. The sphenoïd bone is visible throughout its inferior rface; the pterygoïdians, forming a simple continuation the palatine bones, are prolonged to the internal border the tympanic cavities (caisses), not touching the sphenoïd, except upon a lateral tuberosity of that bone, and not niting together.

3. The sphenoïd is prolonged forwards into a cartilagious stem upon which the interorbitary partition is elevated; d in this last, various points of ossifications show themlves, which belong to the ethmoïd bone.

4. The bone analogous to the *os petrosum*, which is not idden by the tympanic cavity, is extended outwards, and rms, between the sphenoïd and the occipital bones, the hole of the posterior lateral wall of the cranium.

5. The anterior lateral wall of the cranium, from the *os etrosum* to the interorbitary partition, is membranous, and ntains only on each side a bone of various configuration ccording to the species, the temporal *ala* and the orbitary *la*.

6. An osseous stem rises from the upper border of the terygoïdian, where it is articulated in a fosset up to the teral or parietal border, where it is attached by a ligament. ome anatomists,* says Cuvier, have thought that they w in it the analogue of the temporal *ala*, but it does not lfil the functions of that process; others† have named it *mpanic*, without even a perceptible motive, however disnt, for such a determination. One cannot even say that is properly comprised in the wall of the cranium, and this all has also sometimes in the thickness of its membranes point of ossification which represents the true temporal *la*. Cuvier then states that he would call this bone the *olumella*. Its function is to sustain the vault of the ranium, which is not otherwise supported in front, because e orbital *ala*, the temporal *ala*, and the ethmoïd bone are great part membranous.

7. The lateral occipital bone has a part projecting outards, to which are united by their extremities the masoïdian, which is very much reduced, and the temporal ones; to this common reunion of the three bones is susended the tympanic bone, which descends vertically to erve as a pedicle to the lower jaw. This bone, most freuently, is not attached, except to the anterior edge of the mpanum; and the rest of the contour of that membrane, s well as the posterior wall of the tympanic cavity, is carlaginous or even only simply membranous.

The Eustachian tube is only a wide communication of e tympanic cavity to the posterior part of the mouth, beween the extremity of the pterygoïdian and the sphenoïd. n the recent animal it answers to that part of the inside of e mouth near the articulation of the jaws, and the comunication is sometimes so open that the *ossiculum audiûs* may be said to be in the mouth or in the pharynx. The avity of the vestibule is formed in common by the *os petroum*, the lateral occipital, and the superior occipital. The *nestra ovalis*, where the *ossiculum auditûs* is attached, is ommon to the *os petrosum* and the external occipital. nder it is a wider aperture, pierced in the lateral occipital one only, and at the bottom of which are two holes, one nterior, which goes into the cranium, and one posterior, hich is the *fenestra rotunda*, and leads into a fosset of the estibular cavity, which represents the *cochlea*.

8. The transverse bone unites the pterygoïdian bone to the jugal and the maxillary, as in the crocodile.

9. The palatine bones have no palatine laminæ, or, at least, these laminæ are not sufficiently extended to unite; and the posterior bony nostrils are great holes in the anterior part of the vault of the palate, between the maxillary bones, the vomers, and the palatine bones.

10. The extremities of the external bony nostrils are always separated in the skeleton by an internasal apophysis of the intermaxillary and sometimes of the maxillary bone.

For the rest, the division of the frontal bone into the principal, the anterior, and the posterior, and the other osteological circumstances, are as in the tortoises and crocodiles.

This constitution of the cranium of the Saurians, adds Cuvier, which will also serve to explain that of birds, requires to be discussed and proved; and he, accordingly addresses himself to the task.

He observes that there is no difficulty with regard to the occipital bones, which are four in number, as in the crocodiles and mammals. The principal frontal and the parietal bones may be demonstrated to be what they are by the same arguments as hold good in the crocodile and in the tortoise. These arguments are also perfectly applicable to the anterior and posterior frontal bones, to the lachrymal bones, to the maxillaries, and the intermaxillaries. It is then, as usual, in the region of the temples and of the ear that some difficulties remain; but these are easily disposed of when we consider each of the pieces which compose it in the genera, which offer tangible analogies with the crocodiles and tortoises. Thus, the nature of the *os petrosum* is determined, as in the crocodile and in the tortoise, by the part which it takes in the constitution of the internal ear, and especially of the vestibular cavity, as well as by the notch for the exit of the nerve of the fifth pair.

The tympanic bone is nearly always reduced to a prismatic form, does not consolidate (ne s'engrène point) with the other bones to form a part of the solid envelope of the head, and seems in the skeleton to be nothing but a pedicle for the lower jaw. But besides that the tympanum is always attached to it, it will be found on examination, in the dragon for instance, in the form of a drum, more hollow and with edges more reflected (revenans en avant) than in the tortoises themselves, having behind, as in the tortoises, a notch for the *ossiculum auditûs*. The only difference is, that its cavity does not extend into the mastoïdian. In the scink it is still more wide and concave, whilst it is less closed by the edges than in the dragon. The scink also exhibits a striking analogy with the tortoises, inasmuch as that its temporal bone is covered by a lamina of the parietal bone, which unites with a great enlargement of the posterior frontal, and with the temporal, placed and notched as in certain tortoises, but longer and narrower. Thus, the mastoïdian bone must be recognised as such, notwithstanding its extreme smallness. The common lizard has the same covering on the temporal bone, and, moreover, all the upper part of its orbit is covered by an expansion of the anterior frontal bone.

The *lower jaw* of the Saurians is composed of six bones on each side, as in the crocodile and tortoise, but rather otherwise disposed, and producing a general form which is somewhat different; thus the coronoïd apophysis projects very much, and is placed more forward; the lower angle has also a more forward position, and the dental part is shorter in proportion.

The dental bone does not carry the teeth in alveoli or sockets, as in the crocodile, but they adhere to its internal surface. Its external surface is united backwards by a squamous suture to those of the complementary, the surangular, and subangular portions. The part of the internal surface of the dental bone, which the opercular bone covers below and behind the teeth, varies much in extent in different subgenera. The opercular bone is united backwards to the internal surface of the complementary, the articular, and angular portions, and often to that of the surangular portion.

The complementary portion forms alone the great coronoïd apophysis, extends on the upper edge of the jaw in front of that apophysis, and descends backwards to the internal surface, where it traverses the surangular to unite itself with the articular portion.

The articular portion furnishes the glenoïd facet, and the apophysis, which is behind it, for the digastric muscle, and has often even a small epiphysis at the extremity of this apophysis; it advances to the internal surface, and even sometimes along the inferior border to the opercular bone.

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* Oken and Spix.

† Bojanus.

The angular portion extends under the portion of the lower border, which is between the lower angle on one side, and the dental or opercular portion on the other. It is not always that the angle of the jaw entirely belongs to this, for the opercular bone sometimes contributes to form it.

The surangular portion occupies nearly the whole of the external surface of the superior moiety between the four other bones which are seen on this aspect. It forms the upper border between the coronoïd apophysis and the articulation.

For the entrance of the nerves and vessels there is a great opening on the internal surface of the coronoïd apophysis, between the complementary, the surangular, and the articular portions; and for their exit there are holes at the external surface of the dental bone and on the internal surface of the opercular bone. The number and the position of these holes vary according to the subgenera and species. The surangular portion generally has two.

Such are the general dispositions, noticed by Cuvier, common to all the Saurians; and he proceeds to point out the principal differences observable in the subgenera.

The same distinguished zoologist remarks that the *os hyoïdes* becomes important in proportion as we approach the fishes; and he observes that in man it is composed of five parts: viz. a body in the form of a flattened transversal arch; two anterior and very long horns, which proceed to attach themselves to the temporal bone below the *meatus auditorius*, and of which the upper part is there soldered at a very early period, and takes the name of the styloïd process of the temporal bone; whilst the lower part, for a long time simply ligamentous, has below, at the point of junction with the body, an osseous grain (*cornu minus*); and finally, two posterior bony *cornua* (*cornua majora*) supporting the larynx by means of a ligament which attaches to them the thyroïd cartilage.

The numerous variations which this bone of the tongue presents in the class *Mammalia*, depend on the form of its body, on the more or less prompt soldering which takes place with the posterior cornua, and on the form and the proportion of the pieces of the anterior cornua. Very often in the Ruminants, the Solipedes, and the Cetaceans, the body takes, in becoming soldered to the posterior cornua, the shape of a crescent; and it often happens also, especially in the two first families, that it produces anteriorly a more or less long apophysis; but the anterior horns are always suspended to the cranium, and nearly without exception to a small apophysis of the *os petrosum* and to the neighbouring part of the tympanic cavity.

This suspension does not take place in those birds in which the anterior horns run round the back of the cranium [Woodpeckers; Trochilidæ], and are only there attached by muscles and cellular substance.

The body of the tongue-bone is most frequently of a rhomboïdal form. To its posterior part is articulated or soldered a slender unequal bone on which the larynx reposes, and which singly represents the two posterior cornua; and to its anterior part another bone, sometimes double, which penetrates into the tongue, and which Cuvier names the lingual bone. The anterior horns consist generally of only two pieces.

Cuvier then refers to a prior part of his work, in which he had pointed out the simplicity of the *os hyoïdes* in the crocodile, and the variety of that bone in different tortoises. In the Saurians it offers some relations with that of the birds; but its composition is more complex. It generally consists of a simple body and two pairs of cornua, to which a third is sometimes added. The body always gives off anteriorly a slender stem, which is prolonged more or less into a cartilage which penetrates into the tongue. The anterior horns are variously reflected, and the posterior horns differently directed according to the species. With regard to those of the third pair, they exist but rarely, and sometimes are rather posterior productions of the body than particular horns.

Cuvier then proceeds to notice the diversities in the different families, &c.; and he remarks that the *os hyoïdes* of the Saurians continues with little change to the *Ophisauri*, the *Orvets* (*Anguis*), and the *Amphisbænæ*. In the two former the anterior horn is nearly reduced to a membranous state; but the posterior one is well ossified. In the Amphisbænæ the second articulation of the anterior horn is reduced to a simple vestige. There is none in the third horn. The *os hyoïdes* in the true serpents is reduced to two long cartilaginous filaments, which only sustain forwards, as the sole vestige of the body, a species of membrane, hardly discernible in those which are not very large.

The *teeth* in the true Saurians are not placed in sockets nor are those which are to replace the teeth which are lost or shed produced in the cavities of the old teeth; but the gelatinous germs of the teeth adhere to the internal surface of the dental bone without having any bony partitions between them, and sometimes without being guarded on the internal side by a lamina of that bone: in the latter case their bases are only separated from the cavity of the mouth by the gum. The base is not divided into roots; but when the tooth grows, the same phenomenon is manifested as is seen in fishes. The gelatinous nucleus becomes ossified; it unites itself intimately on one side to the bone of the jaw, whilst it contracts on the other an intimate adherence with the tooth which it has exuded; the tooth then appears like a prominence, an apophysis of the jaw, only it is covered with enamel, whilst its base is naked and purely osseous, and around this base are to be seen striæ and little pores by which the vessels have penetrated or still penetrate into its internal cavity, and which also mark the spot where the rupture will take place when this tooth must yield up its place. The new teeth spring not in the cavity of the old ones, as in the crocodile, but near the internal surface of their base, or in certain species in the thickness of the bone above or below the base according to the jaw. In the last case which takes place, for example, in the *Monitors* and the *Dragons*, it forms for itself in the bone a cavity which lodges during a certain time the pulpy nucleus and the crown which is produced above. This cavity opens by degrees to the internal surface of the dental bone. In the other case the pulpy nucleus is developed simply under the gum; but in proportion as its crown increases in growth, it often forms a notch in the base of the nearest tooth, where it is partially enclosed. Then it is that one might believe that the new tooth is enclosed in the old one, but it is never entirely enveloped in it. But, continues Cuvier, in whatever manner the new tooth comes, the time arrives when its increase entirely pushes out the old tooth, producing on its ossified base a species of necrosis, which breaks off its adherence to the jaw and causes it to fall out. This is not a rupture in some degree spontaneous, like that of the old antlers of stags, which fall before their successors have budded. (*Ossemens Fossiles.*)

Professor Owen, in his valuable chapter on the 'Teeth of Saurians' (*Odontography*, pt. ii., p. 234, et seq.), commences his inquiry with the *Ophisaurians*, observing that there are several genera of reptiles, which, like the true snakes, are externally devoid of locomotive extremities, or have them indicated only by minute rudiments, but are covered by small uniform scales, and resemble the Saurians much more than the Ophidians in their anatomical structure, especially in the fixed condition of the jaws, which cannot be divaricated laterally, or rotated backwards and forwards upon a moveable tympanic pedicle. These snake-lizards, he observes, have always intermaxillary as well as maxillary teeth.

In the *Amphisbænians*, Professor Owen remarks that there are both pleurodont and acrodont species, as in the true Saurians; but the pleurodonts are the most numerous, and have their teeth applied against the internal surface of an external alveolar wall. In *Trogonophis* however the teeth are blended by their whole base with the alveolar ridge, are so closely approximated that they cohere, and are unequal, conical, subcompressed, and obtuse. The intermaxillary teeth are in unequal number, the middle azygos tooth being longer than the rest.

In Chirotes, Professor Owen found the teeth slightly curved, simple, and nearly equal, with the exception of the azygos intermaxillary tooth, which is longer than the rest. They are small at first, but increase as they are placed backwards.

In Amphisbæna, the teeth are short and conical; five are fixed to the intermaxillary bone, of which the middle tooth is longest; five teeth are on each superior maxillary, and eight on each premandibular bone; the first tooth short, the second and third longest.

The typical *Blind-worms* or *Anguians* [ORVET] have, according to the Professor, only maxillary teeth; the palatine teeth being absent. In *Anguis fragilis* [BLIND-WORM] the first five of the upper teeth on each side are small, with cutting edges, and are placed on the intermaxillaries; the next eight are much larger, pointed, and recurved, and are separated by intervals. In general form therefore, Mr. Owen observes, the teeth of the true *Anguis* adhere to the Ophidian type; but in the *Ophiomerus*, or miliary blind-worm, and in the *Acontias* [JAVELIN SNAKE], they are conical, obtuse, and straight. In the subgenera *Lerista*, *Ablepharus*, *Hysteropus*, *Dibamus*, *Typhlinus*, and the rest of the family of blind-worms, the teeth are likewise simple and conical.

The *Pseudopus Pallasii* [SCHELTOPUSIK] is furnished with sixteen teeth on each side of the upper jaw, and twelve the latter in a continuous series) in the lower jaw. A median interval separates the two lateral series in the upper aw. The anterior teeth in both jaws are conical and obtuse; the posterior teeth have a hemispherical triturating crown. The palate is armed with small conical and simple eeth, which are arranged in one moderately long row on each side.

OPHISAURUS is provided with a close-set row of simple eeth in both jaws, and Professor Owen observes that these glass-snakes very remarkably repeat a dental character obervable in certain Batrachians, especially the Newts of he same continent to which these Ophisaurs are peculiar; for they have teeth at the roof of the mouth, arranged in everal rows, chiefly supported by the pterygoïds, and in a mall proportion by the palatine bones. The teeth composing this 'palatal pavement' are short and conical; the maxillary teeth are described as subcylindrical and simple. The entire number of teeth amounts to twenty on each side f the upper jaw, and eighteen on each side of the lower jaw.

No palatal teeth have been detected in *Pantodactylus*, in which the maxillary teeth are slightly compressed with a ricuspid crown. The intermaxillary teeth are conical and imple. The teeth are close set and equal.

Ecpleopus is similar in its dentition to *Pantodactylus*, with the exception of the inequality in the maxillary teeth, nd their termination in a simple obtuse summit.

In the Monodactyle or Anguine lizard (*Lacerta Monodactyla*, Shaw; *Chamæsaurus*, Dum. et Bib.) these teeth are subcylindrical and obtusely pointed; and, as in the two preceding genera, there are no palatal teeth. In the heterodactyle *Chalcis* [CHALCIDES] the maxillary teeth are slightly compressed, straight, and divided into two or three obtuse oints. Those of the annulated Chalcis are described as conical and terminating in a simple obtuse summit. In neither species are the teeth implanted in sockets, but applied to the inner margin of the alveolar ridge.

In *Zonurus griseus* there are about twenty equal, conical, r subcylindrical, obtuse teeth on each side.

The intermaxillary teeth of *Tribolonotus* and *Saurophis* re conical; and the maxillary teeth are straight and subcylindrical, with obtuse summits. There are no teeth on the roof of the mouth of these genera.

In *Gerrhosaurus*, as in *Tribolonotus*, the intermaxillary nd anterior maxillary teeth are conical; but the posterior teeth are compressed, and terminate in a bilobed summit. The *Gerrhosauri* differ further in having a row of small conical teeth on each pterygoïd bone.

The posterior maxillary teeth of *Gerrhonotus* are simply btuse at the summit, and the pterygoïd teeth are not so umerous.

In BIPES (*Scelotes*, Fitzinger) the teeth are confined to the jaw-bones, and are conical and simple. The same dentition is characteristic of *Seps* [SCINCOIDIANS.] Professor Owen further observes, that the teeth of *Seps chalcides* are ery small, and that their obtuse apex just protrudes above the gum at the anterior part of the mouth; but they gradully increase in size as they are placed farther back.

The SCINCOIDIANS, or smooth-scaled lizards, have small mouths and slender sharp teeth, fitted apparently, observes Professor Owen, for insect food.

The teeth in *Tropidophorus* are described as straight, cylindrical, simple, slightly compressed at the summit, and onfined to the jaws. In the true Scinks (*Scincus*, Dum. t Bibr.), of which the *Scincus officinalis* is the type, the palate also is furnished, four or five small obtuse teeth being ituated on each pterygoid bone. The maxillary teeth of *Scincus* are conical, obtuse, and sometimes slightly incurved.

The palate has no teeth in the short-footed Scinks (*Sphenops*, Wagler), and their maxillary teeth are conical, straight, pointed, smaller, and more numerous than in the common Scink. In the Galliwasps (*Diploglossus*) the jaws are armed with equal, close-set, simple, conical teeth, which are sometimes subcompressed at the crown. The palate is toothless. The teeth are compressed, and their crowns are wedge-shaped in most of the species of *Gongylus*, Dum. et Bibr. They are equal, conical, and only slightly compressed at the summit in the subgenus *Eumeces*. In the carinated Scink and its congeners (*Euprepes*), the pterygoïds are furnished with teeth, which are very numerous in the Golden Scink (*Euprepes Cyprius*), each of whose pterygoïds supports two rows of short, straight, strong conical teeth; the maxillary teeth resemble those of the other *Euprepes*. In a large species of Scink figured by Cuvier, the maxillary teeth have expanded crowns with a dentated margin, but the pterygoïd teeth are wanting.

In a genus of Australian Sincoid lizards (*Cyclodus*), there is, Professor Owen remarks, a difference from the rest of the tribe in the subhemispherical form of the teeth, which resemble tubercles, instead of more or less pointed cones, and the species manifest a corresponding difference in their habits and the nature of their food. The dentition of *Cyclodus nigroluteus* is accurately figured by Mr. Owen, in pl. 26, *fig.* 7, and the details, to which we refer the reader, are given with his accustomed clearness. 'All the teeth are,' he observes, 'attached, after the pleurodont type, by their base and outer margin to a shallow depression on the outer side of the external alveolar parapet. The germs of the successional teeth are developed at the inner side of the base of their predecessors, which they excavate, undermine, and displace in the usual manner. I have not seen any specimens of this genus which had the branches of the lower jaw anchylosed at the symphysis. The pterygoïd bones present a rugous surface at the place where they ordinarily support teeth.'

In the CHAMELEONS, the same author states that the teeth are conical, compressed, trenchant, with the summit simple, or terminating in three points, arranged in the same longitudinal line; and that, in most species, the teeth gradually increase in size, and become wider apart as they are situated farther back upon the jaws. Professor Owen further observes that the teeth are so completely confluent with the alveolar plate, as to appear, externally, when in place, to be mere processes of that border of the jaw; but, he remarks, their true nature is evident when viewed from the inner side of the jaw. The number of teeth vary in the species.

In the *Agamanians*, or Agamoïd Lizards, forming the genus *Uromastyx*, the dentition, which at first sight seems to consist of a merely notched or dentated margin of the jaw, resembles that of the Chameleons. These notches, or processes, are however true teeth, originally developed as independent parts, and afterwards becoming confluent, by their base and a great part of the outer side, with the alveolar parapet of bone. Mr. Owen points out, in continuation, that in the young of *Uromastyx* there are from two to four anterior or intermaxillary teeth, which subsequently become anchylosed together, so as to appear like one lobated tooth. In the lower jaw the crown of this complex tooth is received into a wide interspace between the two anterior teeth. The molar teeth are described as triangular or subcylindrical, with rather obtuse and subcompressed summits, approximated, and increasing in size as they recede backwards.

In the common *Stellio*, Professor Owen found most of the teeth, sixteen or seventeen on each side, triangular, with a small cusp before and behind, and two larger conical teeth, like canines, at the anterior part of the upper and lower maxillary bones. Two small conical teeth, which have no correspondents in the lower jaw, are supported by the intermaxillary bones.

The canines of the DRAGON are proportionally longer than those of *Stellio*, but otherwise the dentition is the same.

There is a resemblance between the mutable *Agamæ* (*Trapelus*) and the *Stelliones*, inasmuch as the former have two conical teeth longer than the rest, beginning the series in the lower jaw and superior maxillary bones; but the *Agamæ* have four small conical intermaxillary teeth, without corresponding teeth below. Seventeen triangular teeth were found to succeed the canines in the lower jaw, and fifteen in the upper jaw, in *Trapelus ater*. *Agama orbi-*

sularis resembles the *Trapeli* in its dentition, with the exception that the molar teeth behind the canines are more conical.

In the common *Calotes* the inferior maxillary dental series is described as commencing with four simple conical teeth, and in the upper jaw with six: of these last, Professor Owen remarks that the middle smaller ones might pass for incisors, and the external ones for canines: behind these he describes a series of molar teeth with compressed triangular and tricuspid crowns, the median cusp being much the longest of the three: these teeth increase in size towards the back part of the jaw.

In the *Geckotians* [GECKO] the teeth are more pointed, more slender, more equable, and more numerous than in the preceding group. The Professor remarks that the summit of the tooth is always simple, and that the base is obliquely soldered to the internal surface of an outer alveolar parapet. The number of the teeth varies very much in the different subgenera; but none of the *Geckotidæ* have teeth on the roof of the mouth.

The *Iguanians* [IGUANA] are next noticed by Professor Owen as characterised, like the preceding groups, by a short contractile tongue, slightly notched at its extremity, but, as he remarks, they are distinguished for the most part by having teeth on the pterygoïd bone, and also by the complicated form of the crown of the maxillary teeth in the typical genera, the species of which subsist chiefly on vegetable substances. In most of the family the teeth are set in a common shallow oblique alveolar groove, and are soldered to excavations on the inner surface of the outer wall of the groove.

The following genera are enumerated by MM. Duméril and Bibron as showing the pleurodont type of dentition, and as being also furnished with pterygoïd teeth, viz.:—*Polychrus*, *Urostrophus*, *Anolis*, *Corythophanes*, *Basiliscus*, *Aploponotus*, *Amblyrhynchus*, *Iguana*, *Metopoceros*, *Cyclurus*, *Brachylophus*, *Leiosarus*, *Hypsibates*, *Proctotretes*, *Ecphymotes*, *Stenocercus*, and *Oplurus*. But the following pleurodonts, *Hyperanodon*, *Tropidolepis*, *Phrynosoma*, and *Callisaurus* have no pterygoïd teeth.

In the genera *Istiurus*, *Calotes*, *Lophyrus*, *Otocryptis*, and *Chlamydosaurus* among the Acrodonts, the maxillary teeth may, Professor Owen observes, be divided into anterior, laniary, and posterior molar teeth; and he states that no Iguanian lizard has teeth on the palatine bones.

'The most strictly vegetable-feeding reptiles,' says the Professor, 'are the true *Iguanæ* and the *Amblyrhynchi*; yet the size of the teeth, their mode of implantation, and the limited motions of the jaws permit only an imperfect comminution of the food by these instruments; and their summits are rather chipped off than ground down by use. The appearance of abrasion is greatest in the posterior teeth; especially in the *Iguana cornuta*, in which the crowns of the teeth are thicker than in the *Iguana tuberculata*, and make a nearer approach to the very remarkable form of tooth that characterises the gigantic *Iguanodon*.

'Before however proceeding to describe the teeth of this extinct lizard, I shall offer a few observations on the microscopic structure of the teeth of the existing Iguana. In both the common and horned species the teeth consist of a body of simple compact dentine, with the crown covered externally by a thin layer of enamel, and the fang with an investment of cement. The dentine, viewed by transmitted light in a thin horizontal section, exhibits minute calcigerous tubes in a clear substance, radiating from a simple conical pulp-cavity, which is widely open at the base of the tooth, and continues in a linear form into the crown of the tooth; the calcigerous tubes at the base of the tooth proceed in an irregular sinuous course, at right angles to the axis of the tooth: above this part they sweep outwards in a graceful curve, with the concavity turned towards the base of the tooth; as they approach the summit of the tooth, they gradually incline towards it, and those from the apex to the pulp-fissure proceed directly in the axis of the tooth; throughout their course the calcigerous tubes are disposed in minute undulations, and they send off from the concave side of the primary flexures numerous short parallel branches, at an angle of 45°; the branches rise less regularly the nearer the main tube is to its origin from the pulp-cavity. The diameter of the calcigerous tubes is [illegible]th of an inch: their interspaces are equal to between three or four of their diameters. In general they do not divide until within a short distance from the periphery of the tooth, near which they subdivide frequently. . . . The tubes at the base of the tooth divide nearer their origin, and more frequently. . . The pulp-cavity in old teeth becomes occupied by a certain coarse bone, characterised by large irregularly shaped calcigerous cells, and the interspaces are filled with irregular moss-like reticulations of tubes. Branches of the pulp-cavity are never continued in the form of medullary canals into the substance of the dentine in the existing Iguanæ. . . . The germs of the successional teeth are developed from the mucous membrane covering the inner side of the base of those in place. The apex of the dentated crown is first formed; by its pressure it excites absorption of the base of the fixed tooth, and soon undermines it, and then occupies the recess in the alveolar plate in the interspace of the two adjoining fixed teeth. After the crown is completed, the rest of the tooth forms a contracted and elongated fang, which at first is hollow, then becomes consolidated by ossification of the remaining pulp, and afterwards a second time excavated by the pressure of a new tooth.'

Professor Owen, after quoting Dr. Mantell and Baron Cuvier, with reference to the IGUANODON, observes that a subsequent discovery by the former of a portion of the lower jaw of this extinct lizard confirmed the previous inference as to the mode of attachment of the teeth, and approximates this gigantic species to the pleurodont section of the Iguanians; whence, he remarks, it may be inferred that the teeth were nearly all uniform in size and shape, at least not divisible into laniaries and molars, as in the Acrodont Iguanians. He further states that the portion of the lower jaw alluded to, which is now in the British Museum with the rest of Dr. Mantell's noble collection, shows that the Iguanodon differed from the Crocodile not only in the lateral adhesion of the teeth to an alveolar wall, but in their arrangement in a close-set series.

Besides the opportunity of studying this fossil and the extensive series of detached teeth in the Mantellian collection in the British Museum, Professor Owen, having examined the private collections of Dr. Mantell and Mr. Dixon of Worthing, and having been favoured by both those gentlemen with the teeth of Iguanodon, had sections prepared for microscopical examination, with the following results:—

'The teeth of the *Iguanodon*, though resembling most closely those of the *Iguana*, do not present an exact magnified image of them, but differ in the greater relative thickness of the crown, its more complicated external surface, and, still more essentially, in a modification of the internal structure, by which the Iguanodon equally deviates from every other known reptile. As in the Iguana, the base of the tooth is elongated, contracted, and subcylindrical; the crown expanded, and smoothly convex on the inner side; when first formed, it is accuminated, compressed, its sloping sides serrated, and its external surface traversed by a median longitudinal ridge, and coated by a layer of enamel; but beyond this point the description of the tooth of the Iguanodon indicates characters peculiar to that genus. In most of the teeth that have hitherto been found three longitudinal ridges traverse the outer surface of the crown, one on each side of the median primitive ridge; these are separated from each other and from the serrated margins of the crown by four wide and smooth longitudinal grooves. The relative width of these grooves varies in different teeth; sometimes a fourth small longitudinal ridge is developed on the outer side of the crown. The marginal serrations, which at first sight appear to be simple notches, as in Iguana, present under a low magnifying power the forms of transverse ridges, themselves notched so as to resemble the mammillated margins of the unworn plates of the elephant's grinder: slight grooves lead from the interspaces of these notches upon the sides of the marginal ridges. These ridges or dentations do not extend beyond the expanded part of the crown; the longitudinal ridges are continued farther down, especially the median ones, which do not subside till the fang of the tooth begins to assume its subcylindrical form. The tooth at first increases both in breadth and thickness; it then diminishes in breadth, but its thickness goes on increasing; in the larger and fully formed teeth the fang decreases in every diameter, and sometimes tapers almost to a point.' A fracture of such a tooth, figured by Professor Owen,* shows that the pulp was not entirely solidified; but that its cav had continued open at the thickest part of the tooth. 'The apex of the tooth soon begins to be worn away; and it would appear, by many specimens, that the teeth were retained until nearly the whole of the crown had yielded to the daily abrasion. In these teeth however the deep excavation of the remaining fang plainly bespeaks the progress of the successional tooth prepared to supply the place of the worn-out grinder. At the earlier stages of abrasion a sharp edge is maintained at the external part of the tooth by means of the enamel which covers that surface of the crown; the prominent ridges upon that surface give a sinuous contour to the middle of the cutting edge, whilst its sides are jagged by the lateral serrations.' [IGUANODON, vol. xii., p. 441.] 'The adaptation of this admirable dental instrument to the cropping and comminution of such tough vegetable food as the *Clathrariæ* and similar plants, which are found buried with the Iguanodon, is pointed out by Dr. Buckland, with his usual felicity of illustration, in his *Bridgewater Treatise*, vol. i., p. 246.' 'When the crown is worn away beyond the enamel, it presents a broad and nearly horizontal grinding surface; and now another dental substance is brought into use to give an inequality to that surface; this is the ossified remnant of the pulp, which, being firmer than the surrounding dentine, forms a slight transverse ridge in the middle of the grinding surface: the tooth in this stage has exchanged the functions of an incisor for that of a molar, and is prepared to give the final compression or comminution to the coarsely divided vegetable matters. The marginal edge of the incisive condition of the tooth, and the median ridge of the molar stage, are more effectually established by the introduction of a modification into the texture of the dentine, by which it is rendered softer than in the existing Iguanæ and other reptiles, and more easily worn away: this is effected by an arrest of the calcifying process along certain cylindrical tracts of the pulp, which is thus continued in the form of medullary canals, analogous to those in the soft dentine of the Megatherium's grinder, from the central cavity, at pretty regular intervals, parallel with the calcigerous tubes near to the surface of the tooth. The medullary canals radiate from the internal and lateral sides of the pulp-cavity, and are confined to the dentine forming the corresponding walls of the tooth: their diameter is [illegible]th of an inch: they are separated by pretty regular intervals equal to from six to eight of their own diameters; they sometimes divide once in their course. Each medullary canal is surrounded by a clear space: its cavity was occupied in the section described by a substance of a deeper yellow colour than the rest of the dentine. The calcigerous tubes present a diameter of [illegible]th of an inch, with interspaces equal to about four of their diameters. At the first part of their course, near the pulp-cavity, they are bent in strong undulations, but afterwards proceed in slight and regular primary curves, or in nearly straight lines to the periphery of the tooth. When viewed in a longitudinal section of the tooth, the concavity of the primary curvature is turned towards the base of the tooth: the lowest tubes are inclined towards the root, the rest have a general direction at right angles to the axis of the tooth; the few calcigerous tubes, which proceed vertically to the apex, are soon worn away, and can be seen only in a section of the apical part of the crown of an incompletely developed tooth. The secondary undulations of each tooth are regular and very minute. The branches, both primary and secondary, of the calcigerous tubes, are sent off from the concave side of the main inflections; the minute secondary branches are remarkable at certain parts of the tooth for their flexuous ramifications, anastomoses, and dilatations into minute calcigerous cells, which take place along nearly parallel lines for a limited extent of the course of the main tubes. This modification must contribute, with the medullary canals, though in a minor degree, in producing that inequality of texture and of density in the dentine which renders the broad and thick tooth of the Iguanodon more efficient as a triturating instrument. The enamel which invests the harder dentine forming the outer side of the tooth presents the same peculiar dirty brown colour when viewed by transmitted light as in most other teeth; very minute and scarcely perceptible undulating fibres, running vertically to the surface of the tooth, is the only structure I have been able to detect in it. The remains of the pulp in the contracted cavity of the completely formed tooth are converted into a dense but true osseous substance, characterised by minute elliptical radiated cells, whose long axis is parallel with the plane of the concentric lamellæ, which surround the few and contracted medullary canals in this substance.'

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* Pl. 63 A.

Such is Professor Owen's elaborate and accurate account of his microscopical examination of the teeth of this giant of the Weald, which existed long before man was created; an examination which, as the Professor remarks, contributes additional evidence of the perfection of their adaptation to the offices for which their more obvious characters had indicated them to have been destined. He further appropriately observes, that if Dr. Buckland's reflections in his *Bridgewater Treatise* (vol. i., p. 249) were natural and just after a review of the external characters of the dental organs of the Iguanodon, their truth and beauty become more manifest as our knowledge of the subject becomes more particular and exact. That knowledge we have given in Professor Owen's own words, as the clearest that could be used. A reference to the work itself, and the accurate and highly finished engravings which illustrate it, will leave the palæontologist nothing to wish with regard to the dentition of the Iguanodon.

Professor Owen describes the fang of the tooth of HYLÆOSAURUS as subcylindrical, subelongate, and smooth; the crown as expanded, compressed, slightly incurved, and with the narrow sides straight and converging at a slightly acute angle to the apex. In all the teeth which the Professor had seen, these sloping sides showed the effects of attrition, the enamel being worn away and the dentine exposed. The tooth is described as consisting of a body of dentine covered by a thick coating of clear structureless enamel, and surrounding a small central column of true bone, consisting of the ossified remains of the pulp, which presents the usual characters of the texture of the bone in the higher reptiles. The dentine differs, like that of existing Lacertians, from the dentine of the Iguanodon in the entire absence of the numerous medullary canals which form so striking a characteristic of the latter reptile. The main calcigerous tubes are described as characterised by the slight degree of their primary inflections, and as continued in an unusually direct course from the pulp-cavity to the outer surface of the dentine at nearly right angles with that surface, but slightly inclined towards the expanded summit of the tooth. They are stated to be chiefly remarkable for the large relative size of their secondary branches, which diverge from the trunks in irregular and broken curves, the concavity being always turned to the pulp-cavity. In most parts of the tooth the Professor found the numbers of these branches obscuring even the thinnest sections. The ossified pulp exhibited the parallel concentric layers of the ossified matter surrounding slender medullary canals, interspersed with irregular, elliptical, radiated cells.

In the first group or subfamily of the typical or squamate Saurians (*Pleodont Lacertians* of MM. Duméril and Bibron) the teeth are solid, or without any internal cavity, and are described as very firmly anchylosed by their base to the alveolar groove upon the inner side of the jaw; so that the extremity of the tooth is slightly directed outwards. In the second group, or *Cœlodonts* of the same authors, the teeth are excavated by a sort of canal, and are less firmly fixed to the jaws, being applied vertically, like piles or buttresses, against the outer alveolar parapet, but not adhering by their base. The first group includes the genera *Crocodilurus*, *Thoricles*, *Neusticurus*, *Aporomera*, *Monitor*, *Ameiva*, *Cnemidophora*, *Dicrodon*, *Acrantus*, and *Centropyx*; the second, *Tachydromus*, *Tropidosaurus*, *Lacerta*, *Ophiops*, *Calosaurus*, *Eremias*, *Scapteira*, *Acarithodactylus*, and *Psammodroma*. For the disposition and number of the teeth on the maxillary, intermaxillary, and pterygoid bones in the different genera, we must refer the reader to the work itself.

Professor Owen observes that one gigantic extinct species of Saurian Reptile [MOSASAURUS] has been found to agree with many of the existing species in the Lacertian, Iguanian, Anolian, and Scincoid families, in having the pterygoïd bones armed with teeth; but, he remarks, the maxillary teeth combine the pleodont with the acrodont characters; and the skeleton indicates a special adaptation for swimming and marine life. The dentition is described as eminently exhibiting the acrodont character; the teeth being supported on expanded conical bases anchylosed to the summit of the alveolar ridge of the jaws: no existing Saurian, observes the Professor, exactly parallels this mode of attachment of the teeth, either in regard to the breadth of the alveolar border, or in the relative size of the osseous cones to the teeth which they support. A shallow socket remains where the tooth and its supporting base are shed. The form of the teeth differs likewise from that of any existing Saurian hitherto observed; for they are pyramidal with the outer side nearly plane, or slightly convex and separated by two sharp ridges from the remaining surface of the tooth, which forms a half-cone. The teeth, all of which are slightly recurved and smooth on their peripheral surface, are implanted on the intermaxillary, maxillary, premandibular, and pterygoid bones; the series placed on the pterygoïds are much smaller. 'The superior maxillary bone,' continues Mr. Owen, 'in the great cranium preserved in the Paris museum—the most celebrated fossil of the present species—contained eleven teeth. Cuvier calculates that the intermaxillary bone may have contained three teeth; meaning probably three on each side. The premandibular element of the lower jaw supported fourteen teeth; the number of the teeth thus approximating to that which characterises the *Varanus Niloticus*. They are arranged in a pretty close and regular series. There appear to have been eight teeth on each pterygoïd bone. In the mode and place of development of the successional teeth the Mosasaurus resembles the Iguanæ and most other Lacertians. In the great cranium above mentioned, germs of new teeth in various stages of growth are lodged in hollows of corresponding degrees of depth on the inner side of the bases of the adherent teeth, and have evidently owed the commencement of their formation to the mucous membrane which originally covered those supporting cones of the teeth in place. The attention of Camper was particularly arrested by the observation of this fact, which appeared the more singular to him, as this mode of dental succession, which is common in reptiles and osseous fishes, was not then known.'

Professor Owen, after quoting the passage from Camper bearing out the last proposition, thus continues: 'The crown of the tooth consists of a body of simple and firm dentine, invested with a moderately thick coat of enamel; the expanded base is composed of a more irregular mass of dentine, which, by its progressive subdivision into vertical columnar processes, assumes a structure resembling that of true bone; this part is covered with a layer of cement, which is continued as an extremely thin coat upon the enamel. The pulp-cavity generally remains open at the middle of the base of the crown of the tooth; irregular processes of the cavity extend as medullary canals into the conical base of the tooth; but no processes of the pulp-cavity are continued, as in the Iguanodon, into the substance of the coronal dentine. This substance consists, as in the Crocodile, of fine and close-set calcigerous tubes, arranged according to the usual law, and much resembling that of the tooth of the varanian monitor figured in plate 67. The calcigerous tubes have a diameter of $\frac{1}{10000}$th of an inch, with interspaces equalling about four of these diameters: their secondary curvatures and branches resemble those in the tooth of the *Varanus*.' The commencement of the subdivision of the mass of dentine, by the divergence of the calcigerous tubes from secondary centres, after quitting the main pulp-cavity, is shown in Mr. Owen's plate 69, *fig*. 3. 'The fibrous structure of the enamel is very conspicuous in the tooth of the Mosasaur: the lines to which this structure is due seem to be continued from the peripheral cells of the dentine; and they bifurcate repeatedly as they traverse the enamel. This subdivision of the pulp-cavity, and multiplication of centres of radiation for the calcigerous tubes, increase until the piles of dentine can be scarcely distinguished from the Haversian canals of the bone of the jaw, with which the root or base of the tooth is confluent. The gradual transition from the simple structure of the compact crown to the multifid dentine of the anchylosed base of the tooth was not known to Cuvier, otherwise he could not have supposed that the crown and base of the tooth of the Mosasaurus were formed by vital processes of so dissimilar a nature as to forbid him considering them as parts of one and the same body. Cuvier had originally described the expanded base of the tooth of the Mosasaur as the root of the tooth; but afterwards finding that the corresponding base became anchylosed by ossification of the remains of the pulp with the jaw, he conceived that it was incorrect to regard it as a part of a body which he believed to be an inorganic product and the result of excretion. The necessity under which Cuvier felt himself compelled to regard the crown and the base of the tooth of the Mosasaur as two distinct parts, is at once banished by the recognition of the principle that the processes of calcification are essentially the same at every part of a tooth, whether it be free or anchylosed; and that they are modified only, as I have shown in my memoir on the formation of the teeth of the shark (*Comptes Rendus*, December 16, 1839), according to the density of the part to be produced.'

A few vertebræ found in the English chalk-formations are generically if not specifically related to the Mosasaurus of Maestricht. Dr. Mantell, in his *Wonders of Geology*, notices the only teeth there found (Norfolk chalk) approaching in form to that genus, as belonging to an unknown reptile or sauroïd fish. Professor Owen remarks that the portion of the jaw to which these teeth were attached exhibits such a similarity of attachment as to leave no doubt of their near relationship, nor does he think it by any means improbable that this fragment of jaw and teeth may belong to the same species as the above mentioned vertebræ. He suggests that till this conjecture be refuted, the fossil may be indicated by the name of *Leiodon*, from the smoothness of the teeth, which are about half the size of those of *Mosasaurus Hoffmanni*, but differ in having their outer side as convex as the inner side; their base is circular.

The teeth of *Geosaurus*, which appears not to be happily named, inasmuch as the large eyes defended by broad sclerotic plates indicate, as Professor Owen observes, that the sea was its dwelling-place, resemble those of the large *Varanians* in their compressed subrecurved crown, with a trenchant anterior and posterior edge, which likewise presents a fine and close dentation. A very fine fragment, we believe, the best known, is in the British Museum. Soemmering's conjecture that Geosaurus might be a young Mosasaur is no longer held good, and Cuvier's observations on the difference of their teeth are acknowledged to be just. Professor Owen remarks that the form of the vertebræ of *Geosaurus* indicates its near affinity to the crocodilian group, and that the Argenton fossil crocodile presents the same subcompressed teeth with dentated margins as *Geosaurus*.

The *Varanians* form a family of scaled Saurians, including the *Monitors* of the Old World: some of the species come nearest in size to the crocodiles. This family, Professor Owen remarks, manifests its affinity to that group in the absence of pterygoid teeth, and in the number of successive tooth-germs which may be observed at the same time behind the fixed and functional teeth. Independently of these characters, the Varanians must, observes the Professor, excite our interest from exhibiting in some species a form of tooth which most nearly resembles that which characterises *Megalosaurus* and other very remarkable extinct terrestrial species of gigantic squamate Saurians.

In a small extinct species of Lizard from the gault and chalk formations, and for which Professor Owen proposes the name of *Raphiosaurus*, the teeth were awl-shaped, about three lines in length above the alveolar border, close-set, and equal-sized. Their rounded base was anchylosed to the alveolar groove, and their outer side attached to a well-developed external alveolar wall.

For the varieties in the form of the teeth presented by the existing Varanians we must refer to the work itself, observing only that Professor Owen points out the *Heloderm*, *Varanus Niloticus*, *Varanus arenarius*, *V. Timoriensis*, *V. Bengalensis*, *V. bivittatus*, *V. variegatus*, and *V. crocodilinus* as the principal species which exhibit such varieties.

Professor Owen commences the family of the *Thecodonts*, extinct Saurians which exhibit a mode of fixation of the teeth different from the *Acrodonts* and *Pleurodonts*, with the genus *Thecodontosaurus*, observing that these *Thecodonts*, which in other parts of their organization adhere to the squamate or Lacertine division of the order, have their teeth implanted in sockets, either loosely, or confluent with the bony walls of the cavity; and to this group the most ancient Saurians belong.

The THECODONTOSAURUS discovered by Dr. Riley and Mr. Stutchbury in the dolomitic conglomerate at Redland near Bristol, is, as well as their PALÆOSAURUS, also there found by them, allied in the form of the teeth to the typical Varanian Monitors, but Professor Owen remarks that they differ in having the teeth imbedded in distinct sockets: to this condition however, he observes, the *Varani* make an approach in the shallow cavities containing the base of the teeth along the bottom of the alveolar groove. But in the ntient extinct *Thecodontosaurus* the sockets are deeper, nd the inner alveolar wall is nearly as high as the outer ne: the teeth present a close-set series, slightly decreasing n size towards the posterior part of the jaw. The number f teeth supposed to have been contained in each ramus of he lower jaw is supposed to have been twenty-one. 'These,' ays Mr. Owen, 'are conical, rather slender, compressed nd acutely pointed, with an anterior and posterior finely errated edge, the serratures being directed towards the pex of the tooth; the outer surface is more convex than he inner one: the apex is slightly recurved: the base of he crown contracts a little to form the fang, which is subylindrical. The pulp-cavity remains open in the base of e crown. In microscopic structure the teeth of the *Pa-rosaurus* closely correspond with that of the teeth of the 'aranus, Monitor, and Megalosaurus. The body of the oth consists of compact dentine, in which the calcigerous ubes diverge from the open pulp-cavity at nearly right ngles to the surface of the tooth; they form a slight curve t their origin, with the concavity directed towards the base f the tooth, then proceed straight, and at the periphery end upwards in the contrary direction. The diameter of e calcigerous tube is [illegible]th of an inch. The crown of the oth is invested with a simple coat of enamel.'

This examination, as Professor Owen remarks, satisfacorily establishes the distinction between the Saurian of the ristol conglomerate and the reptiles of the new red-sandtone system in Warwickshire, described under the generic ame of *Labyrinthodon*. [SALAMANDROÏDES.]

One of the two teeth of *Palæosaurus* found by Dr. Riley nd Mr. Stutchbury is compressed and pointed, with opposite renchant and serrated margins; but its breadth is much reater than its length; this they ascribe to a species which hey name *Palæosaurus platyodon:* the other they refer to species designated by them *P. cylindrodon.* The crown f *P. platyodon* measured nine lines in length and five lines breadth, and is figured in *Odontography*, pl. 62 A, *fig.* 7. he portion of the tooth of *P. cylindrodon* shows a subcomressed crown traversed by two opposite finely-serrated dges, and is five lines long and two lines broad.

The genus *Cladeiodon* (Owen) derives great interest from aving been found in the same quarries of new red-sandtone (Keuper?) at Warwick and Leamington as contained e remains of *Labyrinthodon*. 'In their compressed form,' ys Professor Owen, 'anterior and posterior serrated edges, harp points, and microscopic structure, these teeth agree ith those of the Saurian reptiles of the Bristol conglomeate. In their breadth, as compared with their length and ickness, they are intermediate between the Thecodontoaurus and the *Palæosaurus platyodon;* they are also larger nd more recurved, and thus more nearly approach the rm characteristic of the teeth of the *Megalosaurus*. From ese teeth however they differ in their greater degree of mpression, and in a slight contraction of the base of the own. I propose therefore to indicate the genus, of which, yet, only the teeth are known, by the name of *Cladeiodon*, d for the species from the Warwickshire sandstone the ame of *Cladeiodon Lloydii*, in testimony of the friendly d of Dr. Lloyd of Leamington, to whose exertions I owe e materials for the description of the teeth of the present nus, and the still more remarkable ones of the British ecies of Labyrinthodon, with which the teeth of the *Cla-eiodon* are associated.'

Professor Owen retains the name of PROTOROSAURUS for e small species of Saurian found in the pyritic schists of huringia, which, he observes, like the dolomitic breccia ar Bristol, rank as the oldest member of the new redndstone. Spener first described it as a sort of crocodile. *Miscellanea Berolinensia*, 1710.) Cuvier, after elaborate vestigation, came to the conclusion that it was a *Monitor* *Tupinambis*, and Hermann von Meyer gave it the name *Protorosaurus Speneri*. The name is retained by Prossor Owen, because the species in question actually differs om the existing Monitors and other Lacertians by the same aracter which distinguishes the *Thecodontosaurus*, viz. e implantation of the teeth in distinct sockets. 'Of these ckets,' remarks Mr. Owen, 'the dislocated ramus of the wer jaw in Spener's specimen exhibits fourteen, which e of a square shape, with the angles rounded off, close-set, d sub-equal. The teeth, of which eighteen may be unted in the upper jaw, are relatively longer, more slender, d more cylindrical than in the *Thecodon;* they are more less broken; the most perfect of them measure three lines in length, and two-thirds of a line across the base; they are of a jet-black colour, and, being imbedded in a dark matrix, have not enabled me to determine whether the *Protorosaurus*, like the equally antient reptiles of the Bristol conglomerate, had the teeth armed with serrated ridges.' Professor Owen adds in a note, that besides the Thecodont type of dentition, the *Protorosaurus* differs from all recent Saurians, and resembles the Pterodactyle in the great relative size of the cervical vertebræ and the ossified tendons of the muscles of that region of the spine; it differs from all reptiles, except the extinct *Rachæosaurus*, in the bifurcate superior spines of the caudal vertebræ.

After observing that the compressed varanian form of tooth, with trenchant and finely dentated margins, which characterised the antient *Palæosaur* and *Cladeiodon*, is continued in the comparatively more recent and gigantic MEGALOSAURUS, and quoting Dr. Buckland's graphic description of the external form and renewal of the teeth (*Bridgewater Treatise*, vol. i., p. 237), Professor Owen informs us that they consist of a central body of dentine, with an investment of enamel upon the crown, and of cement over all, but thickest upon the fang. The marginal serrations are, he states, formed almost entirely by the enamel; and when slightly magnified, are seen to be rounded and separated by slight basal grooves: the smooth and polished enamel upon the sides of the crown presents a finely wrinkled appearance, and the remains of the pulp are converted into a coarse bone in the completely formed tooth. The dentine he describes as consisting of extremely fine and close-set calcigerous tubes, without admixture of medullary canals, radiating from the pulp-cavity at right angles with the external surface of the tooth; the primary curvatures corresponding with those of the calcigerous tubes in the monitor's tooth, but less marked, so that the tubes appear straighter. Their diameter was found to be [illegible]th of an inch, with interspaces varying between two and three times that diameter; they dichotomise sparingly, but the number of minute secondary branches sent off into the intermediate substance is described as being very great. These secondary branches were seen to proceed at acute angles from the primary tubes, and the divisions of the tubes to become very frequent near the periphery of the dentine, the terminal branches dilating into or inosculating with a stratum of calcigerous cells which separates the dentine from the enamel. 'The highly organised nature of a tooth,' says Professor Owen, in concluding his observations on the teeth of this enormous extinct and carnivorous terrestrial lizard, 'is well illustrated in this example of one of the simplest of Saurian teeth, in which, in addition to the tubular and cellular modification of the dentine, there is also enamel, cement, and an internal coarse kind of bone. The dentition of the Megalosaurus, besides exemplifying on a larger scale the mechanical advantages of the varanian form of tooth, exhibits an interesting transitional character between the squamate and loricate types of Saurians, the distinct sockets making the approach to the crocodiles, while the raised external alveolar wall shows the retention of the lacertine structure.'

In the extinct Saurian from the oolitic formation at Neuffen in Würtemberg (*Thaumatosaurus oolithicus*, Meyer), Professor Owen found the teeth conical, slightly curved, straighter on the inner side of the crown, and implanted by a long and strong root, rather obliquely, in a deep socket. The base and basal portion of the crown presented a nearly circular transverse section, and the wide pulp-cavity in this part of the tooth exhibited an elliptical transverse contour; the tooth becomes slightly compressed towards the apex. Its implanted base is stated to be the broadest part of the tooth; the breadth of the crown to its height is as one to three; the crown is described as invested with a thin layer of enamel, the basal half of which is marked by longitudinal striæ; these striæ seemed to consist of folds of the enamel, which do not extend into the dentine. The successional teeth are noticed as penetrating into the interior of the fixed teeth in the progress of their development.

The teeth of *Ischyrodon*, a gigantic reptile from the Jura limestone of the canton of Aargau, are described as somewhat resembling those of the *Thaumatosaurus*, but the external longitudinal striæ of the crown of the tooth as being sharper and more elevated, and the enamel between the striæ as roughened by irregular linear risings; whilst the teeth of the *Pœcilopleuron*, an extinct reptile, also of gigantic dimensions, from the oolitic beds at Caen, has, according to the single tooth referred to that species, a more compressed crown than the teeth of *Thaumatosaurus;* the striæ are also described as wider apart, and the two diametral ones as developed into ridges which extend to the apex of the tooth.

Professor Owen had not, when he published the second part of his 'Odontography,' enjoyed the opportunity of examining the microscopical structure of an undoubted tooth of a PTERODACTYLE; but the dentition had been justly described by Cuvier as presenting nothing equivocal, the teeth being simple, conical, and nearly alike, as in the crocodiles, the monitors, and other lizards. Professor Owen remarks that the disposition of the teeth in the jaws, with wide interspaces, and their separate implantation in distinct sockets, are characters in which the Pterodactyle approximates to the extinct Saurian genera *Thecodon, Megalosaurus, Plesiosaurus,* and the Crocodilians. After describing the relative number of teeth in different species, Professor Owen observes that those figured in his plate 63 A., *fig.* 7, are referred by Dr. Buckland to the large species of Pterodactyle (*Pter. Macronyx*) discovered by the latter at Lyme Regis; but Professor Owen remarks that though they are implanted, like the teeth of other species of the genus, in separate sockets, in the breadth and shortness, lateral compression, and trenchant anterior and posterior margins of the protruded crown, they much more closely resemble the teeth of certain Scomberoid fishes, which are similarly implanted in the jaws. He further calls attention to H. von Meyer's observation that the jaw of a Pterodactyle from the lias at Banz, which he refers to the species *Macronyx,* contains the sockets of only fourteen teeth, whilst the fragment of jaw with the sphyrenoïd teeth from Lyme Regis above mentioned must have contained a much greater number. After noticing that some portions of the skeleton of a large Pterodactyle have been discovered by Dr. Buckland in the oolite at Stonesfield, Professor Owen goes on to state that a few teeth from the same formation in the collection of the Earl of Enniskillen bear the same proportion to these bones as do the teeth of *Pter. crassirostris* to its skeleton; they are, he informs us, long, slender, conical, slightly curved, and sharp-pointed; their base is smooth, the enamelled crown is marked with fine striæ converging obliquely upwards to a longitudinal line on the convex side of the tooth. These teeth vary from nine to fourteen lines in length, and are one line or one line and a half across the base.

In noticing the teeth of the ENALIOSAURIANS, Professor Owen observes that those of the *Ichthyosauri* [ICHTHYOSAURUS] have a simple, more or less acutely conical form, with a long and usually expanded or ventricose base or implanted fang, and that they are confined to the intermaxillary, maxillary, and premandibular bones, in which they are arranged in a pretty close and uninterrupted series, and are nearly of equal size. They consist, he informs us, of a body of unvascular dentine, invested at the base by a thick layer of cement, and at the crown by a layer of enamel, which is itself covered by a very thin coat of cement; the pulp-cavity is more or less occupied, in fully-formed teeth, by a coarse bone. He observes that the external surface of the tooth is marked by longitudinal impressions and ridges, but the teeth vary both as to outward sculpture and general form in the different species, for which differences, as well as their relative numbers, we refer to the work itself. The following is the result of Professor Owen's microscopic investigation of the teeth of *Icthyosauri Platyodon* and *intermedius*:—'The dentine has the same simple compact structure as in the teeth of existing carnivorous Saurians. The calcigerous tubes present a diameter of $\frac{1}{20000}$th of an inch, with interspaces of $\frac{1}{5000}$th of an inch. They radiate from the pulp-cavity, and from a line continued from its upper end to near the apex of the tooth, according to their usual course, towards the periphery of the tooth; they describe at their origin a graceful curve, the concavity of which is directed towards the base of the tooth, and then proceed in straight lines at right angles to the periphery of the tooth. The secondary curvatures or undulations of the tubes are more regular, more numerous, and more marked than in the crocodile's tooth; the tubes divide dichotomously many times during their course, and send off lateral branches obliquely into the clear intermediate substance, and principally from their concave side; the terminal divisions of the calcigerous tubes become less regular, appear to decussate and communicate, at their extremities, either directly with one another, by inosculating loops, or through the medium of minute cells.

'The enamel is a clear dense substance, presenting faint traces of a fibrous structure, the lines being vertical to the surface of the tooth.

'The coronal cement appears only as a line of substance more opaque than the enamel which it invests; it augments in thickness at the base of the tooth, where the radiated corpuscles or cells that characterise its structure are very conspicuous; the cement is inflected at each of the basal grooves, in the form of a short, straight, and simple vertical fold, into the substance of the dentine. The peripheral portion of the basal dentine is thus divided, to the extent represented in plate 64 B, *fig.* 3, into a corresponding number of processes; fissures of the pulp-cavity radiate to their bases, becoming there the centres of divergence of as many series of calcigerous tubes, which obey in their course the usual law of verticality to the external surface of the dentine. This structure can be seen only in a transverse section of the base of the tooth: its correspondence with that of the apex of the crown of the teeth of the Labyrinthodon will be obvious on comparing *fig.* 3, pl. 64 B, with *fig.* 1, pl. 63 B, and, as has been already stated, it gave the key to the nature and principle of the complicated labrynthic interblending of dentine and cement, which was first observed in the great tusk of the *Labyrinthodon Jaegeri.*

'The remains of the pulp, after the formation of the due quantity of dentine, became converted, as in the pleodont lizards, by a process of coarse ossification, into a reticulate fibrous or spongy bone;* but it continues open at the crown after the basal part of the tooth is thus consolidated, as shown in the longitudinal section (pl. 73, *fig.* 8), wherein *a* is the pulp-cavity, filled with crystallized spath; *b* the ossified pulp at the base of the tooth. The radiated cells or corpuscles are very conspicuous in both this bone and the external cement.

'The chief peculiarity of the dental system of the Ichthyosaur is the mode of implantation of the teeth; instead of being anchylosed to the bottom and side of a continuous shallow groove, as in most Lacertians, or implanted in distinct sockets, as in the Thecodon, Megalosaur, or Pterodactyle, they are lodged loosely in a long and deep continuous furrow, and retained by slight ridges, extending between the teeth, along the sides and bottom of the furrow (pl. 73, *fig.* 9), and by the gum and the organised membranes continued into the groove and upon the base of the teeth.

'The germs of the new teeth are developed at the inner side of the base of the old ones.' Mr. Conybeare has given a figure of a transverse section across the jaw-bone (reproduced at pl. 73, *fig.* 7), in which the new tooth (*c*) has penetrated the osseous substance of the base of the old tooth (*b*), and its point has nearly entered the remains of the pulp-cavity, which has continued open in the crown of the tooth (*a*).

From the circumstance of the consolidation of the base of the teeth in the Ichthyosaur, Mr. Conybeare infers that they were retained longer in the jaw than are the hollow teeth of the crocodiles; but the analogy of other Saurians, and the observation of two new teeth at successive stages of formation, at the base of an old tooth, prove that the succession of new sets of teeth was repeated more than once, though probably not so frequently as in the crocodile.'

The same author describes the teeth of the PLESIOSAURUS as conical, long, slender, and sharp-pointed, appearing to retain their internal cavity, as in the teeth of a crocodile; the very long round fang or implanted base contracts, in old teeth, as it sinks into the jaw, and terminates almost in a point. The chief distinction offered by the dental system between the *Ichthyosauri* and *Plesiosauri* is pointed out by Professor Owen as existing in the loose implantation of the teeth of the latter in separate alveoli. In this deviation from those of the Ichthyosaur, the Plesiosaur, observes the Professor, approximates to the crocodilian type, and this affinity, he adds, is likewise manifested in the unequal size of the teeth, and the development of some of the anterior ones into large tusks. They are described as being composed, like those of the Ichthyosaur, of a body of hard and simple dentine, covered at the crown by a coat of enamel and at the base by a coat of cement; but the atter is relatively thinner than in *Ichthyosaurus*, and s not inflected into the substance of the dentine. The rown is characterised by well-defined, narrow, elevated ongitudinal ridges, terminating abruptly at different disances from the apex, to which however Professor Owen tates that none of them extend. The calcigerous tubes in heir general course were found to bear a considerable reemblance to the same parts in the Ichthyosaurus, but the rimary curvature presents, Mr. Owen tells us, a more raceful sigmoïd line, from the inclination of the peripheral xtremities of the tubes towards the apex. The diameter f the tubes at their origin is given at [illegible]th of an inch; heir interspaces were found to equal five or six of their iameters; the secondary undulations were relatively wider han in the *Ichthyosaurus*, and the secondary branches onger and more bent; the tubes were seen to divide dichoomously several times in their course, the divisions, after slight divergence, proceeding in the same parallel line ith each other and with the main stem. The finer seondary branches dilated into extremely minute cells along racts which ran parallel with the contour of the tooth self, and occasioned the apparent alternation of opaque nd clear layers observable in the section by transmitted ght. The enamel presented the same fine fibrous strucure as that of the *Ichthyosaurus*, but the mode of succesion of the teeth differed, the Professor remarks, from that f *Ichthyosaurus*, in the growing tooth being developed in a ell at the inner side of the old socket, and affecting, by its ressure, the bone of the jaw rather than the tooth about to e displaced. Professor Owen further observes that, notithstanding the approximation to the crocodilian type which he teeth of the Plesiosaurus make in their persistent pulpavity, there is not more than a single successional tooth in rogress of development at the base of the tooth in use at ny period; and that the dentition of the *Plesiosaurus* furer differs from that of the crocodile, inasmuch as the new ooth, instead of emerging from the pulp-cavity of the old ooth, or even from the same socket, protrudes its apex hrough a distinct foramen at the inner side of the alveolus f its predecessor.

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* 'The tooth in these genera becomes completely solid, its interior cavity being filled up by the ossification of the pulpy substance.'—Conybeare, *loc. cit.*, p. 106.

Professor Owen proposes the subgeneric name of *Pleioaurus* for a gigantic extinct reptile whose remains have een found in the Kimmeridge clay. The teeth are deribed as differing from those of *Plesiosaurus* in their reater relative thickness as compared with their length, and the subtrihedral shape of their crown. The outer side is ightly convex, sometimes nearly flat; it is separated from e two other facets by two sharp ridges; these are more onvex, and the angle dividing them is often so rounded off, at they form a demi-cone, and the shape of the tooth us approximates very closely to that of *Mosasaurus*, with hich it is equal in size, but from which it is readily disnguished even when the crown only is preserved, by the dges which traverse the inner or convex sides; the outer attened surface alone being smooth. The long fang of e perfect tooth at once removes it from the *Acrodonts* and lies it with the *Thecodonts*, among which it approaches earest, in the superficial markings of the crown, to *Plesiourus*. The vertebræ of the neck are so modified that the eculiarly elongated proportion of this part of the spine, hich characterises the typical *Plesiosauri*, is exchanged r one that much more nearly approaches the opposite conition of the cervical region in the *Ichthyosauri*; thus preenting an abrogation of the main characteristic of the *Pleiosauri* combined with the more crocodilian proportions of he teeth of this *Pleiosaurus*, of which a fine specimen *Pleiosaurus brachydeirus*, Owen) from Market-Raisin is reserved in Dr. Buckland's collection at Oxford, consisting f considerable portions of the upper and lower jaws.

‘The teeth,’ says Professor Owen, ‘are arranged in sepaate sockets, in a close and regular series, along the alveolar orders of the intermaxillary, maxillary, and premandibular ones. Twenty-six sockets may be counted on the most erfect side of the upper jaw, but the series is evidently inomplete posteriorly. An interspace not quite equal to the readth of a socket divides the fourth from the fifth tooth, ounting backwards, and the jaw is slightly compressed at his interspace; the four anterior teeth, thus marked off, ccupy the slightly expanded anterior extremity of the pper jaw, but do not present the disproportionately large ize which characterises the anterior teeth in the true Pleiosaurs. After the fifth tooth the sockets progessively inrease in size to the twelfth tooth, and, from the fourteenth they begin gradually to diminish in size; becoming, beyond the twentieth tooth, smaller than those at the fore part of the jaw.

‘The alveolar septa are narrow, and are thinned off to an edge, which is lower than either the outer or inner walls of the sockets: these walls are equally developed. A line drawn transversely across any of the twelve anterior sockets would be transverse to the jaws, but in the remaining sockets it would incline obliquely from without, inwards and backwards. The transverse diameter of the thirteenth socket is one inch, six lines; its antero-posterior diameter is one inch, eight lines. The extent of the alveolar series is nearly three feet; the breadth of the palate at the twenty-sixth tooth is nearly one foot; the breadth of the upper jaw at the third tooth is four inches, three lines; the breadth of the socket of that tooth is one inch, three lines.

‘In the lower jaw of the specimen in the Oxford Museum the posterior extremity of the dental series is complete, but not the anterior one; thirty-five teeth are present in each premandibular bone. The first, from its large size, I conclude to have been received into the slight concavity at the side of the upper jaw where the diastema separates the fourth and fifth teeth; there are probably therefore thirty-eight teeth on each side of the lower jaw; counting backwards, on this supposition, the teeth begin to diminish in size beyond the fifteenth, and at the posterior extremity of the series the sockets are less than half an inch in diameter; in their close arrangement and position they correspond with those of the upper jaw.’

The teeth which are preserved in this magnificent cranial fragment present the characters described at the commencement of this section; the outer smooth surface of the crown of a tooth of the lower jaw is represented at pl. 68, *fig.* 5; the inner surface of two of the teeth of the upper jaw is represented at 5′ and 5′: the inserted fang of each of these teeth is four inches and a half in length, the entire tooth being thus seven inches in length. The ridges which divide the outer from the inner surface of the tooth subside at the base of the crown; the fang is smooth; it assumes a subcircular form, gradually expands for about half its length, and then contracts to its termination, but this is always less pointed than in the fully-formed teeth of the true Plesiosaur. In the old teeth with the elongated fang, the pulp-cavity remains open, as in the Plesiosaurian teeth; it presents at the expanded part of the fang a narrow elliptic transverse section. In a tooth of the present species, six inches and a half in length, from the Kimmeridge clay at Shotover, the diameter of the persistent pulp-cavity was thirteen lines. In this tooth the flattened surface is polished, but marked with minute shallow wrinkles; one of the ridged surfaces which stood at right angles to the preceding, was traversed by eleven well-marked linear ridges, of unequal length, separated by smooth interspaces of about three times the breadth of the ridges; the third surface, which formed an acute angle with the smooth outer surface, was traversed by twelve ridges. These ridges on the inner surfaces of the tooth slightly incline towards the rounded angle dividing these surfaces; they terminate abruptly; some cease half way from the apex of the crown; about ten are continued to within half an inch of the apex, which is smooth; the two ridges which divide the flat or smooth side from the ridged surfaces of the tooth are alone continued to the sub-acute apex of the tooth.

‘The teeth of the Pleiosaur present varieties of form as well as of size; the rounding off of the angle between the ridged surfaces has been already alluded to; the smooth outer surface is sometimes so convex, that the transverse section of the tooth is more elliptical than triangular. All the teeth of the Pleiosaur are slightly bent inwards and backwards, but the smaller posterior teeth are most recurved, and have the sharpest apex; in the crown of these teeth, also, the ordinary rounded or elliptical form of the cone is most nearly attained; but the distinction of the smooth external surface and the ridged internal surfaces of the crown of the tooth is retained, and would suffice to characterise any of these teeth if found detached.

‘The teeth of the Pleiosaur consist, like those of the Plesiosaur and Crocodile, of a central body of compact dentine, with a coronal investment of enamel, and a general covering of cement, of extreme tenuity upon the crown, but thicker upon the base of the tooth.

‘The dentine consists of fine calcigerous tubes, without admixture of medullary canals; the arrangement, division, secondary undulations, and branches of the calcigerous tubes correspond so closely with those of the teeth of the Plesiosaur, as to render a particular description of them unnecessary.

'The germs of the successional teeth are developed at the inner side of the bases of the old teeth, but do not penetrate these teeth; the apices of the new teeth make their appearance through foramina situated at the inner side, and generally at the interspace of the sockets of the old teeth. Here therefore, as perhaps also in the Pterodactyle, the growing teeth may be included in closed recesses of the osseous substance of the jaw, and emerge through tracts distinct from the sockets of their predecessors; but this is an exceptional condition of the reproduction of the teeth in Reptiles.'

For the interesting details of the dentition of the *Crocodilians* [CROCODILE], we must refer to the work itself—one of the most important to the general physiologist and palæontologist that has yet appeared; and the reader will now have before him a general review, collected therefrom, of the various modifications of the teeth in the whole of the Saurians, taking that term in its largest acceptation.

We now have to examine the other parts of the skeleton of the Saurians in the more restricted sense mentioned towards the commencement of this article. That of the *Enaliosaurians* is noticed in the articles ICHTHYOSAURUS and PLESIOSAURUS; that of the Crocodilians, under the article CROCODILE; and we shall find, as in other departments of the animal kingdom, a wonderful adaptation of the organization to the progression and habits of life of the animals. In the extinct Pterodactyle, we have, more especially in the anterior extremities, a modification in the development of the bones, to enable the animal to move through the air with a true flight. In the great mass of the terrestrial Saurians, the bones of the extremities are elongated, to facilitate progression on the earth, on trees, or even, as in the case of the Geckos, on smooth walls and ceilings. When we come to the aquatic groups, we have in the Crocodilians a more compact form of the bones of the hand and foot, but still adapted to occasional progression on land, till at last, in the Enaliosaurians, the short, compact, and compressed bones of the extremities become mere paddles to row the body through the water, like those of the tortoises among the Reptiles, and of the seals and whales (in the latter as far as the anterior extremities are concerned) among the Mammiferous animals.

Cuvier remarks that the study of the vertebræ of the living Saurians is highly necessary, in order to a recognition of the numerous fossil bones belonging to this family, and he thus proceeds to describe those of the former:—The atlas of the *Monitor* is a ring composed of three pieces; two upper ones united to each other at the dorsal part, notched in front and behind for the nerves, and one lower piece. The anterior surface of the axis (*dentata*), or rather of that portion of it which is analogous to the odontoïd, penetrates in the ring of the atlas and fills nearly half its width, leaving always, in front, a concavity for the condyle of the head. Below, on the junction of the atlas, of the odontoïd, and of the body of the axis, is a triangular piece which gives off a pointed hook directed backwards. The axis is compressed; its annular part takes, above, the form of a longitudinal pointed crest; its anterior articular facets have their plane turned outwards; the posterior ones have them downwards; the body terminates in a transverse convexity of a kidney shape; on each of its lateral surfaces is a small and but slightly projecting crest, which has, towards its anterior third, a small point; below, there is a crest, under the posterior part, which is enlarged backwards. The sutures which distinguish the annular part of the body are soon effaced; but for a long period a small epiphysis may be seen at the posterior point of each of the two crests. The five succeeding vertebræ resemble the axis, excepting that they are without an odontoïd; but their anterior surface has a concavity proportioned to the convexity of the preceding vertebræ, their dorsal or spinous crest or process is elevated and shorter, and their transverse processes enlarge slightly and present a convex facet for the support of the cervical rib. The lower crest exists; and this is what distinguishes the cervical from the dorsal vertebræ, the body of which last is even below, with the exception of the three first, which have each a tubercle becoming gradually less and less. At the point of these crests is an epiphysis, which in the other subgenera forms the crest by itself. The dorsal vertebræ after the twelfth have always a squared spinous process, an anterior concave and a posterior convex surface, both of a kidney-shape, horizontal articular apophyses, the posterior looking downwards, the anterior upwards; and on each side under the anterior apophysis, by way of a transverse apophysis, a vertical oval-shaped tubercle for supporting the rib. The number of these vertebræ are twenty-two, there being no lumbar vertebræ; for there are ribs from the neck to the pelvis amounting to twenty-seven pairs, including the five cervical, but the first and the last of these ribs are very small. The first pair of ribs is attached to the third cervical vertebra. The five first pairs are not united by means of cartilages to the sternum, and on this circumstance Cuvier relies to distinguish the cervical vertebræ, which, adding the atlas and dentata (these last having no ribs), makes their number seven, as in the crocodiles and mammals generally. The three first dorsal ribs only are attached to the sternum; the seventeen succeeding ones are false ribs. Cuvier remarks that the total absence of lumbar vertebræ appears to him a general rule in the family of Saurians.

There are two sacral vertebræ in the *Monitor*. The first has, in lieu of a small tubercle, a large apophysis convex externally, and presenting to the *ossa ilii* an articular surface notched behind, and of a horse-shoe shape. The second has also a large apophysis, but simply widened and flattened horizontally. The caudal vertebræ after the eighth, are very numerous (seventy, eighty, and more); they may be easily recognised by their spinous and transverse apophyses or processes, which are long and narrow, and their articular apophyses or processes, which are nearly vertical, the anterior looking inwards, the posterior outwards; and also by having on their lower surface, towards the hinder part, two small tubercles for supporting the chevron bone, which occupies the place of a lower spinous process. These two small tubercles are placed more forward in the Monitors than in the other subgenera; for in the latter they touch the posterior articulation, so that the chevron bone appears to be attached to the vertebræ. All the caudal vertebræ of the Monitor have, like the preceding, the anterior surface concave and the posterior convex, and they go on diminishing in proportion as they approach the extremity of the tail, their prominences finishing by being reduced almost to nothing.

In the *Sauvegarde* of America, Cuvier found the lower crests of the cervical vertebræ showing themselves as epiphyses, or even separate little bones attached on the articulation of two vertebræ, but which ended in being soldered to the anterior one.

The cervical vertebræ, determined by the anterior false ribs, are eight in number, that is to say, there are six pairs of these false ribs, and this number is found in many other subgenera, particularly in the Iguanæ, the Basilisks, the Lizards, the Geckos, the Anolides, the Agamæ, and the Stelliones. But Cuvier remarks that it should be avowed that the two, and sometimes the three last ribs, though they do not reach to the sternum, yet are placed under the shoulder, and concur in the formation of the thorax, so that the vertebræ which support them may be placed among the dorsal, which would reduce to five the number of vertebræ really belonging to the neck. In the ordinary Lizards, the Scinks, and slightly in the Anolides and the Geckos, the cervical ribs attached to the fourth, fifth, and sixth vertebræ are singularly compressed and widened at their free extremity. The differences which characterise the vertebræ of the different subgenera, independently of what Cuvier had already remarked as to the position of the tubercles of the caudal vertebræ for the chevron bones, especially consist, he informs us, in the respective length and stoutness of their bodies, and the respective length and width of their apophyses. The Iguana has the spinous processes of its dorsal vertebræ less lofty, and cut, as it were, more obliquely. The bodies of its caudal vertebræ are more elongated, so that with a less number they form a greater length. Their spinous processes decrease more rapidly. The Basilisks have very nearly the characters of the Iguanæ, but their dorsal spinous processes are high and narrow, as well as those of a part of their tail. The Agamæ have also the dorsal spinous processes high, straight, and narrow; but the Stellions have them low. In the Lizards they are tolerably high, but directed somewhat obliquely backwards.

Cuvier considers it a very interesting fact that a great part of the caudal vertebræ of the ordinary lizards are divided at their middle vertically into two portions, which separate very easily, even much more easily than the vertebræ at the point of their articulation, and this for the simple reason that the articulation is complicated, formed by many apophyses, and strengthened by ligaments, whilst the solution of continuity of which he speaks is only retained by the periosteum and the surrounding tendons. It is probably on account of this peculiarity that the tails of lizards break so easily. Cuvier further states that he has observed this peculiarity in the *Iguanæ* and the *Anolides*, and he is of opinion that vestiges of it would probably be found in all the species where this rupture of the tail is a common occurrence. Every one knows, adds Cuvier, that the tail shoots out again after having been broken, but neither the skeleton nor its nteguments are, in that case, the same as before the rupture. The scales of the skin are generally small, without ridges and without spines, though they may have had the contrary qualities in the original tail; and internally, instead of the numerous vertebræ, with all their apparatus of apophysis and ligaments, there is nothing but a long cartilaginous cone of one piece, which only presents annular wrinkles, numerous indeed, but scarcely at all elevated.

The *ribs* of the Saurians are slender, round, and the anterior ones only have the costal head slightly enlarged and compressed. Cuvier had never seen any of them with a division at their upper extremity into a head and tubercle. The anterior ribs of the Monitors are a little more widened n the upper part than those of other Saurians. Instead of hose simply ventral ribs which are seen in the crocodile, many subgenera, especially in the *Polychri*, Anolises, and Chameleons, after the ribs which are united to the sternum, have others which unite mutually with their corresponding ib, and thus surround the abdomen with entire circles.

The *sternum* of the Saurians, taken together with their *houlder*, forms, says Cuvier, a kind of cuirass for the heart and large blood-vessels. It is more complicated than in the rocodiles, and formed upon a plan very different from that f the tortoises. It consists essentially of a long, narrow, epressed bone, which gives off anteriorly two branches directed to each side, more or less recurrent, according to the pecies, and between which its point passes sometimes to dvance more forward under the neck. This bone penetrates with its posterior part into a cartilaginous plate of a homboïdal shape, which has two sides forward and two ackward, and which often shows traces of a longitudinal ivision into two portions. Its interior sides are continued with the edges of the anterior part of the bone, but in divaricating to the right and left. They are sometimes ossified, particularly their edge, which has a groove, in order to ive support, like a mortise, to the sternal edge of the clavicular bone. The posterior sides of the rhomboïdal cartilage serve for the insertion of the false ribs. So far there is no reat difference in this part of the organization from that of he crocodile, except in the anterior branches of the elongated bone, which give it the form of a T, of an arrow, or of cross, according to the species; but a more considerable ifference is apparent in the development of the coracoïd one, and in the constant presence of a clavicle more or less arge. The coracoïd bone, as in the crocodiles, the tortoises, nd all the animals which have a true arm, concurs in the ormation of the glenoïd cavity, and in the true Saurians ffords nearly half of it. Widening more than the bony late of the shoulder-blade, it proceeds to articulate itself to he sternal rhomboïd by a wide edge, which takes the form f the blade of an axe; but its peculiarity consists in the giving off one or two apophyses, by means of which it supports a great cartilaginous arch which passes on the slender nd advanced bone of the sternum, and lies across that of he coracoïd bone of the other side. Cuvier observes that we should remark that in this singular crossing, which is to e found even in the lowest batrachians, it is generally the artilage of the right side which passes to that of the left. There is always a small hole pierced for the vessels in the neck of the bone, between its apophyses and its glenoïd avity. The apophyses, moreover, which proceed to join he demicircle or cartilaginous disk, leave one or two oval pertures between them, which trench on the demicircle, and are only closed by a membrane. This cartilaginous emicircle acquires consistence and firmness by age, though ot the hardness of the other bones. It hardens by the accumulation of small calcareous grains, as is the case with he bones of the chondropterygian fishes. It is to this, observes Cuvier, that the bony piece which adheres to the oracoïd bone of the *Ornithorhynchus* and *Echidna* [ORNITHORHYNCHUS, vol. xvii., p. 30] has been compared; and, in fact, this piece is placed like the cartilage, and crosses with its opposite on the first bone of the sternum, which is also in the shape of a T; but in this apparatus the great membranous apertures which notch the similar development in the Saurians are wanting.

The *scapula*, or shoulder-blade, produces the other part of the glenoïd facet; it goes on, as ordinarily, enlarging on the side of the thorax and towards the back; and at about a third or the middle of its length stops short, but is continued in a single portion, which is generally cartilaginous, or which, when it is ossified, which frequently happens, becomes so in a different manner, and with another texture, like the cartilage adhering to the coracoïd bone. In the case of ossification, the scapula is always divided into two bones.

The *clavicle* rests on one side against the slender bone of the sternum, or against its lateral branch, and often also it reaches to the opposite clavicle; on the other side it proceeds to rest against the anterior edge of the scapula, either against the osseous portion or that which remains longer cartilaginous, and which often presents a tubercle or small crest for its reception. Sometimes the bony scapula gives off an apophysis which goes to sustain the body of the clavicle, but this is all that it presents as a slight resemblance to an acromion: the tubercle of the cartilaginous part resembles that process much more. Such is the general structure among the Saurians; nor does it differ much from that of the crocodiles, except in the presence of a clavicle, and of that cartilaginous appendage which enlarges the coracoïd bone.

The T-formed or arrow-shaped bone may also, in strictness, be compared to the unequal bone of the *plastron* of the tortoises, which sometimes takes this shape, and some think that the two first equal pieces of this plastron are the representatives of the clavicles; the second, of the cartilaginous appendages of the coracoïds; the third, of the rhomboïdal piece, which, even in the lizards, often presents a longitudinal furrow, indicatory of division; and, finally, the fourth, of the appendages, which sometimes support the two last cartilages of the ribs.

The differences observable among the various subgenera are hardly of sufficient importance to justify the occupation of space here, and we refer the reader to the *Ossemens Fossiles*, from which the osteology of the skeleton here given is taken, and in which Cuvier details those differences. (Vol. v., pt. 2, p. 291.)

The *pelvis* of the Saurians (Cuvier takes the *Monitor* as the example) is composed of three bones, which concur, as in the viviparous quadrupeds, to compose the cotyloïd fossa. Its upper part is formed by the *ossa ilii;* its neck is wide and short; its spinal part, instead of being directed forwards, as in the viviparous quadrupeds, or of being rounded as in the crocodile, runs obliquely backwards in the form of a narrow band, and has only a small point in front. The pubis and the ischium are each united to its opposite in the median inferior line; but the pubis is not joined to the ischium, and the two oval holes are only separated by a ligament. Their neck is wide, short, and flat. That of the pubis is pierced with a rather large hole, and its anterior border produces a point which is recurved downwards and outwards. Cuvier adds that the pelvis in the different subgenera is especially distinguished by the symphysis of the pubis, which is formed by a rather wide truncature in the Monitors, and even slightly in the Sauvegardes; but only by a narrow point in the majority of others. The Chameleon differs from all the others in its narrow *ossa ilii*, which proceed perpendicularly, in widening slightly to attach themselves to the spine. These *ossa ilii* are still further distinguished by a triangular cartilage, analogous to that of the shoulder-blade. The symphysis of its pubis is formed by a truncature, and there is no lateral point. Vestiges of a pelvis exist in OPHISAURUS and the Blindworm [ORVETS], which consist of a small os ilium, with a rudiment of an ischium, but without a symphysis. [SCHELTOPUSIK.]

The *cylindrical bones* of the Saurians exhibit the following characters:—The *humerus* agrees very much in form with that of BIRDS. Its upper head is compressed, to answer to the hollow fosset which the shoulder-blade and coracoïd bone together present to it. Its lower pulley is formed of two projecting rotatory portions, entirely rounded, the external of which is the least developed. The internal condyle also projects more than the external, the deltoïd crest produces an angle more projecting forwards, and its posterior tuberosity is less hooked. In these two last respects it more resembles that of the crocodile; but it has, in general, all its articular surfaces much better defined. But the humerus of a lizard may always be distinguished from that of a bird, because the former is not hollow, nor pierced with holes for the admission of air into its interior. The *ulna* of the Saurians is compressed and trenchant on its radial edge. Its sigmoïd facet is oval, and its olecranon projects but little; its carpian head is also oval and uniformly convex. The *radius* is delicate; its upper head is oval and concave; its lower, which is slightly convex, presents to the first bone of the carpus a rounded tubercle and a fosset of a crescent-shape. The *femur* in its upper part resembles that of the crocodile much more than that of birds, and this has reference to the direction of the foot in reptiles. Its upper head is compressed and curved in front, and has its trochanter on the tibial side placed nearer to the head of the bone than in the crocodile, much more projecting, and of a compressed form. The lower head of the femur, on the contrary, much resembles that of birds, especially in the small hollow on the peroneal side for the head of the fibula. The *patella* is very small, often hardly visible. The leg is always composed of two bones, of which the *tibia* is the largest. Its upper head is triangular, as ordinarily; its lower is transversely oblong and flat. The *fibula* of the Monitors is flattened and widened below, where it unites to the tarsus by a narrow line. In the Iguanas and the greater part of the other genera it is nearly of a size throughout, slender, with its upper head compressed, and its lower demi-oval and slightly oblique.

The *bones of the fore and hind feet* in the Saurians consist of a *carpus* composed of nine bones, like that of the tortoises, and Cuvier remarks that its composition may equally be compared to the *Simiadæ*. In the first row are a radial bone, a cubital bone (rather large), and a pisiform bone fitted against the lower part of the ulna. In the lower row are five small bones, disposed in a curve and answering to the five metatarsal bones, and a ninth, placed between the two large bones of the first row, and the first, second, third, and fourth of the second row. The metacarpals of the thumb and little finger are rather shorter than those of the other three fingers. The number of phalanges amounts to two for the thumb, three for the fore finger, four for the middle finger, five for the ring finger, and three for the little finger. The *tarsus*, like that of the crocodile, has only four bones. In the first row are two: 1, a tibial bone, which extends also partially under the fibula, and presents a facet to it; it is irregularly rectangular, wider than it is long, thick on its internal border, and presenting in its profile some relationship to the astragalus of a Ruminant; 2, a fibular bone, smaller and soon uniting itself into a single piece with the preceding, on the same plane with which it is. In the second row are also two; one larger, triangular on its anterior surface, and stouter backwards, where it articulates with the two of the first row, and supports the metatarsals of the fourth and fifth toes; the second, smaller, placed between the preceding and the metatarsals of the third and second toes. This last also slightly touches upon the astragalus, which only supports the metatarsal of the great toe. The four first metatarsals are slender and nearly straight; they go on elongating to the fourth; the fifth is short, widened, and recurved on its upper head towards the great bone of the second row, to which it is articulated by the side. The great toe has two phalanges; the second toe, three; the third, four; the fourth, five. It is this, which is the longest, that gives to the foot that elongated and unequal form which characterises it in the lizards. The fifth, which is nearly as short as the great toe, has, like the third, four phalanges. Cuvier remarks that in the ordinary position of the hind feet of the Saurians, that is, with the toes directed backwards, the tibia and great toe are at the external border of the foot, and the little toe is at the internal border. The ungueal phalanges of all the feet are trenchant, arched, and pointed. This description, observes Cuvier, allowing for some differences in proportion, answers for all the subgenera which have well-developed feet, with the exception of the Chameleons alone and some peculiarities relative to the toes in certain Geckos; and even in the Chameleon it is in the proportion of the bones of the carpus and tarsus, rather than in their number and arrangement, that the difference appears. The mode in which the bones of the feet are grouped in the chameleon in an inverse manner, that is, the great and little toes of all the feet together and directed inwards, and the three others also together and directed outwards (a peculiarity observed by Aristotle), will be seen in the cut in the article CHAMELEONS.

We have dwelt here at some length upon the dentition and osteology of the *Saurians*, not only because of the interest attached to this great group of animals on its own account, but in consequence of the necessity of a full understanding of this part of their organization by those who study that branch of palæontology more particularly conversant with the extinct Saurian forms—forms including the most gigantic proportions and the most heteroclite shapes, that were alive countless ages ago, when as yet man was not, and were absolutely swept away from the face of the earth thousands of years before he stood upon it. Of all the fossils which remain to remind the observer of the wreck of a former world, these, from the antiquity of the strata in which they are found, present perhaps the most striking materials for illustrating the antient history of our planet.

The other parts of the organization of the Saurians will be found in detail, where necessary, under REPTILES and the different articles relating to the families and genera. We shall here only observe that their heart, like that of the tortoises, is composed of two auricles and one ventricle, which is sometimes divided by imperfect partitions. Their ribs are moveable, and can be raised or depressed for the purposes of respiration. Their lung extends more or less towards the hind part of the body, and often penetrates into the abdomen, whose transverse muscles glide under the ribs and even towards the neck to embrace it. Their generation, with few exceptions (*Zootoca*, for instance), is oviparous, and the eggs have a more or less hard shell. In some (*Chameleon*, for instance) it is a mere tough calcareous skin, and this is its general condition. The coitus is complete, and effected sometimes by means of two intromittent organs and sometimes by means of one only. The young come into existence in the same form which they retain through life. The toes are armed with nails, with very few exceptions, and the skin is either covered with scales more or less serrated, or at least with small scaly grains. All have a tail more or less long, nearly always thick at the base. The greatest number have four feet, some two only, and a few mere rudiments not apparent externally.

FOSSIL SAURIANS.

Besides the notice of fossil Saurian forms in the course of this sketch, a detailed account of most of the extinct genera is given under their several titles in this work.

SAURIN, JOSEPH, a French mathematician and natural philosopher, was born in 1659, in the South of France, at Courtaison in the principality of Orange, where his father was the minister of a Protestant congregation. The young man was educated in the principles of the Reformed Church, and before he was twenty-four years of age he was called to the ministry at Eure in Dauphiné. Possessing an ardent temperament and a bold eloquence, he soon distinguished himself as a preacher; but, in one of his sermons, happening to censure too freely the measures taken by government for diminishing the privileges of the Protestants, he was obliged to retire into the canton of Bern, where he obtained the curacy of Berchier in the bailliage of Yverdun. Certain circumstances, which have been differently related by his friends and enemies, obliged him soon afterwards to take refuge in France, where, in 1690, he abjured the doctrines of the Calvinists. His own account is, that having refused to sign the *Consensus* of Geneva, condemning the doctrines of the French Protestant theologians respecting original sin and the vowel points of the Hebrew text, he was vehemently censured by a party in the church. He adds that the harsh treatment to which he was subjected on this account led him to suspect the sincerity of his adversaries' sentiments in religion; and that an attentive study of the works of the celebrated Bossuet convinced him of the errors of Protestantism. On the other hand it is stated that Saurin, having been guilty of theft, withdrew to France in order to avoid the prosecution with which he was threatened: this accusation, true or false, is founded on a confession which he is said to have made in a letter dated 1689, and printed in the 'Mercure Suisse,' and upon some documents relating to the criminal process instituted on the occasion, which are stated to have been preserved in the Chancery of Bern.

After his recantation, having, through the interest of Bossuet, obtained a pension from the king (Louis XIV.), Saurin devoted himself to the study of the mathematical sciences; and between 1702 and 1708 he wrote several papers which were published in the 'Journal des Savans.' At the same time he was engaged in a controversy with Huyghens on the subject of the vortices of Descartes, and with Rolle concerning the infinitesimal calculus. He became a member of the Académie des Sciences in 1707, and between 1709 and 1727 he enriched its 'Mémoires' with numerous mathematical and philosophical papers, among which are some containing profound investigations relating to the curves of swiftest descent, and dissertations, conformably to the Cartesian hypothesis, on the force of gravity.

Saurin's scientific pursuits were interrupted for a time by the imprisonment which he suffered in consequence of an accusation brought against him by J. Baptiste Rousseau, that he was the author of certain profane and defamatory verses, with the composition of which Rousseau himself had been charged. As the accusation could not be substantiated, the judgment of the court was given against the accuser, who, in consequence, was banished from France, while the accused was liberated. [ROUSSEAU, J. B.]

Saurin died December 29, 1737, of a lethargic fever. He appears to have been a man of lofty and vigorous mind, but it is said that he was capable of using any means for obtaining the ends which he had in view; and it must be observed, that the cause of his departure from Switzerland, and the abjuration of his first religious opinions, have never been satisfactorily explained.

SAURIN, JAMES, an eminent French Protestant divine, was born at Nismes, January 6, 1677. He was the son of a lawyer, of the same persuasion, who quitted France upon the revocation of the Edict of Nantes, and retired apparently to Geneva. At least it is known that James Saurin finished his education there, after having borne arms for a short time in the English service. In 1701 we find him pastor of the Walloon church in London, whence, after four years, he repaired to Holland, and establishing himself at the Hague, remained there in the exercise of the ministry until his death, December 30, 1730. That event is said to have been hastened by mortification at the disputes and ecclesiastical censures in which he was involved by his Dissertation sur le Mensonge Officieux,' on falsehoods which are expedient, a delicate subject to handle.

As a preacher he is ranked at the head of the French Protestants. 'Depth of thought, force of argument, skilful connection of parts, strength of drawing, bursts of pathos, original turns, points which strike the imagination and move the heart, majestic and imposing simplicity like that of the Scriptures, are the characteristics of his eloquence.' Such is the criticism of a French biographer.

He published five volumes of sermons, to which seven volumes were added after his death: the first portion is eputed the best. His other chief works are, 'On the State of Christianity in France,' and 'Discourses, historical, theo-ogical, and moral, on the principal events of the Old and New Testaments,' 2 vols. fol. (known as Saurin's Bible), to which four volumes by other hands were added after his death. In these is contained the 'Dissertation on Falsehood' above noticed. Six volumes of his sermons have been trans-ated into English.

Another French Protestant divine of some note is ELIAS SAURIN, brother of Joseph Saurin the mathematician, no elation apparently to James Saurin. He also settled in Holland: he was born in 1639, and died in 1703.

SAURO'PHAGUS. [SHRIKES.]

SAU'ROPHIS, Fitzinger's name for a genus of Li-ards belonging to the group of *Chalcidian Lizards*, or *Cyclosaur Saurians* (Section PTYCHOPLEURES), of MM. Duméril and Bibron.

Generic Character.—Tongue of an arrow-head shape, ree at its anterior half, slightly notched in front, marked with chevron folds above, and offering squamiform im-ricated papillæ towards its point. No palatal teeth. Intermaxillary teeth small, conical, simple and pointed. Maxil-ary teeth stronger, subcylindrical, straight, with an ob-usely pointed crown. Nostrils lateral, each circumscribed by three plates, one naso-rostral, one naso-frenal, and the irst superior-labial. Eyelids. Membrane of the tympanum extended within the auricular border, which has in front a small opercular scale. Temples scutellated. Fore-feet very little elongated, each terminated by four short, unguiculated, lightly compressed toes, which are smooth below. Femoral pores. A furrow on each side along the neck and the trunk.

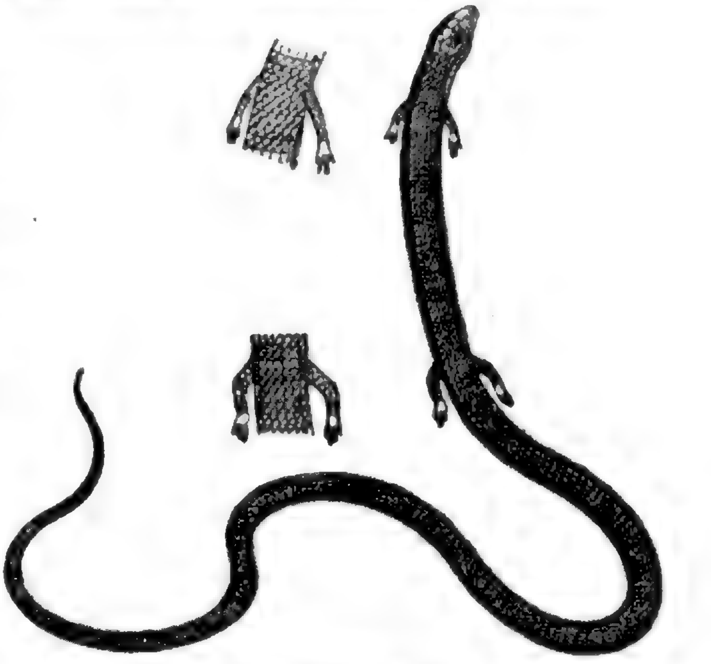
The type of this genus is the *Lacerta tetradactyla* of Lacépède.

Description.—No fronto-inter-naso-rostral plates. Fronto-parietals sometimes intimately soldered to the parietals. One inter-parietal. Auricular lobe very small. No scales between the submaxillary plates of the second pair. Dorsal scales striated, with a small keel in the middle. Fourteen longitudinal rows of scales from the lower part of one side to the other. Six longitudinal bands of ventral lamellæ. Four or five femoral pores on each side. Upper part of the head yellow, sprinkled with some brownish points. All the upper scales yellow, with a broken border backwards. Lips and lower region of the temple white. Two square black spots below the eye; and two others of the same form and colour, but rather smaller, in front of the ear. All the lower parts of the body are of a whitish tinge. The sub-collar scales, in two marginal rows, have their posterior border of a brown colour.

Locality.—The southern point of the African continent.

MM. Duméril and Bibron, from whom the character and description are taken, observe that many naturalists (Cuvier among them) have thought that this was the species which Linnæus intended to make known under the name of *Lacerta Seps*; but MM. Duméril and Bibron are not of that opinion. They think that the *Lacerta Seps* of Linnæus ought to be referred to the *Scincus sepiformis* of Schneider (*Gerrhosaurus sepiformis*, Dum. and Bibr.).

This species is figured in the article CHALCIDES under the name of *Chalcis tetradactyla*. The head is there given of sufficient size; but as the extremities can hardly be defined, we add another figure with them on a larger scale.



Saurophis tetradactylus.

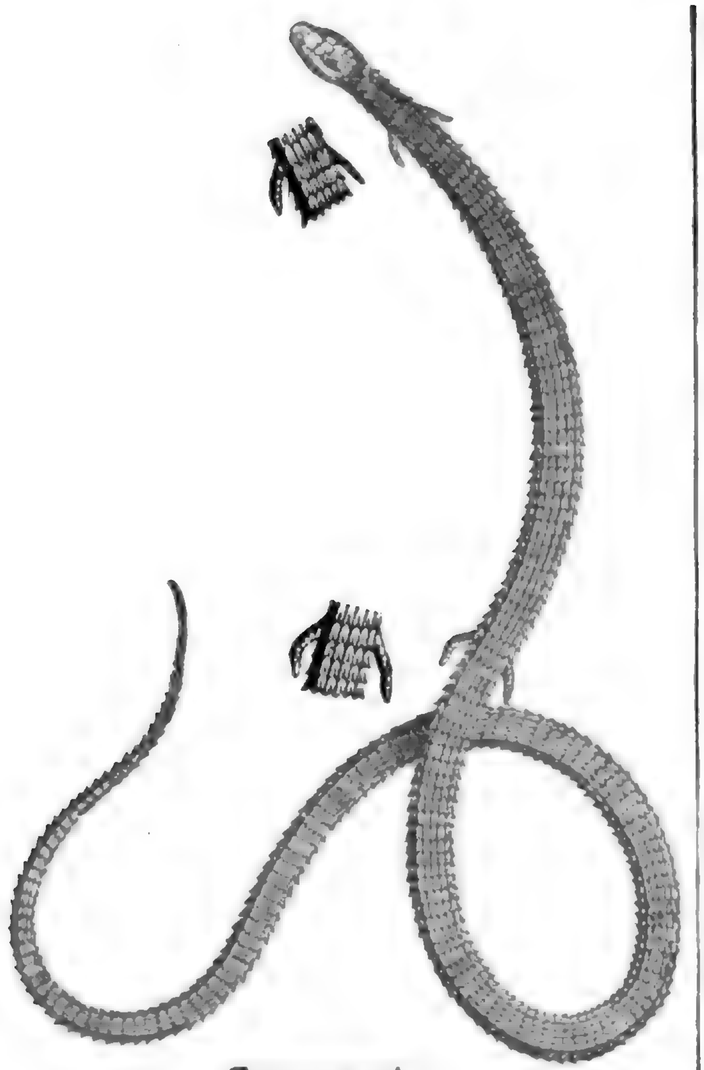
We shall here notice another Saurian form of the same group and section—*Chamæsaura*.

Generic Character.—Tongue of an arrow-head shape, free on its anterior third, very slightly notched in front, with filiform, short, soft, thick papillæ. No palatal teeth. Intermaxillary teeth conical, simple. Maxillary teeth subcylindrical, obtusely pointed. Nostrils lateral, each pierced in a large naso-rostral plate. Eyelids. A small external auricular hole. The last supercranial plates blending with the scales of the nape. Temples covered with scales like those of all the other parts of the body, or rhomboïdal, carinated, and imbricated. Four very short styled feet, terminated by a single unguiculated toe. No lateral furrows. Ovoviviparous.

Example, *Chamæsaura anguina*, Wiegm. (*Lacerta anguina*, Linn.).

Description.—The form may be seen in the cut. The upper part of the head, back, upper part of the neck, and upper part of the tail are brown; but those parts have their median line traversed by a narrow band of a yellow tint; a tint which, becoming a little brighter, is spread over the sides and lower regions of the body. (Dum. and Bibr., from specimens in spirit.)

Locality.—South Africa, Cape of Good Hope.

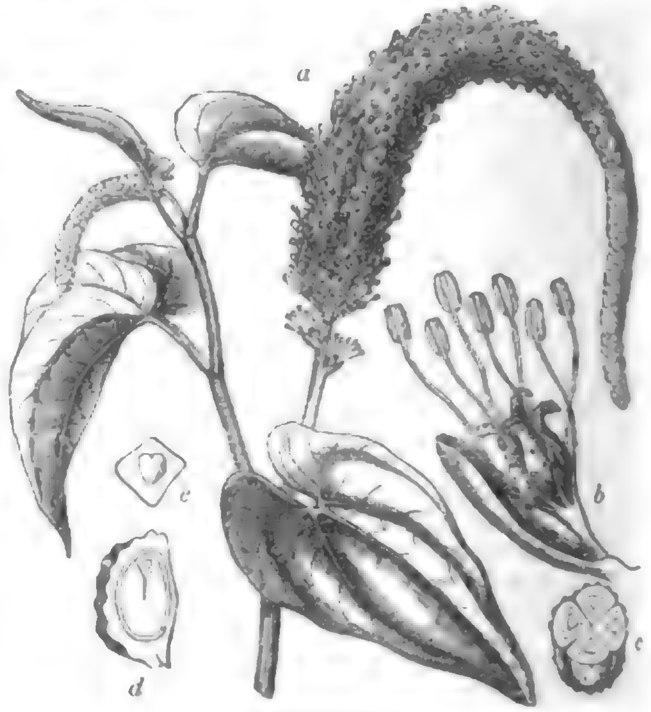


Chamæsaura anguina.

It is interesting to trace in the Saurians the gradual deterioration and abolition of the extremities till the form becomes completely serpentine. In *Heterodactylus* there are still five fingers; but the first finger of the anterior feet is so very short as to be rudimentary. In *Chalcis* (*Cophias*, Fitzinger) there are five toes before, but only three, reduced to tubercles, behind. In *Saurophis* the toes on each of the feet are reduced to four. In *Chamæsaura* there is but one on each foot. In CHIROTES the anterior extremities are short indeed, but five-toed; the posterior extremities are altogether absent. In BIPES the hind feet are each terminated by two unequal processes or toes. In *Pygopus* [BIPES] the anterior extremities are also lost, and the posterior extremities appear in the form of a foot in which no toe is to be seen externally; and in the SCHELTOPUSIKS all trace of external extremities is lost, though the rudiments of posterior extremities may be seen attached to the pelvis. [CHALCIDES.]

SAUROTHE'RA. [INDICATORINÆ, vol. xii., p. 459.]

SAURURA'CEÆ, a natural order of plants belonging to the Achlamydose group of incomplete Exogens. It consists of only a few genera, which are aquatic or marshy herbs or herbaceous plants, with perennial root-stocks, knotted stems, and simple, entire, alternate leaves, with vaginal stipules. The flowers are naked, and seated upon a scale. The stamens are six in number, hypogynous; filament slender; anthers continuous with the filament, having two lobes bursting longitudinally. The ovaries are four, containing one or more ovules; style short; stigma simple. The seeds are few, with an abundant albumen, in the midst of which lies a small embryo, which is enclosed in a persistent vitellus. These plants are very near Piperaceæ, from which they mostly differ in the compound nature of their ovary. This order connects Dicotyledons with Monocotyledons. Its foliage, stipules, and seeds connect it with the former; but the floating habit of some of the species, and their general character, ally them with some of the families of the latter class. They are natives of North America, China, the north of India, and the Cape of Good Hope, where they are found growing in marshes and pools of water. Their properties are not well known, but they seem to be the representatives of the peppers in colder climates; and on account of their less exposure to light, their secretions are not so strong and their properties not so active as their allies in the tropics.



Saururus cernuus.

a, branch, with leaves and spikes of flowers; *b*, a naked flower seated on a bract; *c*, transverse section of fruit; *d*, section of fruit showing the seed, with large albumen and the embryo in its permanent sac; *e*, the seed.

SAUSSURE, HORACE-BENEDICT DE, was born at Geneva, Feb. 17, 1740. His father Nicolas de Saussure was also a native of Geneva, and is known as the author of some essays, chiefly on agricultural subjects. Young De Saussure was educated with great care, partly at the college of Geneva, and partly under the superintendence of his father and his maternal uncle Charles Bonnet. At the age of twenty-two he was appointed professor of philosophy in the college, in which situation he performed the duties of a public teacher for twenty-five years, interrupted only by his travels in search of physical and especially geological knowledge. The events of his life are consequently few, and the substance of them may be best given in his own words:—

'I had a decided passion for mountains from my infancy. At the age of eighteen I had already been several times over the mountains nearest to Geneva; but these were of comparatively little elevation, and by no means satisfied my curiosity. I felt an intense desire to view more closely the High Alps, which, as seen from the summits of these lower mountains, appear so majestic. At length, in 1760, alone and on foot, I visited the glacier of Chamouni, then little frequented, and the ascent of which was regarded not only as difficult but dangerous. I went there again the following year; and from that time I have not allowed a single year to elapse without making considerable excursions, and even long journeys, for the purpose of studying mountains. In the course of that period I have traversed the entire chain of the Alps fourteen times by eight different routes. I have made sixteen other excursions to the central parts of the mountain mass. I have gone over the Jura, the Vosges, the mountains of Switzerland and a part of Germany, those of England, of Italy, and of Sicily and the adjacent islands. I have visited the antient volcanoes of Auvergne, a part of the Vivarais, several of the mountains of Forez, of Dauphiné, and of Burgundy. All these journeys I have made with the mineralogist's hammer in my hand, with no other aim than the study of natural phenomena, clambering up to every accessible summit that promised anything of interest, and always returning with specimens of the minerals and mountains, especially such as afforded confirmations or contradictions of any theory, in order that I might examine and study them at my leisure. I also imposed upon myself the severe task of always making notes upon the spot, and, whenever it was practicable, of writing out my observations in full within the twenty-four hours.'

This sketch of Saussure's travels and labours extends from 1758 till 1779. In addition it deserves to be particularly mentioned, that in 1787 he ascended to the top of Mont Blanc, and remained there three hours and a half making observations; in 1788, accompanied by his eldest on, he encamped for seventeen days on the summit of the Col du Géant, at an elevation of 11,170 feet, for the purpose of studying meteorological phenomena; and in 1789 he eached the summit of Mont Rosa in the Pennine Alps, which was the last ascent of importance which he performed.

Saussure resigned his professorship in 1786. He was afterwards a member of the Council of Two Hundred of Geneva; and when that republic was united to France in 798, he was for some time a member of the National Asembly. The French Revolution however deprived him of almost all his property, which had been deposited in the public funds. An organic disease had begun to develop itself when he was about fifty (probably in consequence of his xertions and privations among the Alps), which, combined with the loss of his property, and the anxiety and distress which he suffered from the convulsions of his country, caried him off at the age of fifty-nine. He died on the 23rd of January, 1799.

Saussure kept up a correspondence with many of the disinguished literary men of his time: he was a member of he Académie des Sciences of Paris, and of several other of he scientific societies of Europe; and he was the founder of he Society for the Advancement of the Arts at Geneva, which is still in a flourishing state.

The labours of Saussure in geology are of a character to ecure for his name a just and enduring reputation. Phyical geology, the research after the causes of geological henomena, found in him a diligent and discriminating oberver unbiassed by the many speculations of his day, but ooking forward, through the results of diligent inquiry into acts, to an improved condition of theory. Less speculative han De Luc, more philosophical than Werner, more oriinal than either, he has had few disciples; but modern eologists have largely imbibed the adventurous spirit which arried him round all the precipices and through all the efiles of the Alps, and may yet copy with advantage the alm and correct induction which he applied to the compliated disorder of the strata in these mountains.

Besides geology and mineralogy, the sciences to which he had especially devoted himself, Saussure had directed his ttention to botany, chemistry, electricity, and meteorology. He was also the inventor of several ingenious and useful phiosophical instruments—a thermometer for measuring the emperature of water at all depths; an hygrometer to indiate the quantity of aqueous vapour; an electrometer to ascertain the electrical state of the atmosphere; and others.

Saussure's first publication was a 'Dissertatio Physica de gne,' Geneva, 1759: his next was 'Observations sur l'Ecorce des Feuilles et des Pétales,' Geneva, 1762, which was a kind f supplement to his uncle Bonnet's work, 'Sur l'Usage des Feuilles:' and he wrote some excellent 'Essais sur l'Hygrométrie,' 1763, 4to., in which he made known the important discovery that the air expands and becomes specifically ighter in proportion to the increase of the quantity of moisture in it. But his great work is his 'Voyages dans les Alpes,' of which the first volume was published in 1779, the econd in 1786, and the two last in 1796. The title of this work conveys a very imperfect notion of its contents, which ndeed embrace the whole of those geological travels which have been before alluded to. His other works consist chiefly of dissertations on physical subjects, in the 'Journal de Physique,' the 'Journal de Genève,' and other scientific publications.

SAUSSURITE, *Axe-stone, Jade*, occurs massive. Cleaves parallel to the faces of a rhombic prism. Fracture splinery. Hardness 5·5. Extremely tough. Colour greenish and greyish white. Streak white. Lustre pearly, inclining o vitreous on the faces of cleavage. Nearly opaque, but ranslucent on the edges. Specific gravity 3·2 to 3·4.

Before the blow-pipe fuses with difficulty into a white glass.

It was discovered on the edge of the lake of Geneva by Saussure, in rounded masses. It has also been found in Styria, Corsica, and at Madras.

Analysis by Saussure:—

Silica . . .	44·
Alumina . .	30·
Soda . . .	6·
Lime . . .	4·
Oxide of iron . .	12·5
	96·5

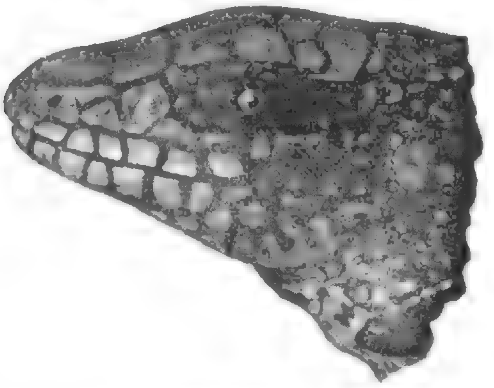
SAUVAGES, FRANÇOIS-BOISSIER DE, was born at Alais in Lower Languedoc, in 1706. In 1722, having received a moderately good education, he commenced the study of medicine at Montpellier, and he took his doctor's degree in 1726. In 1730 he went to Paris, and soon after seems first to have entertained the idea of forming a classification of diseases like those usually adopted for the objects of natural history. He published a sketch of his system in a small volume in 1731, and by this, and some papers which he wrote at the same time, gained so much reputation, that in 1734 he was appointed a professor at Montpellier. The doctrines which he taught there were chiefly those of Stahl, and he contributed greatly towards the removal of the mechanical theories of medicine that had before been prevalent. In 1740 he was elected professor of botany, and subsequently pursued that science with as much energy as that of medicine. In 1763 he published his most important work, the 'Medical Nosology,' in accumulating materials for which he had steadily laboured for upwards of thirty years. He died in 1767.

Of all the works of Sauvages, and they were very numerous, the 'Nosology' is the only one now often referred to. The system adopted in it has indeed shared the fate of all other nosologies [NOSOLOGY], but it still presents a good and complete account of all that was known of practical medicine at the time of its publication. His other writings were short monographs and essays, which were chiefly printed in the scientific Transactions of the day: the best among them are those on hydrophobia, the remedial value of electricity in paralysis, and the 'Methodus Foliorum,' an essay towards the means of determining plants by the characters of their leaves.

SAUVAGE'SIEÆ, a natural order of plants formed by Bartling, and consisting only of the genus Sauvagesia, of which there are six or seven species. Another genus, Luxemburgia, was referred to this order by Bartling, but this has been placed by De Candolle in Frankeniaceæ. Lindley, in his 'Natural System,' makes Sauvagesiæ a suborder of Violaceæ, from which, he observes, it is principally distinguished 'by the stamens being opposite the petals, by the anthers not having a membranous termination, by the presence of five hypogynous scales, and by their fruit having a septicidal dehiscence, so that the seeds adhere to the edges and not the centre of the valves, and by the strongly ribbed and imbricated calyx.' This last character gives them a relation to Hypericaceæ, but from this order they differ in their parietal placentæ and the presence of stipules. They are natives of the tropical parts of South America, growing in moist meadows and the vicinity of streams. The genus Sauvagesia, named after the celebrated physician Sauvages, is characterised by possessing three rows of petals; the outer petals five, ovate or oblong, spreading, deciduous; the intermediate ones filiform, variable in number; the interior five opposite the outer, erect, converging into a tube much smaller; calyx deeply 5-parted, and a capsule enclosed in the permanent floral organs, more or less deeply 3-valved and many-seeded. One of the species, *S. erecta*, upright Sauvagesia, is held in great repute as a medicine in South America. It is very mucilaginous, and has a bitter taste. It is used in Brasil in diseases of the eye, and in Peru and the West Indies it is employed in slight inflammatory affections of the mucous membranes of the bladder and intestines.

SAUVEGARDE, the name by which the monitory lizards or *Safeguards* of the New World are known; *Salvator* of MM. Duméril and Bibron, *Podinema* and *Ctenodon* of Wagler, *Podinema* of the Prince of Canino, *Tejus* of Mr. J. E. Gray.

Generic Character.—Tongue with a sheathing base, very long, very extensible, divided at its extremity into two slender smooth filaments, with rhomboidal papillæ. Palate edentulous. Intermaxillary teeth slightly flattened from before backwards, with two or three notches at their summit. First maxillary teeth *en crocs*. The succeeding ones straight, compressed, tricuspidate in youth, tuberculous in old subjects. Nostrils opening on the sides of the extremity of the muzzle, between a naso-rostral, a naso-frenal, and the first upper labial plates. Eyelids. The tympanic membrane extended on a level with the aperture of the ear. Skin of the lower region of the neck forming two or three transverse simple folds. Back covered with small angular, smooth, non-imbricate scales, disposed in transverse bands. Ventral plates flat, smooth, quadrilateral, oblong, and quin cuncial. Femoral pores. Each foot terminated by five toes, slightly compressed, and not carinated below; two of the posterior toes having a small dentilation on their internal border. Tail cyclotetragonal, a little compressed backwards. (Dum. and Bibr.)



Head of Sauvegarde.

MM. Duméril and Bibron give the following synoptical table of the *Safeguards*:—

Naso-frenal plate followed by	Two plates.	1. Salvator Merianæ.
	A single plate.	2. Salvator nigropunctatus.

Geographical Distribution, Habits, &c.—The warm countries of America are the native places of these Lizards, which arrive at a considerable size, often measuring as much as four or five feet in length. MM. Duméril and Bibron state that they ordinarily inhabit the fields and the borders of woods, although they never climb trees; but they also appear to frequent sandy, and, consequently, arid tracts, where they are said to excavate burrows, in which they lay themselves up for the winter. When, in their flight to avoid pursuit, they come upon a lake, pond, or river, they plunge in, according to D'Azara, to escape from the danger which menaces them, and do not leave the water till all fear of danger is past. These Lizards, observe MM. Duméril and Bibron, have not, indeed, webbed feet; but their long and slightly compressed tail becomes, without doubt, under such circumstances, a sort of oar, of which they well avail themselves. D'Azara states that they feed on fruits and insects, and that they also eat serpents, toads, young chicks, and eggs. He also relates that they are fond of honey; and that in order to procure it without fear of the bees, they come forward at intervals, and, as they run away each time, give the hive a blow with their tail, till by repeated attacks they weary out the industrious insects, and drive them from their home. MM. Duméril and Bibron remark that they have been unable to assure themselves that the *Safeguards* are frugivorous; but they are certain that they feed on insects, because they found remains of them in the stomachs of all the individuals which they opened. Once only among the fragments of *Coleoptera* and the remains of caterpillars they found portions of skin and bones which had certainly belonged to a common *Ameiva*.

MM. Duméril and Bibron think that to *Salvator* should be referred Kaup's genus *Exypneustes*, which, vague as are its characters, seems to them to have for its type one of the two species noted above in the synoptical table. These two *Safeguards*, they observe, though very easily distinguished when the true characters proper to each are well apprehended, bear, nevertheless, so great a resemblance to each other, especially in colour, that it is by no means surprising that they have been confounded together; for, in fact, it was not till after the publication of the work of Spix on the animals of Brazil that these species were mentioned as different.

Example, *Salvator Merianæ*, Dum. and Bibr.

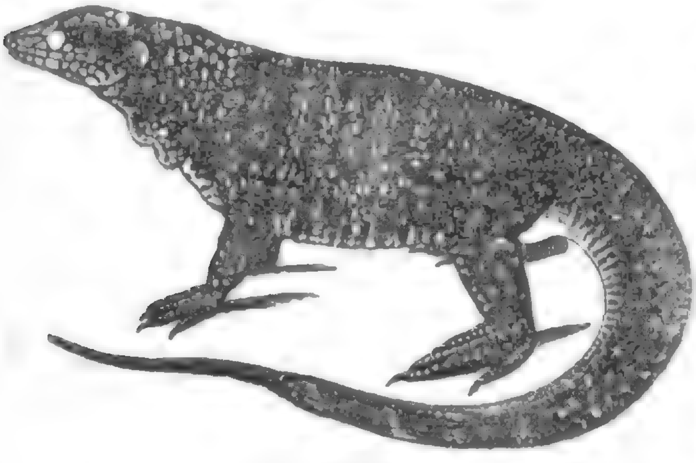
Description.—Intermaxillary teeth ten in number; from thirteen to fifteen maxillary teeth on each side of the upper jaw, the four or five first of which are simple, and augment gradually in length; but the three or four following ones, though equally simple, are shorter, and all the others have a tricuspidate or tuberculous summit, according to the age of the individual. Each of the sides of the lower jaw is armed with from fifteen to eighteen teeth, like those above.

The rostral plate, although having five sides, appears triangular, and it is the same with the two naso-rostral plates, which touch each other by a very small border. The inter-naso-rostral plate is large; it has six faces (pans), of which two only, the greatest, are enclosed in the two naso-rostral plates. The fronto-nasal plates are very much developed, pentagonal, oblong, and nearly as wide before as behind. The frontal plate, equally well dilated, is hexagonal, and generally narrowed at its posterior extremity. The fronto-parietal plates are oblong, hexagonal, and less wide before than behind. The parietal plates are cyclo-polygonal, and bound on each side the interparietal plate, the form of which is very variable. The two first superocular plates are always a little larger than the two last. The naso-frenal plate has nearly a trapezoïdal figure; its anterior border advances into the aperture of the nostril; it is immediately followed by a plate higher than it is long, ordinarily with four faces, after which comes a second, still more developed, having, notwithstanding its six faces, a quadrilateral appearance. This great plate is only separated from the orbit by a row of small scutellæ bordering the anterior edge of the eye. There are eight or nine superior labial plates: the first is oblong-pentagonal; the second trapezoïdal; the third tetragono-equilateral, the same as the succeeding ones, with the exception of the last, whose posterior border is lower than the anterior one. The chin-plate is simple, triangular in appearance, although it really has four sides. There are eight or nine lower labial-plates, all more or less regularly squared. Behind the chin-plate is sometimes found one, sometimes there are found two, which are followed to the right and left by from seven to nine plates, occupying the lower surface of each submaxillary branch. Each of these rows of submaxillary plates is separated from the series of superior labial plates by another suite of plates not less developed than those. The temple is furnished with small smooth plates in juxtaposition: its upper border has five or six, a little larger than the others. When laid along the neck, the fore feet reach the anterior border of the eye. The posterior feet, placed along the sides, do not extend beyond the origin of the arm. The tail sometimes forms by itself two-thirds of the total length of the animal. The upper part of the neck and the back are furnished with small, non-imbricate, smooth, rather convex, square scales, with more or less rounded angles, disposed in transverse bands. They are oval, it seems, in young subjects. The throat and lower part of the neck have hexagonal, smooth, close-set scales; the sides, and sides of the neck, are furnished with smaller scales, but of the same form as those of the cervical and dorsal regions. On the breast are three or four transverse rows of hexagonal scales, like those on the lower surface of the neck, whose folds present very small oval or circular scales, surrounded with very fine granules. Then come, to cover the rest of the breast and all the abdominal region, from twenty-eight to thirty other transverse rows of small quadrilateral oblong plates with a smooth surface, and in juxtaposition. Each of these series is composed of from twenty to thirty-five scutellæ on the preanal region, where they constitute from five to eight transversal rows: these preanal scutellæ are more or less regularly hexagonal, and with age they become rather thick, and put on a porous aspect. The anterior side of the upper part of the arm is covered with smooth, lozenge-shaped, non-imbricate scales; and the same side of the fore arm presents some which are equally smooth and close-set, but of a square form. The upper side of the toes is covered with a row of quadrilateral imbricated scutellæ, with rounded angles, and very much dilated across. The under side of the anterior foot is entirely clothed with very small, oval, smooth scales, rather distant, and surrounded with granules; these scales extend even upon the palms, where they become more dilated than under the arms. Upon each finger is a row of quadrilateral, imbricate, very wide scutellæ, with rounded angles; and on each side are one or two series of scales of a tubercular aspect. The front of the thigh is protected by rather large tetragonal or hexagonal, smooth, very slightly imbricated scales. The calves of the legs have, by way of scales, great lozenge-shaped distinctly imbricate lamellæ. The upper and posterior surfaces of the hind feet are covered with very small rhomboido-convex scales surrounded by granules. The toes, which are slightly compressed, have their external side defended by a series of great scutellæ like those on the upper part of the anterior toes, and their internal border is invested with four or five rows of small, thick, convex plates, more or less regularly quadrilateral. Below, but rather towards the outside, as on the lower surface of the fingers of the hands, is a band of tetragonal scutellæ imbricated and very much extended ransversely. The soles of the feet have the same scaly covering as the palms of the hands. Under each thigh are rom fifteen to twenty pores; they are very small and pierced on the re-entering border of a notch made in one cale for the reception of another smaller one. The caudal quamules are so disposed that they form a succession of ntire verticillations, each alternating with a demi-verticillation placed on the upper part of the tail. All these scales re quadrilateral, much longer than they are wide, and trongly ridged; those of the upper surface are at least ouble the size of those below and at the sides.

The colour is very variable above: the ground-colour is lways black, sometimes very deep; on this is spread a eautiful yellow in the form of spots, sometimes very small nd irregularly disseminated, sometimes, on the contrary, ather large and disposed in transverse bands, and very frequently in two rays, which extend one to the right and the ther to the left, from the angle of the occiput to the root f the tail, and are continued along the upper part of the ide of the neck and the lateral part of the trunk. The pper part of the head and limbs are more or less sprinkled with small yellow drops, which are also seen on the tail: his last is ringed with yellow and black for the two posterior hirds of its extent. All the lower parts are yellow, marked cross with black bands more or less narrow, sometimes well defined, and sometimes interrupted and feebly indiated. Some young individuals have been seen with wide nd well-defined black bands on a ground of uniform brown pplied transversely throughout the length of the neck and he back. The length, according to travellers, is sometimes our and even five feet; but MM. Duméril and Bibron never saw an individual of such dimensions.

Locality.—Nearly the whole of South America and the Antilles. (Dum. and Bibr.)

This is the *Lacerta Teguixin* of Linnæus; *Seps marmoatus* of Laurenti; *Lacerta Monitor* of Latreille; *Tupiambis Monitor* of Daudin; *Monitor Merianæ* of De Blainville, Van Hasselt and Kuhl, &c.; *Tejus Monitor*, Merr., &c.; *Monitor Teguixin*, Fitzing.; *Podinema Teguixin*, Wagl., Wiegm.; *Teguixin Monitor*, Gray; *Monior Teguixin*, Eichw.; *Tejus Teguixin*, Schinz; *Le grand Sauvegarde d'Amerique*, Cuv.; *Variegated Lizard*, Shaw; *Great American Safeguard*, Griffith's Cuvier.



Salvator Merianæ.

SAUVEUR, JOSEPH, a French mathematician, distinguished by the improvements which he made in the branch of science called acoustics, was born March 24, 1653, at La Flèche, where his father followed the occupation of a notary. Till he was seven years old he was quite dumb, and his organ of voice was never completely developed. He appears to have been born however with a taste for the mechanical arts, and even in childhood he is said to have constructed siphons, fountains, and models of mills. He was sent to a school of the Jesuits, but his taste for calculations caused his mind to be so much diverted from rhetoric and heology, that he made little progress in these studies; and happening to obtain a superficial treatise on arithmetic, he made himself master, without any assistance, of its contents. In 1670 Sauveur travelled on foot to Paris; and one of his uncles having promised to make him a small allowance for his support on condition that he would qualify himself for the ecclesiastical profession, he resumed for a time his theological studies, but a copy of Euclid's Elements which fell in his way, and the lectures of Rohault, soon determined him to abandon this pursuit. Being thrown upon his own resources, for his uncle immediately withdrew the promised allowance, he sought to obtain a subsistence by teaching the mathematics, and in this he appears to have succeeded. At twenty-three years of age, he had the good fortune to attract the notice of Prince Eugene, who received from him some instruction in the sciences; and a foreigner of distinction wishing to be taught the geometry of Descartes, Sauveur, who then had no knowledge of the works of that philosopher, applied himself to the subject with such vigour, that in eight days he was able to give the required instruction. From 1678 to 1680 he was occupied with the study of problems relating to the application of the theory of probabilities to games of chance, and in the latter year he was made mathematical master to the pages of the Dauphiness. In 1681 he was appointed, with Mariotte, to go to Chantilly in order to make some hydraulic experiments at that place; and it was there probably that he was introduced to the Prince of Condé, with whom he subsequently had the honour of corresponding. The conversation of the prince appears to have inspired Sauveur with a desire to make himself master of the art of fortification; and in order that he might join practice to theory, he went in 1691 to the siege of Mons, where he attended daily in the trenches. At the termination of the siege, he visited the fortified places in Flanders, and at the same time he applied himself to the study of military tactics in all its details. At the recommendation of Vauban, he was appointed examiner of the engineers, and was allowed a pension, which he enjoyed till his death.

After his return to Paris, he was appointed, in 1686, to the chair of mathematics in the Royal College; and in ten years afterwards he was made a member of the Académie des Sciences. During the remainder of his life he was employed constantly in improving the mathematical theory of sound; and we learn, not without surprise, that the man who discovered by theory and experiment the velocity of the vibrations of musical strings under various circumstances of magnitude and tension, had neither ear nor voice; in fact it appears that he was obliged to avail himself of the aid of practical musicians in order to appreciate the musical intervals and concords.

This mathematician may be said to have almost invented the science which has since been so much extended by Dr. Brook Taylor, by Daniel Bernoulli, D'Alembert, Euler, and Chladni. Theoretical music had been the subject of part of his lectures at the Royal College in 1697; but the first published details respecting his researches in acoustics are contained in the volume of the Académie for the year 1700. The different papers which he wrote afterwards are in the volumes for 1702, 1707, 1711, and 1713.

Sauveur was twice married, and he died July 9, 1716, at the age of 63 years, with the reputation of having been a man of kind disposition and great uniformity of temper. It appears that the few persons who, in France, cultivated the sciences in that age were nearly excluded from general society; for J. J. Rousseau, in his 'Confessions,' compares those persons to the asymptotes of certain curves; observing that they endeavoured perpetually to approach, without being able to come in contact with, the rest of the world. The observation does not however apply to the subject of this article, who, probably from the sociability of his manners, seems to have been surrounded by a numerous and agreeable circle of friends.

SA'VACOU. [BOAT-BILL.]

SAVAGE, RICHARD, was born January 10, 1697-8. His mother, the countess of Macclesfield, had during her pregnancy made a public avowal of her infidelity to her husband, who, in consequence, obtained an act of parliament by which their marriage was annulled, and the offspring rendered illegitimate. Lord Rivers, who was declared by Lady Macclesfield to be the father of her son, so far recognised him as to become his godfather, and to allow him to be called by his name; but he afterwards abandoned him to the care of his mother. The countess disowned her unhappy child, leaving him to pass his infancy and boyhood under the precarious protection of strangers; and had it not been for the charitable intervention of her mother, Lady Mason, the destiny of Savage would probably have been as obscure as the most unnatural parent could have wished. By the kindness of this lady he was sent to a small grammar-school near St. Alban's, and afterwards placed by his mother with a shoemaker in London. Soon after this, by the accidental discovery of some papers, he became acquainted with the circumstances of his birth, which had been studiously concealed from him; and he made many efforts to obtain an interview with his mother, who however resolutely refused to see him. While very young, Savage commenced his career as an author by taking part in the Bangorian controversy, on which he wrote an unsuccessful poem, afterwards suppressed by himself. At the age of eighteen he published a comedy called 'Woman's a Riddle;' and two years afterwards another, 'Love in a Veil,' both borrowed from the Spanish. Though these were failures, he thereby obtained the notice of Sir Richard Steele and Mr. Wilks, an actor. He became better known as an author by his tragedy of 'Sir Thomas Overbury,' in which he himself acted the part of Sir Thomas Overbury; and the profits of this play, and of a subscription raised for him at the time, produced a sum which appeared considerable to one so necessitous. In the year 1727 his irregular habits of life led him into one of the tavern broils then very common, in which he unfortunately killed a man, and was tried and condemned to death. The circumstances of the affair, and the doubtful character of the witnesses who appeared against him, becoming generally known after his sentence, intercession was made for him with the queen of George II. by the countess of Hertford, and the royal pardon was granted to him, in spite of the efforts of his mother, who on this occasion spread a report that he had once attempted her own life.

The notoriety of this event was succeeded by an extraordinary reaction of public opinion in his favour: he was courted by all ranks, the fashions of the day were ruled by his opinions, and he was enabled to maintain an appearance in society above his station by means of an annuity of 200*l.* a year obtained from his mother's relations, under the threat that he would expose her cruelty by lampoons, if she refused to support him. At this time he published his longest poem, the 'Wanderer,' which was much admired at the time.

Prosperity made more apparent that fickleness of character which led him into extravagance and alienated his friends from him. His fair prospects were soon for ever clouded by a quarrel with his patron Lord Tyrconnel, who accused him of ingratitude, and banished him from his house. His acquaintance in consequence generally deserted him, and he sank into obscure poverty as suddenly as he had emerged from it. The remainder of his life was passed in discreditable efforts to regain his position in society by alternately flattering and satirising all from whom he had anything to hope or fear. In despair of ever conciliating his mother, he published 'The Bastard,' the severity of which drew down upon her much public indignation, though it does not seem to have reawakened sympathy in favour of the author. After an unsuccessful attempt to obtain the situation of poet-laureat, Savage received from the queen a pension of 50*l.* a year as a reward for a poem in honour of her birthday, which his gratitude renewed annually from this time till her death, when the royal bounty was withdrawn from him. Having made no provision for such a contingency, he was obliged, from his necessities, to leave London in the year 1739, retiring first to Bristol and then to Swansea, where he lived for about a year, receiving an allowance raised by subscription among his friends. In January, 1742-3, on his return to Bristol, he was arrested for a debt of 8*l.*, and sent to prison in that city, where he died, July 31, 1743.

The name of Savage has become better known than his merits deserve, from the singularity of his early misfortunes, and still more from the elaborate life of him which Johnson, the companion of his distresses, has inserted in his 'Lives of the Poets.' This memoir is interesting not only as a most faithful picture of the adventurous career of Savage and of the manners of his age, but because it exhibits very strikingly the chief excellencies and defects of the author as a biographer and a critic. In the judgment which he pronounces upon the poems of his friend he is more swayed by prejudice than in his estimation of his moral worth. The writings of Savage are in unison with his character. The carelessness and want of system in his graver compositions, the frivolity in the choice and treatment of lighter subjects, his unchastened style, feeble in its vehemence, illustrate the strength of feeling and passion, the infirmity of purpose, the thoughtless improvidence, and want of settled principles of conduct, which made the actions of Savage as inconsistent as his fortune was chequered.

In his 'Wanderer,' he declaims without the moral dignity of a didactic writer, his versification is harsh, his descriptions tedious, and the whole poem ill arranged and thronged with confused imagery. His panegyrics betray the needy adventurer deficient both in self-respect and in tact. His praise is unskilful, his compliments (as has been well observed by Johnson) are constrained and violent, heaped together without the grace of order or decency of introduction.

He made enemies as readily as friends, and he testified his resentment by satires full of coarse personal invective.

From this general censure of the works of Savage 'The Bastard' is in a great measure to be excepted. Strong natural feelings, goaded by a sense of undeserved wrongs, gave to this poem a concentrated energy of expression, a refinement of sarcasm, and an exalted tone of thought, of which there are only faint traces in his other writings.

Of the person of Savage Johnson has left this description:—'He was of a middle stature, of a thin habit of body, a long visage, coarse features, and melancholy aspect; of a grave and manly deportment, a solemn dignity of mien, but which upon a nearer acquaintance softened into an engaging easiness of manners. His walk was slow, and his voice tremulous and mournful. He was easily excited to smile, but very seldom provoked to laughter.'

SAVANNA. [PLAINS.]

SAVANNAH, Town and River. [GEORGIA.]

SAVARY, NICOLAS, was born in 1750, at Vitré in Bretagne, France. Having completed his studies at the college of Rennes, he went to Paris, where he resided for some time. He had early conceived a desire of travelling, and in 1776 he landed in Egypt, where he remained till 1779. He was some time at Alexandria and Rosetta, but fixed his residence chiefly at Cairo, making occasional excursions in the neighbourhood, and to Damietta and other places in Lower Egypt. He re-embarked at Alexandria in September, 1779, and travelled during two years or thereabouts among the islands of the Grecian Archipelago. It is probable that he returned to France about the middle of 1781.

The first work which Savary published after his return was a translation of the Korán, the greater part of which had been made in Egypt, 'Le Coran, traduit de l'Arabe, accompagné de Notes, et précédé d'un Abrégé de la Vie de Mahomet,' Paris, 1783, 2 vols. 8vo. This is the best translation of the Korán which the French possess. The materials for the Life of Mohammed have been drawn chiefly from Abu'l Feda and the 'Sunnah,' a collection of traditions considered authentic by the Arabians. Savary next published a series of extracts from 'Le Coran,' under the title of 'Morale de Mahomet, ou Recueil des plus pures Maximes du Coran,' Paris, 1784, 12mo. and 18mo.

In 1784 Savary published the first volume of his 'Lettres sur l'Egypte.' The other two volumes were published in 1785, together with a new edition of the first volume, Paris, 3 vols. 8vo. This work had at first an extraordinary reputation. The interest connected with the country itself, especially the monuments of Antient Egypt, the picturesque style, and the brilliant colouring of the descriptions, rendered the work extremely popular. It was translated into German (Berlin, 1786, 8vo.) and English (London, 1786-7, 2 vols. 8vo.). Many objections however were afterwards made to the work, as that it contained few new facts, the description of the pyramids having been taken from Maillet, the account of Upper Egypt from the Père Sicard, and other parts from Joinville, &c.

Savary was afterwards severely commented upon by Michaelis, in his 'Journal of Arabic Literature,' who affirmed that in making use of Abu'l Feda he has always had recourse to Michaelis's Latin translation, and has not even understood that correctly, and that he was ignorant even of the pronunciation of the vernacular Arabic. The publication of Volney's 'Travels in Egypt' about the same time, which contains numerous contradictions of Savary, added to the annoyance arising from the criticisms of Michaelis and the decline of his reputation, is said to have affected his health, which was naturally delicate. He died at Paris, February 4, 1788, at the age of 38.

A few months after Savary's death, his 'Lettres sur la Grèce,' a work which he was engaged upon during his illness, was published at Paris, 8vo. It is incomplete, the author having worked up only a part of his materials at the time of his death. A tale translated from the Arabic, 'Les Amours d'Anas Eloujond et de Ouardi,' was published in 1789, 18mo. Savary had composed while in Egypt a Grammaire de la Langue Arabe Vulgaire et Littérale,' which he had presented to the French government in 1784, and it was ordered to be printed, but for want of Arabic type it lay in the royal printing-office till it was claimed on behalf of Savary's brother, by whom it was again presented to the government, and it was again ordered to be printed in 1796, but the publication however was not completed till 1813 (Paris, 4to.), and in the mean time the Arabic grammars of D'Herbin and Silvestre de Sacy had already appeared. It is in French and Latin, with many familiar dialogues and Arabic tales and songs, which in some degree compensate for the brevity of the syntax. This grammar however will not bear comparison with that of De Sacy. Savary was also engaged upon an Arabic Dictionary, but none of it has ever been printed.

(*Biographie Universelle.*)

SAVE, River. [AUSTRIA.]

SAVERDUN, a town in France, in the department of Arriège, eight or nine miles north of Pamiers. It was antiently one of the chief towns and strongest fortresses in the county of Foix: it resisted the attack of Simon de Montfort in the crusade against the Albigeois, and was, in the fifteenth century, one of the strongholds of the Huguenots. The fortifications have been destroyed. It is divided into the upper and lower towns, the latter the handsomer and more populous of the two. The inhabitants amounted, in 1831, to 1897 for the town, or 3327 for the whole commune; they trade in cattle and fruit, and have six fairs in the year.

SAVERNE. [RHIN, BAS.]

SAVIGLIANO. [SALUZZO.]

SAVI'GNIUM, Dr. Leach's name for a genus of Sessile Cirrhipeds, with four valves soldered together, and a bivalve convex operculum, the ventral and posterior valve on each side being soldered together. In other points the genus resembles PYRGOMA.

SAVILE, SIR HENRY, an eminent scholar and mathematician, born at Over Bradley, near Halifax, in Yorkshire, November 30, 1549. He was admitted a student of Merton College, Oxford, in 1561, where he proceeded to the degree of B.A., and was chosen fellow of the college. He took the degree of M.A. in 1570, about which time his fondness for the mathematics induced him voluntarily to read public lectures in the University on Euclid, Ptolemy, and other writers. He also served as proctor for two years, and in 1578 he made a tour through the Continent, and at his return had the distinguished honour of being chosen tutor in the Greek language to Queen Elizabeth, who, it is said, had a great esteem for him. He was elected warden of Merton College in 1585, in which office he continued for thirty-six years, and greatly benefited that society by his exertions. During this time he enriched the literature of his country with several classical and historical publications. He was made provost of Eton College in 1596, and on the accession of King James he was knighted. He died at Eton College, on the 19th of February, 1622, in the seventy-third year of his age, and was buried in the chapel there. On this occasion the University of Oxford paid the greatest honours to his memory, by having a public speech and verses made in his praise, which were published under the title of 'Ultima Linea Savilii.' He was indeed a munificent benefactor to the University of Oxford, in which, besides various other donations, he founded, in 1619, two professorships, one of geometry, the other of astronomy, which are still maintained. His library, consisting of a very curious and valuable collection of scientific books and manuscripts, he left to the University, and it is now preserved in a separate room near the Bodleian Library, the two Savilian professors being the only persons who have immediate access to it. His fame principally rests on a magnificent edition of all the works of St. Chrysostom, which was published in 1613, in 8 vols. folio, in the production of which he is said to have expended no less than 8000*l.*, and on his collection of our best historians, published in 1596, under the title of 'Rerum Anglicarum Scriptores post Bedam.' As a mathematician, he is known principally by his 'Lectures on the first book of Euclid's Elements,' published in 1621, but several MS. collections of his on the history of the sciences are preserved in his library at Oxford.

SAVILE, GEORGE, MARQUIS OF HALIFAX, was the son of Sir William Savile, a Yorkshire baronet, of antient family, and of Anne, daughter of the lord keeper Coventry. Being hereditarily attached to the Stuarts, ambitious, and endowed with brilliant talents, he played an active and a successful part in the intriguing reigns of Charles II. and James II. In 1668 he was raised to the peerage, by the titles of Lord Savile of Eland and Viscount Halifax; he was created earl in 1679, and marquis in 1682. He died in 1695, and the title became extinct in 1700, by the death of his son. The witty Lord Chesterfield was his grandson by the mother's side.

It is hard to state shortly his political history or principles, except by saying that he was the chief of the body to which the expressive name of Trimmers was given. So far however as he was attached to any principle, it seems to have been to the cause of civil liberty as then understood. He opposed the Non-resisting Test Bill in 1675, as well as, both in those times and after the accession of James, the relaxation of the tests enacted against the papists. He opposed the scheme for excluding the Duke of York from the succession, preferring to limit his authority when the crown should devolve on him. He declined to take part in bringing over the Prince of Orange; but was president of the convention parliament, and strongly supported the motion for declaring the throne vacant. On the accession of William and Mary he was made privy seal; but he soon retired from the administration, upon inquiry being proposed to be made as to the authors of the prosecutions of Lord Russell, Sidney, &c., in which he, as a member of the then existing government, had concurred; and he continued in opposition thenceforward till his death.

'He was,' says Burnet, 'a man of great and ready wit, full of life, and very pleasant, much turned to satire. . . He was punctual in his payments and just in all private dealings; but with relation to the public, he went backward and forward, and changed sides so often, that in the conclusion no side trusted him; he seemed full of commonwealth notions, yet he went into the worst part of King Charles's reign. The liveliness of his imagination was always too hard for his judgment. His severe jest was preferred by him to all arguments whatever; and he was endless in council, for when after much discourse a point was settled, if he could find a new jest, whereby he could make that which was digested by himself seem ridiculous, he could not hold, but would study to raise the credit of his wit, though it made others call his judgment into question,' &c.

His works are lively and elegant. The chief of them are these: 'Character of a Trimmer,' 'Anatomy of an Equivalent,' 'Letter to a Dissenter,' 'Miscellanies,' and 'Maxims of State.' He left two manuscript copies of his memoirs, both of which were destroyed unpublished, one by the Earl of Nottingham, the other by his granddaughter Lady Burlington. Horace Walpole says that this was done at Pope's suggestion, because the papists were represented in an unfavourable light. The loss is to be regretted, considering the strong satirical talent and position of the author.

SAVIN. [JUNIPERUS.]

SAVINGS' BANKS. [BANKS FOR SAVINGS.]

SAVO'NA, the name of a province and town of the Sardinian States, in the western Riviera of Genoa. The province of Savona is bounded on the north-east by the province of Genoa Proper, and on the south-west by that of Albenga, south-east by the Mediterranean Sea, and north-west by the Apennines, which separate it from the province of Mondovi in Piedmont. The soil partakes of the general character of the Riviera, and produces abundance of fruit, oil, and wine. The climate is somewhat colder in winter than at San Remo and other places farther west, because it is more open to the northern winds. The Apennines near Savona are lower than the rest of the Ligurian Apennines, being only 1500 feet above the sea, and on the other side of them is the valley of the Bormida, which slopes towards the plains of the Po. The population of the province of Savona amounts to 62,000, distributed in thirty-eight communes. The principal towns are: 1, Savona, a walled town of 15,500 inhabitants, and the most considerable in the duchy of Genoa, after the capital. (Bertolotti.) The streets are narrow, though well paved, and the interior aspect of the town is gloomy. It carries on a considerable trade; the harbour, which was once good, was partly filled up by the Genoese in 1525-28, through commercial jealousy; it is still very safe, but only fit for vessels of 200 tons. Savona is the residence of many noble and other substantial proprietors of the surrounding country; it contains some good palaces and several fine churches, among others the new cathedral built in the seventeenth century, the former cathedral, which had been raised by Julius II., when bishop of Savona, having been destroyed to make room for the citadel. The present cathedral is adorned with valuable paintings and sculptures. The sanctuary of La Madonna di Savona, situated five miles northwest of the town, in the Apennines, and on the road which leads to Mondovi in Piedmont, has also some good paintings, besides numerous votive offerings. Savona is the birth-place of Chiabrera, one of the best Italian lyric poets. 2, Albissola, a pretty town on the sea-shore, has 3500 inhabitants, and several handsome villas of the Genoese nobility. Julius II. was born at Albissola. 3, Noli, a small town in a picturesque situation near the sea. 4, Cairo, in the Apennines, has 3400 inhabitants. Near Cairo is the village of Millesimo, famous in the history of Bonaparte's first Italian campaign, in 1796. In the neighbouring old castle of Cosseria, 1500 Piedmontese grenadiers withstood for thirty-six hours all the attacks of the French, in which two French generals were killed and Joubert was wounded. At last they were obliged to surrender from want of water.

SAVONAROLA, GIRO'LAMO, a Dominican monk, a native of Ferrara, made himself known by his eloquent preaching at Florence, where he was living in the convent of S. Marco, which belonged to his order, in the latter part of the fifteenth century. In his sermons he used at times to assume the tone of a prophet, foretelling public calamities as a punishment for the sins of the people. Florence was then enjoying peace and prosperity under the administration of Lorenzo de' Medici, all Italy was quiet, and yet Savonarola startled his hearers by foretelling the approaching irruption of fierce foreign hosts, which would bring bloodshed and desolation over the land. A few years after his prophecy was fulfilled by the invasion of Charles VIII. of France and his ruthless bands, and an age of calamities began for Italy. Before this however Savonarola was wont to inculcate democratic doctrines; he recommended a return to the former popular system of government, which had been interrupted by the ascendency of the Medici; and he even declaimed against Lorenzo himself. Lorenzo took little notice of this; and when his friends urged him to check the monk's audacity, he replied, that as long as the preacher exerted himself to reform the morals of the citizens of Florence, he should willingly excuse his incivility to himself. When Lorenzo fell ill, in the spring of 1492, and his life was despaired of, Savonarola appeared by his bed-side, some say at Lorenzo's own request. The conversation that followed is variously related. Poliziano, an eye-witness, states that Savonarola exhorted Lorenzo to be firm in the Catholic faith, to which the sick man assented. The monk then asked Lorenzo whether, in case he recovered, he purposed to live a virtuous and well-regulated life, to which a ready assent was also given. Lastly, Savonarola told Lorenzo that he ought to bear his death with resignation, if such be the will of God. 'With cheerfulness,' replied Lorenzo. Savonarola was then going to quit the room, when Lorenzo called him back, and requested his benediction, which the monk readily gave in the solemn form of the liturgy, Lorenzo pronouncing the usual responses with a firm and collected voice.

Such is the account of Poliziano, written soon after the event, but a different one came into circulation a long time after, and was registered in the biography of Savonarola, written by Gianfrancesco Pico of Mirandola, nephew of the celebrated Giovanni Pico, the friend of Lorenzo. The story is, that Savonarola was sent for to hear Lorenzo's confession, and that among other injunctions to which Lorenzo readily assented, the monk required him to promise that if he should recover, he would restore the republic to its former state of popular freedom, and as Lorenzo made no reply to this, Savonarola left him without giving him absolution. Roscoe thinks this tale to have been an invention of that party spirit which broke out some time after Lorenzo's death, and which led to the expulsion of Piero de' Medici, Lorenzo's son, in 1494. Savonarola acted a conspicuous part in the disturbances which followed. He became the leader of the democratic party, which was styled the Piagnoni or lachrymose party, because, in imitation of their leader, they were continually denouncing and bewailing the sins and corruption of their fellow-citizens. The opposite or aristocratic party, that wished to place the government in a few hands, were styled Compagnacci, and also Arrabbiati, or 'enraged.' The Piagnoni succeeded for a time, and a general legislative council was formed of 830 citizens, above thirty years of age, and who were 'netti di specchio,' that is to say, inscribed in the public books as having always paid their taxes regularly. A vast hall was constructed for their meetings in the town palace. Savonarola's influence was now very great, being looked upon by his party as a kind of prophet and supreme judge. Grave citizens mixed with friars, and children, assembled in the public places crying 'Viva Cristo,' singing hymns composed for the occasion, and dancing with frantic gestures. But the Arrabbiati were not idle; they represented Savonarola as an impostor, and they accused him of heresy at Rome. Pope Alexander VI. (Borgia) summoned him to appear before him, in default of which he excommunicated him. Savonarola, who had long been preaching against the corruptions of the clergy, did not spare the head of the church, whom he styled a usurper, and he wrote to several princes urging them to assemble a general council, before which he made sure of proving that Alexander not only was not a legitimate pontiff, but was not even a Christian. In the year 1497, Piero de' Medici made an attempt to re-enter Florence by surprise, at the head of an armed party, but the plot was discovered, and several of his abettors within the town being arrested, five of them were condemned to death, and the rest to banishment. They appealed from their sentence to the great council of the citizens, but Savonarola and his party urged the immediate execution of the sentence, and the five were beheaded. This enraged the aristocratic party, who, joined to the secret enemies which Savonarola had among the clergy, encouraged two Franciscan monks to preach against him. Savonarola, thus assailed, called to his aid a brother Dominican, Domenico da Pescia, and both retorted from the pulpit against the Franciscans. The contest was kept up for some time with mutual accusations and vituperations, until Frà Domenico, excited beyond reason, proposed to prove the superiority and sanctity of his master by walking through the flames, and, strange to say, one of the Franciscans undertook to do the same on the part of his brethren. The mode of trial was arranged by the magistrates; a mass of combustibles was laid in the square, and a walk was made across, through which the champions were to pass while the faggots were blazing. On the appointed day, 17th April, 1498, Savonarola and his champion, attended by a numerous procession, made their appearance, giving out the psalm 'Exurgat Deus et dissipentur inimici ejus.' His opponent Frà Giuliano Rondinelli, attended by some Franciscan monks, walked silently and steadily to the place of trial; the flames were kindled, and the crowded spectators stood in mute astonishment and expectation, when Savonarola proposed that his champion Domenico should bear the consecrated host through the fire. This proposal shocked the whole assembly, and the magistrates and heads of the clergy exclaimed against it as a profanation, and as a tempting of God himself. Frà Domenico however refused to proceed without the host, and the trial was given up. This business ruined the credit of Savonarola: on his return to his convent of S. Marco he was taunted by the populace, and soon after a party of his enemies entered the convent by force, and dragged him, with Domenico and another monk, to prison. He was tried before a mixed lay and ecclesiastic commission appointed by Alexander VI. His eloquence at first startled his judges, but the implements of torture being produced, the firmness of Savonarola failed him, and he acknowledged the falsehood of his pretensions to supernatural powers. He was condemned to death, and he and his two associates, being led to the spot prepared for the trial, were first strangled, and their bodies thrown into the flames, on the 23rd of May, 1498.

Savonarola left several works, both in Italian and in Latin, one of which, entitled 'Triumphus Crucis,' is a demonstration of the truths of Christianity. His sermons however, of which some remain, are the most remarkable of his productions. He was eminently a popular orator, and profoundly versed in the art of exciting the feelings. His memory has found several apologists, among the rest Filippo Neri, and Barotti, in his 'Biographies of Authors, Natives of Ferrara.'

SAVOY (*Savoia* in Italian, *Savoie* in French), a country with the title of duchy, which belongs to the Sardinian monarchy. It forms part of the highlands of the Alps and is geographically united to South-western Switzerland, being included in the basin of the Rhône. Savoy extends from 45° 4′ to 46° 24′ N. lat., and from 5° 37′ to 7° E. long. The boundaries of Savoy are: on the east, the great chain of the Graian and Pennine Alps, which divide it from Piedmont and the Valais; on the north, the Leman lake; on the west, the Rhône, which divides it from France; and on the south, an offset of the Cottian Alps, which, running westwards from the group of Mont Cenis, divides the valley of Maurienne, the southernmost part of Savoy, from Dauphiné. This offset ends at the valley of the Isère, which forms a natural opening on the south-west, between Savoy and France. North of the Isère a ridge runs in the direction of the Rhône, forming a natural barrier to Savoy on that side. This ridge has been cut through at the place called Les Echelles, to make the high road from Chambéry to Lyon.

Savoy consists of several valleys formed by offsets of the Alps. It is divided into three basins: the northern basin, the waters of which flow northwards into the Leman lake; the central basin, the waters of which flow by means of the Arve, the Fier, and the lake Bourget westward into the Rhône; and the southern basin, which is drained by the Isère and its affluents. The Isère runs southwards into France.

The administrative division of Savoy corresponds to the geographical configuration of its surface and its principal valleys. The country is divided into eight provinces:—1, Chablais, which comprises the southern coast of the Leman lake and the numerous valleys which slope towards it. The Dranse, which rises in the mountains near the borders of the Valais, and enters the lake half-way between the towns of Evian and Thonon, is the principal river of Chablais. 2, Faucigny, south of Chablais, consists chiefly of the long valley of the Arve, from its source in the Col de Balme to a few miles below Bonneville, where the river enters the province of Carouge. The well known valley of Chamouny belongs to Faucigny, and the romantic but comparatively neglected valley of the Giffre, the principal affluent of the Arve, with its fine cascades and the bordering glaciers of Mont Buet, forms also part of Faucigny. 3, Genevois, west of Faucigny, consists of the valley of the river Fier, an affluent of the Rhône, and of the basin of the lake of Annecy, the waters of which have their outlet in the Fier. 4, The province of Carouge lies north of the Genevois, and between it and the borders of the canton of Geneva, to which part of its territory and the town of Carouge itself, from which the province takes its name, were ceded by the treaty of St. Julien in 1815. St. Julien is now the chief town of the province. The small river Les Usses, which enters the Rhône near Seyssel, is the principal outlet of the waters of the province of Carouge. 5, Haute Savoie, south of Faucigny, consists of the valley of the Arli, an affluent of the Isère, which flows from north to south. 6, Tarantasia or Tarentaise, south of Haute Savoie, consists of the long valley of the Isère, running from east to west, from its sources at the foot of Mont Iseran to the confluence of the Arli. Tarantasia is, next to Faucigny, the most Alpine part of Savoy, and the most interesting to mountain tourists. 7, Maurienne, south of Tarantasia, consists of the valley of the Arc, which has its source at the foot of Mont Cenis, and joins the Isère above Montmélian. The high road to Italy leads through the whole length of Maurienne. 8, Savoy Proper, the most level and most fertile part of Savoy, lies west of Maurienne and Tarentaise, and south of Genevois. It is divided on the west from France by the Rhône and its affluent the Guier. The waters of Savoy Proper find an outlet partly southwards by the Isère, and partly by the Leisse and other streams which run westward into the lake of Bourget, which lake enters the Rhône by a canal called that of Saviere. The lake of Bourget lies five miles north-west of Chambéry; it is ten miles long and three wide, and the surface is 700 feet above the sea.

The principal towns of Savoy are—1, **Chambery**, the capital of the whole duchy. 2, **Annecy**, the head town of the province of Genevois. 3, Thonon, the head town of Chablais, situated on an eminence which commands a splendid view of the Leman lake. The country around Thonon is very fertile. Thonon has a handsome town-house and some other good buildings, and 4200 inhabitants. A few miles north-east of Thonon are the remains, of the convent of Ripaille, built by Amadeus VIII. Being sold by the French at the time of the Revolution, it was stripped of all its ornaments, and it has been since converted into a farm. Some of the towers remain; the church and the library have been transformed into barns. 4, Aix-les-Bains, in Savoy Proper, much frequented for its baths. [Aix.] 5, Rumilly, in the province of Genevois, has 4000 inhabitants. 6, Moutiers, the capital of Tarentaise, is a small town with 2000 inhabitants, and a bishop's see. Moutiers has salt-works for purifying the salt which is derived from the neighbouring springs of Salins, and also a school of mineralogy and metallurgy, with three professors, a cabinet of minerals, a library, and a chemical laboratory. The lead-mines of Pesei and Macot, in the mountains near Moutiers, employ about 600 workmen. The net yearly produce of the mines, which are worked for the government, is valued at between 60,000 and 80,000 francs.

The mine of Pesei is situated at an elevation of 4500 feet above the sea, and that of Macot at the height of 6000 feet. The ore is sent to Conflans, where it is smelted and purified. The mineral springs of La Perriere, situated in the valley of the Doron, about three miles from Moutiers, have been much frequented of late years by invalids from Switzerland and France. They are particularly recommended for cutaneous diseases and rheumatism. The province of Tarentaise has also numerous mines of anthracite, which are worked by the country people, and it is rich in marble of various colours. 7, Bourg St. Maurice in Upper Tarentaise, on the road leading to Italy by the Little St. Bernard, is a town of 3000 inhabitants, and carries on considerable trade in cattle. From the village of Scez above Bourg St. Maurice, the narrow valley of Tignes leads south-east to the sources of the Isère, at the foot of Mont Iseran, a noble pyramid 13,300 feet high, covered with perpetual snow and surrounded by glaciers. From Scez a road leads in an easterly direction to the pass of the Little St. Bernard, 7192 feet above the sea, and from thence into the valley of Aosta. The pass is practicable nearly all the year round, but only for horses and mules. A Roman road constructed by Augustus led formerly from Aosta, or Augusta Prætoria, over the Little St. Bernard, and down the valley of the Isère to Vienne on the Rhône. Traces of this road are still visible in the valley of Aosta, but all vestiges of it have disappeared on the Savoy side. On the summit of the pass is an antient column of cipoline marble, 15 feet high, which is called 'Colonne de Iou,' or of Jove, and near it is a circle of stones probably Druidical, but which the country people call the circle of Hannibal. It is now generally admitted that Hannibal entered Italy by the pass of the Little St. Bernard. Tarentaise is altogether a very interesting region, though little visited by tourists. Albanis Beaumont, in his 'Description des Alpes Grecques et Cottiennes;' Vernheil, in the 'Statistique du Département du Mont Blanc,' Paris, 1807; Roche, in his 'Notizie Istoriche,' printed at Moutiers in 1819; and Bertolotti, in his 'Viaggio in Savoia,' 1828, have illustrated this province. It was the country of the antient Centrones, who, with their neighbours the Salassi, long resisted the Roman arms, and were only subjugated in the time of Augustus. A village on the banks of the Isère, above Moutiers, bears the name of Centrone, and a little higher up, in the village of Aixme, several Roman inscriptions exist, one of which is the following votive one in verse, written by the Proconsul I. Pomponius Victor, in the time of Augustus, and which is interesting for the feeling which it displays:—

'Silvane sacra semicluse fraxino,
Et huius alti summe custos hortuli,
Tibi hasce grates dedicamus musicas,
Quod nos per arva, perque montes Alpicos
Tuique luci suave olentis hospites,
Dum jus guberno, remque fungor Cæsarum,
Tuo favore prosperante sospitas,
Tu me, meosque reduces Romam sistito,
Daque Itala rura te colamus præside.
Ego jam dicabo mille magnas arbores.'

I. Pomponii Victoris, Proc.
Augusti T.

8, The town of St. Jean, the chief place in the province of Maurienne, has 2500 inhabitants, and a very old cathedral, in which lie buried some of the earlier counts of the house of Savoy. The other towns of Maurienne, Modane, St. Michel, Lanslebourg, and Aiguebelle, do not reckon 2000 inhabitants each. Maurienne has mines of iron, copper, and lead, the aggregate produce of which amounts to 600,000 francs yearly.

The late king Charles Felix began the embankment of the three principal rivers of Savoy, the Arve, the Isère, and the Arc, by which means large tracts of fertile land have been reclaimed.

The population of the duchy of Savoy is 501,000, 129,000 of whom inhabit the province of Savoy Proper. A great part of the country is rocky and barren, and the male inhabitants are obliged to leave their homes in order to get a subsistence. Cattle and sheep constitute the chief wealth of the Alpine districts. Savoy does not produce corn enough for its consumption. Wine is made in most parts, and some of it is very good. Silkworms are reared in Savoy Proper, and fruit-trees are abundant. The people of Savoy have an old established reputation for honesty, loyalty, and bravery. Savoy has produced many distinguished men of learning, among others, St. Réal, Vaugelas, Gerdil, Berthollet, Ducis, Brogny, Berger, &c.

The popular language of Savoy is a Romance dialect, like those of Western Switzerland, but the people of the towns speak good French.

The statistics of the administration, education, &c. of Savoy are given under SARDINIAN STATES.

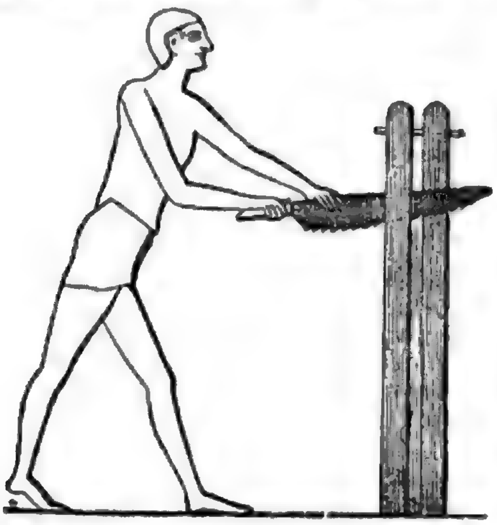
SAVOY, HOUSE OF. [SARDINIAN STATES.]

SAW, an instrument for cutting timber or other hard substances, usually formed of a plate of steel with a notched or serrated edge. The action of a saw is different from that of a knife or sharp-edged tool; the latter being used simply to separate the fibres, while the former is made, by a rapid motion in the direction of its length, to cut or tear away a portion of wood equal to the thickness of the blade.

The division of wood by riving or splitting was probably the most antient method of reducing it to pieces of convenient size and shape; and, owing to the facility with which it is done, and the superior strength of the planks so produced, this process is still occasionally resorted to. If the grain of timber were straight, this plan would have the advantage of economy, but as it is not so in general, considerable waste is occasioned by it when the pieces are required to be straight, much wood having to be removed with an adze in order to make it so. The superior strength of split timber arises from all its fibres being kept unbroken; while, in such as is divided by sawing, many are cut through, owing to their irregular direction. From this circumstance split timber is preferred for the staves of barrels, sieve-hoops, and a variety of other purposes for which great strength and elasticity are required. For a notice of machines for cutting wood by means of knives or knife-like instruments, see WOOD-CUTTING MACHINERY.

Saws were used by the antient Egyptians. The annexed cut represents a saw that was discovered, with several other carpenters' tools, in a private tomb at Thebes, and which is now preserved in the British Museum.

The blade, which appears to be of brass, is ten inches and a half long, and one inch and a quarter broad at the widest part. The teeth are irregular, and appear to have been formed by striking a blunt-edged instrument against the edge of the plate; the bur, or rough shoulder, thus produced, not being removed. The following cut, from a painting copied in Rosellini's work on Egyptian antiquities, represents a man using a similar saw; the piece of wood which he is cutting being held between two upright posts. In other representations the timber is bound with ropes to a single post; and in one, also copied by Rosellini, the workman is engaged in tightening the rope, having left the saw sticking in the cut. In an engraving given in the third volume of Wilkinson's 'Manners and Customs of the Antient Egyptians,' a saw is represented of much larger dimensions, its length being, by comparison with the man, not less than three or four feet. It does not appear that the Egyptians used saws worked by two men.



The invention of saws was variously attributed by the Greeks to two or three individuals, who are supposed to have taken the idea from the jaw-bone of a snake or the back-bone of a fish. There is a very curious picture among the remains discovered in the ruins of Herculaneum, representing the interior of a carpenter's workshop, with two genii cutting a piece of wood with a frame-saw; and on an altar preserved in the Capitoline Museum at Rome there is a perfect representation of a bow-saw, exactly resembling, in the form of the frame, and the twisted cord for tightening it, those used by modern carpenters. (*Mus. Capitolin.*, vol. iv., plate 15.) From these remains it is evident that these forms of the instrument were known to the antients.

Saws are of various forms and sizes, according to the purposes to which they are to be applied. Those used by carpenters and other artificers in wood are the most numerous. Among these are the following:—The *cross-cut saw*, for dividing logs transversely, two persons being employed to pull the saw alternately backwards and forwards, and the teeth being so formed as to cut equally in each direction. The *pit-saw*, a long blade of steel with large teeth, and a transverse handle at each end. It is used for sawing logs into planks or scantlings, the piece of wood to be cut being laid over a saw-pit, or excavation six or seven feet deep. One man stands on the log, and the other in the pit, and they pull the saw alternately up and down, in a nearly vertical direction; the saw cutting in its descent only. The *frame-saw* is a blade from five to seven feet long, stretched tightly in a frame of timber, the plane of the saw being at right angles with that of the frame. It is used in a similar manner to the pit-saw, but causes less waste, because the blade, being stretched, may be made much thinner. The *ripping-saw*, *half-ripper*, *hand-saw*, and *pannel-saw* are saws for the use of one person, the blades tapering in width from the handle. They are of different lengths, the largest being about twenty-eight inches; and the teeth vary from rather more than one-third to one-sixth or one-eighth of an inch. *Tenon-saws*, *sash-saws*, *dovetail-saws*, &c. are saws made of very thin blades of steel, of equal width throughout their whole length, and stiffened with stout pieces of iron or brass fixed on their back edges. These are used for cutting across the grain, as in the shoulders of tenons, dovetail joints, &c., and for many other purposes for which a neat clean cut is required, but where it is not necessary for the whole width of the saw-blade to pass through the wood. Such saws vary in length from about six to twenty inches, the teeth being from one-eighth or one-tenth of an inch down to a very minute size; extremely small teeth being required for some of the most delicate operations of the cabinet-maker. *Compass* and *key-hole saws* are long narrow saws, tapering from about an inch to an eighth of an inch in width, used for making curved cuts. They are made considerably thicker at the edge than at the back, in order that they may move freely in a curved kerf, and the latter is mounted in a long handle, having a slit to receive the blade, and a screw to fix it in any required place, so that it may be made to project more or less as required. Small *frame-saws* and *bow-saws*, in which very thin narrow blades are tightly stretched, are occasionally used for cutting both wood and metal. Saws are made for cutting bone, iron, brass, and many other hard substances, and there are several varieties used by the carpenter besides what have been enumerated; but it is unnecessary here to detail them.

A minute account of the process of manufacturing saws, as practised at Sheffield, whence, it is observed, 'three-fourths of the inhabitants of the globe are supplied' with these useful intruments, is given in Hebert's 'Engineer's and Mechanic's Encyclopædia,' to which we are indebted for the following particulars. The very commonest kind of saws are made of iron-plates, hammer-hardened, and planished upon an anvil, to give them some degree of stiffness and elasticity. Such instruments, though spurned by workmen, are sold in great quantities, their cost being very trifling. The more useful saws are made either of shear or cast steel, of which the latter is preferred, on account of its greater uniformity of structure. The steel is cast in the form of a small slab, about an inch and a half thick. This slab is extended, by rolling, to the required degree of tenuity, and then cut, by shears, into pieces of suitable form and size. 'The edges are next perfected by filing, and holding the flat side of the plates against large grindstones, which process prepares them for the cutting of the teeth. This operation is usually performed by a die-cutter in a fly-press, the motion of the saw-plate being duly regulated, so that the teeth shall be uniform; the larger teeth being cut one at a time; and the smaller, two, three, or more at a time, according to circumstances.' The wire edges left on the teeth by the cutting-out press are removed by filing, after which the plates undergo the processes of hardening and tempering. Various fatty compositions have been used for this purpose, being considered to possess peculiar efficacy in hardening. Mr. Gill (in the 'Technical Repository,' vol. i., p. 212) recommends the following mixture as suitable not only for saw-plates, but for springs generally:—

Spermaceti oil	20 gallons.
Beef-suet, rendered . .	20 lbs.
Neat's-foot oil	1 gallon.
Pitch	1 lb.
Black resin	3 lbs.

The pitch and resin are to be melted together, and then added to the other ingredients, the whole being heated in an iron vessel until the aqueous vapour is driven off, and the composition will take fire on the application of flame to its surface; the flame being extinguished by putting on the cover of the vessel. The liquid mixture thus prepared is put into a vessel of suitable form, and, when cold, the saw-plates, which are heated to a cherry-red, are precipitated edgewise into it. When sufficiently cooled therein to be handled, they are taken out, and are found to be extremely hard and brittle. The unctuous matter which adheres to them being then partially removed, they are taken up individually by a pair of tongs, and passed backwards and forwards over a clear charcoal fire, so as to cause the unctuous matter to inflame, or *blaze off*, as it is termed, which reduces the saws to the required temper; and, whilst the saw-plates remain hot, any warping they may have acquired in the process is removed by smart blows from a hammer, on an anvil strewed with sand to prevent their slipping about. The next operation is planishing by hammers, to make them more even and equally elastic; after which the saws are ground on large grindstones. The plate is held against the circular face of the stone by an interposing board, against which the grinder presses with all his force, in order to grind it as evenly as possible. He stands on tip-toes, stretching over the stone, which revolves with great rapidity; his hands, arms, breast, and knees being all brought into action to produce the desired effect, while he becomes covered with the sludge formed by the operation.

As the process of grinding impairs the flatness and elasticity of the saw-plates, they are submitted to a second hammering by the planishers, and their elasticity is restored by heating them over a coke fire until they attain a faint straw-colour. The marks of the hammer are removed by again passing the saws lightly over a grindstone, after which the final polish is given by a fine hard stone, a glazing-wheel covered with buff-leather and emery, or a wooden wheel, called the *hard-head*. Any defects acquired during these processes are removed by a few blows with a small polished hammer upon a post of hard wood.

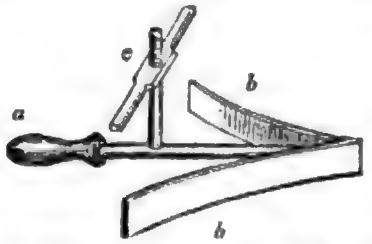
The saws are 'cleaned off' by women, by rubbing fine emery over them lengthwise with a piece of cork-wood; and then handed to the *setter*, who lays each alternate tooth over the edge of a small anvil, and strikes them so as to bend each uniformly into a slight deviation from the plane of the saw, and then, turning the saw-plate, sets the remaining teeth in like manner, but in the opposite direction. Owing to this set of the teeth, the kerf or cut made by the saw is rather wider than the thickness of the blade, which therefore passes through it with little resistance. The degree of deviation from the plane of the saw depends upon the kind of wood to be cut; the softest wood requiring the widest or *runkest* set. Sometimes an instrument with a notched edge, called a *saw-wrest*, is used for setting the teeth, each being separately bent to the required degree, or, in some cases, two or more at a time; and recently an ingenious contrivance resembling a pair of plyers, and having a stop-screw to regulate the degree of set, and a moveable plate to prevent too much of the tooth being bent, has been introduced. It may be observed that the mode of performing this operation with a hammer has been considered to have an advantageous effect in hardening the teeth. After being set, the saw is placed, between two plates of lead, in a vice, and the teeth are sharpened with a triangular file. The handles are then fixed on by nuts and screws, and the saws cleaned off, oiled, and packed in brown paper for sale.

The common test of a good saw is bending it into a bow, and letting it spring back again into a straight line. It is a satisfactory test of perfect elasticity and uniformity of thickness in the blade, which are two of the essential properties of a good saw; but it is considered by some to be an unnecessary trial, and to spoil saws which possess, in other respects, the qualities of a good tool.

The teeth of carpenters' saws are so formed as to contain an angle of 60°, and they are made to incline more or less forward according to the intended use of the saw. Ripping saws have the front of the teeth perpendicular to a line ranging with their points; but those for cutting across the grain, or for hard wood, must have the front of the teeth more or less inclined towards that imaginary line. Very small thin saws are sometimes made with the teeth of such a form that they cut towards, instead of from, the person using them; an arrangement which counteracts the tendency to bending consequent on the thinness of the plate. For very delicate operations saws are frequently made of watch-spring.

Circular saws, being used only in connection with machinery, are described under SAW-MILL. It has been recommended to file their teeth in such a manner that their surfaces may not be perpendicular to the face of the saw, but inclined in the direction that the teeth are set; so that the teeth, when cutting, first remove the wood from the sides of the kerf, leaving a little ridge in the centre, which tends to keep the saw steady in its course.

In cutting a log into planks with a pit-saw, it is necessary to insert wedges in the kerf, in order to keep it open, and allow free passage for the saw. To save the trouble and inconvenience of shifting these as the saw proceeds, Mr. Griffiths invented an expanding wedge, for which he received a reward from the Society of Arts. It is represented in the annexed cut, *a* being the handle, *b b* two springs, and *c* a cross-piece to prevent the wedge from falling into the pit when fully expanded. When the saw has cut two or three feet into the log, the springs are to be compressed by hand, and the wedge pushed into the cut up to the ends of the springs; the cross-piece resting on the top of the balk. The elasticity of the springs will cause the cut to open as it proceeds, without the wedge being moved; and the cross-bar will prevent its falling when it has attained its full expansion.



For an account of the application of machinery to sawing timber, see SAW-MILL.

Saws for cutting stone are without teeth, although they are sometimes slightly notched upon the cutting edge, that they may collect and retain the particles of sand that are conducted into the cut by a small current of water, and by the attrition of which the effect is mainly produced. The saw-plate is tightly stretched in a kind of rectangular frame, of which it forms the lower side; and the frame, being suspended by ropes, is moved backwards and forwards by one or two men. A board is laid sloping towards the cut, to conduct a constant supply of water from a reservoir, and a quantity of sand is laid on the board, so that the operator can, by means of a hooked stick, draw a little into the stream of water when necessary. Coarse sharp sand is used for cutting soft stones, and fine sand for those of harder quality; the sand being in all cases carefully cleaned and sifted. Sawing stone is a very slow and laborious operation; a good workman not being able to cut more than twenty-five or thirty square feet of Portland stone in a day; and, as commonly practised, it involves considerable waste of material, owing to the tendency of the saw to swerve from the right direction when the stone is not uniform in hardness. The defects of the common process have been partially avoided, of late years, by the use of stone-sawing machinery, worked by steam or water power, in which the effect is so much increased by greater pressure upon the saws, that, according to the 'Encyclopædia Metropolitana,' one saw performs as much work in seventy hours as a man in six weeks, and with such accuracy that the surface scarcely requires any dressing. As in saw-mills for wood, any number of saws may be worked together, so adjusted as to cut a block of stone into slabs of any required thickness. Curved forms may be cut in stone by means of straight saws; but a patent was obtained in 1810, by Mr. Murdock, for cutting columns, stone pipes, &c. by means of a cylindrical saw, so mounted as to receive rotatory motion alternately in each direction; such a motion being found more suitable for cutting stone than a continued rotation in one direction.

SAW-FISH, a fish belonging to the fixed-gilled Chondropterygians, nearly related on the one hand to the Sharks (*Squalidæ*), and on the other to the Rays. [SQUALIDÆ.]

SAW-MILL. In this article will be embraced not only such points in the mechanism of saw-mills, strictly so called, as appear to require notice, but also some other contrivances in which saws are used in connection with machinery, and not simply as tools impelled and guided by the hand. Saws, considered merely as tools, have been described under SAW, where an account of their manufacture will also be found.

Although saw-mills have not been very generally introduced till within a few years, they are by no means of recent origin. Saws worked by machinery were known on the Continent at least as early as the fifteenth century, though the improvement of having several saws in the same frame, so as to cut a log into many planks by one operation, is supposed not to have been tried prior to the sixteenth century. Notwithstanding their successful use in Germany, Holland, Norway, and other places, the introduction of saw-mills in England was much opposed. One was erected near London in 1663, by a Dutchman; but it was soon abandoned. In No. 419 of Houghton's 'Collection for Improvement of Husbandry and Trade,' published August 2, 1700, the adoption of saw-mills in this country is strongly recommended, although some opposition from the populace is mentioned as not improbable. About the year 1767 or 1768 a saw-mill was established at Limehouse, under the sanction of the Society for the Encouragement of Arts, Manufactures, and Commerce. It was driven by wind, and superintended by a person who had become acquainted with the use of saw-mills on the Continent. This mill was destroyed by a riotous mob; but the ringleaders being severely punished, and the damage made good by the county, it was again set up, and soon followed by others, particularly after the improvement of the steam-engine made it available as a moving power. A similar mill is said to have existed a few years previously at Leith. Many of the earlier saw-mills were driven by water, and those of North America are still generally worked by that power.

The earliest kind of sawing-machinery was, in its essential features, the same as that still used for sawing logs of timber into planks. In this machine the saws are stretched in a frame which slides up and down on vertical guides; the reciprocating motion being imparted to the frame by a crank upon an axle turned by a connection with the water-wheel or other prime mover. The log is supported on a carriage resting upon rollers, and is made to advance a little at each stroke of the saws, which cut during their descent only. *Figs.* 1 and 2 represent the common reciprocating saw-mill, the same letters in both referring to corresponding parts. The machinery, in the form here represented, occupies two stories; the cast-iron framing being securely bolted down to the basement floor, and rising through the upper floor, which is shown in section at *k k*. An horizontal axle, revolving in bearings attached to the lower part of the framing, is turned by means of a strap from the axle immediately impelled by the steam-engine, water-wheel, or other moving power. Two drums or riggers are used, that marked *a* being *fixed* on the axle, while the other, *b*, revolves freely; the driving strap being shifted to this loose rigger when it is desired to stop the machine without stopping the engine that propels it. In some of the earlier saw-mills the motion was communicated by a train of cogged wheels; but straps are preferable, as they occasion less friction, and, in case of any accidental obstruction to the machinery, will give way without injury, while cog-wheels would be broken to pieces. It may be observed here, that important advantages have been derived from the recent introduction of straps or bands formed partly of caoutchouc, for driving machinery; as their elasticity renders them much more effective and durable than those of leather, and obviates the inconvenience of slipping over the pulleys, to which the common bands are liable when stretched with use. The axle, being cranked, imparts a reciprocating motion to the saw-frame *d*, by means of the connecting-rod *c*. The vertical motion of the saw-frame is ensured by its sliding up and down upon smooth pillars or guide-rods attached to the frame-work of the machine; these being usually made square, that the parts sliding upon them may be screwed up so as to fit accurately when reduced by wear. In some machines friction-rollers are used instead of mere slides for guiding the saw-frame. The saws (of which eight are represented in *Fig.* 2, although a smaller number may be used) are stretched tightly in the frame, commonly by means of wedges driven through mortise-holes in their upper end. In the saw-mills erected at the Royal Arsenal, Woolwich, by Mr. (now Sir M. I.) Brunel, an ingenious apparatus is used to stretch the saws equally. At each end of every saw is a piece of iron terminating in a hook. The hook at the lower end of the saw catches upon the lower cross-bar of the saw-frame, and that at the upper end is connected with

Fig. 1.

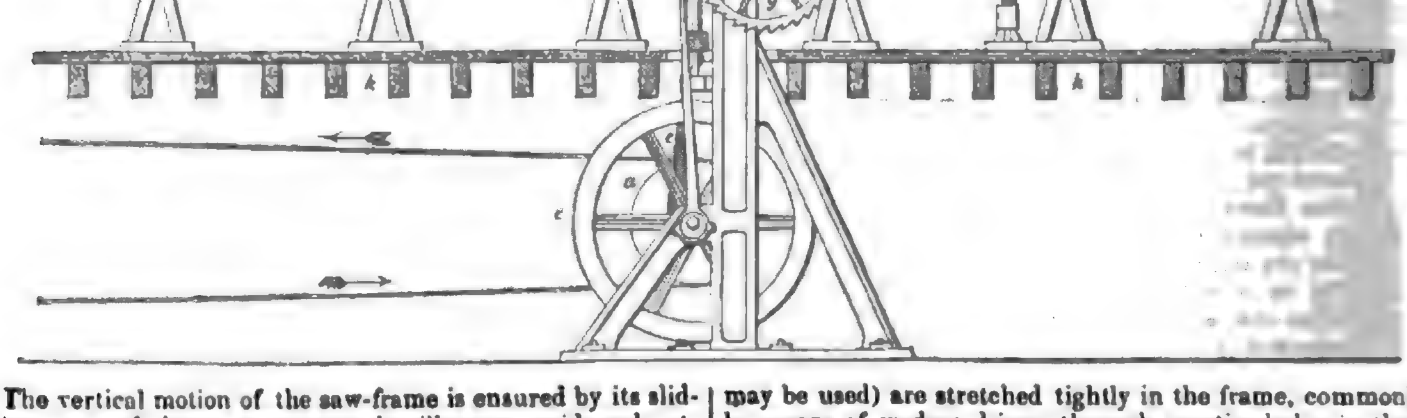
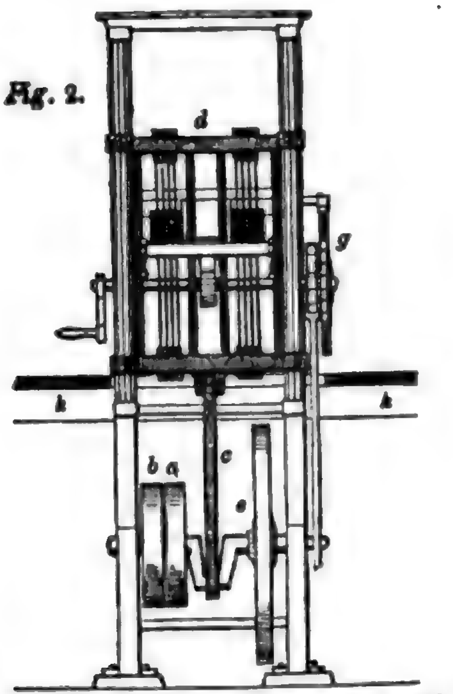


Fig. 2.



a shackle hanging on the upper cross-bar, and capable of being tightened by wedges. When it is desired to fix or tighten the saws, the saw-frame is raised to the highest point that the crank will allow, and held securely in that position while a steelyard, loaded to the degree necessary to produce the required tension, is connected with the shackle of each saw successively; and, while they are thus stretched, the wedges are pushed in by hand. The saws are kept parallel, and at the required distance apart, by placing between them, at top and bottom, pieces of wood of the thickness of the intended planks, with similar pieces outside, and then screwing the whole firmly together.

As the saws cut only in their descent, and the resistance to be overcome is therefore very unequal, it is necessary to add a fly-wheel, *e*, to the machine, and to load its periphery in such a manner as to produce as equable a motion as possible. Attempts have been made to introduce sawing-machines with two sets of saws, one of which should cut *upwards*; but they do not appear to have succeeded. A similar effect is sometimes produced by connecting two machines with one axle; the cranks being so adjusted that one saw-frame descends while the other rises. As some inconvenience may be occasioned by the common arrangement of a saw-mill, in which several machines are impelled by one engine, when the different quality of the wood to be cut, or other circumstances, may render various rates of speed desirable, it is proposed, in a patent obtained by Mr. M'Dowall, in 1836, to work each saw-frame by a separate steam-engine, the velocity of which might be regulated without interfering with the rest.

The balks of timber to be divided into planks, of which two are generally operated upon simultaneously, are represented in section in *Fig.* 2, and one of them in profile at *f f*, *Fig.* 1. They are supported by rollers, *h h*, and secured at the ends by suitable fastenings to a long iron carriage capable of passing through the saw-frame, and having a toothed rack along its under side. *g* is a ratchet-wheel, which by the intervention of a pall, connected with an eccentric on the main axle of the machine, is turned a little on its axis during each descent of the saw-frame. The axle of this wheel extends completely across the machine, and has a toothed pinion working into the rack on the under side of the timber-carriage, which is thereby moved a little in the direction indicated by the arrows in *Fig.* 1, at every downward stroke of the saws. Thus the carriage and balks of timber are propelled forward as fast as the wood is cut; and when the planks are completely divided, they are removed from the carriage, which is returned to its original situation, ready for the next operation, by turning a winch-handle on the end of the axis bearing the ratchet-wheel *g*, (the palls or detents of which are turned back to allow it to return); or, in some machines, by connecting the axle with the engine in such a manner as to obtain a reversed motion. In order to keep the balks of timber steady during the cut, their inner sides slide against polished steel plates fixed to the frame-work of the machine, against which they are pressed by rollers held in contact with their outer sides by weighted levers, one of which is shown at *i*, *Fig.* 1.

In the saw-mills erected at Woolwich by Brunel, to which allusion has been made before, a contrivance is added to allow the saw-frame to retreat backwards a little in its ascent, that the teeth may not touch the wood when not cutting. An American inventor, in a patent obtained about 1836, proposes to sharpen the back of about every third tooth of the saws to a knife-edge; the cutting-edges being alternately towards each side of the saw. By this means the saws, during their ascent, shave or as it were *plane* the cut surfaces, and leave them much smoother than when of the ordinary kind.

As in all reciprocating machinery, much power is lost in the apparatus just described, in consequence of the alternating motion. This circumstance also limits the speed of the saws, while the rapidity with which the work is performed is further retarded by the saws cutting in one direction only, one-half of the time being occupied in the ascent of the saw-frame to bring it into the position for making an effective stroke. These circumstances have led to the use of circular saws, which, by revolving constantly in one direction, require less power, and may be driven with far greater speed than reciprocating saws; while their continuous action not only expedites the operation of sawing, but also makes the motion of the machinery more uniform. Circular saws have therefore been very extensively applied to the more delicate kinds of sawing within the last thirty or forty years, although it does not appear to be known by whom they were first applied to the cutting of wood. It is said that circular saws were used for cutting the teeth of watch and clock wheels long before they were used for other purposes. Perhaps the most interesting kind of circular saw is that used for cutting logs of hard wood into veneers. Brunel, to whom England is indebted for many valuable improvements in this class of machinery, took out a patent in 1806 for a method of constructing very large circular saws by attaching several pieces of steel plate to a flanch of iron turned perfectly true. In this way saws have been made of as much as eighteen feet diameter; but such large saws can only be used for cutting veneers or very thin boards, which will easily bend so as to pass the flanch of the saw, which is necessarily of considerable thickness. *Figs.* 3 and 4 present side and end elevations of a circular veneering-saw, as used at the City Saw-Mills, to the proprietors of which, Messrs Esdaile and Margrave, the writer is indebted for the facilities so liberally accorded to him in the inspection of their interesting works. As in the former illustrations, the same letters refer to corresponding parts in each view of the machine. *a* is the saw, consisting of a

Fig. 3.

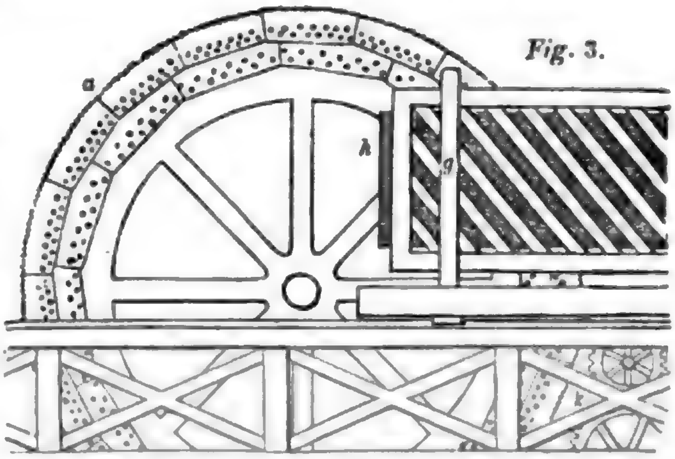
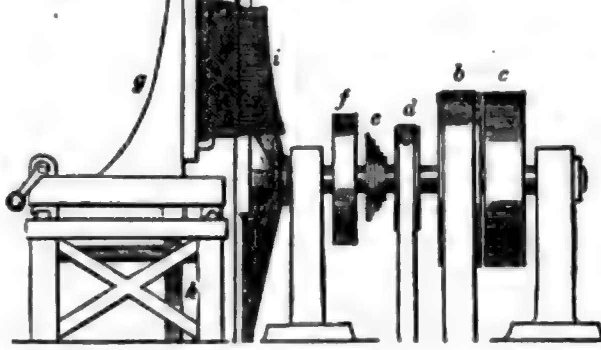


Fig. 4.



number of plates about twenty inches long, and from six to ten inches wide, secured by screws to another set of plates that are firmly attached to the flanch or foundation, which is of cast-iron, very thick in the centre, and tapering to a thin edge. The outer side of the flanch, or that along which the log to be cut has to pass, is made either quite flat or slightly concave. When the saw is very large, the lower part, as shown in the diagrams, passes through the floor of the room. The saw is mounted on one end of an axle, revolving in firmly secured bearings. *b* is a rigger fixed on the axle, to receive motion, by means of a broad strap, from the engine; and *c* a loose rigger, to which the strap is shifted when it is necessary to stop the saw. As the mere cessation of the moving power would not stop the machine as quickly as is desirable, a wooden wheel *f* is added, to the periphery of which an iron strap may be pressed by a lever so as to arrest its revolution, and bring the machine to a stand. The log to be cut, which is marked *h*, is fixed to a carriage *g*, which slides on a kind of railway elevated on a substantial framework. The under side of the carriage is supplied with a rack, working into a pinion at *k*, to which motion is imparted by a train of wheels, partly under the floor, and turned by a strap from the rigger *d*, on the axis of the saw; *e* is a wheel with several grooves of different diameters, by a band from which an apparatus (not shown in the cuts) is moved for regulating the velocity with which the carriage is propelled. By means of screws turned by a handle attached to the carriage, the log is made to project beyond the plane of the saw in a trifling degree; and then the attendant throwing the pinion *k* into gear, the carriage with the log upon it is steadily moved along its railway, while the thin and flexible veneer separated by the saw slides along the convex side of the saw-flanch at *i*. When the carriage has traversed the whole length of the log, the detached veneer is carefully removed, and the carriage brought rapidly back to its original situation by reversing the motion of the pinion; a process readily effected by means of a clutch-box beneath the floor, with a handle brought to a convenient situation for the attendant. The apparatus which imparts a transverse motion to the log is then again moved, so as to project the log sufficiently beyond the plane of the saw to allow another veneer to be cut off, and the same process is again gone through.

A stationary shield of thin brass is used to cover the saw on the convex side, at the point where the veneer turns out of the straight course to pass the flanch; and, when the wood is very brittle, another shield is used, pressing the outer side of the veneer, both to diminish the risk of its breaking, and to prevent bits that may be detached from it flying off against the face of the person attending the machine. Several minor contrivances, which it is unnecessary here to detail, are added for various purposes of convenience and safety. The axle, with its riggers, &c., are enclosed by boarding, and a boarded channel is usually made to receive the veneer. In some machines the veneer passes beneath the axle, and in others in a curved channel by its side, in which case it is not necessary to place the log either above or below the level of the axle. When large logs are to be operated on, they are secured to the carriage by iron clamps, or *dogs*; but when they are reduced to a thin slice, or *flitch*, they are glued to a wooden frame attached to the carriage, by which arrangement the saw will cut as long as there remains a sufficient thickness of wood to be divided; and, by softening the glue with hot water, the thin slice remaining on the frame may be detached. When the saw-plates are worn down by repeated sharpening, they are moved farther from the centre of the flanch, different rows of screw-holes being provided for that purpose. By a judicious arrangement of these holes, the plates may be used until one row is filed away, and they are reduced to about an inch and a half in width.

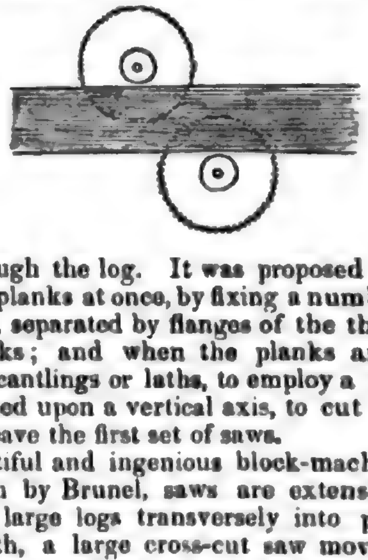
In the principal room for cutting veneers at the City Saw-Mills, there are eight saws, varying from eight to seventeen feet diameter, and revolving from seventy to ninety times in a minute. In erecting the mills the greatest possible care was taken to ensure solidity of base for the machinery; each saw having a separate foundation of brickwork. The necessity for such precaution may be readily conceived when the size of the saws is considered, and it is remembered that they are to cut from ten to fourteen veneers out of an inch of wood; and so completely has the desired solidity and steadiness been attained, that when the eye is brought into the plane of the largest saw while it is revolving its motion can scarcely be discerned. Logs of about five feet diameter have been cut by this apparatus. The writer was present during the conversion, or cutting up, of the largest log that had been placed on the carriage in one piece,—a log of Honduras mahogany, eighteen feet long and three feet one inch square; from which unbroken sheets were taken off at the rate of about ten to an inch, and so beautifully smooth as to require scarcely any dressing.

A patent was obtained by Mr. Craig, in 1831, for several contrivances for cutting veneers, in one of which a number of small circular saws are made to traverse the whole length of the log, which revolves slowly on its axis; so that, by the combined motion of the saws and the log, the whole piece of wood is converted into a continuous spiral veneer, resembling those produced by the celebrated veneer-cutting machinery used in Russia, in which a knife-edged instrument is used as a cutter. [WOOD-CUTTING MACHINERY.]

As before explained, large circular saws are only adapted for cutting very thin slices or boards; they are never used for cutting off a greater thickness than half an inch, and rarely so much. When, therefore, the piece cut off is too thick to be diverted from the straight line to pass the flanch of the saw, a saw of much smaller size, and formed of a single plate of steel, is used. Such a saw is usually mounted in a bench or table, under which the axle passes, and having a slit or opening through which the upper part of the saw projects. The saw is kept steady by means of two thick plates or flanges of iron, about one-third its diameter, one of which is screwed tightly up to each side of the plate. The true motion of the saw is sometimes further provided for by means of adjusting screws inserted in the bench, in such a manner as to confine the saw-plate very near its periphery. The piece of wood to be cut is laid on the smooth surface of the table, and pushed towards the saw by hand; its motion being directed by a moveable guide or rule screwed to the table, and capable of adjustment to any distance from the saw, but always remaining parallel to it. By inclining the surface of the table, or the axle of the saw, the wood may be cut to any require bevel; and by fixing two or more saws on the same axle, several pieces may be cut off simultaneously. Small circular saws, so mounted, are often moved by means of a treadle and crank, and, by a variety of ingenious modifications, may be applied to many useful purposes.

Circular bench-saws are occasionally used of three or four feet diameter, though they are generally much smaller; but, owing to the projection of their flanges, they will only cut through a piece of wood of about one-third their diameter. Among the suggestions made for applying the advantages of continuous motion without this inconvenience, is that of the late Mr. Smart, who did much in introducing and improving sawing-machinery. He proposed to use a long endless band of steel, stretched tightly between two rollers, and toothed on one edge; by which an effect would be produced similar to that of two straight saws, one always cutting downwards and the other upwards. A contrivance was patented in 1824, by Messrs. Sayner and Greenwood, by which timbers of large size may be cut by two circular saws, each cutting, as represented in *Fig*. 5, rather more than half through the log. It was proposed in this patent to cut several planks at once, by fixing a number of saws on the same axle, separated by flanges of the thickness of the intended planks; and when the planks are to be subdivided into scantlings or laths, to employ a series of horizontal saws fixed upon a vertical axis, to cut the planks as soon as they leave the first set of saws.

Fig 5.



In the beautiful and ingenious block-machinery erected at Portsmouth by Brunel, saws are extensively applied. For dividing large logs transversely into pieces of any required length, a large cross-cut saw moved backwards and forwards by machinery in a similar manner to the usual mode of working such by hand, is used; but for cutting smaller blocks a circular saw is employed, mounted in such a manner that it may be applied to any side of the log, the saw always continuing in the same plane. *Fig.* 6 represents the contrivance by which this is effected, omitting every part not essential for explaining the manner in which the saw is moved. *a* is the log to be cut, supported on a frame which allows the saw to be brought in contact with the log in any direction; *b* the saw, fixed on the end of an axle supported by a swinging frame, pivoted at *c* to the end of another moveable frame vibrating on an axis at *d*. The motion is communicated by a strap passing over guide-wheels near the axis *d*, to a wheel on the axis *c*; and from a second wheel on the axis *c*, also by an endless band, to a wheel on the axis to which the saw is attached. *e*, *e*, are two small wheels made to press against the last-mentioned band when it is necessary to tighten it. *f* and *g* are rods used to guide the saw-frame, the former affecting its motion horizontally and the latter vertically; these rods being moved by racks attached to them, working into pinions turned by the handles *h* and *i*. When the log is properly adjusted, the attendant, by moving the handles *h* and *i*, brings the saw successively in contact with each of its sides; and thus, as it will cut in any direction as far as the centre of the log, it will divide a piece of wood of nearly its own diameter. This apparatus is used for cutting elm for the shells of the blocks, and a somewhat similar contrivance is adopted for dividing lignum vitæ into suitable pieces for the sheaves. In it the saw is placed horizontally, its axle being vertical, and attached to a frame which moves on a vertical axis, like a door on its hinges. The log, which is placed vertically, is made to revolve slowly, so as to present every side to the saw, which is pressed against it by a lever attached to the frame. Of these and several other sawing-machines a very full description is given by Farey, in his account of the block machinery, in Rees's 'Cyclopædia,' art. 'Machinery.'

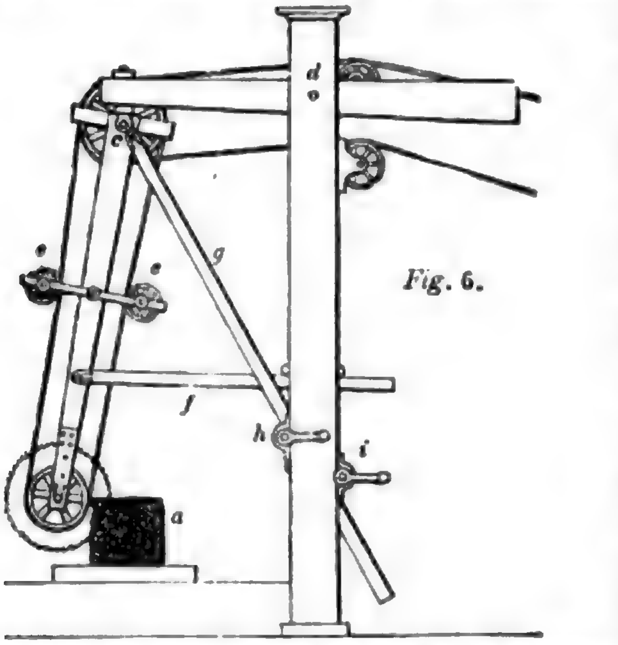
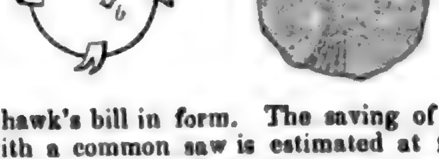


Fig. 6.

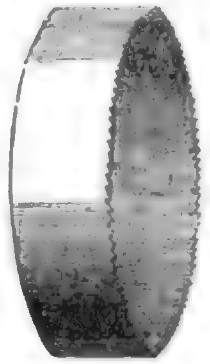
Mr. Eastman, of the United States, patented some curious modifications of sawing machinery about 1824. He found that when a circular saw is propelled with great velocity, it will cut much more smoothly and easily if it have only a few teeth placed at equal distances round its circumference than if, as usual, its periphery be full of teeth. *a*, *Fig.* 7, represents this kind of saw, which has four cutting instruments called *section teeth*, each consisting of two teeth resembling a hawk's bill in form. The saving of labour as compared with a common saw is estimated at full three-fourths, and it is stated that, when driven at a proper speed (which is from a thousand to twelve hundred revolutions per minute), it will cut nine or ten inches in depth into the hardest white oak timber with the greatest ease. Mr. Eastman contrived these saws for cutting up timber in an unusual way, not through the log, but from the circumference to the centre; so that the cuts form the radii of a circle, and the planks or boards produced are thicker at the outer than the inner edge. *c*, *Fig.* 7, is an end view of the log, showing a few cuts of the saw. It is laid on a carriage which moves it towards the saw, and is so fixed that at the conclusion of one cut it turns a little upon its axis to prepare it for the next. To make the outer edges of the planks smooth and uniform, a pair of teeth called *sappers* (marked *b*, *b* in the cut) are screwed to the side of the saw; and these remove one or two inches of the sap or soft outer wood from each plank. When the log is of sufficient size, a second set of cuts may be made, after removing the planks formed by the first operation. The boards cut by this machinery are much used for covering buildings, for which their feather-edged form especially adapts them; and they are found to withstand the influence of the weather far better than others; a circumstance readily accounted for by the fact, which may be observed in a stick of timber that has been exposed to the weather, that all cracks caused by shrinkage tend towards the centre of the tree, or in the direction in which these boards are cut.

Fig. 7.



All the varieties of apparatus that have been described are for the purpose of making *straight* cuts; but it is sometimes desirable to produce *curved* forms by sawing, for which purpose there are several ingenious contrivances. In 1806 the Society of Arts rewarded Mr. Trotter for the invention of a concave circular saw, resembling a watch-glass in form, which was mounted in a bench like the common bench-saw, and to which the wood was directed by curved guides. Many useful forms are cut by a saw consisting of a cylinder of steel, toothed on the edge, as represented in *Fig.* 8. Such saws, which are called crown or curvilinear saws, or, from their resemblance to the saws used in the operation of trepanning, *trepan* saws, are used for cutting circular pieces of wood to form the sheaves of blocks; and, when of larger dimensions, for cutting chair-backs, felloes of wheels, curved brush-handles, &c. For these purposes they are sometimes used as much as five feet in diameter. In the machine patented by Mr. Dodds, in 1835, an arrangement resembling the common reciprocating saw-mill is applied to curvilinear sawing, by causing the carriage on which the timber is supported to deviate from the straight course, and follow the curvatures of a model of the required form; while the saws, being attached to the frame by pivots, are capable of adapting their position to the curve. This machine is applicable in many cases in which neither of the preceding would be available; and, by using several saws, many pieces of wood may be cut together.

Fig. 8.



SAXE, MARSHAL. MAURICE, COUNT OF SAXONY, was the natural son of Augustus II., king of Poland and elector of Saxony, and of the countess of Kœnigsmarck, a Swedish lady of high rank. Maurice was born at Dresden, October 19, 1696. In 1708, when only twelve years old, he served in the army of the allies under the count of Schulembourg before Lisle; in 1709 he had a horse shot under him at the siege of Tournay; and he was at the battle of Malplaquet in the same year. His father soon afterwards gave him a regiment of cavalry, with which he fought against Sweden, and was at the taking of Stralsund. When he was only fifteen years of age his mother got up a marriage between him and the heiress of the counts of Loben, a German lady, who was about the same age.

When Prince Eugene was besieging Belgrade he was joined by Maurice of Saxony, who, when the campaign was terminated, returned to Dresden, and after a short stay repaired to Paris (1720), where he was introduced to the duke of Orleans, then regent, who received him in the most flattering manner, and conferred on him the title of Mareschalde-Camp. On his return to Dresden to ask his father's permission to accept the dignity, he contrived to separate himself from his wife by procuring a divorce. No blame is imputed to her except jealousy, for which there was no doubt sufficient cause, constancy in his attachments to the other sex being by no means one of the characteristics of Maurice. He soon returned to France, and took the command of a regiment, which he manœuvred according to a plan of his own, and for which he received the praise of Folard. He continued for a considerable time to study mathematics and the art of attacking fortified places under that skilful tactician.

In the year 1726 Maurice of Saxony set out for the north, in the hope of being elected duke of Courland through the interest of his father. By the exertions of Anna Iwanowna, duchess of Courland (widow of the duke Frederic-William, who died in 1711), who had conceived an attachment to him, his election was carried, though there were other candidates, and he was opposed by the czarina Catharina I., who sent Menzikoff to seize him in Mitau; but he defended himself in the palace, and the Russians retired. The Russian influence was then used in the Polish diet, which, in virtue of its right of suzereignty, summoned him to appear before them, but he refused to do so, and the diet in consequence signed his proscription. He attempted to defend himself in his territory, but the Russians forced him to flee, and he escaped to France with nothing but his diploma of election. In 1728, after the death of Catharina I., the duchess of Courland, whose attachment to him continued, invited him to return, which he did, and there is little doubt that she would have made him her partner on the throne of the czars, to which she was elected in 1730, if she had not previously discovered a glaring instance of his inconstancy, whereupon he was immediately dismissed. He then returned to Paris, and afterwards repaired to Dresden. His father, Augustus II., died in 1733.

War having been declared between France and Austria in 1733, Maurice of Saxony repaired to the court of Versailles to solicit employment, and he was sent to the army of the Rhine, commanded by the duke of Berwick. He distinguished himself at the siege of Philipsburg, and was appointed lieutenant-general at the peace of 1736. He now returned to Dresden for the purpose of prosecuting his claim to the dukedom of Courland, but failing in this attempt, he went again to Paris, and devoted himself to the study of the art of war and to the completion of a work on which he had employed himself for some time, and which he called 'Mes Rêveries.'

On the death of the emperor Charles VI. in 1740, a general war broke out. Louis XV. sent an army into Bohemia under the marshal of Belle-Isle, the left wing of which was confided to the Count of Saxony, who was charged with the investment of Prague (1741), which he took by assault in a few days, and with equal rapidity the fortress of Egra. He was afterwards appointed to the command of the army of Bavaria, and displayed equal skill in defensive warfare as in offensive. He was also employed in the defence of Alsace, when he was suddenly summoned by Louis XV. to assist in placing Prince Edward the Pretender on the throne of his ancestors, but he had scarcely reached Dunkirk when a tempest destroyed a part of his squadron, and the rest was blockaded by an English fleet. Maurice returned to Versailles, and Louis bestowed on him the staff of a Marshal of France (March, 1743).

In 1744 Louis XV. entered Flanders with an army of 80,000 men, the left wing being under the command of Marshal Saxe, who was appointed to cover the sieges which were to be undertaken by Marshal Noailles under the immediate inspection of the king. Menai, Ypres, and Furnes were quickly gained, when news was brought that Prince Charles had entered Alsace. The king and Marshal Noailles hastened to its defence with the greatest part of the troops, leaving Marshal Saxe alone in Flanders to act on the defensive against an army three times as numerous as his own; he maintained his position however with consummate skill, keeping the allies continually in check, and retaining the conquests which had been made at the beginning of the campaign.

In 1745 Louis XV. returned to Flanders with a large additional force, amounting, with that already in Flanders, to 100,000 men, of which Marshal Saxe was now appointed general-in-chief, Marshal Noailles consenting to act under him. On the 22nd of April, 1745, the campaign was opened by the siege of Tournay. The allies advanced to its support with 45,000 men, English, Hanoverians, and Dutch. Marshal Saxe was suffering under dropsy, and underwent the operation of tapping on the 18th. Notwithstanding, he advanced to oppose the allies with a force not exceeding theirs, he himself being obliged to be borne in a litter. On the 11th of May he was attacked near the village of Fontenoy, where he had put himself in position. The English and Hanoverians advanced to the attack of his redoubts in a dense column, and for awhile bore everything before them, sustaining repeated attacks of cavalry and the steady and uninterrupted fire of the French infantry with a determination which seemed to make victory certain. But the perseverance of Marshal Saxe at length prevailed; the Dutch kept aloof, and four large pieces of artillery being also brought to bear upon the English column, it was at length compelled to give way, and defeat followed. The French victory at Fontenoy, one of the most memorable of the eighteenth century, was soon followed by the conquest of all Belgium. The conqueror of Fontenoy was presented by Louis XV. with the château of Chambord, and 100,000 francs of annual revenue arising from the estate. Tournay, Ghent, Bruges, Oudenarde, Ostend, Brussels, Mons, Charleroi, and Namur were all taken between May 23, 1745, and Sept. 19, 1746.

In the campaign of 1747 Marshal Saxe took Lafeldt after a hard-fought battle (July 2), which he followed up by the conquest of Bergen-op-Zoom, and in 1748 by that of Maastricht. The allies now made overtures of peace, which was definitely settled at Aix-la-Chapelle in the same year.

Marshal Saxe survived about two years to enjoy the honours which were lavishly showered upon him. He died November 30, 1750.

Marshal Saxe's work, 'Mes Rêveries,' was published in 1757, 5 vols. 4to. It is a work on military affairs, which is said to contain a good deal of valuable matter mixed up with many assertions which cannot be relied on. It was translated into English by Sir William Fawcett, 'The Reveries; or, Memoirs upon the Art of War, by Field-Marshal Count Saxe; translated from the French,' 1757, 4to.

Marshal Saxe was a soldier, and 'a ripe and good one,' but nothing more. When at the height of his reputation, the Académie Française absurdly offered to make him a member, which he had the good sense to decline, for though he had great knowledge of his art and of all matters connected with it, his literary acquirements would have done no honour to that learned body, if we may judge from the following specimen of his orthography given in the 'Biographie Universelle:' 'Ils veule me fere de la Cademie; sela miret come une bage a un chas.' The Marshal was a man of large size and extraordinary personal strength.

(*L'Art de vérifier les Dates; Biographie Universelle.*)

SAXE-ALTENBURG, a small duchy on the northern frontiers of the Thuringian Forest, consists of two principal divisions; the eastern along the banks of the Pleisse, and the western, which is traversed by the Saale. The two parts are separated by the intervening territory of Reuss. The eastern is bounded on the north-east and south-east by the kingdom of Saxony, on the south-west by Weimar, on the west by Reuss, and on the north-west by Prussian Saxony; the western division is bounded on the north by Prussian Saxony, on the east by Reuss, on the south-east and west by Weimar, and on the south-west by Coburg and Schwarzburg. The duchy lies between 51° and 53° N. lat., and 11° and 13° E. long. The area is 483 square miles. The climate is mild and salubrious. The country is hilly, richly wooded, and fertile. It is also favourably situated for commerce, and on the whole it is one of the most flourishing and best cultivated of the German states. The hills in the eastern division are gentle undulations, and covered with forest-trees, those in the western chiefly with pines. The highest points, the Dolenstein near Kahla, and the Buchberg, are however not above 1000 feet high. Insulated branches of the Thuringian Forest run north-east as far as the duchy of Altenburg, where the valley of the Saale separates them from the low hills of the duchy. The rivers, which are very inconsiderable, and all tributaries of the Elbe, are the Saale, with the Orla and Roda, and the Pleisse, which is properly the river of the country, with its small tributary streams the Sprotta and Gerstenberg. There are several large lakes and also mineral springs, the most celebrated of which is that at Ronneburg. The soil is highly favourable to the cultivation of corn (particularly rye and wheat), pulse, potatoes, rape-seed, flax, and hemp. The natives of Altenburg excel the other Saxons in agriculture, and are considered inferior only to the farmers of Holstein and Belgium. They also pay much attention to the rearing of cattle; their sheep are of a superior breed, and the horses of a remarkably strong make; swine are abundant, also wild-boars, and deer. Fruit is very plentiful, and much improved since the establishment of an horticultural society. There are but few minerals. Attempts are now making to work the iron-mines in the vicinity of Ronneburg; the extensive peat-fields near Altenburg yield abundance of fuel. A very fine porcelain earth is also found in the neighbourhood of Altenburg, which supplies the famous porcelain manufactory at Gotha. Manufacturing industry is chiefly confined to woollen cloths, stockings, and wooden-wares. There are considerable tanneries at Altenburg, Kahla, Eisenberg, and Lucka. The articles of export are corn, cattle, wool, butter, and timber.

The duchy contained, in 1838, a population of 121,590, of whom 71,519 were Wends, who are distinguished by their pecular costume and manners. The inhabitants profess the Protestant religion, and the number of Roman Catholics does not exceed 200. The duchy contains 8 towns, 2 market-towns, 458 villages, and 19,856 houses. With regard to education, Jena is the common university of Altenburg and the other Saxon duchies. There is a gymnasium at Altenburg, a lyceum at Eisenberg, six town schools, besides several preparatory and Sunday schools, a seminary for schoolmasters, a school of design, another for arts and mechanics, a foundation for noble ladies, and some scientific associations.

The duke of Saxe-Altenburg is a member of the Germanic Confederation, and has one vote. By the new constitution of 29th April, 1831, the States, which assemble every four years, consist of three classes, but all the twelve delegates, under a president nominated by the duke, form only one chamber.

Altenburg, like all the country between the Saale and the Mulda, forms part of the antient Osterland, and appears from a very early period to have been under the margraves of Meissen. After numerous changes of masters, it was formed into a separate principality in 1603, when duke John of Weimar, grandson of John Frederic, the unfortunate elector of Saxony, divided the hereditary dominions with the son of his deceased brother, Frederic William I., to whom he gave Altenburg, while he himself retained Weimar. On the extinction of the house of Altenburg in 1672, the larger portion reverted to Ernest the Pious, duke of Gotha. From this period the principality of Altenburg was governed by the family of Saxe-Gotha, till it expired in the person of Frederic IV., in February, 1825. By the territorial compact among the three junior branches of the house of Gotha, viz. Meiningen, Hildburghausen, and Coburg, the duke of Hildburghausen, on the 15th November, 1826, resigned his own territories to Meiningen, and received in lieu the duchy of Altenburg, with the exception of the districts of Eisenberg and Kamburg. The only towns in this duchy with more than 4000 inhabitants are:—1, Altenburg, which has 13,763 inhabitants. 2, Ronneburg, a walled town, containing a ducal palace, two churches, and above 5000 inhabitants, who subsist by agriculture, mechanical trades, manufactures of woollen cloths, pottery, porcelain, and leather. Near the town there is a mineral spring which is much frequented. Black chalk for drawing is found in the neighbourhood. 3, Eisenburg, which is situated on a considerable eminence. It is surrounded with walls, has four gates, and a palace, which is generally the residence of the dowager-duchess. It has three churches, an observatory, a town-hall, a poorhouse, and 4465 inhabitants, who manufacture woollens, ribbons, leather, porcelain, household furniture, and carriages, with which they carry on a considerable trade. [ALTENBURG.]

SAXE-COBURG-GOTHA, a duchy in the southern part of Thuringia, is composed of two large and various smaller detached portions, which are surrounded by the territories of Prussia, Schwarzburg, Sonderhausen, Weimar, Electoral Hesse, Meiningen, and Bavaria. The principality of Coburg lies between 50° 8′ and 50° 23′ N. lat., and between 10° 49′ and 11° 14′ E. long., and that of Gotha between 50° 38′ and 51° 20′ N. lat., and between 10° 15′ and 11° 2′ E. long. The area of Coburg is about 200 square miles; that of Gotha about 590: making a total of about 790 square miles. The country, though occasionally level, especially in the south of Coburg, is on the whole of a mountainous character, more particularly in the south part of Gotha, which is traversed by a large portion of the Thuringian range, of which the loftiest points are, the Schneekopf, 3113 feet, the Inselberg, 2947 feet, and others of nearly equal elevation. This chain, extending in a south-easterly direction from Eisenach through Gotha to the frontiers of Reuss, where it receives the name of Frankenwald, is on the whole nearly 70 miles in length and from 4 to 6 in breadth. It runs nearly to the Saale, where it is divided by the valley of the Rodach from the Fichtelgebirge, and is for the most part covered with pine and fir. A little corn is cultivated, and there are some rich pasture-lands. This mountain-chain contains gold, silver, copper, and a large quantity of iron, lead, arsenic, and cobalt.

The rivers are tributaries of the Main, the Weser, and the Saale. The rivers of Coburg are the Itz, Steinach, Rodach, and Nasslach; those of Gotha, the Hörsel, with the Emse, Ruhl, and Nessa, the Unstrut, Gera, and Apfelstedt.

Agriculture is the principal occupation of the inhabitants, especially in the low lands, which yield abundance of corn, hops, vegetables, carrots for the making of sugar, flax, anise, carraway, poppy, and canary seed, and excellent fruit. The forests yield timber, potash, and pitch.

The rearing of cattle is prosecuted with much activity; the sheep are generally of the Merino breed, and the horses strong and of a good make; swine and poultry, particularly geese, are plentiful. Iron is found near Friederichsstadt; there are also coals, sandstone, millstones, marble, alabasters, gypsum, lime, potters'-clay, porcelain-earth, and salt There is considerable manufacturing industry in Gotha, but little in the other districts; the chief articles are linen-yarn, ticking, twills, woollens, and cottons; tar and lampblack; also manufactories of iron, steel, starch, tobacco, whitelead, soap, paper, porcelain, copper and iron utensils, and glass.

The exports are—from Gotha, timber, pine and other wood seeds, wool, coriander and anise seed, and oil, pitch lampblack, peat, linen and cotton goods, metal and wooden wares; from Coburg, cattle, butter, linen, and wool. In addition to the exports, the duchy has a considerable transit trade, as the high road from Leipzig to Frankfort passes through it.

The population of Coburg is 41,000, and that of Gotha 96,658; making a total of 137,658, of whom 134,220 are Lutheran Protestants, 2238 Roman Catholics, and 1200 Jews. It contains 9 towns, 10 market-towns, 429 villages, and 23,950 houses.

Saxe-Coburg participates in the joint proprietorship of the University of Jena, and has 4 gymnasia, 2 institutions for schoolmasters, 1 for commerce, 4 for design and mechanics, besides several hundreds of town, village, and Sunday schools.

The principality of Coburg has had a representative constitution since 1821, composed of 17 delegates; Gotha has had its chamber of representatives from an early period, which differs in its nature and arrangement from that of Coburg.

Coburg formerly belonged to the counts of Henneberg, but came by marriage into the Ernestine branch of the house of Saxony. On the death of the unfortunate elector John Frederic, his territories were divided between his sons, and after the extinction of his house it reverted first to the princes of Altenburg, and upon their dissolution to Ernest the Pious, duke of Gotha, whose second son Albert inherited the principality of Coburg, while his seventh son John Ernest, who received some districts in the principality of Altenburg and Saalfeld, became the founder of the line of Coburg-Saalfeld, after very long and severe contests among the different ducal branches of the house of Gotha. His two sons, who reigned jointly, removed the seat of government to Coburg, and it was governed by their descendants till 1806, when Napoleon took possession of it, because Duke Ernest, who had just succeeded his father, was absent in the Russian service. He was reinstated at the peace of Tilsit, and as an acknowledgment for the active share he had taken in the liberation of Germany, he received, in 1816, a considerable accession of territory in the principality of Lichtenberg, with 20,000 inhabitants, which he however ceded to Prussia in 1834, in consideration of an annual rental of 80,000 dollars. On the territorial division of the duchy of Gotha-Altenburg, in 1825, Coburg resigned its possessions on the left bank of the Steinach in exchange for the principality of Gotha, with the exception of a few smal districts: it also obtained Königsberg and Sonnefeld from

Hildburghausen, and Kahlenberg and Gauerstadt from Meiningen.

The house of Gotha, properly so called, commenced in 1640. Upon the defeat of the famous elector John Frederic (who was of the Ernestine line) by Charles V. at the battle of Mühlberg, in 1547, the electoral dignity was transferred to the Albertine branch, and John Frederic afterwards received as a compensation various districts in Southern Thuringia. His son fixed his residence at Gotha, and his grandsons became the founders of the four houses of Coburg, Eisenach, Altenburg, and Weimar. On the extinction of the two first in 1640, their lands were divided among the surviving branches. Ernest the Pious received that portion in which Gotha was situated; he considerably augmented it by inheritance, and caused it to be erected into an independent principality by the German Diet. He promoted the welfare of his subjects, and restored order and tranquillity in his dominions, which had been desolated by the Thirty Years' War. He directed by will that his territories should continue undivided, and be governed jointly by his seven sons; but finding such an arrangement impracticable, they agreed to separate them, and formed seven distinct houses. The eldest son, Frederic I., had Gotha and other neighbouring districts as his portion, and to prevent a similar partition, he established the law of primogeniture. His successors were great promoters of the arts and sciences, and laid the foundation of many noble collections. On the death of the last lineal descendant, in February, 1825, the duchy of Gotha was divided among the dukes of Saxe-Meiningen, Hildburghausen, and Coburg, the last having as its share the principality of Gotha, but it still retains its antient and peculiar constitutional and political laws and customs. The only towns with more than 5000 inhabitants are, Coburg with 9076 and Gotha with 13,838 inhabitants.

SAXE-LAUENBURG. [LAUENBURG.]

SAXE - MEININGEN - HILDBURGHAUSEN, a duchy composed of the antient duchy of Meiningen, the principalities of Hildburghausen and Saalfeld, the districts Themar, Römhild, Kranichfeld, and Kamburg, with seven villages from Coburg, which (with the exception of the newly acquired districts from Gotha and Altenburg) form one compact territory, extending in a semicircle along the banks of the Werra, and skirted by the chain of the Thuringian Forest. It lies between 50° 13′ and 50° 58′ N. lat. and 9° 57′ and 11° 54′ E. long., and has an area of nearly 882 square miles, of which Hildburghausen occupies 194 and Saalfeld 171 square miles, and it is enclosed by the territories of Bavaria, Coburg, Reuss, Weimar, Schwarzburg, Electoral Hesse, Gotha, and Eisenach. Being situated between the Thuringian and Fichtel chains, the character of the surface is mountainous: the loftiest points are the Bletzberg, 2760 feet high, the Kieferle, 2598, the Gerberstein, 2184, the Geba, Dolmar, &c. of nearly equal elevation. Their valleys supply rich pasturage to numerous flocks and herds; they also contain many curious caverns, of which the most remarkable are the Zinselloch, the Griebisch, and the Altensteinerhöhe.

The principal rivers are, the Werra, which, with many tributaries, traverses the whole duchy; the Saale, Itz, Rodach, Milz, and Steinach; the vales of some of these rivers are very picturesque. There are mineral springs near Liebenstein and Salzungen, and salt springs near Friedrichshall and Neusulza. Notwithstanding its limited extent, there is a marked difference in the climate of the high and low lands; in the former, which is one complete mass of mountains, the winter is very severe, while in the latter it is mild. The productions are those of central Germany—grain of all kinds, fruits, vegetables, rapeseed, tobacco, timber, which is the staple of the country, game, fish, poultry, and honey. Among its mineral products are freestone and sandstone, slate, marble, porcelain and potters'-clay, bole, fullers'-earth, flint, gold sand from the Werra, copper, lead, iron, sulphur, cobalt, salt, coals, pitch, tar, lampblack, vitriol, alum, and basalt.

Agriculture is the most important branch of industry, though some of the districts do not raise sufficient corn for their own consumption; fruit is cultivated to a great extent; cattle and sheep of the improved breeds are reared in all the districts; there are also large flocks of goats.

There is considerable manufacturing industry, particularly in the highlands and in the principality of Saalfeld, where there are many furnaces, works, mills, and glass-houses. The ordinary manufactures are coarse linens, sail-cloth, woollens, and cottons; there are also distilleries, breweries, and tan-yards. The exports are wood, of which above 1000 floats are annually sent by the Werra to Münden, sheep, horned cattle, tobacco, wool, leather, butter, yarn, pitch, potash, tar, Sonnenburg toys, in which a large trade is carried on, woollens, glass, porcelain, and paints.

The University of Jena, being founded for the use of the states of the Ernestine line, is open to Meiningen, which also possesses a share in the mutual gymnasium at Schleusingen, besides having a gymnasium at Meiningen and Hildburghausen. There is a grammar-school at Saalfeld, one school for teachers, one for forest economy, and above 200 town and village schools.

The population of the duchy and its dependencies is 144,294, of whom 140,200 are of the established Lutheran religion, 394 of the Reformed, 450 Roman Catholics, and 1030 Jews. It contains 23 towns, 17 towns having annual fairs, and 431 villages. The principal towns are—Meiningen, with 6000 inhabitants; Saalfeld, 4300; Hildburghausen, 3500; Pösneck, 3500; Sonneberg, 3480; and Eisfeld, 3000.

The duchy of Saxe-Meiningen formerly constituted a part of the domains of the counts of Henneberg, and having passed by marriage to the house of Saxony, it came, after various territorial divisions, into the possession of Ernest the Pious, duke of Gotha. On the division of his extensive dominions among his seven sons, Bernhard, his third son, became the founder of the line of Meiningen in 1680. His three sons reigned jointly, a custom which continued in this family till the time of Duke George, who, on the death of his brother, introduced the law of primogeniture in 1800. He was succeeded in 1803 by his infant son Duke Bernhard, who, under the guardianship of his mother, joined the Confederation of the Rhine in 1806, and the allies in 1813. Duke Bernhard has introduced many salutary reforms in the civil and judicial administration. On the extinction of the house of Saxe-Gotha-Altenburg, in 1826, Meiningen received a considerable accession of territory in the principalities of Hildburghausen and Saalfeld, seven villages in Neustadt, also Themar, part of Römhild, Kamburg, Eisenberg, and Kranichfeld, with the exception of some minor districts, giving up at the same time Kahlenberg and Gauerstadt.

Hildburghausen was founded by Ernest, sixth son of Ernest the Pious, in whose family it continued till 1826, when, by a family compact among the junior ducal houses, the reigning duke Frederic exchanged it for the duchy of Altenburg; since this period it has merged into the duchy of Meiningen, with the exception of a few districts which were ceded to Coburg.

SAXE-WEIMAR-EISENACH, a grand-duchy on the northern frontiers of the Thuringian Forest, consists of the two principalities of Weimar and Eisenach, which are separated by Saxe-Gotha, and of the insulated district of Neustadt, besides various detached portions. Weimar lies along the banks of the Saale, and Eisenach on those of the Werra near the Thuringian and Rhön mountains. It extends from 50° 25′ to 51° 27′ N. lat. and 9° 53′ to 12° 18′ E. long., over an area of about 1404 square miles (of which Weimar occupies about 966 and Eisenach 445), and is bounded on the north and north-east by Prussian Saxony, east and south-east by Altenburg and Reuss, and south and west by portions of Schwarzburg, Coburg-Gotha, Meiningen, Bavaria, and Electoral Hesse.

Except in the district of Neustadt, the soil is rich and well adapted to agriculture, wherever the gently undulating hills do not rise into mountain-ridges, but the most elevated point, the Gikkelhahn near Ilmenau, does not attain a height of more than 2700 feet. The climate of the mountain-region is very bleak, but the valleys and the level districts are mild and agreeable.

The principal rivers are,—the Saale, Ilm, Elster Orla, Unstrut, and Gera, in Weimar, and the Werra, Hörsel, Nessa, Ulster, and Felda in Eisenach, which are all tributaries of the Elbe and Weser. There are mineral springs near Berka and Ruhla.

There is a considerable diversity in the three districts of Weimar, Eisenach, and Neustadt. Weimar is entirely agricultural, and in favourable years raises more corn than is required for home consumption; though Neustadt grows a good deal of grain, yet in bad seasons it is liable to scarcity; Eisenach, which is extremely mountainous, is dependent for food either upon the other districts or else upon its own abundant crops of potatoes.

The chief productions are wool, which is the staple article of commerce, grain of all kinds, vegetables, fruit, flax, hemp, rapeseed, hops, a small quantity of wine, pitch, tar, and lampblack. The mineral productions, which are very sparingly wrought, are manganese, alabaster, gypsum, porcelain and potters' clay, basalt, sandstone and freestone, iron, and salt. Peat is also dug in some parts of the country. The rearing of cattle forms an important branch of industry; the horned cattle are mostly reared in Neustadt; and sheep of an improved breed in Weimar.

Manufactures make little progress; Eisenach possesses the greatest number, such as woollens, coarse linens, and stockings; there are a few potteries, porcelain manufactories, and paper-mills. The exports are wool, woollen, linen and cotton goods, stockings, hats, pottery, potash, ironware, dried fruits, juniper berries, and game.

The population of Saxe-Weimar-Eisenach, in 1838, was 245,813, of whom 227,398 belonged to the established Lutheran church, 6679 to the Reformed, 10,330 to the Roman Catholic, and 1406 to the Jewish persuasion. It is now 248,498, of whom 174,937 live in the country, and 73,561 in the 33 towns, the principal of which are WEIMAR, with 11,485 inhabitants; EISENACH, with 9340; JENA, with 6004; and APOLDA, with 4236 inhabitants. There is a university at Jena with 433 students, two gymnasia, three upper schools, and above 500 town and village schools; two institutions for training schoolmasters, one blind and one deaf and dumb asylum, a school for forest economy, free schools of industry, &c., besides many literary and scientific institutions. The court of Weimar has long been celebrated for its liberal encouragement of the fine arts, which has diffused a cultivated taste among the natives of Weimar, and attracted the most eminent literary characters of Germany, among whom were Herder, Wieland, Schiller, Göthe, and others.

The frequent subdivisions of the Ernestine ducal Saxon houses render their history extremity intricate. Like all its cognate branches, the line of Weimar boasts its descent from the illustrious John Frederic of Saxony, who, on being deprived by Charles V. of his electoral dignity and dominions, had certain territories assigned to him in Thuringia. The founder of the house of Weimar is John, who was born in 1570, and whose original patrimony has been considerably augmented by purchase and the extinction of some of the collateral branches. His sons took a very prominent part in the Thirty Years' War, and the name of Bernhard of Weimar is inseparably interwoven with its history. Duke Ernest Augustus, in order to secure the integrity of his dominions, introduced the law of primogeniture, which was confirmed by the emperor in 1724; in 1741 he inherited Eisenach and Jena, on the death of Duke William Henry of Saxe-Eisenach without male issue. He died in 1748, leaving his son a minor. This son, dying in 1758, left an infant son Charles Augustus under the guardianship of his widow, Anna Amelia of Brunswick, a princess of distinguished talents, which she devoted to the advancement of the general interests of her states, and laid the foundations of the literary celebrity of Weimar. Charles Augustus, following the example of his mother, made his dominions the centre of German arts and sciences. He took an active share in the wars of Prussia against France, but after the unfortunate battle of Jena was compelled to join the Confederation of the Rhine in 1806; on the victory of Leipzig however he united himself to the allies and undertook the command of an army in the Netherlands. At the Congress of Vienna, he received an accession of territory with 77,000 subjects, and the dignity of grand-duke, which gives him claim to the title of royal highness. In 1816 he gave his people a representative constitution, and secured their affection by his paternal administration. He was succeeded in 1828 by his son Charles Frederic. [APOLDA; EISENACH; JENA; WEIMAR.]

SAXE-WEIMAR, BERNHARD, DUKE OF, born at Weimar, Aug. 16, 1600, was the fourth of the seven sons of John, duke of Saxe-Weimar. As all the important circumstances of his life are connected with the Thirty Years' War in Germany, the detail of them will be most clearly understood when viewed in connection with the other leading events of that great contest. [THIRTY YEARS' WAR.] We shall only give here a brief statement of the leading facts of his career, with the addition of the sketch of his character drawn by Schiller

After the battle of Prague, Nov 8 1620, Bernhard served in the army raised by the margrave of Baden-Durlach for the purpose of assisting Frederick V., king of Bohemia and elector palatine, to support himself after the loss sustained in that disastrous affair. In 1623 he commanded a regiment of infantry in the army of Duke Christian of Brunswick; and in 1625, and again in 1627, he was placed at the head of a regiment of cavalry in the Danish army raised by Christian IV. in support of the Protestant union. After the alliance between Louis XIII. and Gustavus Adolphus, Jan. 13, 1631, he joined the latter, who promised him the bishoprics of Bamberg and Würzburg, with the title of duke of Franconia. Bernhard distinguished himself at the siege of Würzburg, in forcing the passage of Oppenheim, and in the Palatinate, where he took Mannheim by stratagem, and forced the enemy from all his posts in that quarter. Gustavus afterwards appointed him to the command of an army designed for the conquest of Bavaria, with which he advanced as far as the mountains of the Tyrol, obtained possession of the three fortresses of Ehrenburg, the keys of that country, and put the emperor in fear for his Italian states. Gustavus however recalled Bernhard to assist him against Wallenstein, and shortly afterwards they fought together at the battle of Lützen, Nov. 16, 1632; and when Gustavus fell, the duke of Weimar took the command, and forced the enemy to retreat, and shortly afterwards drove the Imperial army out of Saxony. The Swedish army was afterwards divided into two parts by the chancellor Oxenstierna, and placed under the command of Marshal Horn and Bernhard of Weimar. Bernhard besieged and took Ratisbon, which however was afterwards retaken by the Imperial army, July 29, 1634, and Bernhard and Horn were afterwards defeated at Nordlingen, Sept. 7, 1634, owing to the impatience of the duke of Weimar to give battle without waiting for the arrival of reinforcements. On the 6th of October, 1635, Bernhard concluded a treaty of alliance and subsidy with the king of France. He was occupied for a considerable time in a series of less important affairs, and in quelling the mutinous spirit of the German armies, by procuring, through the agency of Oxenstierna, a portion at least of the arrears of pay. On the 3rd of March, 1638, he gained the great victory of Rheinfelden, and obtained possession of the fortress on the 22nd of March. He afterwards besieged Alt Breisach, then considered one of the strongest places in Europe, which capitulated Dec. 19, 1638. He died suddenly at Neuburg on the Rhine, of a pestilential fever, July 18, 1639.

'The duke of Weimar imitated,' says Schiller, 'the lofty example of Gustavus Adolphus, in whose school he was trained, and only required a longer life to have reached it, perhaps to have surpassed it. To the personal bravery of the soldier he joined the cool and steady eye of the general; to the courageous endurance of manhood, the rapid decision of youth; to the fiery impetuosity of the warrior, the dignity of the prince, the moderation of the wise man, and the delicacy of the man of honour. Unsubdued by misfortune, he sprung up after the most severe blow with undiminished promptitude and energy. No impediment could check his daring spirit, no failure could damp his invincible courage. His aims were lofty, perhaps higher than he could have reached; but men of his character are not subject to the ordinary laws of prudence by which the mass of mankind is governed. Capable of accomplishing more than others, their plans are sketched with a boldness bordering on audacity. Bernhard of Weimar stands in modern history as a fine specimen of those vigorous times when personal greatness was the highest title to honour, when valour won kingdoms, and the virtues of a hero raised a German knight to the Imperial throne.'

(*Biographie Universelle*; Schiller's *Geschichte des Dreyssigjährigen Kriegs*.) [GUSTAVUS ADOLPHUS; OXENSTIERNA; WALLENSTEIN.]

SAXI'CAVA. [LITHOPHAGIDÆ, vol. xiv., p. 50.]

SAXI'COLA, the scientific generic name for the *Stonechats*. [WARBLERS.]

SAXICOLI'NÆ. [WARBLERS.]

SAX'IFRAGA (from *saxum* and *frango*, in allusion to to their supposed medical virtues), a genus of plants, the type of the natural order Saxifragaceæ. It is characterised by possessing a calyx, either free or partly united to the ovary, and divided into 5 segments; a corolla consisting of 5 petals; 10 stamens, with awl-shaped filaments and roundish anthers; pistils having two styles with obtuse stigmas; a capsule with 2 beaks, 2-celled, many-seeded, opening between the beaks; the seeds upon a receptacle attached to the dissepiment.

The species of this genus have been a source of as much difficulty to botanists, as those of Rosa, Rubus, and Salix; and although much has been done lately towards the identification of species and varieties, much yet remains to be effected. DeCandolle enumerates 150 species, whilst D. Don, who has paid great attention to this genus, and has written a valuable monograph on it, published in the 13th volume of the 'Linnæan Transactions,' makes only 110 species. Of these 24 are British. They are mostly inhabitants of alpine and subalpine regions of the colder and temperate parts of the northern zone. They are most of them true rock plants, and send forth their roots between the crevices of rocks on which they grow, by which means they loosen fragments of the rock, and in this way their name applies to them much better than to their supposed influence over calculus in the human system. Many of these species are well known as ornamental plants in our gardens, for which their hardy habits and beautiful flowers well adapt them. The numerous species are grouped by most botanists in various sections, whilst some have split the genus Saxifraga into many independent genera. In this place we shall only give a few examples of the species.

Saxifraga umbrosa, London-pride, or None-so-pretty: calyx reflexed; leaves undivided, obovate with sharp cartilaginous teeth, tapering gradually into a broad foot-stalk which varies in length; scape from 9 to 18 inches high, erect, panicled, red and hairy, with a few small scattered entire bracts; flowers numerous, with obtuse petals, white or flesh-coloured, beautifully spotted with yellow near the base, and dark red towards the extremity; capsule superior, purplish. This plant was found by Tournefort on the hills of Spain, and is a native of Great Britain and Ireland. It is one of the most popular of garden flowers, blossoming in April and June, and attaining perfection even amidst the smoke of London. In Ireland it is known by the name of St. Patrick's cabbage.

S. Gemu, Kidney-leaved Saxifrage: calyx reflexed; leaves undivided, roundish, kidney-shaped, sharply toothed, more or less hairy; footstalks linear, channelled; scape panicled, capsules superior. This species is found on mountains in the South of Ireland, and is considered by some botanists as only a variety of the former.

There is another species, the *S. hirsuta*, Hairy oval-leaved Saxifrage, with characters between the other two; the leaves are oval and heart-shaped, and the whole plant is hairy. With the two last, it is found in Ireland, on the Pyrenees, and the Southern Alps of Germany and Switzerland.

S. Granulata, White or Granulated Meadow Saxifrage: calyx spreading; radical leaves, kidney-shaped, on long footstalks, obtusely lobed, those of the upper part of the stem nearly sessile, acutely lobed; stem panicled, root consisting of numerous small clustered tubers. This plant is found in Great Britain, and, though not common, is abundant on gravelly soils. The roots of this species, forming as they do little granular masses, were at one time sold in the shops under the name of saxifrage seed. It was formerly used extensively in nephritic and urinary diseases, but as its use arose out of the exploded doctrine of 'signatures,' by which it was supposed that every plant by the form or character of some part indicated the disease for which it might be employed, and as its power of relieving disease has never been satisfactorily observed, it is now deservedly falling into disuse. The purpose which these little knobs seem to serve in the economy of the plant is that of supplying nutriment to the stem and other parts during seasons of drought; and this is rendered more probable by the fact of these bodies being found larger at the commencement of a dry season. Several varieties of this pretty saxifrage are frequently found in gardens.

S. Aizoon, Aizoon or Marginated Saxifrage: leaves undivided, radical ones aggregated, tongue-shaped, silvery, with sharp cartilaginous serratures; flowers corymbose; calyx naked and smooth, with acute segments; petals nearly orbicular. This plant is a native of Alpine situations in Austria, Switzerland, and most countries of the continent of Europe. It is frequent in gardens, bearing flowers with cream-coloured petals and reddish dots, opening in June and July. It is perennial and perfectly hardy.

S. cotyledon, Pyramidal Saxifrage: leaves ligulate, obtuse, cartilaginously serrated; calyx densely beset with glands with linear, lanceolate, obtuse segments; petals oblong three-ribbed, of a pure white without any spots. It is a native of the mountains of Lapland, Norway, Iceland, Switzerland, and the Pyrenees. It is commonly cultivated, and is well known for the profusion of beautiful white flowers it produces, which appear early in the summer. There are several varieties of this plant found in gardens, which are all remarkable for their pyramid of snow-white blossoms. These will continue for some time, provided the plants are kept in the shade, and well screened from the influence of the wind and rain.

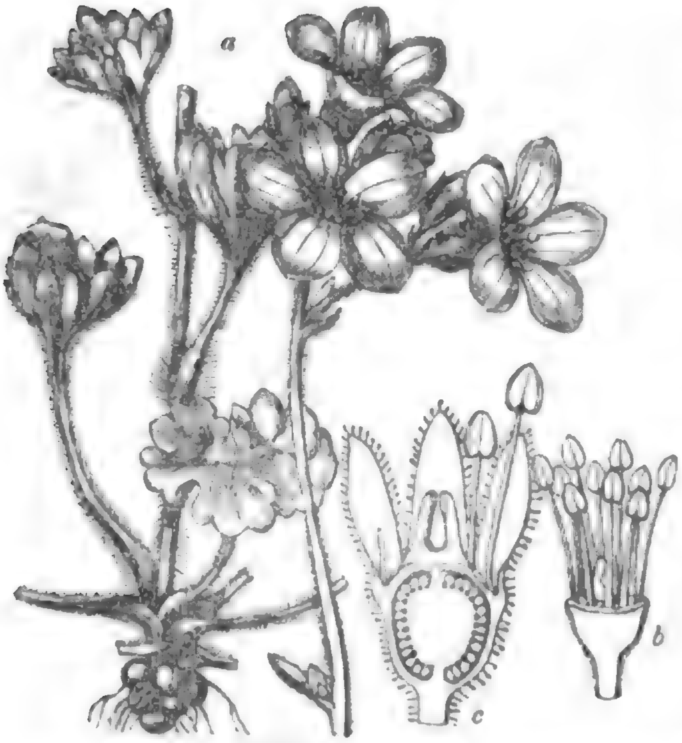
S. hypnoides, Mossy Saxifrage, or Ladies' Cushion: calyx spreading; leaves lobed, radical ones three- or five-cleft, those of the procumbent shoot undivided or three-cleft, all bristle-pointed, and more or less fringed; segments of the calyx ovate, pointed, petals roundish, obovate or oblong, three-ribbed, with or without lateral veins. This is a frequent plant in mountainous situations of Great Britain, especially among limestone rocks. It is also found on the mountains of Norway and on the Pyrenees. It is frequently found in gardens, where it thrives on shady walls and amongst rock-work. Several varieties of this species have been described, some of which have been elevated into species. An excellent description of the varieties of this and other British species will be found in Hooker's 'British Flora.' In planting, this species is easily increased, by means of its trailing branches, which being placed in moist earth, in a shady situation in autumn, will put forth shoots in the following spring.

S. crassifolia, Thick-leaved Saxifrage: leaves undivided, coriaceous, roundish-oval, abrupt, stalked, serrated, smooth; scape naked; panicle dense, cymose. This plant, although now one of the most common in our gardens, is a native of the mountains of Siberia. It is said to have been first introduced into this country in 1765, by Dr. Solander. It flowers early in March and April, and the great size of the plant and its thick large coriaceous leaves distinguish it from the other species. The flowers are abundant, and of a light purple colour. This plant may be easily propagated in gardens by parting the roots, and planting them out separate, in the spring or autumn, in open ground or in pots.

S. sarmentosa, Chinese Saxifrage: leaves undivided, roundish, toothed, hairy; petals, two of them elongated. This species is a native of China and Japan, and is frequently found growing on rock-work and in shady places in our gardens. It is remarkable for its trailing stems, which it spreads round like a young strawberry plant, which taking root in the ground, produces young plants in great abundance. The irregularity of the flower of this species has induced some botanists to place it in a new genus, but it is still most generally referred to under its original name. It may be readily raised from the runners which it gives off, which may be planted in pots, and placed in the greenhouse, although in mild winters they will grow in the open air in sheltered situations.

SAXIFRAGA'CEÆ, a natural order of plants belonging to the apocarpous group of polypetalous Exogens. It consists of shrubs and herbaceous plants with single alternate leaves without stipules. The calyx consists of five sepals more or less united at the base. The petals are equal in number to the lobes of the calyx, and alternate with them. The stamens are perigynous, 5-10 in number; anthers five-celled. They have an hypogynous or perigynous disk. The ovary is inferior, or nearly superior, consisting of two carpels, which cohere more or less by their face at the base, but diverge at the apex; one- or two-celled, with a parietal or central placenta. They have no styles, and the stigma is sessile on the tops of the lobes of the ovary. The seeds are numerous, very minute; the embryo is taper, lying in the axis of fleshy albumen. The genus Parnassia belonging to this order differs in having four parietal placentæ, which are opposite the lobes of the stigma. The genus Heuchera has irregular flowers and stipules.

This order is most nearly allied to Rosaceæ, but it differs in its many-seeded partially-united carpels, its albuminous seeds, and in its not possessing stipules. The habit of Saxifragaceæ allies them to Caryophylleæ, but they differ in the character of their placentæ, the situation of the embryo, and other points. This order also approaches Crassulaceæ, but Saxifragaceæ are distinguished by possessing a less number of carpels, and by the absence of glands at the base of the carpels. They are for the most part mountain plants, chiefly remarkable for the delicacy and beauty of their flowers, which are usually white,



Saxifraga granulata.

a, entire plant; b, calyx cohering to the carpels, with perigynous stamens; c, longitudinal section of flower, showing the half superior ovary and ovules attached to central placentæ, with the relation of the stamens to the petals.

They inhabit the mountainous districts of Europe and the northern parts of the world, and constitute the chief beauty of the vegetation in high Alpine stations.

The whole order is represented by De Candolle as possessing astringent properties. The Heuchera Americana is remarkable for its powerful astringency, and is used in medicine under the name of the North American alum root. Chrysopleium is reputed to possess both aperient and diuretic properties; but these cannot be very powerful, as it is used in the Vosges as a salad, under the name of *Cresson de Roché*.

SAXO, with whose name is commonly found the addition of GRAMMATICUS, the Grammarian, or the Learned Man, was a Dane of the twelfth century, and the author of a history of that nation, which is regarded as the best authority on the subject. This work was prepared at the suggestion of his patron Absalom, archbishop of Lunden. It ends with the year 1186. It is written in Latin, in a somewhat florid style, and, for the later years, is a most authentic and valuable historical remain; but the earlier portions are supposed to be of less certain authority.

There is an edition in folio, Paris, 1514, with the title 'bHistoria Regum Heroumque Danorum;' and another by one of the Stephens', with prolegomena, in which what little is known concerning him is to be found.

The name of Saxo-Grammaticus is connected with English literature as being the author who first gives the history of King Hamlet.

SAXON ARCHITECTURE. [GOTHIC ARCHITECTURE.]

SAXON LANGUAGE AND LITERATURE. The terms Saxon and Anglo-Saxon are popularly used to designate that dialect of our language which prevailed to the close of the twelfth century. The use of these terms is however comparatively modern, and the men who spoke this dialect always called it the English. Several of our MS. chronicles begin thus:—'Britain island is eight hundred miles long, and two hundred miles broad. And there are in the island five languages, *Ænglish*, and Brit-Welsh, and Scottish, and Pightish, and Book-Latin,' &c. Still we may use these terms with some convenience, and (thus cautioned) without any danger of being misled. We proceed to point out the peculiarities which distinguish the Anglo-Saxon from the succeeding dialects of our language.

The Anglo-Saxon, like the Latin and the Greek, often distinguished the cases of its noun, and the conjugations, numbers, and persons of its verb, by a change in the vowel of the final syllable; in the dialect which succeeded, and which has been called the Old English, all these vowels were confounded, and in our modern dialect they have, for the most part, been lost. Thus the Anglo-Saxon *ath* has *athas* in the nominative and accusative plural, and *athes* in the genitive singular; the Old English *oth* has *othes* not only for its genitive singular, but also for its nominative and accusative plural; and in our modern English these three cases are all represented by the monosyllable *oaths*. Again, in the Anglo-Saxon, *athe* was the dative singular, and *atha* the genitive plural; in the Old English, *othe* represented both dative singular and genitive plural; and our present dialect, having lost the final vowel, had no means left of distinguishing these cases from the nominative *oath*. The third person singular of *lufian* was *lufath*, and the first, second, and third persons plural *lufiath*; in the Old English, *loveth* represented both numbers, and *lov'th* is the third person singular in the *spoken* language of the present day.

We say 'spoken language,' because our *grammarians* make *eth* the ending of the third person singular. But in Somersetshire, west of the Parret, where the southern dialect still lingers, they uniformly say *he lov'th, he read'th, he zee'th, it rain'th*, &c. (Jennings, *Obs. on the West. Dial.*) We have very satisfactory evidence, that in the sixteenth and seventeenth centuries this dialect was general throughout the south of England, and we find numerous traces of its peculiarities in the literature of that period. Dolman wrote the following passage, in the sixteenth century:—

> 'So, mid the vale, the greyhound seeing stert
> His fearful foe *persu'th*, before she *flee'th*,
> And where she *turn'th*, he *turn'th* her there to beare,
> The one prey *prick'th*, the other safeties feare.'
>
> *Mirr. for Mag.* Hastings.

Spenser has *melt'th* and *hat'th*, and Sackville *leap'th*. It is probable, that the inflexion used by the translators of the Bible, and which is found in other contemporary works, was merely an old form, taken from the language of books, and adopted chiefly with the view of raising the style. The same observation will apply to *est*, the inflexion of the second person singular, and to some other endings, which are still preserved entire in our grammars, though they have lost their vowel in the spoken language, for the last two centuries.

It is obvious, that either of the changes above noticed must have brought with it a new language. When, in the twelfth century, the vowels of the final syllables were confounded, there was at the same time a confusion of case and number, of tense and person,—in short, of those grammatical forms to which language owes its precision and its clearness. A writer had to seek for new forms of expression before he could convey his meaning clearly. As he had lost the means of distinguishing several cases of his noun, he called in the prepositions to his aid, and to show more clearly the 'regimen' of his sentence, was obliged to confine within very narrow limits the position of his verb,—thus abandoning all that freedom of transposition, which is almost as remarkable in the Anglo-Saxon as in the Greek and Latin. The confusion introduced into his conjugations and tenses, he sought to remedy by various devices, which have hitherto been very little investigated, and at last he had recourse to that general use of the auxiliary verbs, which is at present so marked a feature in the language. The new dialect which resulted from these changes kept its ground for nearly two centuries. It exhibits the most striking analogies with the contemporary dialects of Germany and the Netherlands, and the further changes which converted it into our modern English were rapidly working a like revolution in these sister-tongues, when the invention of printing doubled the influence of their written language, and thus preserved them from further corruption. Unfortunately, at the time of this discovery, the vowels of our final syllables had already given way; the inflexions of our noun were gradually reduced to the miserable remnant which our grammars still recognise; our adjectives, singular and plural, definite and indefinite, were all confounded; the past tense in *ede* could no longer be distinguished from the participle in *ed*, and our modern English was the result, —a language, according to some critics, flexible yet precise, copious yet methodical, enriched from all languages, yet possessing a noble simplicity of structure; according to others, broken and inconsistent, vague and fluctuating, neither possessing a sufficiency of terms, nor provided with laws and analogies by which they can be invented.

In tracing the causes which melted down the Anglo-Saxon into the Old-English, we have not once alluded to the influences supposed to have been exercised by the French language. The popular notions on this subject are, we believe, most erroneous. Had Harold been the conqueror at Hastings, the Anglo-Saxon must have perished, just as the Old-German perished in Germany, and the Old-

Norse in Denmark. The victory of William merely hastened by a few years an event that was inevitable. The use of Norman-Romance as the court language of England rendered unfashionable a literature already too weak to stem those changes to which the language of a busy adventurous people is peculiarly liable; and thus far the Norman conquest may be considered as having assisted in the destruction of the Anglo-Saxon. But the vulgar notion, that it produced a mixed language, a jargon composed half of English and half of French, is wholly at variance with the MS. literature of that period. The Ormulum, in which all the peculiar features of the Old-English are developed, and not a trace of the Anglo-Saxon can be found, is almost as free from *Gallicisms* as any of our MSS. written before the Norman-French existed. The same may be said of most of the Old-English MSS. of the thirteenth century, and it is not till we approach the latter half of the fourteenth century that we find those 'cart-loads' of French words poured into the language, of which Skinner complains so loudly. We must reluctantly agree with this writer, in charging upon Chaucer much of the mischief resulting from these importations, not that he first introduced, but that his authority chiefly sanctioned them. The learned but pedantic writers of the Elizabethan æra, and, at a later period, Johnson, followed his example. They have 'enriched' our language with the spoils of the foreigner, till its vitality has been almost extinguished —till its native forms and analogies have grown so nearly obsolete, as to be almost unavailable to the production of a new term, or to the modification of those which have been so lavishly poured into it.

Having noticed the changes which converted the Anglo-Saxon into the Old-English, we will now call the reader's attention to a subject of rather difficult inquiry—its local dialects. It is abundantly clear that the Romans looked upon all the Gothic races as forming but one people, and as speaking the same language; but a comparison of the Anglo-Saxon with the Maeso-Gothic, as well as the analogy of other languages, may convince us that even thus early there were dialects, and these dialects have now been acted upon by various influences for nearly 2000 years, till they have at last arranged themselves into four great families—the Northern, the English, the Low-Dutch, and the High-Dutch. Now we have ample proof that the *Sexe* came from the south-western corner of the Cimbric Chersonesus, and that they were only separated by the Elbe from the Netherlands, or flat alluvial country, where the Low-Dutch was spoken. We know also that the Engle came from the eastern coast, and that they were separated from the Danish islands merely by a narrow arm of the sea. We might then expect that in the counties colonised by the Engle we should find many peculiarities of the Northern languages, and in the counties colonised by the Sexe much that reminded us of the Netherlandish or Low-Dutch. We believe the Northern and Southern dialects of our island have been at all times distinguished by such peculiarities, but so few early records have come down to us written in the pure dialect of our northern counties, that it is only by comparing them in the second or Old-English stage of their progress that we can form any just notion of their distinguishing features. Perhaps these are best seen in the conjugation of the verb. The following table may show us how closely the inflexions which distinguish our northern dialect agree with those of a Swedish conjugation:—

	South Dialect.		*North Dialect.*		*Swedish.*	
Pres.,	Ich	hop-e	I	hop-es	jag	hopp-as
"	thu	hop-est	thu	hop-es	du	hopp-as
"	he	hop-eth	he	hop-es	han	hopp-as
"	we	hop-eth	we	hop-es	vi	hopp-as
"	ye	hop-eth	ye	hop-es	I	hopp-ens
"	they	hop-eth	they	hop-es	de	hopp-as
Perf.,	thu	hoped-est	thu	hoped-es	du	hoppad-es
Imper.,		hop-eth ye		hop-es ye		
Infin.,	to	hop-en	to	hop-e	att	hopp-as

The inflexions in *s* are generally used in the Northern languages with a passive meaning; and there are some traces of their having been used in our Northern dialect for the same purpose.

Another peculiarity of our Northern dialect is the frequent use of the substantival ending *er* (in which it again resembles the languages of Northern Europe), as *wulfer*, a wolf; *hunker*, a haunch; *teamer*, a team; *heather*, heath; *fletcher*, a fletch, &c.

In this dialect we have also a less frequent use of the articles, conjunctions, and personal pronouns. This is one of its most striking features. Every person who has been in the North of England must have heard such phrases as 'come out o house,' 'gang into field,' 'put'n in poke,' &c.

All these peculiarities of our Northern dialect may be traced to the Anglo-Saxon period; and there is little doubt that the most striking feature of the Southern dialect, namely, its preference of the vocal to the whisper letters, as *z* for *s*, and *v* for *f*, is equally antient. It always prevailed in the Netherlandish dialects, and may be traced in the orthography of our Southern manuscripts to the beginning of the thirteenth century; but, as the Anglo-Saxons had neither a *v* nor a *z*, it is only by analogy we infer the existence of the corresponding sounds in their language. The argument however from analogy is so strong, that we may safely conclude either that the Anglo-Saxon *f, s* were pronounced in our southern counties as *v, z*, or that, like the modern *s*, they represented both a whisper and a vocal sound; in other words, were pronounced sometimes as *f, s*, and sometimes as *v, z*.

It may possibly be asked, were not the forms here attributed to our Northern dialect introduced by the Danes? Are they not, in fact, the peculiar features of the 'Dano-Saxon?' We will not affect to treat these questions as altogether without difficulty; but there are some considerations which may be laid concisely before the reader, and which, if they appear to him as forcible as they appear to us, may lead him to answer these questions in the negative.

In the first place, it must be remembered, that if no Dane had ever set foot on the island, the very results which *have* taken place might have been expected. It is also an argument of weight, that we find all the great features of our Northern dialect in places where there never was a Danish settlement, and vainly search for them, or at best only faintly trace them, in counties where we have historical evidence that the Northmen were numerous. But the strongest argument may be drawn from the pages of our Northern manuscripts. We have two of very antient date—the Gloss of the Durham Bible, written by a priest named Aldred, and the Durham Ritual, lately published by the Surtees Society. The first of these was written, according to Wanley, in the age of Alfred, and the second has been assigned by its editor to the early part of the ninth century. If we can rely on the judgment of either of these antiquaries, the question seems to be answered; for there was no Danish settlement in the north of England till a later period; and we have the Northern conjugation and other peculiarities of the Northern dialect in every page of the Gloss, and in many parts of the Ritual. The name too of Aldred is thoroughly English; and we can hardly suppose that the monks of Durham would have permitted a rude and unlettered foreigner to interpolate their most precious manuscript—a volume which we know they regarded with even superstitious veneration. The language used by Aldred was probably a mixture of the written language of the day and the spoken dialect of his shire, such as might be used by a provincial writer of the present day, and such as was avowedly used by Gawin Douglas in the fifteenth century, and at a later period by Burns.

This mixture of the written and the spoken language in our manuscripts, and the total extinction in many counties of our local dialects, render it extremely difficult to point out the limits within which our two great dialects were spoken. Layamon, whose language seems clearly to belong to the Southern dialect, is described in all the histories of our poetry as a native of South Gloucestershire; but the localities mentioned in his poem belong to the north of Worcestershire; and he was, beyond doubt, an inhabitant of Areley-Regis near Stourport in that county.* If he used the dialect of the neighbourhood (and this must be assumed till the contrary be shown), the Southern dialect must have prevailed over the whole of Worcestershire, and the men of that shire must have been Sexe in origin, and not, as hitherto supposed, a colony of Engle. Perhaps a line drawn from the north of Essex to the north of Worcestershire would pretty accurately define the portions of the island respectively colonised by the Engle and the Sexe.

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* Hallam, in the corrigenda to his late work on the literature of the sixteenth century, has adopted this view, and by its aid corrected a mistatement in one of his earlier published volumes. He states however that Areley lies 'near Bewdley in Worcestershire, but is itself in the county of Stafford.' He has mistaken Areley-Regis for Over-Areley.

The origin of the Midland dialect may admit of the following explanation. Neither natural obstacles nor political divisions ever separated the Northern and the Southern dialects. During the heptarchy, Gloucestershire and Oxfordshire belonged to Mercia, and not to the kindred race of the West-Sexe; and when the Danes held possession of the north of England, the shires of Warwick and Northampton, and generally that of Leicester also, were united in the closest ties with the southern counties. This fellowship seems to have led, at a very early period, to the use of an intermediate dialect, which would naturally be encouraged by the vast numbers that flocked from all parts of the country to the universities. The 'Reve's Tale' affords us a specimen of the ridicule which attached to the forms of Northern speech, and we know that the speech of the Southron was treated with just as little ceremony in the north of England. (See *Towneley Mysteries*, Secunda Past.) Hence we may understand the progress made by the intermediate dialect, and are prepared for the conclusion, to which we are led by an examination of our Old-English manuscripts, no less than by the express declaration of a contemporary philologist. Higden, who lived in the fourteenth century, ranges our provincial dialects under three heads, the Northern, the Midland, and the Southern; and this division seems to have been generally recognised by our antiquaries, for in our catalogues we find some manuscripts noticed as belonging to our Southern dialect, others as belonging to the Northern, while many of them, exhibiting the marked peculiarities of neither dialect, are passed over without remark.

The change which gradually produced the Midland dialect most probably first showed itself in the counties of Northampton, Warwick, and Leicester. It seems to have been brought about not so much by adopting the peculiarities of Southern speech, as by giving greater prominence to such parts of the native dialect as were common to the South. The Southern conjugations must at all times have been familiar, at least in dignified composition; but other conjugations were *popularly* used, and in the gradual disuse of these and other forms peculiar to the North the change consisted. We have many MSS. written in the Midland counties, in which all trace of the Northern dialect seems to have been studiously avoided; yet in very many of them may be found some verbal inflexion in *es*, or some other popular form, quite sufficient to betray the writer. These counties were long considered as belonging to the north of England. When the feuds between the two races at Cambridge and Oxford produced a schism, it was generally at Stamford or Northampton that the Northern men fixed the seat of their new University.

The Northern dialect was still broadly spoken, within the last three centuries, in the counties of Lincoln, Rutland, Derby, and Stafford; but it has been gradually giving way before a language so much more widely understood, till it is now to be found only in scattered localities amid the mountains of the North of England or in the Lowlands of Scotland. The Southern dialect began to yield at a later period. It was certainly spoken at the beginning of the seventeenth century in all the counties round London;* and Milton when he issued forth

'To breathe
Among the pleasant villages and farms,'

must have heard a dialect around him in all essential particulars the same as the Somersetshire. Like the Northern dialect, it gradually retreated before its formidable rival; it lingered for a century in Wilts and Hampshire, and has now taken up a doubtful stand behind the Parret. Before another generation has passed away, the schoolmaster will probably have driven it from this its last place of refuge.

We will now take a rapid survey of the literature which belongs to the language whose history and peculiarities we have been endeavouring to trace. As is the case with the literature of most nations, we find that all its earlier specimens are metrical. We will therefore first call the reader's attention to our Anglo-Saxon poems; and to define more clearly the range of our present inquiry, we will briefly notice the properties which, at that early period, distinguished verse from prose.

An Anglo-Saxon verse is made up of two sections, which together may contain four, five, six, or even more accented syllables. These sections are bound together by the law of alliteration, or, in other words, each verse must have at least two accented syllables (one in each section) beginning with the same consonant or with vowels. Sometimes, and particularly in the longer verses, there are two such alliterative syllables in the first section, as in the verse

met|od for|thy *mæ*|le——*man*|cynne fram|

It is very incorrect to call this alliteration the 'essence' or the 'groundwork' of Anglo-Saxon verse. It is certainly an important part, but still a mere adjunct. The purposes it served were similar to those which are provided for by the final rhyme of our modern versification. The essence of Anglo-Saxon verse consisted in its system of rhythm. As the accents generally varied from four to six, it may be thought that the rhythm was too vague and loose, but in practice it is generally found sufficiently definite; and there are some of its rules which certainly give it a more scientific character than belongs to the system that has superseded it. For example, no sentence, nor any important member of a sentence, could end otherwise than at the close of a section. In our modern poets we often find a sentence ending in the midst of a section, or even immediately before the last syllable of the verse:

'His peers
Have found | him guil | ty—of high-trea | son. Much |
He spoke and learnedly for life.' &c.;

but such a verse would not have been tolerated in an Anglo-Saxon poem. We may indeed find scores of such verses in the printed editions of these poems; but not one single example, and we speak advisedly, in any Anglo-Saxon MS.

The 'Gleeman's Song'* is the oldest specimen extant of Anglo-Saxon literature. It is found in what is called the Exeter MS., one of the books left by Bishop Leofric to his cathedral, about the middle of the eleventh century. Of the Gleeman himself we know nothing, save what can be learned from the poem; but from certain passages in it we may gather, that he was born among the Mirgings, a tribe which dwelt on the marches that separated the Engle from the Swefe in the fourth century. In early youth, he attended a Mirging princess named Ealhild to the court of Eormanric, the celebrated king of the East-Goten, and who figures so often in Roman history under the name of Ermenricus.† His professional skill appears to have gained him the favour of this monarch, and of the great lords who frequented the court, and whom he visited in their respective governments. He afterwards accompanied a Mirging prince into Italy, probably during the inroad of Alaric, A.D. 401; and as Gothic leaders were now rapidly gaining a footing in the empire, he seems to have seized the opportunity of wandering through its provinces. On his return, he must have been an eye-witness of the wars waged between Ætla (Attila) and the East-Goten; and as Ætla's accession dates only in 433, and Eormanric died in 375, he must have been more than seventy when he wrote the poem.

The 'Gleeman's Song,' like many other Anglo-Saxon poems, has a short preface in verse, which appears to be of almost equal antiquity with the poem. It may be literally translated as follows:—

Wide travel told, his word-store unlocked
He, who most marvels, over earth.
And nations visited. Oft in Hall he gat
Memorable largess. Him from among the Myrgings
Nobles rear'd. He with Ealhild
(Leal artificer of love) in his first journey
Sought the home of the fierce king,
East from Ongle—the home of Eormanric
Wrathful treachour.‡ Gan he the number tell.
Many men I wot of,' &c.

Here follows a list of celebrated kings, from which the Gleeman selects for special notice Alexandreas, who appears to be Alexander of Macedon, and Wala, who is, no doubt, the Wallia that founded the kingdom of the Visigoths at Toulouse, A.D. 417. With the exception of Alexander, all of them appear to have been the Gleeman's contemporaries. After this enumeration he proceeds—

'So I fared through many stranger-lands,
Through the wide earth; of good and evil
There I tasted; from family parted,
From kinsmen far, widely I did my suit—

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* For specimens of the Middlesex dialect see Ben Jonson's 'Tale of a Tub;' 'Lear,' iv. 6, furnishes us with an example of the Kentish dialect; and nearly one half of 'Gammer Gurton's Needle' is written in the dialect of Essex

* The text of this poem may be found at the end of Kemble's 'Beowulf (1837), a text and translation in Conybeare's 'Illustration of Anglo-Saxon Poetry' (1826), and in Guest's 'Hist. of English Rhythms' (1838).

† Amm. Marc., xxxi. 3, &c.

‡ The cruelties perpetrated by Eormanric, towards the latter part of his life, are mentioned by the Latin historians (Jornandes, 'De Reb. Get.,' c. 24, &c.), and more than once alluded to in our Anglo-Saxon poems.

Therefore may I sing, and story tell,
Relate 'fore the crowd, in mead-hall,
How me the high-born with largess blest.

I was with the Huns,' &c.

We have then the names of nations and of countries visited by him, which appear to be strung together in the order best suited to the alliteration. There are also certain notices of the great people by whose bounty he had benefited, and the reader will not be surprised at the Gleeman seeing only a liberal patron in the same monarch whom the author of the preface denounces as 'a wrathful treachour.' The whole concludes with a short eulogy on the dignity and privileges of his craft.

The great value of this poem lies chiefly in that string of names, which we have omitted as being so little interesting to the general reader. We do not stop to examine the question, whether any or how many of these notices have been interpolated during the five centuries which elapsed between the composition of the poem and the writing of the MS. Our knowledge of early Saxon history is so scanty, that all such speculations must be hazardous. But we may observe, that the Scriptures had been translated into a Gothic dialect long before the Gleeman began his wanderings, and we know from Roman history that during the fourth century nearly one-half of the Gothic tribes were Christians. We need not therefore necessarily feel suspicion, when we read of the Assyrians and the Persians, the Jews and the Idumæans; they may have been as well known to the Gleeman as to the Saxon monk who transcribed the MS. The chief interest however attaches to the mention of the various Gothic, Slavish, and Finnish races. In tracing their history, the 'Gleeman's Song' is the great link which connects the knowledge gained from Latin sources with the information gleaned from the Middle-Age chronicle. In many instances it furnishes the only means of penetrating the mystery which surrounds these races. There are tribes, still to be found between the Wolga and the Vistula, which we can identify with others named by the Gleeman, and thereby prove to have had a political existence fourteen hundred years ago, of whom hardly another trustworthy memorial can be found, till within the last two or three centuries. The helps which it affords us in unravelling the web of Gothic fiction are also most valuable, and may, if rightly taken advantage of, save us from much of that speculation in which German scholars have indulged so largely. To write a full and satisfactory exposition of this song would require a volume, but till it be written the history of modern Europe must remain incomplete.

There are two other poems, which must have been composed before the Engle left the Continent, the 'Battle of Fins-burgh,'[*] and the 'Tale of Beowulf.'[†] The first of these is a mere fragment, and appears to have belonged to one of those historical songs which Tacitus (*Germ.*, 2) represents as the only literature of the antient Germans. The other is chiefly taken up with the relation of two of Beowulf's adventures: the first against a monster called the 'Grendel;' the second against a terrific 'worm,' or 'earthdrake.' The poem has come down to us in a modernised form, and the mixture of Christian and heathen notions is sometimes singularly curious. For the most part, the nature of the subject, and the marked change that takes place in the rhythm, enable us to lay our finger on the very line where the interpolation begins. The following is one of the attempts to reconcile the old superstitions and the new creed:

'The grim stranger was Grendel hight—
Mighty pacer of the March; who held the moors,
Fen and fastness—land of the Fifel-kin.

The hapless man long had kept it,
Sithen his Maker him had doomed.
On Cain's kin the slaughter avenged
The eternal Lord,—for that he Abel slew;
For joy'd he in that feud, but him out-drave
His Maker, for the sin, far from mankind.
Thence evil births all proceeded,
Ettyns, and Elves and Orknees;
So too the Giants, that with God fought
A long throw—for it he paid them meed!'

The Goths seem to have peopled every solitude with a race of monsters called the Fifel-kin. The sea, the moor, the fen, the march, or desert track which surrounded the territory of every Gothic tribe, were their dwelling-place. The battle, by which Offa settled the marches between the Engle and the Swede, was fought at Fifel-door (see 'Gleeman's Song'), and Alfred, when he brings his hero from Troy, launches him on Fifel-stream, that is, the monster-deep. Ettyns were long remembered in our popular superstitions:

> 'They say the King of Portugal cannot sit at his meat, but the giants and *ettyns* will come and snatch it from him.'
>
> Beaum. and Fl., *Knight of the Burning Pestle.*

Elves still live in our poetry; and genuine Gothic giants (notwithstanding the worthy monk tried hard to convert them into rebel angels) still terrify or amuse the nursery. The Orknees are probably the same monsters as the Orks of the Italian romancers.

Some of the oldest pieces of poetry, written after the removal of the Engle to this country, and now extant, are the songs of Cædmon.[*] The circumstances which first called forth the talents of this poet are related by Bede; and as he must have known many of Cædmon's contemporaries, his account may be looked upon as a simple narrative of facts. Cædmon, it appears, was neatherd to the monastery of Whitby, then under the government of its first abbess, the celebrated Hild. One day at supper, as the harp was passing from hand to hand, and it came to his turn to amuse the company, he stole from the room in one of those fits of diffidence which so often overtake the sensitive poet. As he slept in the neathouse, some one, he thought, encouraged him to sing, and the song he composed, and which was next day repeated to an admiring audience, established his reputation as a poet, and gained him the patronage of the abbess. He became a monk; was looked upon as one who had received the gift of song from above; and on his death his body was enshrined, and valued as one of their most precious relics by the monks of Whitby.

Only six of Cædmon's poems have reached us. The subject of the first is the Creation; that of the second, the Temptation and Fall, to which is added, rather inartificially, a narrative of the events recorded in Genesis, to the offering of Isaac; the third relates the Exodus; the fourth, the story of Daniel; and the Torments of the Damned, and Christ's Harrowing of Hell, followed by his Ascension and Glory, are the subjects of the other two. Bede tells us that he also wrote on our Lord's Incarnation and his Passion, as also on the Advent of the Holy Ghost, and the teaching of the Apostles. What remains is equal in length to about one half of the 'Paradise Lost.'

Cædmon appears to have been the first Englishman who exchanged the images of the old mythology for the chaster beauties of Christian poetry. Perhaps there never lived an individual who exerted a greater influence on our national modes of thought and expression; and on this ground alone, if on no other, he must rank with the greatest names of our literature. For six centuries he was the great model whom all imitated and none could equal, and fragments of his verses may be found in the verses of almost every succeeding poet. To point out the excellencies which won the admiration of Bede, and which our forefathers could only trace to the inspiration of Heaven, would require a critical analysis that might be thought tedious. We may mention however, as one of the greatest, the command which he exercises over his rhythm. With a lofty theme, the march of Milton himself is not more stately; and with every outpouring of joy or exultation his rhythm flows onward, as if conscious of the feelings it bore along with it. We have reason for believing that to this beauty our forefathers were deeply sensitive, and that Cædmon owed to it no small portion of his popularity. Among the early imitators of this great poet we should perhaps rank Aldhelm, bishop of Shireburn. His poems were still sung by the people in the days of Malmesbury, but are now lost, or more probably lie unowned amid the heaps of devotional poetry which fill our Anglo-Saxon MSS.

We have called the 'Battle of Fins-burgh' an historical poem: another poem of the same class was written on the death of Byrthnoth,[†] who bravely fell in resisting one of the Danish inroads, A.D. 993. (Hume, *Hist.*, i. 3.) Works, now lost, were written in the eleventh century, by Leofric, Hereward's chaplain, on the warriors of our early history; and the songs commemorative of Hereward's exploits, which Ingulf tells us were in his day so popular, were probably written by the same hand. There can be little doubt also that many of the Old-English romances, as 'Horn,' 'Havelok,' 'Bevis of Southampton,' 'Guy of Warwick,' &c., are mere adaptations of Anglo-Saxon poems. Occasionally the subject was taken from foreign sources, of which the 'Tale of Judith,'[*] probably written in the tenth century, affords us a splendid example. The 'Tale of Apollonius of Tyre'[†] is in prose, and a mere translation from the Latin.

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[*] The text was published by Hickes from a MS. now lost.

[†] Text and translation by Thorkelin (1815); by Kemble (1837).

[*] Text published by Junius; text and translation by Thorpe.

[†] Text published by Thorpe, in his 'Analecta.'

There are other songs preserved in our chronicles, and closely allied to those last mentioned, but which are much shorter, and partake more of the lyrical character. Among them may be enumerated the Brunanburgh war-song,[‡] Edgar's coronation song,[§] the two songs which commemorate the death of this monarch,[§] and the elegy written on the death of the Confessor.[‖] The first and last of these are among the noblest specimens of Anglo-Saxon poetry.

A great deal of Anglo-Saxon verse was written during the eleventh century. One of the writers seems to have been called Deor. His name occurs in a poem[¶] which exhibits many difficulties of construction, and perhaps some blunders of transcription; but it may be gathered that he was *scop* or minstrel to the Danish princes who succeeded Knut, and he appears to have lost his place at court when the Confessor mounted the throne of England. The name of Cynewulf has also been extracted[**] from certain poems found in the Exeter and Vercelli MSS. It was hid in a kind of riddle, similar in character to our modern acrostic. He was probably the compiler of the two MSS., and may have been the author of much of the poetry which they contain.

But the noblest relic of this period is the Psalter published some five years back by the University of Oxford, from a MS. preserved in the 'Bibliothèque du Roi.' In the first part, each psalm has an Anglo-Saxon translation in prose; and also a preface giving some account of its history, general scope, and tendency. The translation often paraphrases the Latin, so as to show more clearly its doctrinal or prophetical meaning: but from the 50th Psalm, the translation is metrical, and though generally literal, exhibits many cases of glaring misconstruction. The prefaces also disappear, and the whole seems to be the work of a man very slenderly provided even with the rudiments of learning. This deficiency however may now be considered as amply compensated for by the high character of the poetry. Some of the psalms are translated with a terseness and also an elegance, which place the translation far above any of our modern versions, and there is occasionally a Miltonic sweep of language, that has not often been surpassed even in the choicest specimens of our sacred poetry.

A note in the MS. informs us that a priest named Wulfwin Cada 'wrote it with his own hand' (manu suâ conscripsit). We think it extremely probable that Wulfwin copied from some manuscript the prose version as far as it went, and then drew on his own resources. There are numberless instances of transcribers altering and continuing the work they were copying. Most of our MS. chronicles were transcripts up to a certain date, and were then continued as original compositions. The verb *conscripsit* shows it was a compilation; and if Wulfwin had before him a metrical translation, he would hardly, with that passion for stately language so common among his countrymen, have postponed it to the prose version. To Wulfwin Cada we think may fairly be ascribed both the faults and the merits of the metrical translation.

Among the most important prose works of our Saxon literature must be ranked those extraordinary compilations which are commonly called (as if they constituted but one work) the 'Saxon Chronicle.' The earliest copy of a Saxon Chronicle now extant is the Plegmund Manuscript, in the library of Corpus Christi College, Cambridge. It is written, as Wanley observes, in the same hand to the year 891, and in hands equally antient to the year 924. After that date it seems to have been continued and interpolated by various transcribers, whose notices of Christ Church, Canterbury, leave little doubt that the volume was once the property of that cathedral. As Plegmund was consecrated archbishop in 890, and died in 923, it has been inferred that the original text was compiled by his order, and continued from time to time under his direction. The internal evidence favours this supposition. The notices which it contains respecting the operations of Alfred and his immediate predecessors could hardly have been furnished by any but those who were present at them, and were probably the substance of conversations which had passed between the prelate and the king.

The next copy, in point of time, is the Dunstan MS. in the British Museum. This is also a Canterbury manuscript, and appears to have belonged to St. Austin's Abbey. It is written throughout in the same hand, and ends in the year 977. As Dunstan was then archbishop, and as the handwriting resembles that of other manuscripts ascribed to him, he has been named with some degree of confidence as the transcriber. However this be, it must have been written by a man of scholarlike attainment. We have only to compare the passages which relate to the period after Plegmund's death, with the corresponding passages in the Christ Church manuscript, to see at once its superiority. This is particularly striking in the poetical portions. The noble ode on the battle of Brunanburgh would have remained for ever mutilated, and in parts unintelligible, but for the copy preserved in the Dunstan Chronicle.

Besides these two chronicles, we have a Worcester, an Abingdon, another Canterbury Chronicle, and a fourth which appears to have been written at Peterborough. It has been inferred (chiefly for reasons connected with the handwriting) that these were compiled respectively in the years 1016, 1048, 1058, and 1125. We have also divers transcripts and collations made by Lambarde, Junius, Josselyn, and other antiquaries of the sixteenth and seventeenth centuries, some of which were evidently taken from manuscript authorities no longer extant. Josselyn appears to have had in his possession a second Peterborough Chronicle; and Lambarde's transcript in Trinity College, Dublin, is thought to have been made from an antient manuscript which perished in the fatal fire that destroyed so many of our Cottonian treasures.

The Plegmund, the Dunstan, the Abingdon, and the antient chronicle transcribed by Lambarde, all began with Cæsar's invasion. The Worcester, Peterborough, and latest Canterbury manuscripts begin with a description of Britain, extracted chiefly from Bede and Orosius. Then follow (with variations in the different manuscripts) the accessions of the Roman emperors, with the deaths of the apostles and of various popes to the year 464. At this year is inserted an account of the arrival of Hengist and Horsa, which is somewhat difficult to trace to its proper source; but the four entries which follow, we have no hesitation in classing among the 'writings of the antients' mentioned by Bede, and the 'histories of the English' alluded to by Nennius:—

'An. 455. Now Hengest and Horsa fought with Wyrtgeorn the king, in the place which is called Ægeles-ford, and his brother Horsa there they slew; and after that Hengest took to the kingdom and Æsc his son.

'An. 457. Now Hengest and Æsc his son fought with the Brits in the place that is called Creccan-ford, and there slew they four thousand men, and the Brits then forsook Cent-land and with much fear fled to Lunden-bury.

'An. 465. Now Hengest and Æsc fought with the Weals nigh Wippeds-fleet, and there twelve Wealish aldermen they slew, and of their own men a thane was there slain, whose name was Wipped.

'An. 473. Now Hengest and Æsc fought with the Weals and took untold booty, and the Weals fled the Englen, as it were fire.'

If the reader be startled at finding the name of Engle in what must have been a Yutish Chronicle, he must recollect that Ida, when laying down laws for his West-Sexe, recognises only two races, the Welsh and the English. None of the invading tribes, or 'kins,' as they were termed, seem to have refused the name of Englishmen, and in some of the chronicles the very Yutes of whom we are now speaking are termed the Engle-kin. We see no reason why *two* of these entries may not even belong to the period when the fearful struggle they commemorate was yet in progress.

The antiquaries of the sixteenth and seventeenth centuries seem to have assumed that the Anglo-Saxon monasteries kept a regular record of contemporary events; and there are certainly grounds for believing that registers of a certain kind were really kept by them. Bede's 'History' (iv. 14) has been referred to in proof of this. He tells us, that in the year 681 a boy, who was an inmate of Selsey Abbey, was seized with the plague, which was then desolating the country. As the poor lad was lying on his bed, he was accosted by two angel-visitants, who bade him tell the frightened monks that the plague would spread no farther, that it had been stayed by the prayers of Oswald, of whose death that very day was the anniversary. 'Let them,' said Saint Peter, for no less a person is the speaker, 'search in their books (in suis codicibus) in which are recorded the deaths of deceased persons (defunctorum depositio), and they will find that on this day he was taken,' &c. The abbot, we are told, believed the boy's words, and straightway went and searched in his chronicle (in Annali suo), and found that on that very day King Oswald had been slain,' &c. Here reference seems to be made to some public register of the convent; and this register, or the earlier MS. it was copied from, seems to have furnished materials for the Peterborough Chronicle.

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[*] Text published by Thorpe, in his 'Analecta.'

[†] Text and translation by Thorpe (1834).

[‡] Text and translation by Price, in his edition of Warton's 'Hist.,' i. 87; and by Guest, in the 'Hist. of Engl. Rhythms,' ii. 61.

[§] Text and translation in Ingram's edition of the 'Saxon Chronicle.'

[‖] Text and translation in Ingram's 'Chronicle,' and in 'Hist. of Engl. Rhythms,' ii. 71.

[¶] 'Hist. of Engl. Rhythms,' ii. 325

[**] 'Archæologia, xxviii. 12.

'An. 642. Now was Oswald, king of the Northhymbre, slain,' &c., 'upon the Maser-field, on the day called the nones of August,' &c.

The mention of the day on which an event occurred, is rare in our chronicles; it is therefore probable that we have here the very passage which the worthy monk was sent in search of.

That there were also public (or perhaps we might say national) registers, in which were recorded the accessions, &c. of the kings, we also gather from the same venerable historian. We are told (*Hist.*, iii. 4), such was the horror excited by the cruelties of the Welshman Ceadwalla, and the apostacy of the Northumbrian kings, that 'it was resolved upon by all who had to reckon the chronology of the kings (regum tempora computantibus) that the memory of the faithless kings should be blotted out, and the year assigned to the reign of the king next following,' &c.; and he elsewhere adds, with studied phraseology, 'unanimo omnium consensu firmatum est,' *Hist.*, iii. 9. In the Chronicles we have the entry—

'An. 634.———And Oswald also took to the kingdom of the Northhymbre, and he reigned ix. winters. They assigned him the *ninth*, on account of the heathenism which they practised who reigned the one year between him and Eadwine.'

Here we find, within a century after Ida landed at Bamborough, a register kept of the Northumbrian kings, and general interest excited as to the entries made in it. From details mentioned by Bede, and which could only have been supplied by written documents, it is clear that these historical notices reached to the times of paganism. They must have been originally written in English, and with Runes, those antient characters which were only partially given up when Christianity introduced the literature of Rome, and which occasionally make their appearance in our MSS. to the end of the eleventh century. A too literal translation of these venerable documents, no doubt, introduced the many *Anglicisms* to be found in the works of Bede, and even of the Welshmen Nennius and Asser. On this ground only can we account for the intrusion into the pages of scholars like the first and last of these writers, of such phrases as 'victoriam sumpsere' (sige namon, An.-Sax.), 'loco funeris dominati sunt' (ahton wælstowe geweald, An.-Sax.), &c.

With these materials at hand, we may readily understand the course followed in the compilation of our early chronicles. Who were the parties that continued and interpolated these chronicles, is a question very difficult to answer satisfactorily. Archbishop Elfric, Saint Wulfstan, Hugh White the monk of Peterborough, and others have been named, with more or less of confidence, by different critics. For our own parts, we could never resist a feeling, almost amounting to conviction, that the character of William was the work of the venerable Wulfstan. It begins thus:—

'An. 1087.———If any wish to know what manner of man he was, or what state he held, or of how many lands he was lord, then will we of him write, as we him knew, we that have waited on him (the him onlocodon), and otherwhiles in his court have wonned,' &c.

There were few English churchmen at the close of William's reign who could put forth this claim to the confidence of their reader, and still fewer that could have drawn William's character with the freedom and at the same time with the Christian feeling that distinguishes the whole of this noble composition. Wulfstan was at that time the only English bishop; and when, after describing the cruelty and sternness of the king, he adds the prayer, 'may the Almighty God show to his soul mercy, and grant him of his sins forgiveness!' who does not feel that the moral qualities of the writer were as eminent as the opportunities enjoyed or the talents that improved them?

Among Anglo-Saxon prose writers, we must not forget the name of Alfred. His chief works are translations from the Latin, and of these the most remarkable are his versions of Bede, Orosius,* and Boethius.† Certain verses of the last-named author he has also paraphrased in verse.‡ Among what may be termed his original works, are his accounts of the voyages of the two Northmen Wulfstan and Ohthere, which were inserted in Hakluyt's collection, and have been the subject of so much comment and criticism.

Archbishop Wulfstan, better known by the name of Lupus, was a voluminous writer of homilies. He was translated from Worcester to York in 1002, and must be carefully distinguished from the Saint Wulfstan already mentioned. A still more celebrated divine was Elfric, the great champion who led the English church in its resistance to the Romish innovations of the eleventh century. As might have been expected, his authority was appealed to, and with powerful effect, by the friends of the Reformation. One of Archbishop Parker's works is entitled 'A Testimony of Antiquity, showing the antient Faith of the Church of England, &c., being a Sermon translated out of Latin into English by Ælfric, abbot of St. Alban's,' &c. It required all the exertions of the new theological school founded by Lanfranc and Anselm to keep under the principles so deeply sown by Elfric.

We will close this notice of Saxon literature by observing that the influence it has exercised upon the modern literature of the country has been much underrated. Without maintaining, as some authors have done, that Milton diligently studied Cædmon, yet we do not fear to assert that some favourite images, and even certain terms of expression, may be traced through our literature, century after century, from the pages of the Saxon *scop* to those of Spenser and of Shakspere. The mistaken criticism which some of these have called forth might afford matter for instructive comment; and serve in some measure to teach us the value of a literature which has been so much neglected.

SAXONS is the name of a branch of the German nation. Their name is derived by some from that of the Saces on the Indus, by others from *sachs*, an ax, and by others it is traced to the word *sassen*, that is, 'settled,' in contradistinction from those German tribes who led a sort of nomadic life. The earliest writers who mention the Saxons describe them as neighbours of the Danes, south of the Cimbrian Chersonesus. (*Geograph. Ravennas*, iv. 17.) Ptolemaeus also speaks of islands of the Saxons, which were probably the modern islands of Eiderstedt, Nordstrand, Wicking Harde, and Böking Harde. Orosius (vii. 32) says that they inhabited a marshy country which was almost inaccessible to strangers. Towards the south-west they seem at first not to have extended beyond the Elbe. Tacitus, though he speaks of the Angli and Varini, who must have been close neighbours to the Saxons, does not mention them.

The similarity of their language to that of the Persians and antient Indians affords reason for believing that the Saxons were of Eastern origin; but how and when they came to occupy the north-western extremity of Germany, are questions which history cannot answer. Thus much only is certain, that at first they occupied a great part of the country between the Elbe and the Cimbrian Chersonesus; but when, during the migration of the barbarians, the neighbouring tribes changed their countries and migrated towards the south, the Saxons likewise began to extend in the same direction, and at last we find them occupying the country between the Elbe, the Rhine, the Lippe, and the German Ocean. This extensive tract of land is called by Anglo-Saxon writers Old Saxony, to distinguish it from New Saxony, or England.

In the third century the Saxons often landed on the coasts of England and France, and ravaged the maritime districts; but about the middle of the fifth century (449) a large body of Saxons and Angles, led by Hengist and Horsa, sailed over to England, and established permanent settlements in this island. The Angles however seem to have prevailed in numbers or influence, for it was they that gave the name to their new country, Angel-land, Anglia (England), though it was sometimes called Saxonia Transmarina. The name Anglo-Saxons, which comprises both Angles and Saxons, was invented by later historians for the sake of convenience. The history of the Saxons who settled in England, and here, together with the Angles, became the origin of a new population, henceforth forms part of the history of England. [ANGLES; ENGLAND.]

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* Text and Transl. by Barrington (1772).

† Text and Transl. by Cardale (1829).

‡ Text and Transl. by Fox (1835).

Those Saxons who remained in Germany conquered, about 530, conjointly with the Franks, the northern part of Thuringia as far as the little river Unstrut, but soon after gave up the eastern part of their conquest to a Slavonic tribe. The southernmost of the Saxons, about 550, became tributary to the Franks, to whom they paid an annual tribute of 500 cows. In proportion as the Saxons advanced towards the interior of Germany, and became better acquainted with the advantages of agriculture and the breeding of cattle, they gradually abandoned their former piratical mode of living, but remained nevertheless a spirited and warlike people.

Towards the close of the seventh century we find the Saxons divided into three great tribes, viz. the Ostfali on the western side of the Elbe, the Westfali in the country between the Rhine, Lippe, and Ems, and the Engeri in the centre, between the two former tribes, that is, on both banks of the Weser. Their hostile feeling towards the Franks was kindled into a war under Charles Martel, who conquered some Saxon districts on the northern banks of the Lippe, and made their inhabitants tributary. This however was only a prelude to the great and bloody wars which, with several interruptions, were carried on by Charlemagne from 772 till 803. During these wars many thousand Saxons fell in battle, and thousands were put to death because they refused to adopt Christianity. But they held out to the last, even after their chief Wittekind had submitted and become a Christian. The treaty of Selz on the Saale (803) at last terminated the war: the Saxons agreed to become Christians, and were put on a footing of equality with the Franks. Henceforth their history forms a part of that of the Carlovingian empire. To diffuse a knowledge of Christianity among them, and to establish the new religion more firmly, Charlemagne founded seven bishoprics, and from the places he appointed as the seats for these new ecclesiastical dignities, we may see the extent of country which they then occupied. The seats of the bishops were Osnabrück, Verden, Bremen, Paderborn, Minden, Hildesheim, and Münster.

SAXONY. Taken in its most extensive sense, the name of Saxony formerly designated a very large tract in Northern Germany, extending from the Weser on the west, to the frontiers of Poland on the east. No term in geography has been used with greater latitude of signification, and no states have been subject to more frequent territorial changes than those comprehended under this general name. It was not till the restoration of peace in 1495, by the emperor Maximilian I., that Germany was divided into ten circles, when the extensive tract of country hitherto called Saxony was divided into three circles, those of Westphalia, Lower Saxony, and Upper Saxony. The last of these, which might more properly have been called East Saxony, comprised the electorates of Brandenburg and Saxony, the duchy of Pomerania, and several small principalities.

THE KINGDOM OF SAXONY was formed of the electorate of the same name. The duchy of Saxony, to which the electoral dignity and the office of hereditary marshal of the empire were attached, was however no part of the antient German duchy of that name (which was composed of Lauenburg and a tract on the other side of the Elbe), but a Wend or Vandal province which Albert the Bear, margrave of Salzwedel, of the house of Ascania, had conquered, and left to his son Bernhard. This Bernhard received from the emperor Frederick Barbarossa (after Henry the Lion had been declared under the ban of the empire) the dignity of duke of Saxony, to which were attached a part of Engern and Westphalia, extending from the Weser, which separated it from Eastphalia, westwards to the Rhine. But Bernhard not being powerful enough to maintain the rights attached to his dignity, and to take possession of the duchy assigned to him in Westphalia, most of the Saxon allodial proprietors became immediate estates of the empire, by which the duchy was dissolved, and its name transferred to the country inherited by Bernhard from his father, to which, from that time, the ducal dignity was attached. The house of Ascania becoming extinct on the death of Albert III., in 1422, the emperor Sigismund invested Frederick the Warlike, margrave of Meissen, with the electoral title and the duchy of Saxony. The splendour of his new dignity, united with his eminent personal qualities, rendered Frederick one of the most powerful princes in Germany. He was succeeded in the electoral dominions by his son Frederick the Mild, who reigned from 1428 to 1464. On his death, his dominions were divided between his two sons, Albert and Ernest, who were the founders of the Albertine and Ernestine lines, the former of which still reigns in the kingdom of Saxony, and the latter is divided into the four branches of Saxe-Altenburg, Coburg-Gotha, Meiningen, and Weimar. The electoral dignity was inherited by Ernest, who was succeeded by his son Frederick the Wise, who founded, in 1502, the university of Wittenberg, where Luther and Melanchthon commenced the Reformation; and though Frederick did not openly espouse the cause of Luther, yet it was probably owing to his personal influence with the emperors Maximilian and Charles V., and to his able and prudent conduct, that the great reformer did not experience the fate of John Huss. Frederick was succeeded, in 1525, by his brother John the Constant, who died in 1532. At Frederick's death, the doctrines of the Reformation had taken such deep root, that neither the anathemas of the Vatican, the ban of the empire, nor the disastrous wars which were not ended till the peace of Westphalia in 1648, could extirpate them. Accordingly, though John Frederick the Magnanimous, being defeated and taken prisoner by the army of Charles V. in the battle of Mühlburg, in 1547, was deprived of his electoral dignity, which, with the greater part of his dominions, was given to his cousin Maurice, margrave of Meissen, yet Maurice powerfully supported the Protestant cause, and, after a short campaign, obliged Charles V., in 1552, to sign the Convention of Passau, which has been since considered as the bulwark of the religious freedom of Germany.

In 1697 the elector Augustus I. was induced, by the temptation of obtaining the crown of Poland on the death of Sobieski, to embrace the Roman Catholic religion. Charles XII., king of Sweden, not only conquered Poland, but invaded Saxony, which suffered very severely till 1708, when it was relieved by the march of Charles into Russia, and his defeat there; after which Augustus resumed the crown of Poland, which he retained till his death in 1733. Saxony remained neutral in the war between Prussia and Austria which commenced in 1740; but was unfortunately tempted, by the promises of Austria, to take part in the Seven Years' War, in which, instead of obtaining an accession of territory, the Saxon court saw its dominions ravaged and its subjects ruined in the contest with Prussia. The peace of 1763 left the country burdened with an enormous debt, which made the government and the people sensible of the necessity of a total change in the political system, of reducing the military establishment, and endeavouring to lessen the burden of the public debt. In the war with France in 1793, Saxony furnished only a small contingent, and took no decided part; but in 1806 the elector sent all his troops to support the king of Prussia. The ruin of the Prussian power by the battle of Jena enabled Napoleon to gain the Saxons to his cause by the grant of many considerable advantages. Prussian Poland was added to the dominions of Saxony, under the title of the grand-duchy of Warsaw, and the title of elector was changed to that of king. Further cessions from Austria, in 1809, nearly doubled the territory of Saxony; but the adherence of the king to the cause of Bonaparte proved fatal to him in 1813, when the Russians occupied Poland, and, with the Prussians, made Saxony the theatre of the great struggle with the French emperor. In that year the battles of Lützen and Bautzen were fought, and were succeeded by the attacks on Dresden, the great battles of Leipzig, and the retreat of Bonaparte to the Rhine. The people of Saxony had hoped that their attachment to the cause of Germany, as proved by the desertion of their troops from the French army in the battle of the 18th of October, would secure the integrity of their territory. The fate of Saxony was to be decided in the congress of Vienna, and it was at first proposed that the whole kingdom should be united with Prussia, for which a territory in Westphalia, with 300,000 inhabitants, was offered to the king as an indemnity, which was refused. At length it was decided that the kingdom should be divided, and on the 18th of

May 1815, the king signed a treaty of peace with Prussia, by which he gave up more than half his dominions in point of extent, and nearly the half of the population, or a territory of 7880 square miles, with 845,218 inhabitants.

Inhabitants.—The population, according to the census of 1837, was 1,652,114, of whom 1,617,892 were Germans, 33,352 of Slavonian descent, 825 Jews, and 72 Greeks. The Slavonians were the original inhabitants, and their subjection was effected in the tenth century by king Henry I. They are now known under the name of Wends, and live apart from the Germans: they do not intermarry with them, though they inhabit the same towns or villages. Thus they have preserved their language and several peculiar customs. They are only found in that part of Saxony which is east of the Elbe, especially in Bautzen and in the vicinity of that town.

Surface and Soil.—The river Elbe, traversing the kingdom from south-east to north-west, divides it into two unequal portions, between which a considerable difference exists in wealth and productive powers.

The eastern and smaller portion, which comprehends the south-western part of the country, formerly called Lusatia, is less favoured by nature. The most elevated part of the country lies contiguous to the boundary of Bohemia, and is known by the name of the Mountains of Lusatia. It does not however present a chain of mountains, but is an elevated flat, which towards the south descends into Bohemia with a rather rapid slope, but towards the north forms extensive plains, which are nearly level, lowering with an almost imperceptible slope. On these plains rise several masses of rocks in the form of small table-lands, and in some places there are numerous small conical hills. The base of the rocks is granite or gneiss, but the more elevated parts consist of basalt. The most elevated summits, proceeding from east to west, are Mount Oybin and the Hochwald near Zittau, which rise respectively to 1680 and 2520 feet; Mount Lausche, which attains 2637 feet; the Schlossberg near Stolpen, which is 1146 feet high; the Great Winterberg on the right bank of the river Elbe, which is 1836 feet: the Lilienstein, on the right bank of the Elbe opposite Königstein, which is 1338 feet high; Mount Catta near Pirna, which attains 1176 feet, and the Porschberg near Pillnitz, which has an elevation of 1182 feet above the sea-level. The western declivity of this region is intersected by numerous depressions, ravines, and valleys, and, on account of its picturesque beauties, is frequently resorted to by travellers. It is known by the name of the Saxon Switzerland, and extends along the Elbe from Pirna to the Winterberg, and from 6 to 8 miles from the river. The northern boundary-line of this region may be indicated with tolerable exactness by a line drawn from Dresden eastward to Bautzen. It is in general a poor country, partly covered with forests of rather indifferent growth, and partly with heath, but there are tracts which make good sheep-walks. The sheep are noted for the quality of their wool, which is well known under the name of Saxony wool, and fetches the highest price in the market. Agriculture is very limited; potatoes and oats succeed best, and in some parts flax. There is however a large tract of superior fertility, which occupies the most eastern part of the kingdom, on both sides of the upper course of the river Neisse, and constitutes a wide depression in the elevated region. The surface is hilly, but in general it produces all kinds of grain, and nearly as much as is required for the consumption of the large and populous manufacturing villages which surround the town of Zittau on the east, north, and west. The plain of Bautzen, which lies along the northern base of the elevated region, is still more fertile, and supplies corn for the consumption of the manufacturing districts. The mineral wealth of this region is far from being considerable. Some coal and iron are found, especially in the neighbourhood of Zittau; and along the river Elbe there are some quarries of sandstone, the produce of which is exported.

The country, which extends from the base of this region northwards to the boundary-line of Prussia is a plain, on which there are a few isolated hills, among which the Keulenberg, near the town of Königsbrück, attains the height of 1362 feet above the sea. The soil of this plain is sandy or gravelly, and mostly unfit for cultivation: about half the surface is covered with woods, consisting almost entirely of coniferous trees, from which tar and pitch are made, and exported. In the cultivable tracts potatoes, oats, buckwheat, and millet, with some rye, are grown. The sheep-walks are extensive, but of inferior quality. Cattle, goats, and pigs are numerous.

The western or larger portion of Saxony, which is situated west of the river Elbe, is naturally divided into three regions, the mountainous, the hilly, and the plain. The mountain-region lies within the Erzgebirge, extends over the northern slope of that range, and is bounded on the south by Bohemia. The northern boundary-line of this region runs from Pirna on the banks of the Elbe, westward to Tharant, and thence to the south of west through Freyberg, Oederen, and Zschopau to Zwickau, whence it declines more to the south, terminating at Scheitz in the principality of Reuss. The whole of this region is occupied with mountain-masses, with rather steep declivities, which are furrowed in a direction from south to north by wide and open valleys, and in other directions by smaller valleys. The highest mountains occur on or near the boundary of Bohemia. The most elevated summit is the Fichtelberg, near 12° 50′ E. long., which attains an elevation of 3966 feet above the sea-level. Nearly north of it, near Annaberg, stand the Pöhlberg, 2706 feet high, and farther east, near Georgenfeld, the Lugstein, 2934 feet; and near Altenberg, the Kahlenberg and the Geisingberg, which are respectively 2922 and 2730 feet above the sea-level. West of the Fichtelberg are the Cluersberg near Eibenstock, which attains 3345 feet; and near Schöneck, the Rammelsberg and the Schneckenstein, respectively 3165 and 2886 feet high. A large portion of this region cannot be cultivated on account of the steep slopes of the mountains, but the soil in some parts appears to be fertile, as extensive tracts are covered with beech-forests, whilst others are covered with excellent pine-trees. These forests supply fuel for the numerous mines of this district. [ERZGEBIRGE.] In the valleys of this region, whose mean elevation is stated to be between 1500 and 1600 feet above the sea, cultivation is limited to flax, potatoes, and oats, other grains not succeeding on account of the rigour of the climate. As these valleys are rather thickly inhabited, the population is chiefly supplied with grain from the regions lying farther north, and when the crops in these parts fail, the inhabitants of the mountain-region suffer from dearth.

The hilly region, which extends along the northern base of the mountains, reaches northward to a line drawn from Meissen on the Elbe westward to Döbeln, Kolditz on the Mulda, and Borna. This region exhibits an agreeable alternation of hills, vales, and plains of moderate extent. Its fertility in general is not great, though there are some productive tracts, among which the plains near Chemnitz and Zwickau are distinguished. But the whole region is cultivated with great care, as its agricultural produce finds a ready sale in the populous towns and villages of the mountain-region. Its mean elevation above the sea-level is stated to be between 750 and 800 feet, and though the winters are severe in most parts, they are not severe enough to prevent the cultivation of the common kinds of grain. Some parts, especially those along the river Elbe, which are much lower, are noted for their orchards, and in the vicinity of the town of Meissen a considerable quantity of wine is made. It is the most northern place in Europe where a drinkable, though inferior, wine is made to any extent. The region is not rich in minerals, with the exception of coals, which are found in extensive beds not far from Dresden and in the vicinity of Zwickau. Sheep, cattle, and horses are abundant in these parts.

The northern portion of Saxony west of the Elbe is a plain, and constitutes the most southern part of the great plain which extends to the shores of the Baltic. It contains however more hills than occur farther north. The hills are isolated, and generally low, except the Colmberg, west of Oschatz, which attains an elevation of 113 feet above the sea-level. The general level of the country near the hilly region is about 600 feet, and where it borders on Prussia it varies between 290 and 360 feet. It is the most fertile portion of Saxony, and though it contains several tracts covered with heath, some extensive districts are distinguished by fertility. The most fruitful part is the plain of Lommatsch, not far from the banks of the Elbe, and contiguous to it is that of Meissen, which is not much inferior. The plain of Leisnig, on the Freyberger Mulda, the country surrounding the town of Leipzig, and the valley of the Elster, south of Leipzig, near the town of Pegau, are likewise among the most fertile tracts of Northern Germany. Agriculture is the principal occupation of the in habitants, but it is united to the rearing of cattle and horses. Sheep abound in the less fertile tracts. The forests, which cover a considerable portion of the other parts of Saxony, are here of comparatively small extent.

Climate.—The climate must vary greatly in a country whose lowest point, the town of Strehla on the Elbe, is only 286 feet above the sea-level, while the highest, the Fichtelberg, attains nearly 4000 feet. According to meteorological observations, which have been regularly continued for several years at different places, it appears that the temperature of the northern plain does not differ much from that of the hilly region. The mean annual temperature in both regions appears to be 47·5°, or four degrees lower than that of London. The winter is rather severe, the mean temperature being 30° or a little less, whilst that of London is 39°. The temperature of the spring is 49°, and that of London 54°. The temperature of the summer is 62°, or one degree more than that of London. The temperature of the autumn is between 49° and 50°, or nearly six degrees higher than at London. Those districts which lie along the banks of the Elbe are the lowest parts of the region, and accordingly the temperature of Dresden and Meissen is from two to three degrees higher than those given in the above statement. The climate of the towns near the mountain-region, as that of Freyberg and Chemnitz, does not materially differ from that of the countries farther north, but in the valleys of the mountain-region the temperature is considerably lower. At Altenburg, which is 2475 feet above the sea-level, the mean annual temperature does not exceed 40°, that of the winter is 25°, of the spring 41°, of the summer 54°, or equal to the spring of London. The mean temperature of the autumn is about 41°. The quantity of rain which annually falls is stated to be 24 inches, but as the observations from which this result has been drawn have been made chiefly in the mountain-region, it is supposed that it is somewhat too high when applied to the whole country, and that in the hilly region and the plain it probably falls short of 20 inches. The prevailing winds are from the west and south-west; those from north-west and from south and south-east are also common; northern, north-eastern, and eastern winds are rare.

Rivers.—The principal river is the Elbe, which is navigable for large river boats through the whole of its course, as far as it lies within the boundaries of Saxony. It is joined, within Saxony only, by a few small rivers; but several rivers which have their origin in the mountain-regions of that country, and traverse it from south to north, fall into the Elbe after it has left Saxony. Though not navigated by river-barges, they are used to float down timber and fire-wood. The rivers which fall into the Elbe are the Black Elster, with its tributary the Röder, from the east, and from the west the Freyberger and the Zwickauer Mulda, which unite within Saxony, and the White Elster, with its tributary the Pleisse

Natural Productions.—The vegetable kingdom yields corn, but not sufficient for the home consumption, potatoes, rape-seed, hops, flax, hemp, chicory, tobacco, madder, woad, saffron, medicinal herbs, anise, coriander, poppy, &c. Though the meadows are not equal to those of Holstein, they are however most carefully cultivated, and in the Erzgebirge are mown three, four, even five or six times in the year. Within these few years Spanish clover has been very much cultivated. Culinary vegetables are abundant, and large quantities are exported. With the exception of the mountainous district, Saxony resembles a vast orchard, the produce of which is a never-failing source of wealth to the inhabitants. The culture of the vine was introduced in the eleventh century. The annual produce, though not so great as formerly, is still 150,000 casks of 16 gallons. The culture of silk has not proved successful, the climate not being favourable to the growth of the mulberry-tree; yet the government is endeavouring to encourage it by the offer of considerable premiums. Almost a fourth part of the country is covered with forests, consisting chiefly of pine and fir. Of other timber-trees the most common are the beech and the birch; the maple, the elm, and the ash are less common, and the oak very rare.

Animals.—The breed of cattle has been very much improved within the last century. The horses are good, but there is no distinguished race, and the best are still imported from Mecklenburg, Moldavia, and Bessarabia. There are swine and goats in many parts of the country, and domestic poultry abounds. Bears and wolves are wholly extirpated; wild-boars are less numerous than formerly; foxes, badgers, and hares are found in great abundance; lynxes and wild cats are rare; birds of prey, with the exception of eagles, which are seldom seen, are everywhere met with. There are also bustards, storks, heathcocks, pheasants, partridges, and wild geese, ducks, and swans. The breeding of bees, formerly of great importance has now declined. But of all the productions of the animal kingdom the most important is the breed of merino sheep, introduced in 1765 by prince Xaver, regent of the kingdom, who applied to the court of Madrid for some Spanish sheep and received as a present 300 merinos, with six shepherds and six dogs. Subsequent importations were made from Spain, so that at present there are above 2,000,000 sheep of the improved breed, and Saxon, or Electoral wool, as it is called, is preferred in England even to the Spanish; nay, merinos have even been sent from Saxony to Spain, because the breed has suffered much in that country from the long wars.

Minerals are extremely productive, though not so much so as formerly, because the mines, being worked to a greater depth, require more labour and expense. The number of workmen employed in the mines is about 9000, and the annual value of the minerals 1,800,000 dollars;—these are, some gold, copper 615 cwt., iron 80,000 cwt., lead 15,000 cwt., tin 2500 cwt., cobalt 9000 cwt., arsenic 6000 cwt., vitriol 20,000 cwt., likewise bismuth, nickel, zinc, antimony, quicksilver, calamine, rock crystal, amethyst, cornelian, garnets, diamonds, jasper, chalcedony, Labrador stone, good potters'-earth, the finest porcelain clay in Europe, basalt, serpentine, granite, marble, alabaster, fluor spar, sandstone, limestone, slate, porphyry, black amber, brimstone, alum, saltpetre, and coals. All the salt-springs are in the part of the kingdom ceded to Prussia, from which all the salt is imported.

Manufactures.—Next to England and the Netherlands, Saxony has, in proportion to its population, the most extensive manufactures. That of linen has declined, but still employs 60,000 persons. The most important branch is that of damask table-linen at Gross-Schönau (a thousand looms). Thread-lace of extraordinary beauty is manufactured in the Obererzgebirge and the Voigtland. The annual value of the linen manufactures is 3,000,000 dollars. Woollen manufactures are very extensive, and those of cotton have rapidly increased within the last fifty years. There are silk-manufactures on a small scale; sixty paper-manufactories; and tanneries, breweries, and distilleries in almost all the towns. The manufactures connected with the mines are of great importance, especially at Freiburg, which is the central point of this kind of industry, as also for founderies of cannon and balls, and for separating the more valuable metals from the ore. Cobalt is made into smalts, and some places are noted for the manufacture of verdigris. The manufacture of straw bonnets, mats, &c. employs 10,000 hands.

Commerce.—The centre of the commerce of the country is Leipzig. The inland trade amounts to 12,000,000 of dollars, of which 8,000,000 pass through the hands of the merchants of Leipzig, and 2,000,000 through those of Jewish merchants. The whole foreign and domestic trade of Leipzig at three fairs amounts to 18,000,000 of dollars. The book trade is likewise to the amount of some millions. The principal exports are, fine woollen manufactures to England, Spain, Turkey, and Russia, 400,000 dollars. Linen, lace, &c. to Italy, England, Spain, and France, 3,500,000 dollars; thread, wool, worsted, smalts, porcelain, straw manufactures, woodenwares, glass, fruit, timber, and mineral products. The imports are salt, cotton, silk, flax, hemp, colonial produce, salt and dried fish, fancy goods, &c. The value of the exports is said to exceed that of the imports by 3,000,000 of dollars.

Religion.—There is no state religion; the great majority of the inhabitants are Lutherans, but the royal family having embraced the Roman Catholic faith in 1697, that religion was in consequence tolerated, and since the treaty of Posen, in 1811, the Lutheran and Romish religions are placed on an equal footing, and the professors of both enjoy the same rights. The number of Roman Catholics does not however exceed 30,000.

Education.—Saxony holds a very high rank with regard to the number and the excellence of its institutions for education, and the general diffusion of knowledge, there being very few countries where the lower classes are so generally taught to read and write. The number of printing-offices and booksellers greatly exceeds that in any other country of equal extent. There have been eminent Saxon writers in almost every branch of learning; without entering into particulars, but rather referring to the accounts of Dresden, Leipzig, and other cities, we will mention in general the number of such institutions in the whole kingdom:—University of Leipzig, 1; high schools at Grimma and Meissen, 2; gymnasia, 11; seminaries for schoolmasters, 4; Mining Academy, 1; institution for teaching the management of forests, 1; military schools, 2; deaf and dumb school, 1; agricultural school, 1; Sunday-schools and schools of industry, 21; Roman Catholic schools, besides those in Upper Lusatia, 15; Academy of Arts at Dresden, 1; besides free schools for the poor in all the principal towns, and numerous societies for the promotion of various branches of art and science in the chief cities.

Revenue.—The revenue arising from the public estates, the regalia, and taxes is about 5,100,000 dollars per annum, and the expenditure not quite 5,000,000. This has been much reduced of late years, and the public debt, which in 1821 amounted to 21¼ millions of dollars, is now only 11,000,000. The military establishment is 13,000 men, the greater part generally absent on furlough, except at the time of the annual exercises.

The constitution is a monarchy with a representation divided into two Chambers, without the consent of which no law can be issued, altered, or authentically interpreted. The executive power is in the king, and in urgent cases, where the intended object might be defeated by delay, he may issue ordinances without waiting for the assent of the Chambers, for which however the ministers are responsible. The king cannot become the sovereign of another state without the consent of the Chambers. The crown is hereditary in the male line of the Albertine house of Saxony. If that becomes extinct, the succession devolves on the house of Weimar, then on that of Gotha, after which it passes to the collateral branches, and lastly to the female line. Saxony is a member of the German Confederation, and as such furnishes a contingent of 12,000 men and a contribution of 2000 florins. It has the fourth place in the German Diet, between Bavaria and Hanover, and has four votes in the full council.

Divisions of the Kingdom.—The whole kingdom is divided into five provinces, called circles, viz. Meissen, Leipzig, the Erzgebirge, Voigtland, and Lusatia, which are subdivided into bailliwicks, in all 42. No country in Europe, except the Netherlands, is more densely populated. On an average there are 263 inhabitants to an English square mile. In the Erzgebirge 310 to a square mile, and in the territory of Schönburg 464 to a square mile. There are 141 cities and large towns, 51 smaller towns, and 3260 villages. The principal towns, all of which are described in their alphabetical order, are,—Dresden (without military and strangers), 69,253; Leipzig, 47,514; Chemnitz, 22,265; Freiburg, 11,446; Plauen, 9030; Zittau, 8674; Bautzen, 8460; Meissen, 7740; Schneeberg, 6910; Annaberg 6700; Zwickau, 6410; Glauchau, 6300; Pirna, 5560. Other towns with more than 5000 inhabitants are, Grossenhain, 5760; Mitweida, 5600; Dobelm, 5559; Frankenberg, 5550; Zschoppau, 5384; and Oschats, 5360.

SAXONY, PROVINCE OF, in the kingdom of Prussia, is situated between 50° 30′ and 53° N. lat., and between 9° 50′ and 13° 50′ E. long.; it is bounded on the north and north-east by the province of Brandenburg, on the south-west by the kingdom of Saxony, on the south by Gotha, Reuss, Weimar, and Hesse Cassel, and on the west by Hanover and Brunswick. It is divided into the governments of Magdeburg, Merseburg, and Erfurt, and is composed of almost the whole of the portion of Saxony ceded to Prussia at the Congress of Vienna, to which the principalities lying to the north of the duchy of Anhalt and to the west of the Elbe and the Havel have been added; the whole forms an area of 9700 square miles, with 1,564,187 inhabitants. The three duchies of Anhalt, a great part of Schwarzburg, the bailliwick of Alstedt belonging to Weimar, and that of Kalvörde belonging to Brunswick, lie entirely within the territory of this province.

The principal river is the Elbe, which traverses the province from south to north, and is joined in the north at Werben by the Havel, and in the south by the Saale. The greater portion of the province, viz. the whole district of Magdeburg to its extreme south-western border, and the larger (or eastern) part of the district of Merseburg on the other side of the Saale, belong to the plains of Northern Germany, and contain gentle eminences, but no mountains. The western or smaller part of the district of Merseburg and that of Erfurt are more mountainous than level, for on the one side branches of the Harz mountains and on the other side those of the Thüringer Wald run into it; yet this part likewise contains extensive and fruitful plains, and the mountains and hills which traverse it are nowhere of considerable elevation, except in the detached circle of Henneberg; on the south-west border of the province is the highest mountain of Northern Germany, the Brocken, which is 3500 feet above the level of the sea.

The soil, which is generally fertile, supplies the numerous population with the most important articles of food. The province is unquestionably the most equally and the best cultivated in Prussia; the districts of Magdeburg and Thüringen produce a considerable surplus for exportation; potatoes are very generally cultivated; pulse, oleaginous plants, culinary vegetables of all kinds, are amply sufficient for the consumption of the inhabitants; a considerable quantity of wine is made, and with beer and brandy, the usual beverage manufactured in the province, is mostly used for home consumption. In many parts of the government of Magdeburg wood is scarce, and there is barely sufficient anywhere except in the government of Erfurt. The breed of horned cattle is numerous, and Berlin is in part supplied from this province. The fine wool of the improved breed of sheep supplies not only the extensive woollen manufactures of the province, but furnishes a large overplus for exportation. The mineral products are antimony, cobalt, and iron; there is also some silver, but the most important metal is copper, of which about 16,000 cwt. are annually obtained; there are also lime, gypsum, alabaster, freestone, alum, and vitriol. The porcelain clay obtained near Halle is of very superior quality, and the salt from the saline springs furnishes a large supply; in 1835 the quantity was 1,272,446 cwt. The manufactures are woollens, leather, calico, and linen. There are several sugar-refineries in the province, and numerous brandy-distilleries. The manufactories of tobacco, porcelain, and earthenware at Magdeburg and Althaldensleben are on a very large scale. The exports are wool, corn, woollen and cotton manufactures, brandy, copper, iron and steel wares, and salt.

The most important commercial town is Magdeburg, on account of the facility of communication with Hamburg. All the principal towns are described under their respective heads—Aschersleben; Burg; Eilenburg; Eisleben; Erfurt; Halberstadt; Halle; Magdeburg; Merseburg; Mühlhausen; Naumburg; Nordhausen; Quedlinburg; Salzwedel, Torgau; Weissenfels; Wittenberg; Zeitz.

SAY, JEAN BAPTISTE, a writer on political economy was born at Lyon in 1767, and died at Paris, Nov. 16th, 1832. He came to the capital at an early period of the Revolution and was one of the projectors and conductors of a journal entitled 'La Decade Philosophique,' one of the small number of literary and scientific works that maintained an existence during the Revolutionary storm. After the 18th Brumaire, Say was called to the tribunate, the only semblance of a deliberative assembly which remained after the Revolution. It soon became the mere instrument of the First Consul's will, and Say ceased to be a member of it at the time when Napoleon was named emperor. He resigned an appointment, subsequently conferred upon him, of receiver of taxes for the department of Allier. He afterwards established a manufactory of some kind. On the whole he appears to have passed a quiet and retired life, engaged in his various works on political economy, and in lecturing on this and kindred subjects at the Conservatoire des Arts et Métiers at Paris.

The great merit of Say consists in having rendered the science of political economy popular in France. He followed closely in the steps of Adam Smith; but besides having placed the doctrines of his predecessor in a clear and luminous point of view by judicious arrangement, his works contain 'several accurate, original, and profound discussions' (Ricardo), among which may be mentioned his exposition of the nature and causes of gluts. [Political Economy, vol. xviii., p. 341.]

The works of Say are:—1, 'Traité d'Economie Politique,' published in 1802; 5th ed., 1826. 2, 'Catechisme d'Economie Politique,' 1815; 5th ed., 1826. 3, 'Lettres à M.

Malthus sur différents Sujets d'Economie Politique,' 1820. 4, 'Cours Complet d'Economie Politique Pratique,' 6 vols., 1829. This in effect is the 'Traité' more amply and familiarly illustrated. The first and second works in the above list have been translated into English. Say is the author of some smaller works, one of which is entitled 'De l'Angleterre et des Anglais.'

SBIRRI, or **BIRRI**, the name of a police force which existed in the Papal and other Italian states. They were not a military corps; they wore no uniform, and lived in their own houses; they received a small pay, and were furnished with arms. They were ready at any time of the day or night to rally at the summons of their captain, who was styled Bargello, for the purpose of tracing and arresting bad characters or suspected persons. Parties of them went their rounds in the towns at night. The Sbirri acted also as informers, and assumed various disguises for the purpose. They were placed under the orders of the respective governors of the towns and districts. This body of men fell at last into great disrepute: they were open to bribery, and often had a secret understanding with robbers and assassins. They were recruited from among bad characters, respited criminals, &c. They have been replaced now almost everywhere in Italy by the carabinieri, a regular military body like the French gendarmes, who are found much more effective and trustworthy.

SCAB. [Sheep.]

SCA'BIES. [Itch.]

SCABRI'COLA, Mr. Swainson's name for a subgenus of the genus *Mitra*, in his subfamily *Mitrinæ*, of the family *Volutidæ*.

SCA'EVOLA. There were many distinguished persons who bore this name.

Quintus Mucius Scaevola was praetor in the year B.C. 215, and in the following year had the government of Sardinia. He may be the Quintus Mucius, a jurist, mentioned by Pomponius (*Dig.*, i., tit. 2, s. 37), if Mucius is the right reading there.

Publius Mucius Scaevola, one of a family of jurists, was tribunus plebis B.C. 141, praetor B.C. 136, consul in the year B.C. 133, and in the year 131 B.C. he was Pontifex Maximus. Up to his time, says Cicero (*De Or.*, ii. 12), the events of every year were registered by the Pontifex Maximus, and such registers were the Annales Maximi. This Scaevola was a distinguished jurist, and also had the reputation of being an able orator and an honest man. Cicero speaks of his juristical writings, and Pomponius attributes ten works to him. Scaevola is cited in the 'Digest' several times. He was consul during the disturbances in which Tiberius Gracchus perished, and his conduct was marked by moderation.

Quintus Mucius Scaevola, commonly called the Augur, was consul with L. Caecilius Metellus in the year B.C. 117. He is said to have been the son of P. Mucius Scaevola, or Q. M. Scaevola, as he is sometimes called, who was consul B.C. 175, and grandson of Q. M. Scaevola who was praetor in the year B.C. 215. He was less distinguished as an orator than for his knowledge of the Roman law (Jus Civile). He was Cicero's master, but he was then an old man, and after his death Cicero attached himself to Quintus Mucius Scaevola, the pontifex. It is not known that he left any writings behind him, and accordingly he is not mentioned by Pomponius ('De Origine Juris,' *Dig.*, i., tit. 2). He was the son-in-law of C. Laelius, and the father-in-law of the orator L. Crassus, and is one of the interlocutors in Cicero's treatise 'De Oratore' (lib. i.), of the treatise 'De Amicitiâ,' and in the treatise 'De Republica.'

Quintus Mucius Scaevola, commonly called the Pontifex, to distinguish him from Q. M. Scaevola the Augur, was the son of Publius. He was the colleague of L. Crassus as tribunus plebis in the year B.C. 106, the year of Cicero's birth, aedile in B.C. 104, and consul in B.C. 95. As proconsul of the province Asia, he distinguished himself by the wisdom and justice of his administration; and the Greeks commemorated his happy government by establishing a festival called Dies Mucia. He subsequently attained the dignity of Pontifex Maximus. He was a man of strict integrity and great ability; a distinguished orator, and still more eminent as a jurist. (Cic., *De Or.*, i. 39.) After the death of the Augur, Cicero had the advantage of the society of the Pontifex, who formed many distinguished pupils, though he did not profess specially to give instruction in the law. C. Aquilius Gallus, one of the masters of Servius Sulpicius, was a pupil of this Scaevola. He perished in the consulship of the younger Marius, B.C. 82, being among those who were proscribed by him. The Pontifex was murdered in the temple of Vesta, where he had taken refuge, and the altar of the goddess was stained with his blood. (Flor., iii. 21; Cic., *De Or.*, iii. 3.)

This Scaevola was the first Roman who attempted to systematise the Jus Civile, which he did in a work in eighteen books. This work is mentioned by Gellius (vii. 15). It is also cited in the 'Digest,' where the name of Mucius is often mentioned; but there are no extracts from it. The Muciana Cautio took its name from him. (*Dig.*, xxxv., tit. 1, s. 72, &c.) He also wrote a book of Definitions (ὅροι), probably the first of the kind; and this is the oldest work from which any extracts with the author's name at the head were received into the 'Digest' (xli., tit. 1, s. 64; xliii., tit. 20, s. 8, &c.). The work on the Jus Civile was commented on by several subsequent jurists. Gaius (i. 188) speaks of certain books which he composed 'ex Quinto Mucio.'

SCÆVOLA, C. MUTIUS. [Porsena.]

SCAFFOLDING, a temporary erection of timber, usually for the purpose of supporting workmen and materials during the progress of a building.

In ordinary buildings the scaffolding requires very little notice. Poles are erected in a vertical position a few feet from the walls, their lower ends being inserted in the ground. Wherever a platform is required for the workmen, a horizontal pole is tied to the uprights, parallel with the wall; and from this horizontal pole cross-pieces extend to the wall, into which their ends are received, to support a flooring of planks. As the building rises, the scaffold is strengthened by diagonal poles, the lower ends of which rest upon the ground, and which are tied to the vertical pieces wherever they intersect them. As it would be difficult to tie the ropes that bind the scaffold together sufficiently tight, wedges are driven between them and the poles. The platform for the workmen, and most of the cross-bars by which it is supported, are raised as the work advances, and the holes left in the walls to receive their ends are filled in with a brick or half brick. When the height of the building exceeds that of the vertical poles, a second set is added, their lower ends coming several feet below the tops of the first series, to which they are firmly bound with cords. These additional poles are, like the former, strengthened by horizontal and diagonal pieces, and tied to the wall at intervals by the cross-pieces that sustain the platforms, some of which are allowed to remain till the completion of the work, for that purpose. In this way a scaffolding may be carried up to any required height, each set of vertical poles being tied to that immediately below it. Ladders are used to afford access to the platforms, of which, in some stages of the building, there are several; and bricks and mortar are usually carried up in hods on the shoulders of workmen, but occasionally in baskets raised by a rope which passes over a pulley at the upper part of the scaffold. When such a scaffold is erected in a public thoroughfare, the lower part of the poles should be whitewashed, to render them visible at night; and boards should be erected to protect passengers and carriages from inconvenience and danger. London builders frequently enclose the whole of the footpath with their hoards, and make a temporary path of planks outside them. But sometimes, instead of diverting the footpath, a covered way is made under the scaffold for foot passengers; the boards forming the top of which should be strong enough to allow ladders to be planted upon them, and to bear the shock of anything falling on them from above. The planking at the sides of the covered way should be inside the timbers, that there may be no projections to injure passengers. The general use of such covered ways might involve some additional expense; but, as the timber-work might be easily removed from one scaffold to another, the cost would probably be immaterial, while the convenience to the public would be much greater than in the ordinary method.

In the erection of important buildings of stone, a very convenient kind of scaffold has been recently adopted, consisting of large squared timbers well framed together, and terminating at the top in horizontal beams. Such a framing is erected on each side of the wall, unconnected with it, and rails are laid on the top beams, on which runs a carriage, capable of being moved by means of a winch-handle connected with the wheels. The carriage itself consists of a frame supporting another railway at right angles with that

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on which it runs; and on the upper railway is a smaller carriage, which supports tackle suitable for raising the stones. By this arrangement a stone may be lifted up, and moved, by the combined action of the two railways, to any point required on the wall.

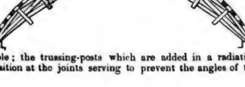
It does not fall within the scope of the present work to enter minutely into the varieties of scaffolding used under different circumstances. The centering of arches, an account of which was omitted under Centering, is however a kind of scaffolding that claims particular notice.

The centering (or centreing) of an arch is the wooden support or mould on which it is formed. It is required to be of great strength, not only on account of the great weight which it has to sustain before the arch is closed in, but also because of the unequal manner in which the load presses at different stages of the work. A centre usually consists of a number of distinct frames, resembling the trusses of a roof, placed equidistant from each other in vertical planes, and covered with a series of planks or beams of timber called bridging-joists, laid at right angles with the frames or trusses. This boarding or covering of bridgings forms a convexity coinciding with the internal concavity of the intended arch. The trusses of the centering may be from three to about eight feet or more apart, according to the weight of the arch and the strength of the covering on which the stones immediately rest. For small arches the centering is usually covered with planks; but in large works bridging-joists, one laid for each course of arch-stones, are preferred, these being kept at the proper distance apart by blocks placed between them. In the latter case however the arch-stones do not always rest immediately upon the bridging-joists; planks of soft wood being sometimes interposed between them, in order that, by cutting away the planks, the arch may be made to take its own bearing without lowering the centre. The whole structure is stiffened by cross-bars to keep the trusses equidistant and parallel to each other.

When the arch is to be built over a small stream, with a good bottom from which intermediate supports may be obtained by piling, or in other cases in which it is not necessary to maintain a free passage under the centering, its construction is a simple matter. Even where the span is large, and no support can be obtained, except at the piers, centering may be constructed on the principles of trussing which are treated of under Roof, provided that it be not necessary to leave a free passage for vessels under the arch. But when a bridge is built over a navigable river, horizontal ties near the bottom of the truss are inadmissible, and much skill is required to construct a strong and inflexible centering. Nicholson, in his 'Architectural Dictionary,' describes several different principles of construction that have been adopted for the trusses or ribs. One consists of a large truss formed of two inclined bars (the thrust being borne by the piers, in the absence of a tie-beam), supporting the centre or crown of the arch, while the intermediate points between the crown and the springing are sustained by smaller trusses resting on the sides of the principal one. In this case the *rafters*, or inclined beams of the main truss, may be used also as tie-beams to the subordinate trusses. In another arrangement a large truncated truss is used to support the haunches, while the crown of the arch is sustained by a small triangular truss resting upon the top of the former. In either case the bars which form the external ring of the trusses, the outer edges of which are of a curved form, are supported at several intermediate points by means of struts abutting on fixed points in the truss.

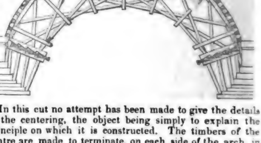
The construction adopted by Perronet, in his celebrated bridges in France, consists of a series of polygons placed within each other; the angles of one polygon bearing against the middle of the bars forming that immediately outside it. *Fig.* 1 represents a centre formed on this principle; the trussing-posts which are added in a radiating position at the joints serving to prevent the angles of the inner polygon from bending the bars against which they abut. In some cases the polygons are not placed in contact with each other, but each forms a distinct and independent arch, the whole being made to act in combination by means of trussing-posts, which are made of two pieces, one half being bolted on each side of the polygons.

Fig. 1.



Centres of the kind just described left a very free passage under the arch, especially as it was usual to contract the timbers at the foot of the centering, to make them bear on a narrow base; but they appear to have been very deficient in stiffness, having sunk very much during the progress of the building, and required a heavy load to be laid on the crown to prevent it from being forced up by the weight of the haunches. The kind of centering used by Mr. Mylne in building Blackfriars Bridge, which has been imitated in several other important works, is found very superior to it in strength and immutability of figure. In this arrangement each fixed point of the curve that supports the bridgings is supported by two timbers abutting on opposite sides of the arch; each pair of which may be considered as an independent truss. *Fig.* 2, which represents this arrangement, shows that the two timbers supporting each point do not actually meet at their upper ends; a short piece of wood, termed an apron-piece, being placed between them.

Fig. 2.



In this cut no attempt has been made to give the details of the centering, the object being simply to explain the principle on which it is constructed. The timbers of the centre are made to terminate, on each side of the arch, in a piece of wood called the upper striking-plate, the under side of which is formed into a series of inclined planes. A similar piece, with the inclined planes upwards, is supported by struts, abutting on steps or offsets on the pier; and between these striking-plates is placed a piece of timber formed into a series of wedges, by driving which farther in, the centre may be very gradually lowered. By this plan much greater stability is obtained than when the base of the centre is contracted so as to bear on one point only on each pier; and, when the bed of the river is not very soft, still greater firmness and security may be obtained by driving piles some distance within the piers, to support the inner ends of the lower striking-plates. The timbers are halved into each other at their intersecting joints, the number of which is perhaps the chief disadvantage of this plan; and double king-posts, as in the construction last described, are added to keep the joints firm.

Robison (*Mech. Phil.*) observes, speaking of centering that is supported wholly on the piers, that 'the framing which is to support our arch before the key is set, must itself be an arch, depending on the mutual abutment of its beams.' This natural principle is acted upon in the centering represented in *Fig.* 1; and also in another kind which is occasionally used, consisting of a number of quadrilateral frames abutting on each other like the voussoirs of an arch, the joints radiating from the centre. Each frame is stiffened by diagonal braces; and the whole structure resembles the *Norman roof* (represented in the article Roof, p. 147), with the addition of pieces parallel with the rafters to complete each frame.

The centering of the new London Bridge was formed on a different plan from any that have been described, the greater part of the arch being supported by one long truss, the upper part of which, being formed of a number of short pieces abutting against each other, coincided with the form of the arch, and which was stiffened by nine vertical trussing-posts, and diagonal braces. This truss was elevated to such a height as to allow free passage under the tie-beam, by means of a trussed framing on each side, resting on the striking-plates; and a broad base was obtained for the whole by piling.

It is frequently difficult to ascertain which of the timbers in a centre will be exposed to tension, and which to compression; and some will be subject to both in different stages of the work; a circumstance for which it is difficult to provide securely. As in other kinds of truss, all transverse strains should be avoided, and the joints should be strongly secured with bolts and straps. As a general rule, the necessary stiffness should be obtained by means of struts rather than ties, on account of the difficulty of making joints that will bear the immense strains to which centering is liable; especially because the temporary character of the structure renders it desirable to cut the timber as little as need be, in order to save expense. The centres contrived by British engineers have generally stood very well; but, as some alteration of shape is unavoidable, owing to the shrinking of the joggles, &c., and as the arch must be expected to sink a little when the support it derives from the centering is withdrawn, the centre should be made rather higher at the crown than the curve which the arch is intended finally to assume, in order that the stones may be in equilibrium.

It is scarcely necessary to observe that the building of the arch should proceed simultaneously on each side, in order to avoid unequal strains on the centering. It is sometimes useful to load the crown of the centering during the progress of the work, to prevent it from changing form by the unbalanced pressure of the haunches. When the arch is completed, the removal of the centering is a delicate and important operation. Perronet removed its support from the arch, or, in technical language, *eased* the centering, by cutting away the transverse pieces upon which the stones immediately rested; beginning at the abutments and advancing equally on each side towards the crown. Another, though a very objectionable plan, of cutting away these cross-pieces alternately, and leaving the arch supported for a time at a few distant points, has been practised. The best plan appears to be, gradually lowering the whole centering simultaneously by means of wedges, as represented in *Fig.* 2. The rubbing surfaces of the wedges and striking-plates are commonly soaped and rubbed with black lead, or, in large works, covered with sheets of copper. While the building is in progress, blocks are put into the spaces behind the wedges, to prevent their slipping; and when completed, these blocks being removed, the wedges are driven back either with mauls, or, if very large, with a battering-ram suspended from the centering. The wedges are sometimes so arranged that they may be struck from the sides of the bridge, so that the men employed need not be under the arch during the operation. The centering is lowered but little in the first instance, and should not be taken away until the arch has completely settled. In most cases it is desirable to lower the centering as uniformly as possible; but where a tendency to unequal settlement is observed in the arch, it may be advisable to ease it irregularly, to assist the arch in settling to a firm bearing. For bridges consisting of several equal and similar arches, two or three centerings may be sufficient, one only being removed at once.

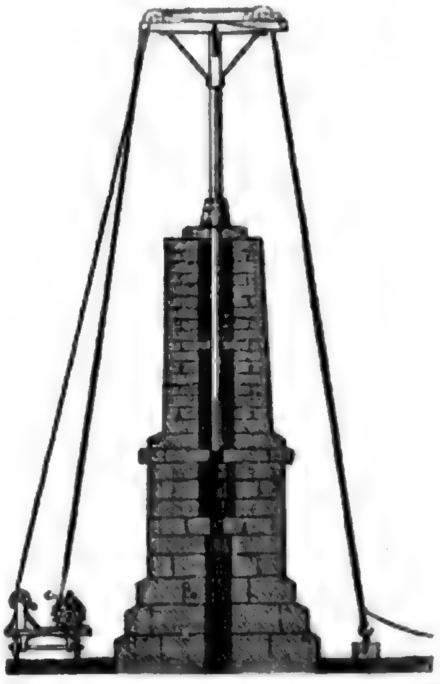
In a Report by Telford on the passage of the Menai Strait, printed in the Parliamentary Papers for 1811, a novel plan is proposed for the centering of very large arches; especially adapted for situations in which, from the nature of the bottom, the rapidity of the current, or the great elevation of the bridge, a centering put up from below would be impracticable. It was suggested for the erection of an iron arch of 500 feet span at Ynys-y-Moch. Telford proposed that the masonry of the abutments should be carried up to the level of the roadway, and surmounted by four massive frames, about fifty feet high, placed at the same distance apart that the ribs of centering were to be. The centering was to be formed of a number of trussed frames, fitting together like the stones of an arch; these frames being twenty-five feet deep at the sides, and gradually diminishing to seven feet six inches at the crown of the arch. The first set of these frames of centering were to be put up by means of scaffolding secured to the abutments; and supported by horizontal ties set in the masonry, and iron rods suspended from the frames at the top of the abutment. On the first portion of centering thus put up, a flooring was to be laid, on which the second set of frames could be moved forward. These, being laid upon the first set in an inverted position, were to be hinged to them by a contrivance resembling the joint of a carpenter's rule, and then turned over until their ends abutted against the ends of the first set. Suspension rods being then extended from the ends of the second set to the frames on the abutment, the flooring was to be extended, and a third portion of the centering moved forward and fixed in like manner. Thus the centering would be suspended from the abutments; and, when completed, it would have the strength of an arch, as well as that of the suspending rods, to enable it to support the superstructure.

To avoid the expense of centering, Brunel (now Sir Mark Isambard Brunel) invented, a few years since, a method of building brick arches, in which, by taking advantage of the cohesive strength of Roman cement, and the introduction of iron hooping to tie the brickwork together, one half of an arch is capable of supporting itself; no centering being required beyond a slight rib to serve as a model of the curve of the arch. This plan has not, we believe, been applied in practice, but it appeared, from an experimental arch (or rather a pier, supporting parts of two arches), erected near the Thames Tunnel, to be adapted even for large spans. If we mistake not, this experimental erection had one half of a very flat arch of sixty feet span; and it stood a much longer time than could, under any circumstances, be required in practice.

The centering of groined arches has been already described under Groins, vol. xi., p. 455.

Much ingenuity has been applied to the construction of scaffolding for peculiar and unusual purposes, as the erection or repair of domes, columns, obelisks, &c. In the 31st volume of the 'Transactions' of the Society of Arts is an engraving of a scaffold, contrived by Mr. Hughes, for repairing the interior of a dome in the Manchester Exchange. It consists of a vertical pole erected in the centre of the dome, to which is connected a framework, supporting a kind of ladder, corresponding with the form of the interior of the dome, and mounted on wheels, so that it may be moved round to any part of it, the vertical pole serving as an axis. In the 51st volume of the same work is a detailed account of an apparatus, invented by Mr. Slacks, a mason, for building an obelisk without scaffolding of the ordinary description. This simple and ingenious machinery is represented in the following cuts, and was used in erecting an obelisk of sandstone, 100 feet high, not including the foundation, on the summit of a mountain called Whitaw, in Dumfriesshire, in honour of the late Major-General Sir John Malcolm. The Society of Arts rewarded the inventor with their gold Isis medal in 1837. *Fig.* 3 is a general view of the apparatus, the obelisk being shown in section, and *Fig.* 4 an enlarged representation of the upper part.

Fig. 3.



The obelisk is hollow, having bond-courses throughout at intervals, in which holes of ten inches diameter are left to receive the lower part of a pole, forty feet long and ten inches in diameter. At the point where the pole passes through the upper bond-course it is surrounded by a collar

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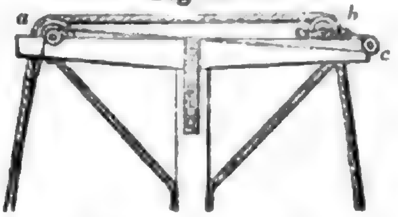
of hard wood, firmly bolted to it; which, resting on the bond-course, supports the whole apparatus, while the lower bond-courses, by embracing the pole, hold it in a vertical position. To enable the pole to turn round with facility, seventeen balls, three inches and a half in diameter, are placed between the collar and the stone, each of which has a circular groove to receive the balls and guide them in the right direction. At the top of the pole a cross-piece, about twelve feet long, is fixed, and secured to the pole by iron braces. Each end of this cross-piece carries a grooved pulley, that at *a* (*Fig.* 4) being inserted in a mortice cut in the beam, while that at *b* is mounted on a small carriage, capable of rolling nearer to or farther from the centre, upon rails fixed on the top of the beam; a long groove or mortice being cut through the beam to receive the lower part of the pulley. A circular railway is laid round the base of the obelisk, on which is placed a carriage, containing a crab, or machine for winding up the rope. The rope, by which the materials and workmen are raised, passes up from the crab over the pulleys *a* and *b*, and down to the ground on the opposite side, where the stones are attached to it, their tendency to swing against the obelisk being checked by a guy or guide-rope held by a man on the ground. The natural effect of the weight raised is to make the pulley *b* approach the centre of the cross-beam, but this tendency is so regulated as to cause the stone to descend upon any required spot, by attaching a small rope to each side of the carriage in which *b* is mounted, which, passing round a small pulley at *c*, and over another on the axis of *a*, is carried down to a small windlass mounted on the same carriage with the crab. There is a rope of this kind on each side of the beam, but, at a short distance below it, the two are united. By winding up this rope, the pulley *b* is caused to approach the end of the beam, and by fixing the windlass it may be made stationary at any required point.

Fig. 4.



For a more particular account of this apparatus, and the means by which it is elevated from one stage to another, the reader is referred to the volume mentioned above, or the 'Mechanic's Magazine,' vol. xxix., pp. 225-230. The contrivance for finishing the top of the obelisk must however be mentioned here. When the first sloping course of the apex was laid, a light hanging scaffold, represented in *Figs.* 5 and 6, was laid upon it. The first cut represents the scaffold in profile, while the second is a ground-plan.

Fig. 5.

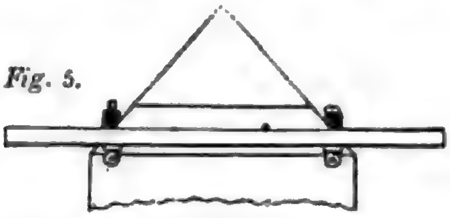
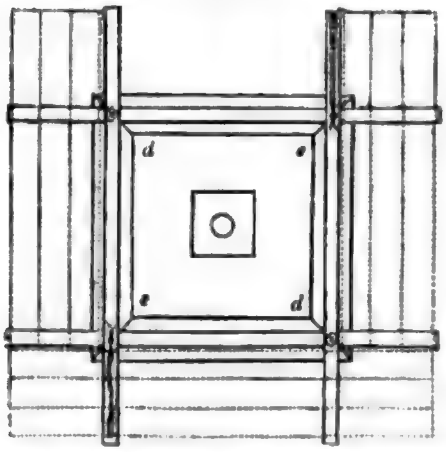


Fig. 6.



The scaffold consists of four pieces of wood, twelve feet six inches long, formed into a frame, the inside of which fits and rests upon the sloping stones. At the angles *d*, *d* these timbers are fixed together by screw-bolts, and at *e*, *e* by slip-bolts with their points upwards, keyed to prevent them from falling through. This frame being held steady by guy-ropes from the ground, a flooring of planks (shown by dotted lines in *Fig.* 6) was laid on three of its projecting sides, and a pulley fixed on the fourth. The stones required to complete the apex in the form indicated by the dotted lines in *Fig.* 5 being then hoisted up, the upright pole was sawn off to the level of the upper course of stone-work, the portion cut off being lowered by the pulley, and the remainder left in the obelisk. When the work was completed, the planks were lowered by the rope and pulley, and ropes were attached to the slip-bolts at *e*, *e*, and others to the keys by which they were secured. The last person then descended, and the ropes attached to the keys and bolts being successively pulled, the frame was disjointed, and fell to the ground. The ropes for withdrawing the keys and bolts were passed through blocks at the base of the obelisk, and thence conducted to a safe distance; and various other arrangements, which it is unnecessary here to detail, were made for the safety of the persons employed.

A kind of portable scaffold, or 'travelling platform,' which may prove useful in some situations where support can be obtained from above, was rewarded by the Society of Arts in 1839. It consists of two boards, twelve inches long and four wide, hinged together, with the joint upwards. Grooves are made in the inner edges of the boards, of such a size that a rope suspended from a point above that at which the platform is to be used, will pass through the opening formed by them when the boards are not pressed upon, but will be grasped tightly when the joint is closed by a weight on the boards. These boards are strapped to the feet of the climber, who has a belt round his waist connected with a ring that slides up and down the rope. He draws himself up by his hands, the rope slipping between the boards as he ascends; but as soon as his weight rests upon the boards, they close upon the rope so tightly as to enable him to remain stationary at any point, leaving his hands at liberty.

SCAGLIO'LA (from the Italian *scaglia*, a scale or shell) is an *incrustation* of artificial composition which is applied to columns, and produces the most perfect imitation of marble, from which it can hardly be distinguished either by the eye or the touch, as it takes an equally high polish and feels equally hard and cold. Scagliola has long been in use in Italy, where, according to Lanzi, it was invented by Guido Fassi of Carpi (1584-1649), and where it was afterwards much used for Florentine or inlay-work of the kind called *a commesso*. It was not introduced into this country before the latter half of the last century, and the earliest application of it was in the columns of the Pantheon in Oxford-street, London, built by James Wyatt. Since that time, it has been brought into more general use, the manufacture of it has been considerably improved, and it can be executed at a comparatively moderate cost. In fact it has now almost superseded the use of coloured marbles for columns and other interior decorations, and has been extensively employed in Buckingham Palace and many of the club-houses in London. It is far less costly than any kind of variegated marble, though too expensive to be brought into ordinary use on every occasion, and it answers the purpose of the real material not only as regards appearance and effect, but durability also, since it will last quite as long as any other part of the interior of a building. There is besides one great advantage attending it, that columns incrusted with scagliola are generally of wood and hollow, or else filled with a plaster core, and consequently do not require that support in the floor beneath them which would be necessary if solid marble shafts were employed; and if required to support a bearing above them, the columns may be made of brick or ordinary stone, and afterwards coated with scagliola. Nor is the use of this composition confined to columns and pilasters only, for it may be and indeed is applied to other ornamental purposes, for table-slabs, pedestal-stands, dados of rooms, borders of floors, &c.

The composition or cement itself is prepared from the purest gypsum, which is first broken into small pieces, and after being calcined is reduced to powder. It is then passed through a fine sieve, and mixed with Flanders glue, isinglass, &c. In this state it is mixed up with colouring matter of the hue required; and as it is generally employed for the imitation of variegated or veined marbles (all coloured ones being more or less so), as many different colours and shades of the same colour must be mixed up separately as there are in the kind of marble to be imitated. Thus prepared, the composition is applied to columns or other surface intended to receive it, and which has a rough coating of lime and hair. The different colours are laid on and mixed by the workman, and consequently much depends upon his skill and taste in regard to the exactness of the imitation or the beauty of the veining and streaking, which is done in the floating, as it is termed, or laying on the cement. The next operation is to prepare the surface for polishing, by rubbing it with pumice-stone and cleansing it with a wet sponge. The polish is then given by rubbing it again, first with tripoli and charcoal on a piece of fine linen, secondly with felt dipped in tripoli and oil, and lastly with oil alone. By this means a durable lustre is obtained fully equal to that of the finest and most highly polished marble.

When scagliola was first introduced into this country, it was executed by Italian artists, and much secresy was observed in regard to all the processes; but it has since been brought to far greater perfection here than on the Continent, where it is regarded merely as a substitute for marble, and secondary even to such as is of inferior kind or has very little beauty in itself. By means of scagliola, not only may the costliest and rarest stones, porphyry, verde antico, giallo antico, &c. be successfully imitated, but any combination of colours may be produced; for instance, purple, or emerald green, streaked with gold, Siena veined with purple, or any other splendid caprice that fancy may dictate.

SCALA, DELLA, or SCALI'GERI, the name of a family of Verona, which acquired sovereign power over its native city in the thirteenth century, and afterwards extended its dominion over the neighbouring towns and territories. Like the Della Torre and the Visconti of Milan, the Della Scala belonged to the order of the nobility. They became party leaders during the factions which agitated the Italian cities in the middle ages, and their party having proved successful, they obtained the dignity of Podestà, or supreme magistracy, first for a term of years, afterwards during the life of the holder, and lastly as an office hereditary in their family, being confirmed in it by the sanction of the German emperors, who, in their quality of kings of Italy, although they had no direct dominion over any part of the country, appointed as their imperial vicars those chiefs who had most influence over their countrymen. [Lombardy and Lombard Cities.]

After the death of Eccelino da Romano, tyrant of Padua, Verona, and Vicenza, and the great Guibeline leader in Northern Italy, the people of Verona elected for their podestà Mastino della Scala, about the year 1260. Mastino belonged to the Guibeline party, which predominated at Verona. After having held office for five years, during which by his conduct he won the public approbation, Mastino was made by acclamation perpetual captain of the city. Being murdered by some private enemies in 1273, the citizens elected for his successor his son Albert, who was afterwards proclaimed lord of Vicenza, Feltre and Belluno, by the citizens of those towns.

Albert died in 1297, and was succeeded by his eldest son Bartolommeo, who, dying three years after, was succeeded by his brother Alboino, a man of a peaceful temper, who, not thinking himself fit to rule alone in those turbulent times, took his younger brother, Can Francesco, a brave aspiring soldier, for his colleague, and some years later resigned to him the undivided sovereignty. Can Francesco della Scala, called 'the Great' by his contemporaries, was the most illustrious of his family. He was appointed captain of the league made by Verona, Mantua, Brescia, and other towns against the marquis of Este, lord of Ferrara, who, being supported by the Anjous of Naples, aspired to extend his dominion over Lombardy. Can Francesco defeated him, and obliged him to withdraw to Ferrara. When Henry of Luxembourg, king of the Germans, came to Italy to be crowned emperor, in 1311, Can Francesco joined him with a body of troops, and assisted him in subduing Brescia and other towns which would not acknowledge the imperial authority, and he was rewarded by Henry appointing him his imperial vicar at Verona. Can Francesco, or Can Grande, as he was henceforth styled, became the acknowledged head of the Guibeline party in Lombardy, like his contemporary Castruccio Castracani in Tuscany. The dominion of Can Grande extended over Verona, Vicenza, Feltre, Belluno, Este, Monselice, Cremona, and lastly, after a war which lasted several years, also over Padua, in short over almost the whole extent of country which has been since called the Venetian territory, Venice at that time having but a strip of ground on the mainland bordering on the lagoons. The last acquisition of Can Grande was that of Treviso, which he obliged to open its gates to him in July, 1329. He made his triumphal entrance into Treviso, but was a few days after seized by a violent fever and died in the height of his success, at the age of thirty-nine, having been ruler of Verona for about nineteen years. Castruccio had died the year before, and thus the Guibelines of Italy lost, nearly about the same time, their two most distinguished leaders.

Can Francesco della Scala acquired celebrity not only by his success as a warrior and a statesman, but by the encouragement which he gave to literature and the arts. His court, which was very splendid, was attended by poets, painters, and sculptors. Dante, in his exile, found for a time an asylum at the court of Della Scala, and he immortalised Can Francesco in his verse. Boccaccio also wrote of him as one of the most illustrious chiefs that Italy ever had, not only on account of his bravery in the field, but also for his abilities in council. He raised the fortress of Peschiera, on the shore of the lake of Garda, as a defence on the side of Mantua and Milan.

Can Francesco was succeeded by his two nephews Alberto and Mattino, who acted a conspicuous part in the wars of the Italian factions in the fourteenth century, fighting against the Visconti and the Venetians. Their descendants continued to rule till the year 1387, when Gian Galeazzo Visconti, duke of Milan, took possession of Verona, having driven away Antonio della Scala, an illegitimate son of the last lord. After some more vicissitudes Verona came into the possession of the Venetians, in the year 1409.

SCALA, Klein's name for the *Scalaria* of authors.

SCALA'RIA. [Wèntletrap.]

SCALARIANS, Lamarck's name for a family of testaceous mollusks, which he arranges in the first section of his order Trachelipoda. The *Scalarians* of Lamarck consist of the genera *Vermetus*, *Scalaria*, and *Delphinula*.

SCALD. [Burns and Scalds.]

SCALD, properly SKA'LLD, is an antient Scandinavian word which signifies poet, as skálldmär or skálldkona signifies a poetess. The name is therefore sometimes applied to the Scandinavian poets in general, but it belonged more especially to that class of poets who celebrated in their songs the exploits of heroes. The Scalds were thus not merely poets, but also the historians of their nation. When Snorri Sturluson, the last and most celebrated of the Scalds (1178-1241) states that the Scalds indeed always praised their contemporary heroes most, but never attributed to them any fictitious deed, we must infer that the creative powers of these poets had no scope, at least as far as contemporaneous history was concerned. In the history of the past they might take greater liberties; but we have reason to believe that even here they strictly adhered to tradition. The form and mode of diction were thus the only parts in which they displayed their poetic powers; and how they availed themselves of this right is clear from the numerous specimens of Scaldic poetry still extant: they are full of the boldest and most extraordinary imagery, whence they are frequently very obscure and almost unintelligible.

Scaldic poetry is almost the only source from which we derive our knowledge of the antient history of the North of Europe. A considerable portion of it goes back to the remotest antiquity, and contains only mythological legends; while another portion, in the form of poetry, contains historical accounts of contemporary events. Such poetical histories, very different from the rhymed chronicles of other nations, continued to be written down to the middle of the thirteenth century. The Scalds were generally in the service of a chief or king, whom they accompanied on his expeditions in the capacity of historiographers; and it was the pride of the chieftains to obtain such Scalds as possessed most ability and learning. Their services were richly rewarded by the heroes whose praise they sang.

We still possess a very long list of Scalds, among whom are persons of the highest rank, and even kings. The most distinguished however were those of Iceland, and it is to these that we are indebted for the collection of antient poetical traditions known under the name of the Eddas. Compare 'Fundgruben des Nordens,' vol. i.; John Olafsen, 'Om Nordens gamle Digtekonst, Grundregler, Versarter, Sprog og Fóredrags mode,' Copenhagen, 1786; F. Wachter, in the introduction to his German translation of Snorri Sturluson's 'Heimskringla;' and the article Snorri Sturluson.

SCALE (Music). A great deal has been written on this subject, by mathematicians, by musicians, and by those who combined both characters; but, from various circumstances, hardly anything which is accessible to the young arithmetician wishing for something which may really be a help to him in his musical studies. The Greek scale [Music; Tetrachord], the only fruitless subject of inquiry out of all that is Greek, has exhausted the learning, science, and ingenuity of the best writers, with no result but this, that over-refinements of theory are found either to have hindered practical excellence, or to have arisen out of the want of it; most likely the latter. The learning however which it was necessary to apply to the explanation of the Greek writers, has made it usual to write on this subject more profoundly than on others of the same difficulty: it is an object in the present article to explain the musical scale, if possible, more simply, and in its simplest parts: leaving to the article Temperament such considerations as, arising out of the present article, are required by those who would understand the higher practical details of the subject.

The object of music being to please the ear, or the mind through the ear, there is no other test of excellence nor criterion of fitness, in any one detail, except the opinion of the best judges. This seems to assume the question, for the best judges can only be described as those who best know what is good music. This circle cannot be avoided, either in speaking of music or any other of the fine arts; to taste we must appeal, but not to the taste of every one. All we have here to do with this is to remark, that the mathematical considerations employed in an article like the present are not to be considered as placing the musical scale upon a mathematical basis, but simply as showing that there is something like an explanation of those rules, which derive their authority not from the mathematical system which embodies them, but from the sanction of the majority of cultivated ears. Those things which are agreeable in practice are found to be in certain mathematical relations to one another which make the theory of the musical scale simple and interesting: but had it been otherwise, we should have left mathematical simplicity, and preferred a more pleasing complexity.

The sounds which are agreeable to the ear are found to be those which are the consequence of vibrations of equal duration following one another. [Acoustics.] The note called A, for instance, sounded at the same time on a harp, a flute, and a horn, presents three different characters, three different intensities, but only one species of vibration as to the time of lasting. If the first instrument communicate 430 vibrations in a second to the air, so does the second instrument, and also the third. With the difference of intensity or loudness, and with the difference of character, the twang of the harp, or the tone of the horn, we have nothing to do in considering the place in the scale of the note they sound: a cultivated ear discovers that they sound the same note, and a mathematician knows that they severally communicate to the air the same number of vibrations per second.

Let us then suppose a string to be mounted, and stretched at both ends, or, better still perhaps, suspended vertically* by one end, and bearing a weight at the other. If this string be then set in vibration by the finger or by the bow of a violin, a musical (that is, a pleasant) sound is produced, if the string be not too long, nor stretched by too small a weight. With the phenomena of vibration, as connected with the length, material, and stretching weight of the string, we have here nothing to do [Cord] except to remark,—1, That the ear observes that, material and tension remaining the same, the longer the string the lower the tone, and *vice versâ*. 2, That the mathematician knows that, *ceteris paribus*, the longer the string the fewer the number of vibrations in a given time, in inverse proportion to the length. Thus, if a certain string, stretched by a certain weight, give 100 vibrations per second, a string of half the length, stretched by the same weight, will give 200 vibrations per second. If a vibration mean a double motion of the string, once backwards and once forwards, the effects begin to be musical soon after the string is short enough, or stretched enough, to give 30 vibrations per second.

The number of musical tones is, theoretically, infinite: that is, between any two tones as many different tones as we please can be interposed, no one of which is so high as the higher, nor so low as the lower. Highness and lowness of tone are terms which are purely relative, and refer to an effect upon the ear which does not admit of definition: common terms usually distinguish only extreme cases: thus, a tone disagreeably high is a squeak, and one disagreeably low is a growl. There is no absolute reason why we should call the former high and the latter low, rather than the contrary; and in fact the earlier Greeks (naming them after the parts of the throat in which they thought they were produced) called the squeaking sounds low, and the growling ones high. But while we endeavour to separate names from things, we must not forget that there is much which all men acknowledge of real connexion between the associations which accompany sounds and those derived from other sensible phenomena. For instance, it would be impossible to persuade any one, that if light and darkness were to be imitated by musical tones, the light ought to be represented by low notes, and the darkness by high notes: and a composer who should accompany words expressive of transition from darkness to light by a marked descent from the higher part of the scale to the lower, would be thought to mean irony or burlesque. No satisfactory explanation has ever come to our knowledge as to what associations are awakened by the lower notes of the scale which connect them with darkness; but that this connexion does exist is certain.

Taking such a string or monochord (*single string*) as above described, it is immediately found that any alteration of its length produces some alteration of the tone. If the change be very slight, a dull or unpractised ear may not readily perceive it; but let the alteration be carried a little further, and there can be no difficulty. Such tones, near to one another, when sounded together, have a disagreeable and jarring effect, accompanied by beats [Acoustics, p. 97]; but when the second string has been considerably shortened (say that this is done gradually), the disagreeable effect ceases almost at once, and at the moment when the shortened string is to the longer one as five to six. Two sounds are then heard which *harmonize* together, and on their joint effect the ear dwells with pleasure until it becomes monotonous (this very common word is itself derived, as to its common signification here used, from the wearying effect of the same tone, or set of tones, long continued). In the mean while, and during the shortening of the string, the joint effect, though always disagreeable, is not equally so throughout; and there is one place in particular where the effect, though not agreeable to the beginner, is bearable for a little while, and highly agreeable to the practised ear, which knows that full compensation is at hand in what is called the resolution of the discord, or transition to a more harmonious combination in a manner which seems peculiarly natural. This intermediate and more tolerable phase of sound takes place when the shortened string is to the other as eight to nine. Moreover, it may be observed that this last combination, hardly bearable, is rendered perfectly so if the two tones, instead of being sounded together, are made to follow each other in succession, no matter how rapidly. In both these cases the student will observe that the proportion of the lengths of the strings is that of some small numbers, five to six, and eight to nine. And it is matter of experiment, that the more simple the proportions of the lengths of two strings (stretched by the same weight), the more useful the combination in music—it is usual to say the more agreeable sounded by itself; but to this we cannot subscribe, as we believe that to most ears the more complicated combination of a *third* (presently to be described) is more agreeable than the less complicated one of a *fifth*.

Instead of speaking of the lengths of the strings, we may pass to the relative numbers of vibrations in a second, which are inversely as the lengths. Thus, two strings of ten and seven feet, stretched by the same weight, vibrate so that the one of ten feet makes eight vibrations while that of eight feet makes ten.

We now proceed to consider the most simple combinations; and first, that of two to one. Let the second string be half the first, or make two vibrations while the first makes one: there is then not only a joint effect which is agreeable, but a peculiar sameness of the two notes, in so much that two instruments made to play together in such manner that the notes of the second shall always be of twice as many vibrations as the simultaneous notes of the first, would be universally admitted to be playing the same air, with no more difference than of that sort which is heard when a man and a boy attempt to sing the same air together. This perfect sameness, for so it will be called, though the two instruments never sound the same tone together, admits of no explanation; for though the ratio of the simultaneous vibrations is the simplest possible (two to one), there is no perceptible reason why, because simple ratios generally give harmonious combinations, the most simple of all should produce an absolute feeling of identity of character in the two tones. To this circumstance however we owe the most material simplification of the musical scale: for let it be settled, for instance, what strings give agreeable notes between those of 20 and 10 feet long, and division by two will give all the strings which can be admitted between those of 10 and 5 feet; thus, if it be proper to admit a string of eight feet in the former set, one of four feet must also take its place in the latter.

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* Woolhouse 'On Musical Intervals,' p. 64. The author repeated the experiments of Fischer [Acoustics, p. 97] and found a monochord thus constructed better than the common one for the purpose. His result was that A (the second space of the treble clef) made 424 vibrations in one second.

Again, it is observed that the relative effect of two tones is always the same as those of other two, when the numbers of vibrations made in a given time in the first pair are *in the same proportion* as the corresponding numbers in the second pair. Thus, suppose that in a given time the numbers of vibrations made by four strings are 12, 18, 40, and 60. Then,

$$12 : 18 :: 40 : 60 \text{ or } \frac{18}{12} = \frac{60}{40}$$

and we may say that, according as the first and second sounded together are pleasant or unpleasant, so are the third and fourth; also if an air beginning on the first string require an immediate transition to the second, then the same air begun on the third string will require an immediate transition to the fourth.

A *musical interval*, then, is given when the fraction which expresses the proportion of the vibrations of its two notes in a given time is given. By the interval $\frac{3}{2}$ we mean that of two notes, the higher of which makes three vibrations while the lower makes two. Thus, if 18, 23, and 30 be the numbers of vibrations made by three strings in the same time, and we wish to find a fourth note which is as much above the third as the second is above the first, we must not make a string of 35 vibrations in the same time (as the beginner might do), that is, not one of 30 + 23 − 18, but one of $30 \times \frac{23}{18}$, or $38\frac{1}{3}$ vibrations in the same time.

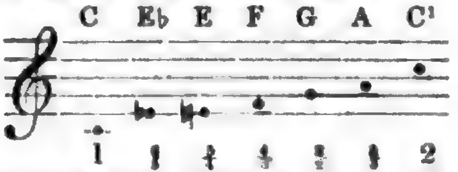
Let us now take a string, and call the note sounded by it C, and let the string of twice as many vibrations (or half its length) have the same name, with a difference (for the reason above given); call it C^1. Let us now seek for the simplest fractions which lie between 1 and 2. Take the numbers up to 6 (the ear does not so well agree with 7 and all higher prime numbers, why of course cannot be told, but simplicity must end somewhere, and, by the constitution of the ear, ratios in which 7 and higher primes occur are not agreeable), and form every fraction out of them which lies between 1 and 2; we have then

$$\frac{3}{2},\ \frac{4}{3},\ \frac{5}{4},\ \frac{5}{3},\ \left(\frac{6}{4} = \frac{3}{2}\right),\ \frac{6}{5}$$

Put these down, with 1 and 2, in order of magnitude, and we have

$$1 \quad \frac{6}{5} \quad \frac{5}{4} \quad \frac{4}{3} \quad \frac{3}{2} \quad \frac{5}{3} \quad 2$$

Take such a set of strings that while the first makes one vibration the second makes $\frac{6}{5}$ of a vibration, the third $\frac{5}{4}$ of a vibration, and so on up to the last, which makes 2 vibrations: or take a set of strings equally stretched, of which the length of the first being 1, that of the second is $\frac{5}{6}$, &c., and of the last $\frac{1}{2}$. Every one of the notes thus produced will be agreeable when sounded with the first, and if the first sound C, the musician will have the following part of the scale before him in its most natural form:—



These intervals have the following names; why, will presently be seen,—

$\frac{6}{5}$	minor third.	$\frac{3}{2}$	fifth.
$\frac{5}{4}$	major third.	$\frac{5}{3}$	major sixth.
$\frac{4}{3}$	fourth.	2	octave or eighth.

We have not yet, however, got a sufficiently agreeable scale, and the reasons why the ear will not be contented with the preceding most simple concords, must be derived from observation, from which it appears—

1. That a frequent repetition of sounds very near to one another is not pleasing to the uncultivated ear. Now the interval from the minor to the major third is as follows: the first makes $\frac{6}{5}$ of a vibration while the second makes $\frac{5}{4}$, or the first makes 1 vibration while the second makes $\frac{5}{4} \times \frac{5}{6}$, or $\frac{25}{24}$. This is much too near to a unison for continual repetition.

2. That a frequent repetition of sounds too far from each other is not pleasing to the ear, after a little cultivation. If we look at the intervals from the fourth to the fifth, and from the fifth to the sixth, we find $\frac{9}{8}$ and $\frac{10}{9}$ for their representatives, while from the fundamental note to the minor third, and also from the sixth to the octave, the interval is $\frac{6}{5}$, much larger than the preceding intervals.

Both these defects, as must easily be seen arithmetically, and as the ear finds out for itself, may be remedied by inserting a note between C and E in place of E♭, which shall make a better division of the interval C E, and by placing an additional note between A and C^1. But how are we to choose these additional notes? If we cannot have any more very simple consonances with the fundamental note, we must take those tones which make the simplest consonances with other notes, and the more they make the better. We have already a repetition of some consonances; for instance,

Interval FC^1 is $2 \div \frac{4}{3} = \frac{3}{2}$, or a fifth.
Interval GC^1 is $2 \div \frac{3}{2} = \frac{4}{3}$, or a fourth.
Interval FA is $\frac{5}{3} \div \frac{4}{3} = \frac{5}{4}$, or a major third.

Now since $\frac{3}{2} \times \frac{3}{4} = \frac{9}{8}$, we see that a note $\frac{9}{8}$, or one which makes 9 vibrations while the fundamental note C makes 8, will be a fourth below G, and $\frac{9}{8}$ divides C and E well, the three notes $1, \frac{9}{8}, \frac{5}{4}$, giving the intervals $\frac{9}{8}, \frac{10}{9}$, already found in another part of the scale. This note is D. Again, observe the interval from E to F, or $\frac{16}{15}$, and take a fifth above E, or $\frac{5}{4} \times \frac{3}{2}$ or $\frac{15}{8}$: this fraction falls between $\frac{5}{3}$ and 2, and looking at the intervals of $\frac{5}{3}, \frac{15}{8}$, and 2, we find $\frac{9}{8}$ and $\frac{16}{15}$, both of them intervals already found. This note $\frac{15}{8}$, or which makes 15 vibrations while the fundamental note makes 8, is B, and the usual scale of civilized nations, called the *diatonic* scale, is now complete in the following—

C	D	E	F	G	A	B	C^1
1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	2

This diatonic scale seems then to be the scale of the simplest concords of the fundamental note, with one alteration on account of the too great proximity of two concordant notes, and one interpolation on account of the too great distance of two others. If we examine all its intervals, we shall find both repetition and variety as follows (C D standing for the interval from C to D, &c.), some new appellations being added:

CD = FG = AB . . = $\frac{9}{8}$ (major tone).
DE = GA . . . . = $\frac{10}{9}$ (minor tone, $\frac{80}{81}$ of major).
EF = BC¹ . . . . = $\frac{16}{15}$ (diatonic semitone).
CE = FA = GB . . = $\frac{5}{4}$ (major third).
EG = AC¹ . . . . = $\frac{6}{5}$ (minor third).
DF . . . . . . = $\frac{32}{27}$ ($\frac{80}{81}$ of minor third).
CF = DG = EA = GC¹ = $\frac{4}{3}$ (fourth).
FB . . . . . . = $\frac{45}{32}$ (flattened fifth).*
CG = EB = FC¹ . = $\frac{3}{2}$ (fifth).
DA . . . . . . = $\frac{40}{27}$ ($\frac{80}{81}$ of fifth).
CA = DB . . . . = $\frac{5}{3}$ (sixth).
EC¹ . . . . . . = $\frac{8}{5}$ (minor sixth).
CB . . . . . . = $\frac{15}{8}$ (seventh).*
DC¹ . . . . . . = $\frac{16}{9}$ (flat seventh).†
CC¹ . . . . . . = $\frac{2}{1}$ (octave).

We observe here the consonances mentioned before, two inharmonious intervals, a new species of consonance (the flat seventh) standing as it were between the more perfect consonances and the others, and new varieties of a tone, of a minor third, and of a fifth, differing from those already described, and flatter by the interval $\frac{81}{80}$. This interval is called a *comma*, and though the ear can distinguish a difference between the tones of two strings, one of which vibrates 81 times while the other vibrates 80, yet the difference is so slight as to produce no prejudicial effect. With regard to the comparatively harmonious character of the flat seventh, observe that $\frac{16}{9}$ is very nearly equal to $\frac{7}{4}$, differing only by the interval $\frac{64}{63}$.

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* An inharmonious interval, when the notes are sounded together.
† Decidedly more harmonious than the seventh.

We have also the diatonic semitone, $\frac{16}{15}$, which is incorrectly named, since, if beginning with 1, we repeat the interval of a semitone twice, we have $\frac{16}{15} \times \frac{16}{15}$, or $\frac{256}{225}$, which is very near to $\frac{9}{8}$, sharper (that is, higher, as flatter means lower) than a major tone by the interval $\frac{2048}{2025}$ and than a minor tone by $\frac{128}{125}$, very nearly.

We shall presently resume the diatonic scale, but we now proceed to mention two varieties of it. It seems to have been offensive to the ears of rude nations to hear any semitones at all. If we deprive the diatonic scale of F and B, the notes which rise semitones at the next step, we have C, D, E, G, A, C, for all the sounds which remain in the octave. This unfinished scale, as we should call it, is the original scale of the Chinese, Avans, Hindus, and Eastern Islands, the northern nations of Europe, &c. It is the well-known scale of the old Scotch and Irish music; it is said to have been found in Wales and Cornwall, in various parts of Africa, and even in old Italian music. The Chinese, who never change, have preserved it in absolute perfection, though the modern form of most antient airs in other countries has been relaxed. We copy the notes of a Chinese air given by Laborde:

DCCGAGGCCAGEDCCGAGAACECAGGCCAGECCEDAC

It will be observed that F and B never occur. An almost perfect specimen of this scale occurs in the Scotch air 'The Campbells are coming.' The effect of the scale may be tried by playing *ad libitum* on the black keys of a pianoforte.

The other scale which we have here to mention is that known by the name of the *minor* scale, the common diatonic scale being for distinction called *major*. It may easily be observed that the intervals of the minor third and minor sixth have a sad, or at least plaintive effect, as compared with the major third and major sixth. No explanation can be given of this: perhaps the effect of musical intervals is governed in some degree by associations derived from the human voice in speaking. All persons, except perhaps schoolboys reading what they do not understand nor care about, are constantly, whether they know it or not, varying the tone in which they speak, and making intervals which are very nearly musically correct: and the effect of sorrow, regret, fatigue, &c. is to make those intervals minor. Any person of a quick musical ear who will watch the method of saying the simple words 'I cannot,' pronounced as a determination of the will, and compare it with the same when it is an expression of regret for want of power, will almost always find such an interval as C F or or C^1 G in the first, and C E♭ or C^1 A in the second; if this be so, it is not surprising that a scale in which minor intervals occupy conspicuous places which in the other scale are occupied by major intervals, should produce those associations which have been alluded to. This is a conjecture merely, for after all nature will take the liberty in art, as in science, of concealing her operations. But this much is certain, first, that the minor scale is more plaintive than the major, and secondly, that all musical composers are acquainted with the fact, from the African women who sung of Mungo Park, 'Let us pity the white man, no mother has he to bring him milk, no wife to grind his corn,' up to the composer of Der Freischütz, with all the power of cultivation and the memory of centuries of art. The change from the minor to the major scale is perhaps the most effective of musical resources, certainly the most powerful of those which are easily understood by ears of the ordinary degree of cultivation. Take as an instance the music of the following words from Oberon:—

Oh-Araby,-blest-Araby, my own, my native-land,
Methought I-crossed the dark-blue sea, and touched a-gain thy strand;
And there I saw my-father's house, &c.

The intervals with which the voice passes over the hyphens in the first two lines are minor, but in the third line a modulation is made into a major scale, and the composer has skilfully taken care to produce a strong result of the new scale in the first two syllables: the effect of the change is strikingly appropriate.

What is the minor scale? This question has been differently answered by different writers on the theory of music, who severally contend for one or another scale as *the true scale*. For ourselves, we are no believers in true and orthodox scales, or rather we hold every scale to have that character which has been used by good composers, and approved by good hearers. It seems to have been thought that because there is one diatonic major scale, by universal consent, therefore there must be one lawful diatonic minor scale: just as well might it be said, that because the iambic trimeter is the one metre of Greek tragic dialogue, there must also be some one other metre, and that one only, in the choruses. Fortunately however the scholar knows, what the musician ought to know, that no one metre is dictated by any absolute law of taste, and teaches that the best tragedians must be the guide, because of the universal approval which has been conceded to their writings. Taking the same sort of guide, we find in the writings of musicians (the unknown authors of national airs, writers of very high authority, included) one major scale and several minor scales; a thing not more atrociously wrong in itself than the one metre of dialogue, and the variety of chorus metres, of the Greeks. And if, moreover, we take the mathematical theory of the scale, we shall find several with equal claims on the score of simplicity of consonances.

Return to the fundamental note C and its consonances, namely—

C	E♭	E	F	G	A	C^1
1	$\frac{6}{5}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	2

Instead of throwing out E♭ as too near to E, let it be the latter which we reject; if we finish this with the D and B of the diatonic scale, we have what is called the *common* ascending minor scale, the commonness of which we cannot deny upon data, though it strikes us that others are as common, if not more so.

(1)	C	D	E♭	F	G	A	B	C^1
	1	$\frac{9}{8}$	$\frac{6}{5}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	2

The ear will not very quickly acknowledge this as a minor scale in descent, and for the obvious reason that in going from C^1 to C there is no distinction between this scale and the major scale till we come to E♭; though in the ascent the minor interval occurs early. To remedy this, A and B are both lowered a semitone, or the A is made A♭, a fourth to E♭, and the B is made B♭, a fifth to E♭, which gives

(2)	C	D	E♭	F	G	A♭	B♭	C^1
	1	$\frac{9}{8}$	$\frac{6}{5}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{8}{5}$	$\frac{9}{5}$	2

and this scale reversed is called the common mode of descending the minor scale; but as we also find it used in ascending, we put it down as a second minor scale, both for ascent and descent, observing also that (1) may be, and is, used in descent. Again, suppose we retain the B of the original scale, and lower the A, we have then

(3)	C	D	E♭	F	G	A♭	B	C
	1	$\frac{9}{8}$	$\frac{6}{5}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{8}{5}$	$\frac{15}{8}$	2

a wild and pleasing scale, both in ascent and descent, and employed too, in spite of the wide interval between A♭ and B. Its harmonies, technically speaking, are easier and more natural than those of the common scale, and Schneider ('Elements of Harmony') makes it the principal minor scale, treating all others as incidental deviations: the English translator of Schneider contends for its absolute truth, and asks (justly enough) which scale a composer would take who was converting the air of 'Robin Adair' into the minor key (the original air having the notes G A B C D E) namely, G A B C D E♭, or G A♭ B C D E♭? There can be no doubt that the latter would be preferable, but we might add, that if the composer were required to make two variations in the minor key, he would probably choose scale (1) for his other case. The following minor scales are used, and are agreeable:—

(4)	C	D♭	E	F	G	A♭	B	C
	1	$\frac{16}{15}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{8}{5}$	$\frac{15}{8}$	2
(5)	C	D	E♭	F	G	A	B♭	C
	1	$\frac{9}{8}$	$\frac{6}{5}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{9}{5}$	2

Of all these minor keys, we prefer (3). For an instance of the use of it, take the first part of the air 'Charlie is my darling,' the notes of which run thus, C D E♭ F G C^1 G A♭ C^1 A♭ G C^1, C D E♭ F G C^1 D^1 E^1♭ C^1 D^1 B C^1. It is also the scale used in the first two lines of the air from Oberon, already noticed.

We now come to the extension of the diatonic scale by the interpolation of notes between all such notes as are far enough apart to bear it, which completes what is called the chromatic scale. There are various ways in which this can be done, and if notes were only occasionally interposed between those of the diatonic scale, it would be a subject of comparatively little importance how it was done. But we must now explain what is meant by different *keys* in music.

The note C having been fixed, and the diatonic scale on it, let an air be composed and written down, say 'Robin Adair.' The consecutive notes of the first part of this air, played in the key of C, that is, in the diatonic scale which has C for its fundamental note, are (we have nothing here to do with the time)

$$G\ A\ B\ C^1\ D^1\ E^1,\ G\ C^1\ A\ C^1\ B\ D^1\ C$$

Let us now transpose this, as it is said, into the key of F, that is, show how it is to be played in a diatonic scale having the F of the preceding scale for its fundamental (or key) note. If all the intervals of the scale were equal, this would be done by playing as follows:—

$$C\ D\ E\ F\ G\ A,\ C\ F\ D\ F,\ E\ G\ F$$

Again, to remove this air into the key of A, or into the diatonic scale constructed on A, we should write (if the intervals were all equal),

$$E\ F\ G\ A\ B\ C^1,\ E\ A\ F\ A\ G\ B\ A$$

If we chose to confound the intervals of a major and minor tone, we should find the second of these (so it happens) correct, for the intervals of the original air are (m, minor tone; M, major tone; s, semitone) $m\,M\,s\,M\,m\ (2M+2m+s)\ (M+m+s)\ (M+s)\,s\ (M+s)\,s\ (M+s)\,M$, and those of the second are $M\,m\,s\,M\,m\ (2M+2m+s)\ (M+m+s)\ (m+s)\ (m+s)\,s\ (M+s)\,M$, which are undistinguishable from each other, if M and m be supposed (as is the fact) too nearly equal to make it worth while to take account of their difference. But the third is $s\,M\,m\,M\,s\,(2M+2s+m)\ (M+m+s)\ (M+m)\ (M+m)\,m\ (m+M)\,M$, which does not agree with either of the other two, nor can do so, except to an ear which cannot distinguish s from m or M. To see what intermediate notes will be wanted, we must construct a diatonic scale on each of the seven notes, which we shall now do, putting an equivalent to every note above C^1 or below C into the octave between C and C^1, by halving or doubling the fraction which expresses its vibrations. Moreover, we express the notes in the diatonic scale on D by D, D_{ii} D_{iii} D_{iv} D_v D_{vi} D_{vii} and D_{viii}; and so on. Also let ${}_{ii}D$ stand for an octave below D_{vii}, ${}_{iv}C$ stand for the note an octave below C_v, and so on, the rule being that ${}_mC$ and C_n are octaves when m and n together make *nine*. All this is well known, if anything of the scale be practically understood. What we have to do, for instance in forming the diatonic scale on F, is to take $\frac{4}{3}$, the representative of F in the diatonic scale of C, and multiply it successively by 1, $\frac{9}{8}$, $\frac{5}{4}$, &c. Our scales then are as follows, putting down under each note gained any note of the original diatonic scale, or any one of the scales previously formed, from which it differs insensibly little, removing each note an octave lower when necessary.

(D)	${}_{ii}D$	D	D_{ii}	D_{iii}	D_{iv}	D_v	D_{vi}	D_{vii}
	$\frac{135}{128}$	$\frac{9}{8}$	$\frac{81}{64}$	$\frac{45}{32}$	$\frac{3}{2}$	$\frac{27}{16}$	$\frac{15}{8}$	$\frac{135}{64}$
		D	E		G	A	B	
(E)	${}_{iii}E$	${}_{ii}E$	E	E_{ii}	E_{iii}	E_{iv}	E_v	E_{vi}
	$\frac{25}{24}$	$\frac{75}{64}$	$\frac{5}{4}$	$\frac{45}{32}$	$\frac{25}{16}$	$\frac{5}{3}$	$\frac{15}{8}$	$\frac{25}{12}$
	${}_{ii}D$		E	D_{iii}		A	B	D_{vii}
(F)	${}_{iv}F$	${}_{iii}F$	${}_{ii}F$	F	F_{ii}	F_{iii}	F_{iv}	F_v
	1	$\frac{10}{9}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{16}{9}$	2
	C	D	E	F	G	A		C^1
(G)	${}_vG$	${}_{iv}G$	${}_{iii}G$	${}_{ii}G$	G	G_{ii}	G_{iii}	G_{iv}
	1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{45}{32}$	$\frac{3}{2}$	$\frac{27}{16}$	$\frac{15}{8}$	2
	C	D	E	D_{iii}	G	A	B	C^1
(A)	${}_{vi}A$	${}_vA$	${}_{iv}A$	${}_{iii}A$	${}_{ii}A$	A	A_{ii}	A_{iii}
	$\frac{25}{24}$	$\frac{10}{9}$	$\frac{5}{4}$	$\frac{25}{18}$	$\frac{25}{16}$	$\frac{5}{3}$	$\frac{15}{8}$	$\frac{25}{12}$
	${}_{iii}E$	D	E	D_{iii}	E_{iii}	A	B	E_{vi}
(B)	${}_{vii}B$	${}_{vi}B$	${}_vB$	${}_{iv}B$	${}_{iii}B$	${}_{ii}B$	B	B_{ii}
	$\frac{135}{128}$	$\frac{75}{64}$	$\frac{5}{4}$	$\frac{45}{32}$	$\frac{25}{16}$	$\frac{225}{128}$	$\frac{15}{8}$	$\frac{135}{64}$
	${}_{ii}D$	${}_{ii}E$	E	D_{iii}	E_{iii}	F_{iv}	B	D_{vii}

In order therefore to make an instrument which shall play in perfect tune in every one of these diatonic scales, we must have it capable of sounding the following notes, those of the original diatonic scale, or very near to them, being in parentheses, and requisite notes of nearly equal sound being written under one another.

$$(1)\ \begin{matrix}\frac{25}{24}\\ \frac{135}{128}\end{matrix}\left(\begin{matrix}\frac{9}{8}\\ \frac{10}{9}\end{matrix}\right)\frac{75}{64}\left(\begin{matrix}\frac{5}{4}\\ \frac{81}{64}\end{matrix}\right)\left(\tfrac{4}{3}\right)\ \begin{matrix}\frac{45}{32}\\ \frac{25}{18}\end{matrix}\ \left(\tfrac{3}{2}\right)\ \frac{25}{16}\left(\begin{matrix}\frac{5}{3}\\ \frac{27}{16}\end{matrix}\right)\begin{matrix}\frac{225}{128}\\ \frac{16}{9}\end{matrix}\ \left(\tfrac{15}{8}\right)\ (2)$$

With this we might go on ad infinitum; for it might be required to construct new diatonic scales on every one of these new notes, which would introduce more new notes, on which again new diatonic scales might be produced, and so on. But since the original scale consists only of major and minor tones (nearly equal) and diatonic semitones (nearly half-tones), the new notes will very nearly divide the whole tones into equal parts, a circumstance of which advantage will presently be taken. In the mean time we proceed to explain, as far as it can be done, the distinction musicians draw between *flats* and *sharps*; unfortunately we are unable to make writers on this subject agree with each other, or with themselves, as to the meaning of these words in an *untempered* scale. The conventions under which the names sharp and flat are used come easily enough, and temperament avowedly makes small adjustments and accommodations between the several notes, which cause the sharpened A to be practically the same as the flattened B, and so on. But what the clear and admitted distinction of sharp and flat is previously to that adjustment, we wish we could evoke or provoke some musician to tell us. One word to those who write on the scale without much mathematical knowledge;—get into a tempered scale as fast as you can, and keep there.

The nomenclature is regulated as follows. The notes A, B, C, D, E, F, G are preserved in every key; so that if any key contain A and a note between A and B, the latter is not called A♯, for then (A A♯) A would occur twice in the scale, but B♭, giving A B♭. Follow this rule in every one of the scales just given, and we shall find the following sets of notes in them severally:

								Name of the Key.
C	D	E	F	G	A	B	C^1	(natural, . . C)
D	E	F♯	G	A	B	C♯	D^1	(two sharps, D)
E	F♯	G♯	A	B	C♯	D♯	E^1	(four sharps, E)
F	G	A	B♭	C	D	E	F^1	(one flat, . . F)
G	A	B	C	D	E	F♯	G^1	(one sharp, . G)
A	B	C♯	D	E	F♯	G♯	A^1	(three sharps, A)
B	C♯	D♯	E	F♯	G♯	A♯	B^1	(five sharps, . B)

That is to say, a diatonic scale on D, for instance, only keeps D, E, G, A, B, or notes very near to them, of the diatonic scale, and requires the insertion of notes between F and G and C and D, which the avoidance of repetition of letters requires us to denote by F♯ and C♯, and not by G♭ or D♭. In the preceding keys then, we have five sharps mentioned (though really seven notes of the kind, two between C and D, two between F and G, one between each of D and E, G and A, A and B) and one flat (between A and B). Where are the other two sharps? If we construct diatonic scales upon F♯ and C♯ we shall find

F♯	G♯	A♯	B	C♯	D♯	E♯	F^1♯	(six sharps, . F♯)
C♯	D♯	E♯	F♯	G♯	A♯	B♯	C^1♯	(seven sharps, C♯)

with not precisely the same notes as before, but very near to them, excepting two notes which are new; one between E and G (called E♯) and one note between B and C (called B♯). But on which of the values of F♯ and C♯ in the table are these scales to be constructed, and why? Again, as to the flats, if we construct diatonic scales on B♭, and on each new flat as it is successively introduced, we shall find that our nomenclature gives us new keys, as follows:—

B_1♭	C	D	E♭	F	G	A	B♭	(two flats, . B♭)
E♭	F	G	A♭	B♭	C^1	D^1	E^1♭	(three flats, E♭)
A_1♭	B_1♭	C	D♭	E♭	F	G	A♭	(four flats, A♭)
D♭	E♭	F	G♭	A♭	B♭	C^1	D^1♭	(five flats, . D♭)
G♭	A♭	B♭	C^1♭	D^1♭	E^1♭	F^1	G^1♭	(six flats, . G♭)
C♭	D♭	E♭	F♭	G♭	A♭	B♭	C^1♭	(seven flats, C♭)

But if we were actually to proceed to form this scale, beginning from B♭ ($\frac{16}{9}$) gained from the preceding process, we should find ourselves keeping very near the chromatic scale of sharps already obtained, so that the notes which appear in the preceding as remnants of the diatonic scale would really be close to the real notes. Let us see, for instance, what the F would be in the key of G♭:

B♭, a fourth above F $= \frac{16}{9}$, E'♭, a fourth above B♭ $= \frac{64}{27}$.
E♭ $= \frac{32}{27}$, A♭, a fourth above E♭ $= \frac{128}{81}$.
D'♭, a fourth above E♭ $= \frac{512}{243}$, D♭ $= \frac{256}{243}$.
G♭, a fourth above D♭ $= \frac{1024}{729}$.
F' (so called) a seventh above G♭ $= \frac{1024}{729} \times \frac{15}{8} = \frac{640}{243}$.
F (so called) $= \frac{320}{243}$, F (really) $= \frac{4}{3}$.

Now from $\frac{320}{243}$ to $\frac{4}{3}$ the interval is only $\frac{81}{80}$, the comma, which we meet with so often elsewhere. But we should find different values for the same flat in the different keys above, just as we have found different values for the same sharp in the preceding. To show however in how confused a state the natural chromatic scale has been left, we copy three scales, the first from Wallis ('Phil. Trans.,' No. 242, A.D. 1698), the second from La Borde ('Essai sur la Musique ancienne et moderne,' vol. ii. p. 9, A.D. 1780), and the third from Montferrier ('Dict. des Math.,' vol. iii. p. 243, A.D. 1840). All these writers *omit the flats*, mentioning only the sharps:—

C	C♯	D	D♯	E	F	F♯	G	G♯	A	A♯	B
1	$\frac{18}{17}$	$\frac{9}{8}$	$\frac{81}{68}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{24}{17}$	$\frac{3}{2}$	$\frac{27}{17}$	$\frac{5}{3}$	$\frac{30}{17}$	$\frac{15}{8}$
1	$\frac{25}{24}$	$\frac{9}{8}$	$\frac{75}{64}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{45}{32}$	$\frac{3}{2}$	$\frac{25}{16}$	$\frac{5}{3}$	$\frac{225}{128}$	$\frac{15}{8}$
1	$\frac{16}{15}$	$\frac{9}{8}$	$\frac{6}{5}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{45}{32}$	$\frac{3}{2}$	$\frac{8}{5}$	$\frac{5}{3}$	$\frac{16}{9}$	$\frac{15}{8}$

It has been laid down by some writers that the definition of a sharp and flat is as follows: when it is necessary to take a note between, say A and B, that note is called A♯ when it is nearer to A, and B♭ when it is nearer to B. Let such be the definition; then the note which is exactly half way between C and D, being expressed by $\sqrt{(9 : 8)}$, is 1·0607, while $\frac{18}{17}$, $\frac{25}{24}$, and $\frac{16}{15}$ are severally 1·0588, 1·0417, and 1·0667. The two first only come under the denomination of C♯, according to this definition, while the third ought to be called D♭. In fact, this third scale is almost a scale with its semitones, collected from the minor keys which are found to please the ear, with a slight alteration and one addition. In (2) B♭ is made as a fourth to F, instead of a fifth to E♭ (giving $\frac{16}{9}$ in place of $\frac{9}{5}$, the interval of the two being only a comma); let $\frac{9}{5}$ be taken instead of $\frac{16}{9}$. Then between F and G insert G♭, a minor third to E♭ (giving $\frac{36}{25}$). Take the simplest sharps from the diatonic scales hereinbefore found, and, putting all the results together, we shall have the following, which, if a complete untempered ENHARMONIC scale is to be given, will, we believe, be as defensible as any. The sharps are all derived from the diatonic major scale, the flats from minor scales made by the usual minor intervals; the sharp of each note is lower than the flat of the following, though the former and the latter are not always in different halves of the interval:—

C	C♯	D♭	D	D♯	E♭	E	F	F♯	G♭	G	G♯	A♭	A	A♯	B♭	B	C
1	$\frac{25}{24}$	$\frac{16}{15}$	$\frac{9}{8}$	$\frac{75}{64}$	$\frac{6}{5}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{45}{32}$	$\frac{36}{25}$	$\frac{3}{2}$	$\frac{25}{16}$	$\frac{8}{5}$	$\frac{5}{3}$	$\frac{225}{128}$	$\frac{9}{5}$	$\frac{15}{8}$	2

The enharmonic intervals of this scale are as follows:—

C♯ D♭ = 1·024, D♯ E♭ = 1·024, F♯ G♭ = 1·024,
G♯ A♭ = 1·024, A♯ B♭ = 1·024:

so that this enharmonic interval will be in every instance $\frac{128}{125}$, or 1·024. This circumstance was not looked for in the formation of the scale, and it is thus seen that if the sharps be derived from the major diatonic scales of the different notes in the fundamental diatonic scale, and the flats solely from the minor scales which have been judged admissible, the result is an enharmonic scale, in which the enharmonic interval is everywhere the same, namely, the interval by which three major thirds fall short of an octave.

If an instrument could give all the above sounds, the same music played in different keys would have slightly different effects. We remember to have seen a statement of the supposed character of the different keys, which would be useless here, on account of its not describing the scale which was supposed to be the basis. We might suppose beforehand that of two keys, the one in which some prominent consonances are a little flatter than in the other, would partake, in a slight degree more than the other, of the plaintive character which distinguishes the minor keys. But, in the first place, instruments in general, and particularly the piano-forte, on which the greater part of music first comes into existence, have not two notes interposed between each note of the diatonic scale, but one only, which must serve both to sharpen the lower, and flatten the higher. Next, the preceding scale would be found not very tolerable in some keys, particularly if laid down on an organ. Some TEMPERAMENT, that is, mutual accommodation of notes to each other, would be necessary, and though we defer to a separate article the account of the systems which prevail, or have been proposed, it will be desirable here to lay the mathematical foundation of the subject, which is easy enough to one who can use logarithms. The following table will be necessary, which we proceed to explain:—

1	00·00	51	68·07	101	79·90	151	86·86	201	91·81
2	12·00	52	68·40	102	80·07	152	86·98	202	91·90
3	19·02	53	68·73	103	80·24	153	87·09	203	91·99
4	24·00	54	69·06	104	80·40	154	87·20	204	92·07
5	27·86	55	69·38	105	80·57	155	87·31	205	92·15
6	31·02	56	69·69	106	80·73	156	87·42	206	92·24
7	33·69	57	70·00	107	80·90	157	87·54	207	92·32
8	36·00	58	70·30	108	81·06	158	87·65	208	92·40
9	38·04	59	70·59	109	81·22	159	87·75	209	92·49
10	39·86	60	70·88	110	81·38	160	87·86	210	92·57
11	41·51	61	71·17	111	81·53	161	87·97	211	92·65
12	43·02	62	71·45	112	81·69	162	88·08	212	92·73
13	44·40	63	71·73	113	81·84	163	88·18	213	92·82
14	45·69	64	72·00	114	82·00	164	88·29	214	92·90
15	46·88	65	72·27	115	82·16	165	88·40	215	92·98
16	48·00	66	72·53	116	82·30	166	88·50	216	93·06
17	49·05	67	72·79	117	82·44	167	88·60	217	93·14
18	50·04	68	73·05	118	82·59	168	88·70	218	93·22
19	50·98	69	73·30	119	82·74	169	88·80	219	93·30
20	51·86	70	73·55	120	82·88	170	88·91	220	93·38
21	52·71	71	73·80	121	83·02	171	89·02	221	93·45
22	53·51	72	74·04	122	83·17	172	89·11	222	93·53
23	54·28	73	74·27	123	83·31	173	89·22	223	93·61
24	55·02	74	74·51	124	83·45	174	89·32	224	93·69
25	55·73	75	74·74	125	83·59	175	89·41	225	93·76
26	56·40	76	74·98	126	83·73	176	89·51	226	93·84
27	57·06	77	75·20	127	83·86	177	89·61	227	93·92
28	57·69	78	75·42	128	84·00	178	89·71	228	94·00
29	58·30	79	75·65	129	84·14	179	89·81	229	94·07
30	58·88	80	75·86	130	84·27	180	89·90	230	94·15
31	59·45	81	76·08	131	84·40	181	90·00	231	94·22
32	60·00	82	76·29	132	84·53	182	90·09	232	94·30
33	60·53	83	76·50	133	84·67	183	90·19	233	94·37
34	61·05	84	76·71	134	84·79	184	90·28	234	94·44
35	61·55	85	76·91	135	84·92	185	90·37	235	94·52
36	62·04	86	77·12	136	85·05	186	90·47	236	94·59
37	62·51	87	77·32	137	85·18	187	90·56	237	94·67
38	62·98	88	77·51	138	85·30	188	90·66	238	94·74
39	63·42	89	77·71	139	85·43	189	90·75	239	94·81
40	63·86	90	77·90	140	85·55	190	90·84	240	94·88
41	64·29	91	78·09	141	85·68	191	90·93	241	94·95
42	64·71	92	78·28	142	85·80	192	91·02	242	95·02
43	65·12	93	78·47	143	85·92	193	91·11	243	95·10
44	65·51	94	78·66	144	86·04	194	91·20	244	95·17
45	65·90	95	78·84	145	86·16	195	91·29	245	95·24
46	66·28	96	79·02	146	86·28	196	91·38	246	95·31
47	66·66	97	79·20	147	86·40	197	91·47	247	95·38
48	67·02	98	79·38	148	86·51	198	91·55	248	95·45
49	67·38	99	79·55	149	86·63	199	91·64	249	95·52
50	67·73	100	79·73	150	86·74	200	91·73	250	95·59

Since all intervals are found by multiplication and division, it is obvious that if for intervals we substitute the logarithms of intervals, we form logarithms of new intervals by addition and subtraction. Hitherto, we express a note which makes a vibrations while the fundamental note makes b vibrations, by $\frac{a}{b}$; let us now express it by $\log a - \log b$, the logarithm of the preceding. It only remains to see what system of logarithms it will be most convenient to take. Having made the octave, or the interval from 1 to 2, consist of twelve semitones (not equal indeed, but nearly so), let us take a new scale, to which all others shall be referred, and which divides the octave into 12 *equal* semitones. This is a tempered scale, on the (theoretically) simplest system of temperament, and it is agreeable enough to the ear in practice. Let 1 be made the logarithm of the interval of any one of these mean semitones, then 12 is the logarithm of the interval of an octave, or we must choose that system of logarithms in which $\log 2 = 12$. The preceding is such a table; to the mathematician it would be described as a system the base of which is $\sqrt[12]{2}$. But to the musician it may be described as follows: it shows the number of mean semitones contained in every HARMONIC of the fundamental note, from the first to the 250th inclusive. Thus, opposite to 21 we see written 52·71, which means that the 21st part of a string sounds a note which is 52 mean semitones and ·71 or $\frac{71}{100}$ of a mean semitone above the fundamental note of the string. This interval ·71 of a mean semitone is one which, repeated a hundred times, gives 71 mean semitones. All the numbers of the table must be understood to be approximate, within the hundredth of a semitone or thereabouts; which is more than exact enough for practical purposes. The following rule is all that is necessary:—If a note make $\frac{a}{b}$ vibrations while the fundamental note makes 1, then that note is $\log a - \log b$ mean semitones above, or $\log b - \log a$ mean semitones below, the fundamental note, according as a is greater than b, or b greater than a.

Example 1. What is the value of a comma in mean semitones? Log 81 − log 80 is 76·08 − 75·86 = ·22, and the answer is, that the comma is 22-hundredths, or something less than a quarter, of a mean semitone. Raising a note by a comma four times successively would not raise it quite a semitone.

Example 2. What is the enharmonic interval above obtained, in mean semitones? Log 128 − log 125 = 84·00 − 83·59 = ·41, or about four-tenths of a mean semitone. This shows that an untempered enharmonic scale, such as that proposed, if bearable when the sharps and flats are only incidental deviations, would never do for any other key except the natural one.

The following is the complete basis above given, of the enharmonic scale, with all the intervals, measured from the fundamental note, expressed in mean semitones; it shows how much alteration a system of mean temperament would require: it being remembered that although some few instruments have been made which give more than twelve different notes in the octave, this is so unusual a circumstance that it is not worth while to dwell upon it:—

C	1	00·00		G♭	$\frac{36}{25}$	6·31	·41
C♯	$\frac{25}{24}$	00·71	·71	G	$\frac{3}{2}$	7·02	·71
D♭	$\frac{16}{15}$	1·12	·41	G♯	$\frac{25}{16}$	7·73	·71
D	$\frac{9}{8}$	2·04	·92	A♭	$\frac{8}{5}$	8·14	·41
D♯	$\frac{75}{64}$	2·74	·70	A	$\frac{5}{3}$	8·84	·70
E♭	$\frac{6}{5}$	3·16	·42	A♯	$\frac{225}{128}$	9·76	·92
E	$\frac{5}{4}$	3·86	·70	B♭	$\frac{9}{5}$	10·18	·42
F	$\frac{4}{3}$	4·98	1·12	B	$\frac{15}{8}$	10·88	·70
F♯	$\frac{45}{32}$	5·90	·92	C	2	12·00	1·12

The first column gives the name of the note: the second, the ratio of its number of vibrations per second to those of the fundamental note; the third, the interval from the fundamental note in mean semitones; the fourth, the interval between each consecutive pair of notes. The small variations observable in the last column arise from imperfection of the table (every table must be imperfect in its last figures); and we see four intervals in it, namely the old diatonic semitone 1·12, the *major* and *minor chromatic semitones* (as we will call them) ·92 and ·72, and the enharmonic interval (or enharmonic *diesis*, as it is called) ·41. And the major tone is in every instance

maj. chrom. semit. + min. do. + enh. int.

while the minor tone is

2 min. semit. + enh. int.

If we confound the major and minor tone (and to distinguish them is the *ultima Thule* of temperament), we must take a mean value, and substitute it both for the major and minor chromatic semitone. The mean tone is 1·9, which is to the diatonic semitone nearly as 5 to 3. The mean chromatic semitone is ·81, about $\frac{3}{4}$ of the diatonic semitone, and the enharmonic interval is its half. This is a well-known system of temperament (that of Huyghens): the octave being divided into 31 equal parts, five of them are a tone, three a diatonic semitone, two a chromatic semitone, and one the enharmonic interval. Introduce E♯ and C♭, which are omitted in the preceding, and we have the following for a tempered enharmonic scale, upon which we doubt of any improvement being practicable, without attempting the distinction between a major and minor tone:

C C♯ D♭ D D♯ E♭ E F♭ E♯ F F♯ G♭ G G♯
2 1 2 2 1 2 1 1 1 2 1 2 2 1

A♭ A A♯ B♭ B C♭ B♯ C
2 2 1 2 1 1 1

This system however is useless, inasmuch as instruments are required to have only twelve notes in the octave; but we should recommend the student to bear it in mind, as explaining those enharmonic changes which in piano-forte music are only fictions. This scale would enable us to play with equal correctness in all keys up to seven flats among the flats, and seven sharps among the sharps. Naming these keys by their principal notes, they are the keys of

C G D A E B F♯ C♯
F B♭ E♭ A♭ D♭ G♭ C♭

Suppose now there is an incidental deviation into the key of A♯. Looking into the preceding scale from A♯ ascending, we find we can get a whole tone at B♯, but the next whole tone is wanting, nor can we get it except by interposing a note between D♭ and D, two tempered chromatic semitones above C, and therefore called C♯♯ or C×. On the piano-forte we must be content with D for C♯♯, and according we have in like manner

E for D♯♯, D for E♭♭, D♯ for F♭♭, &c.

In the preceding scale also, when enharmonic transitions are written, they can most frequently be actually made; on the piano-forte, though written, they can only be made in imagination. The ear, knowing what is coming, as soon as the enharmonic modulation is *seen*, prepares itself for a change of key, and gives the chord in its possession to the mind, not altogether in the same way as when it was not a note of preparation. If any one will compare the effect of music heard the second time with that produced by the first time, he will, we think, be inclined to accede to our opinion, that sounds heard without any knowledge of what is to come afterwards differ more than those which are heard with such knowledge than the effects of two scales constructed on the two most remote of all the approved systems of temperament. In Huyghens's system, his subdivision is ·387 of a mean semitone, the chromatic semitone is ·774, the diatonic semitone 1·161, and the tone 1·935.

The harmonics of any string C may be readily found from the table, reduced into the octave between C and C^1 they may then be compared with the untempered diatonic scale. For example, what is the 53rd harmonic of C? C itself, counting as the first. It is by the table 68·73 mean semitones above C, lower this five octaves, by subtracting 60, and we have 8·73, lying therefore between A♭ and A, but nearer to the latter.

[CHROMATIC SCALE; DIATONIC; ENHARMONIC. For Scales of Voices, ALTO, BASS, &c. For Scales of Musical Instruments, BASSOON, CLARINET, HARP, VIOLIN, &c.]

SCALE (Mathematics). A scale is any line drawn upon wood or other solid substance, and divided into parts, equal or unequal, the lengths of which may be taken off by the compasses, and transferred to paper, in aid of any geometrical construction. The manner in which the scale is divided depends of course upon the nature of the algebraical or trigonometrical expression the values of which are to be represented. When the subdivisions of a scale are equal, any of the methods noticed in GRADUATION may be employed to obtain them; but in other cases, and indeed in the preceding one, it is usual to form scales by copying from an original which is carefully made in the first instance.

The most simple of all scales is that in which the subdivisions are all equal, or, as it is called, a scale of equal parts. Such a scale is not only the most easily constructed, but may be considered as containing all other scales. For example, suppose it required to lay down very accurately an angle of 25 degrees. It appears [CHORD] that if the radius contain 500 equal parts, the chord of 25° contains 216 such parts and four-tenths of a part. With a good scale of equal parts, and five hundred of them taken as a radius, the angle may be laid down, if required, much more correctly than by a common scale of chords. [PROTRACTOR.] The largest table of chords which is laid down on common scales has a radius of three inches, the five hundredth part of which, or about the 167th of an inch, is a very small length, and it is difficult to trust any scale so far without verification, except the scale of equal parts. In the latter species, one part may be tried against another, and any one may for himself very soon ascertain whether there is any perceptible error. In all the most accurate species of drawing, it is better to rely on tables and a really good scale of equal parts than on any of the common scales, though the latter are generally very good, and will do abundantly well for ordinary purposes.

Long scales of equal parts are made with different subdi visions, ranging from the thirtieth part of an inch to the fiftieth. If the substance of the scale be ivory, an inch will very well bear division into sixty parts, but fifty is more convenient for decimal calculation. A common ivory scale, of a rectangular form, such as is usually found in cases of drawing-instruments, if it have no trigonometrical lines laid down, usually contains the following scales of equal parts:—

1. The quarter of an inch divided into ten equal parts, each of which is again subdivided into ten equal parts by a Diagonal Scale. There are commonly two diagonal scales, one at each end of the scale of quarters, the one on the left dividing the eighth of an inch into 100 parts, and the one on the right the quarter. It will easily be seen that the 400th of an inch is a uselessly small quantity, even when the lines are drawn on ivory.

2. A set of scales in which the inch is severally divided into 30, 35, 40, 45, 50, and 60 equal parts. Ten of these parts make, in each case, one of the larger subdivisions of the scale, and one larger division is also divided into twelve equal parts, so that, when the larger division is made to represent a foot, feet and inches may be easily laid down.

3. A set of scales in which the larger divisions are [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], and [illegible] of an inch. The larger division is, as before, divided both into ten and twelve parts.

When trigonometrical lines are laid down, they are usually one or two scales of *chords*, the radius of each of which is found by its chord of sixty degrees; a scale of *rumbs*, which is nothing more than a scale of chords, the angular unit being, not a degree, but a point of the compass; a scale of sines, with one of secants sometimes added; a scale of tangents, and of semitangents, the latter being really the same scale as the former, but marked with double angles, semitangent being a technical term, not for the half of an angle, but for the tangent of half an angle. We shall have something more to say of these lines under Sector. In Gunter's scale, as it is called, which is a scale of two feet in length, used in navigation, there are also scales of logarithms, of numbers, sines, tangents, &c., and also a scale of meridional parts [Rumb Line]; of these logarithmic scales we shall have to speak more particularly under Sliding Rule.

SCALENE, a name given by Euclid, in his definitions (but seldom or never afterwards used by him), to a triangle no two sides of which are equal to one another.

SCA'LIGER, JULIUS CÆSAR, was born, according to the statement of his son, on the 23rd of April, 1484, in the castle of Riva near the Lago di Garda. The history of the descent and the early youth of Scaliger is involved in inextricable difficulties, as he himself at one period of his life made pretensions, which, though supported by his son, are irreconcilable with other well-attested facts, and which were contradicted and ridiculed in his own lifetime by eminent contemporaries. His real name was Della Scala, and he pretended to be descended from the princely family of the Scalas of Verona. There is a patent of naturalization which, in 1528, he requested and obtained from Francis I., king of France, in which he is called 'Julius Cæsar della Scala de Bordone, doctor of physic, a native of Verona in Italy.' This document, which would surely have mentioned his noble descent, if it had been known, shows either that his pretensions were without any foundation, or at least that he did not indulge in this vanity till at a more advanced period of life. Tiraboschi calls him the son of Benedetto Bordone, a native of Padua, who lived at Venice, carried on the trade of illuminator, and assumed the name of Scaliger, either because he had a scale for his sign or because he lived in a street called Scala. According to Scaliger's own account, he had in his twelfth year been made a page to the emperor Maximilian, whom he served for seventeen years, both in peace and war. Afterwards he retired to Ferrara, where he received a pension from the duke of Ferrara. His parents had died in the mean time, and he now determined to abandon his military pursuits and to apply himself to study. He therefore went to Bologna with the intention of studying theology and of entering into the Franciscan order. But he soon gave up his theological studies, returned to the military profession, and served for some time in Piedmont under the French viceroy. At Turin he was persuaded by a physician to begin the study of physic, which he did in his leisure hours and without leaving the army. About this time he also commenced learning Greek, of which he had hitherto been entirely ignorant. As he advanced, his delight in his new studies increased, and this, as well as frequent attacks of the gout, at length induced him to give up his military life and to devote himself entirely to his favourite pursuits. In 1525 he accompanied Antonio de la Rovera, who had been made bishop of Agen, to his new diocese, in the capacity of physician. The degree of doctor of physic, which is mentioned in the document above referred to, must have been obtained before this time, but in what university is uncertain, though it is generally supposed that he obtained it at Padua. It was at first his intention not to stay at Agen, but soon after his arrival there he fell in love with Andietta de Rogues, a young lady of a noble and wealthy family, whom he married. He now settled at Agen, where he lived until his death, on the 21st of October, 1558. He continued the practice of physic, and at the same time prosecuted his scientific and literary studies.

Considering that Scaliger commenced his studies at so advanced a period of life, and considering the number as well as the value of his works, none of which were published before he had attained the age of forty-seven, it must be owned that he was one of the most extraordinary men of the age. He had a most tenacious memory and a sound understanding. His son praises him especially for his great love of truth, but he was of a very irritable temperament and excessively vain; and he treated every opponent or antagonist with the utmost contempt. Although he thus provoked many bitter enemies, he had many friends among his contemporaries, and scholars of subsequent ages have bestowed on him the most extravagant eulogiums, such as Lipsius, Casaubon, Vossius, Huet, and others. His fame as a scholar, though very great in his own days, has in the more just appreciation of subsequent times been far eclipsed by that of his son Joseph.

The following is a list of his principal works:—'Commentarii in Hippocratis librum De Insomniis,' Græc. et Lat., Lyon, 1538, 8vo. 'De Causis Linguæ Latinæ Libri xviii.,' Lyon, 1540, 4to., reprinted at Geneva in 1580. This is the first great work which was written on the Latin language in modern times, and it is still valuable, though it contains a great many fanciful subtleties. 'Exercitationum Exotericarum Liber Quintus-decimus de Subtilitate ad Hieronymum Cardanum,' Paris, 1557, 4to. The fourteen preceding books, which had no relation to Cardanus, have never been published. 'Poetices Libri Septem,' Lyon, 1561, fol. This work perhaps contributed most to the reputation of the author, though it shows that he possessed more grammatical knowledge than profound critical or creative powers. 'In Theophrasti Libros Sex de Causis Plantarum Commentarii,' Geneva, 1566, fol.; 'Commentarii in Aristoteli adscriptos Libros Duos de Plantis,' Geneva, 1566; 'Aristotelis Historiæ Animalium Liber Decimus, cum vers. et comment.,' Lyon, 1584, 8vo.; 'Animadversiones in Theophrasti Historias Plantarum,' Lyon, 1584, 8vo.; 'J. C. Scaligeri adv. Desid. Erasmum Orationes Duæ, Eloquentiæ Romanæ Vindices, cum ejusdem Epistolis et Opusculis,' Toulouse, 1621, 4to. The first of these orations, which were directed against the work of Erasmus, entitled 'Ciceronianus, sive de optimo Dicendi Genere,' was published at Paris in 1531, and appears to have been his earliest work. Scaliger also published a number of Latin poems, which however are of very little value. The style is often obscure and bombastic.

SCALIGER, JOSEPH JUSTUS, the son of Julius Cæsar Scaliger, was born on the 4th of August, 1540, at Agen. He received his earliest instruction from his father. At the age of eleven he was sent with two of his brothers to the college of Bordeaux, where he applied himself chiefly to the study of the Latin language. After a stay of three years at Bordeaux, he was compelled by the appearance of the plague to quit the place and return to Agen. His father now continued his education, and made him write every day a Latin essay on some historical subject, by which exercise the youth became most intimately acquainted with the Latin language. His father sometimes also made him transcribe some of his own poetical compositions, which seems to have inspired the youth with such a love of poetry, that at the age of sixteen he attempted to write a tragedy on the story of King Œdipus. After the death of his father, when he was nineteen years of age, he went to Paris, where he devoted himself principally to the study of Greek. At first he attended the lectures of Adrianus Turnebus, but when he found that he might make more rapid progress by private study, he confined himself to his room and began reading the Greek writers by himself. He commenced with Homer, and in the course of two years which he spent in his seclusion from the world he read nearly all the Greek authors both in verse and prose. He also turned his attention to Oriental languages, which he likewise learned by himself.

Respecting the years which succeeded this period of intense study, from about 1565 till 1593, we know very little of the life of Scaliger. It must have been during this time that he left the church of Rome and became a Protestant, which was probably the reason why he did not obtain any public appointment in France. In the year 1593 he was invited to the chair of belles-lettres in the university of Leyden, where he spent the remainder of his life, devoting himself entirely to the elucidation of antiquity. He was one of that constellation of great scholars who are to this day remembered as the ornaments of the university of Leyden. Among his numerous pupils was Hugo Grotius, who enjoyed the especial friendship of Scaliger, and who was entirely guided by him in his studies. Scaliger's life in Holland presents scarcely any incidents, and we only know that, absorbed in his studies, he paid so little attention to matters of ordinary life, that he spent many days in his study without thinking of taking any food, and that he was sometimes in a state of absolute poverty. Several persons of distinction, who esteemed his talents and his learning, generously offered to extricate him from his difficulties, but his pride never allowed him to accept any present. He was never married. He seems to have inherited his father's character, for he was exceedingly proud, and, like his father, he treated his literary opponents with the most perfect contempt. He revived and defended the idle pretensions of his father respecting the illustrious origin of his family, in a letter addressed to Dausa, 'De Vetustate et Splendore Gentis Scaligeranæ.' This letter was directed against Scioppius, and was full of the bitterest invectives against that scholar. Scaliger died of dropsy, on the 21st of January, 1609.

As a critic Joseph Scaliger is pre-eminent, and there are very few scholars who can be compared with him. Some of his works even now excite our astonishment and admiration by the prodigious learning which they display, combined with an almost unparalleled acuteness and sagacity. Although in his verbal criticism and in his emendations and conjectures he is often too bold and too capricious, yet all that he has done bears the peculiar impress of his great genius, and he scarcely ever exposes himself to the charge of inaccuracy, from which his father was by no means free.

The greatest among the numerous works of Joseph Scaliger is, 'De Emendatione Temporum,' Paris, 1583, fol. A corrected and much improved edition of this work appeared at Geneva, 1629, fol. In this work Scaliger, for the first time, explained the Julian period in a satisfactory manner, and established a complete system of chronology founded on sound principles. Several errors which were detected in the work by his contemporaries, were afterwards corrected by Scaliger himself, in another work, entitled 'Thesaurus Temporum, complectens Eusebii Pamphili Chronicon cum Isagogicis Chronologiæ Canonibus,' the best edition of which is that published at Amsterdam, 1658, in 2 vols. fol. Among his other and less important works there is a Latin translation of two centuries of Arabian proverbs, published at Leyden, 1623; his 'Poemata,' Leyden, 1615, 8vo.; and his 'Epistolæ,' which were edited by Daniel Heinsius, at Leyden, 1637, 8vo. His poems have little merit, but his Epistles are very instructive, and also valuable for the literary history of his time. Scaliger also edited many antient authors with emendations and annotations, and there are few antient writers for whom he has not done something. His commentary on Varro 'De Lingua Latina' was written when he was twenty years of age; it was published at Paris, 1565, and is reprinted in the Bipont edition of Varro. His edition of Theocritus, 'Cum Emendat. Jos. Scalig. et Is. Casaub. Lect.,' appeared at Heidelberg, 1596, 8vo.; 'M. Manilii Astronomicon,' Leyden, 1600, 4to; Catullus, Tibullus, and Propertius, Paris, 1577, 8vo. He also made emendations and wrote commentaries on Seneca the dramatist, Ausonius, Nonnus, Festus, and many other authors.

SCALOPS. [SORECIDÆ.]

SCALPELLUM. [CIRRIPEDA, vol. vii., p. 208.]

SCAMANDER. [TROAD.]

SCAMMONY. [CONVOLVULUS.]

SCAMOZZI, VINCENZIO, was both a contemporary and fellow-countryman of Palladio, having been born in 1552 at Vicenza, where his father Giovanni Domenico also practised as an architect. He was taught by his father the elementary part of his art, and then sent by him to Venice, where he is said to have studied under Palladio, yet this is exceedingly doubtful, and it is certain that in his writings Scamozzi is rather a detractor than an admirer of that master. Before leaving Vicenza he had given proofs of his abilities and taste in several designs for Count Verlati and others; and in 1569 he was employed to remedy the defects of S. Salvatore at Venice (destroyed by fire, 1741). At the age of twenty-two he wrote a treatise on perspective, wherein he entered at length into the subject of scene-painting. It was in 1579 that he first visited Rome, where the sight of the remains of antiquity filled him with admiration. He was most diligent in studying them, sparing neither expense nor personal trouble; and among other things of the kind he made elaborate drawings of the baths of Antoninus and of Diocletian. Having thus occupied himself in that city for eighteen months, he proceeded to Naples, at which place and its environs he was equally diligent in exploring the vestiges of antient buildings.

On his return home he resolved to fix himself at Venice, as offering a wider field to his ambition. His first occupation there was however with his pen, for, at the request of a bookseller, he wrote the explanations to a series of plates by Pittori, to which he prefixed three chapters relative to antient Rome generally, a work which, although extolled by Maffei beyond its real merits, not undeservedly obtained for him credit with his contemporaries as one of the most erudite in his profession. The recent deaths of Sansovino and Palladio (1570 and 1580) were circumstances in his favour, and caused him to be generally looked forward to as their successor in the public esteem. Accordingly almost his very first work, after the monument to the Doge Niccolo da Ponte, was to complete the public library by the first-mentioned of those architects; he was afterwards similarly employed to finish one of Palladio's, namely, the Teatro Olimpico at Vicenza, to which he added the fixed scena, with its three avenues of buildings shown in perspective, but executed in relief. Although such kind of decoration is utterly unsuitable to the modern drama, and is anything but an improvement on painted scenery, it gave such satisfaction, that in 1588 he was employed by the Duke Vespasiano Gonzaga to erect a similar theatre at Sabbionetta, of which structure nothing now remains.

About this time a deputation being sent from the republic to congratulate Sigismund on his accession to the throne of Poland, Scamozzi availed himself of the opportunity offered him by his friend the senator Duodo of visiting that country, and also in the course of their route some of the principal cities of Germany. It was this journey that first suggested what continued to be afterwards a favourite object of his, namely, the work entitled 'Architettura Universale,' which he intended to be a sort of encyclopædia of the art, and to contain specimens of various styles and examples in different parts of Europe. Nor was this the only result of his journey, for on passing through Salzburg he was introduced to the archbishop, by whom he was afterwards employed (1604) to design the cathedral of that city, which may be considered as his work, though not completed till 1628, and which is described by Temanza as one of the noblest temples of modern times, and greatly superior, as regards architecture alone, to St. Peter's. In the meanwhile his engagements at home were numerous, and, besides many noble private habitations erected by him both in the city and on the Venetian terra firma, he built several churches, among others that of S. Nicolo di Tolentino, Venice (remarkable for having a Corinthian hexastyle diprostyle, subsequently added by Tirali), and SS. Simone e Giuda. But his most important work, that which has chiefly contributed to his fame, is the stately range of building on the south side of St. Mark's Place, called the Procuratie Nuove, commenced by him in 1586. The design itself however may be said to belong nearly as much to Sansovino, at least to have been fixed by him, all the lower part as far as the entablature of the second order being in continuation of the façade of the adjoining public library; while the difference is that the excessively deep frieze and cornice of Sansovino's second order are moderated, and a third or Corinthian story added to the elevation. This last order has been considered by some to be the most elegant portion of the whole, but it is also objected to as destroying the general uniformity, in regard to height, of the buildings on three of the sides of the piazza. Scamozzi was almost overwhelmed with commissions and applications for designs. Among his other works are—the Palazzo Roberto Strozzi, Florence; the Palazzo Pretorio, Vicenza; ditto Bergamo; the Villa Duodo, and seven small churches or chapels at Monselice. He also made two designs for the Rialto bridge, one with three arches, the other with a single arch, but neither was adopted. Thus continually engaged, he had little leisure for his pen, and did not therefore complete his 'Architettura Universale,' which was to have been in ten books, but only six appeared, and those were published only a few months before his death, on August 7th, 1616; two days before which he made a singular will, expressive of a most extraordinary solicitude for perpetuating his name, for having no surviving offspring, he there adopted Francesco Gregori, who died shortly after, and protracted litigation as to his successor under the will was the consequence. What renders such solicitude on the part of Scamozzi an inconsistency is that he speaks of himself as having acquired an imperishable name.

SCANDAL (*scandalum magnatum*, slander of great men). By the statute 2 R. II., c. 5, confirmed 12 R. II., c. 11, as to 'devisers of false news and tellers of horrible and false lies of prelates, &c.'), it was enacted that none devise or speak false news, lies, or other such false things of the prelates, nobles, and great men of the realm. By the same statute the tellers of such lies were liable, as by the statute of Westminster the first, to be imprisoned till they discovered the authors of them. No statutory punishment was provided against the authors, perhaps because they were liable at common law to fine and imprisonment. Upon this statute is founded the action of scandalum magnatum, which is now fallen into disuse, and superseded by the common action of libel and by the criminal information. It lies at the suit of any nobleman, though of a dignity created since the date of the statute, of the judges, and of other great officers of the realm. It has been held that the action may be brought not only for such words as are actionable in ordinary cases, but even for those which are not certain enough to maintain an action against a common person, as where one said, 'My lord has no more conscience than a dog.'

The object of the statute originally, though afterwards it appears to have been applied in private cases, was wholly of a political character. The mischief recited is that 'debates and discords might arise betwixt the said lords, or between the lords and the commons, which God forbid, whereof great peril and mischief might come to all the realm, and quick subversion and destruction of the aforesaid realm.' The statute of Westminster, 3 Edw., c. 33, referred to, is also directed to cure the same mischiefs, the discord and scandal that might arise between the king and his people, or the great men of the realm.

The term *scandalous* is applied to matter in a Bill or Answer in Equity which reflects on the character of a defendant or plaintiff, and is at the same time irrelevant. Such matter will be struck out on exceptions being taken to it and allowed.

(2 *Inst.*, 225; Com., *Dig.*, tit. 'Action on the case for Defamation;' B., *Libel*, C. 5.)

SCANDER-BEG, prince of Albania, whose real name was George Castriota, was the son of John Castriota, one of the rulers of that country. He was born in 1404. His father having become a tributary to the Turks, Scander-beg, with three other brothers, was sent to the court of Muråd II., who lodged them in his own palace, and had them educated in the Mohammedan religion, notwithstanding the solemn promise to the contrary given to their father. After the death of his three brothers, Scander-beg rose in favour with that sultan, who received him into his guard, promoted him, and gave him the appointment of Sanjac-beg, with the command of five thousand cavalry. On the death of his father in 1432, his family dominions were seized by Muråd, who appointed a bashaw to govern them in his own name. From that time Scander-beg formed the design of possessing himself of his principality. Having accompanied the Turkish army to Hungary, he entered into a secret arrangement with the celebrated Hunyade, waywode of Transylvania, and commander-in-chief of the combined Christian forces, and he contributed, by a sudden manœuvre of the forces under his command, to the defeat of the Turkish army on the plain of Nissa (10th November, 1443). Having, in the confusion resulting from the battle, penetrated into the tent of the Reis Effendi, he put him to death with his own hand, after compelling him to sign an order to the Turkish bashaw of Epirus, enjoining him to deliver Croia, the capital, and the surrounding districts to the bearer. Scander-beg left the camp with three hundred Albanians, appeared before Croia, massacred the Turkish garrison, and ascended the throne of his fathers, having previously renounced the Mohammedan religion. A long warfare ensued; but although frequently obliged to retire to the fastness of the mountains, Scander-beg renewed his attacks upon the first favourable occasion, and in this manner destroyed a vast number of his enemies. In 1444 he defeated in the Lower Dibra a considerable force which had been sent against him; and though in 1449 Muråd took from him the important fortress of Sfetigrad, though he invested Croia in 1450, that powerful sultan was at last compelled to raise the siege and retire into his own dominions, where he died (at Adrianople) 5th February, 1451. Mohammed II., who was Muråd's successor, having proposed to Scander-beg terms of peace, which were accepted, that warrior, at the request of Pope Pius II., repaired to Italy, to the assistance of Ferdinand, king of Naples, who was closely besieged at Bari by John count of Anjou. Not only did Scander-beg oblige this prince to raise the siege, but he greatly contributed to the victory which Ferdinand gained over his antagonist near Troia (18th August, 1462). The Venetians having declared war against the Turks, Scander-beg was induced by them to break the treaty by which he was bound, and to make an inroad into Mohammed's dominions. He was again successful, and defeated a considerable force which besieged Croia, the capital of his states. He was at length carried off by sickness at Lissa in the Venetian territory, on the 17th January, 1467, in the 63rd year of his age, leaving a son of tender years, whose guardianship he entrusted to the republic of Venice. His death however was soon followed by the entire submission of Albania to the Turkish yoke. [ALBANIA.] Scander-beg was a great warrior; his enterprise and military skill constituted him one of the ablest generals of his day. Such were his personal strength and his courage in the field, that the Turks gave him the surname of Iskander-beg (Prince Alexander). On the taking of Lissa, where his remains were discovered by the conquerors, the Turks dug up his bones and made them into amulets, under the impression that they would thus transfer his courage to them. There are various chronicles of Scander-beg: the principal and the best is that of Marino Barlesio, his contemporary, which appeared for the first time at Frankfort, 1537, folio, under the title of 'De Vitâ et Moribus ac Rebus præcipuè adversus Turcas gestis Georgii Castrioti clarissimi Epirotarum Principis, qui propter celeberrima facinora Scanderbegus, hoc est Alexander Magnus, cognominatus fuit.' It was afterwards reprinted and translated into French and German. Another anonymous history had previously appeared at Rome in 1537, folio. T. M. Monardo published one in Italian (Venice, 1591, folio), which was translated into Portuguese and into Spanish. There are also 'Histoire de Scander-beg,' by Du Poncet, Paris, 1709; 'Scander-beg, ou les Aventures du Prince d'Albanie,' by Chevilly, ibid., 1732, 2 vols. 12mo.; and two Latin poems on the history of Scander-beg, one by Kökert (Lubec, 1643, 4to.), the other by Busieres.

(Hammer Purgstall, *Geschichte des Osmanischen Reichs*, Pesth, 1827-35, vol. ii.; Hawkins's *History of the Ottoman Empire*, London, 1787, vol. i.)

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